

Antonio Víctor Martín-García *Editor*

# Blended Learning: Convergence between Technology and Pedagogy

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Antonio Víctor Martín-García  
Editor

# Blended Learning: Convergence between Technology and Pedagogy

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# Preface

Promoting a culture of innovation is one of the most important functions and challenges in higher education in the international context. This is because it is understood that the necessity to innovate in the form of generating, transmitting and spreading knowledge does not only affect the improvement of student training, but it is also a fundamental instrument to boost social and economic development, contributing to the joint search for solutions to necessities in our society.

In this sense, the exploration of new university training methodologies is one of the lines of work of great strategic interest in today's day and age at the world's main universities, in complete harmony with objectives and challenges proposed in different international forums, where education and training are key elements for the achievement of general aims. The development of this line supposes transcendental changes in the way of understanding teaching and learning processes, adapted to the new requirements in a globalised and increasingly technologised world. One of the strategies to try to establish the foundations of a new university training model is one which is based on the combination and integration of the face-to-face and virtual (distance) modalities, which uses the now commonly accepted denomination of blended learning, BL, or b-learning.

Generating a b-learning training model, that pedagogically organises the teaching–learning process surrounding in-person and online activities, implies adapting and allowing for more flexibility in the workspace (classroom and virtual environments) and the learning time (class hours and previous study time outside the classroom), in a way that allows for a greater group interaction, a better social collaboration, and, definitively, the efficient construction of knowledge and the improvement of academic achievement. For this, it is necessary to start out from a theoretical approach on learning, and, in particular, to contemplate the student as the centre and protagonist of the learning process, which brings with it a predisposition of an active, autonomous, strategic, reflexive, cooperative and responsible student, as well as instruments for the control of tasks outside the classroom, questionnaires and protocols to stimulate the previous study and to fundamentally increase student participation and motivation.

The resulting training design emphasises both the activities to carry out and the skills and content to learn. Due to this, it is of our interest that the instructional methodology generates and is fuelled by contextualised environments, in the activity systems framework, of thought and reflection, necessary to reach lasting and profound learning. A part of this contextualisation can be obtained in the intersection between face-to-face and virtual learning as a fundamental contribution that BL environments propose.

Part of these aspects and of the general philosophy that inspires this thesis is collected in this book. To summarise, this implies a profound change in the combination of three elements or pillars of training: contents, communication between participants (teachers–students) and the activity system defined in the learning community generated, this activity is based on the rules defined by group work, by task sequencing and by learning results in different degrees of complexity. The training design appears in this way focused on the student and on the real contexts from which they come and where they aim to go. In this model, technology occupies a mediating role between participants and these contexts, contents and the world of disciplinary practice that is dealt with in each case.

Taking these bases into account, this present book is focused on essential aspects related to theoretical foundations that sustain BL as a teacher training modality in higher education. The first part of this book covers some of the changes in the world of education that leads to new ways of thinking and learning in increasingly digitalised environments. This question, without a doubt, requires greater attention as it implies a profound change in the way in which these technological resources are used in education, as well as the necessity to rethink the very pedagogical practice, giving way to new teaching methodologies, just as the training system based on blended learning proposes, practices that should be critically analysed and assessed.

This last point implies a shared reflection on the role that technology plays in the current university teacher training programmes, as well as the role that pedagogy plays in increasingly technified contexts. This critical perspective should also include an analysis of the effects of determined academic policies that tend to instrumentalise the use of the BL methodology with merely economic and functionalist purposes, many times without taking pedagogical efficiency into account. In this line, at the end of the first part of the text, we analyse the questions related to the quality of BL training and the identification of indicators to measure this in BL training environments, trying to recognise the models that contribute to a better understanding of the dimensions that help its efficacy.

In the second part of the book, various contributions are presented that select and describe the most relevant theoretical models on the instructional design of B-Learning in the last few years. The idea is that these pedagogical approaches can help university teachers in the design and implementation of combined learning courses, knowing and selecting diverse technological tools specific pedagogical strategies, thought for teaching work in BL environments. Likewise, we present what we call the Salamanca Model (MoSal) of instructional design that is being applied in some countries in the field of higher education. The book closes with various chapters that cover particular aspects related to the implementation and

application of BL with several aims. Similarly, professional skills and professional external internships are analysed using blended learning as a strategy, analysing the interaction and exchange through online chats and forums.

To sum up, this book looks to provide some answers to questions that teachers propose regarding the use of this new training modality, as well as opening new reflections and lines of investigation in the complex process of convergence between technology and pedagogy.

Salamanca, Spain  
January 2020

Antonio Víctor Martín-García

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# Towards ‘Onlife’ Education. How Technology is Forcing Us to Rethink Pedagogy



Ángel García del Dujo and Judith Martín-Lucas

**Abstract** The objective of this chapter is twofold: on the one hand, to provide an explanation for the need we have today to rethink pedagogy based on new realities and the scenarios in which we live, also in education, generated by the technology of our time and, on the other hand, to point out the direction in which we can find a path that leads us to that reflection in the face of the inevitable convergence between technology and pedagogy in which we are today.

**Keywords** Fourth revolution · Onlife education · Rethinking pedagogy · b-learning

## 1 Introduction

In recent years, advances in technology have generated a considerable and extensive wave of changes and transformations in all areas of life, including forms of political, social, economic and cultural thought and action. These changes have been so important lately and affect our world and everyday activities in such a way that we are being forced, in almost all fields of knowledge, to examine and reformulate long-standing approaches, concepts, perspectives and theories about our ways of being, behaving and doing as individuals and citizens. Ubiquity, connectivity and easy accessibility, characteristics of the information of our time made real by digital technology, are drastically changing the ways in which individuals and society act and think about themselves.

In education, as we will see throughout this chapter, this technology is also making notable contributions to all aspects of the educational process, to the point of even generating new scenarios of action; in this regard, we want to believe that the creation of these new environments, based on the virtualisation of traditional spaces or the

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creation of new ones, is resulting in substantial changes to the educational scene that demand a step forward in pedagogical reflection on forms of knowledge construction, thus going beyond a merely instrumental interpretation of this technology in education, an interpretation that must now be definitively overcome.

Before translating and specifying this reflection on the question that can be found in the genesis and development of this chapter, and with the intention of avoiding certain confusions, we hasten to state that we embrace this conception that virtualisation construes as the process of migrating activity, including the space of the physical world, to a digital platform [1], and the virtual environment as a space of action and information, synchronised or not, housed in different situated contexts and which we access easily, flexibly and ubiquitously, a global space that can be shared and reformulated by subjects and informational entities and that, at the moment, undoubtedly constitutes the main source and place of information and knowledge construction.

With this interpretation of the virtual realm, which enables us to create digital technology, the questions that interest us here come immediately to mind: Does this virtual environment cause a change in the way we human beings learn? Is it likely that the technological characteristics and conditions of this environment will generate changes in forms of action and information processing in such a way that it is appropriate to rethink ad hoc pedagogy? To these and other questions, we will seek to find answers by using Luciano Floridi's interpretation of the world and informational life—onlife—which we take as a starting point with the intention of extracting—and also contributing to—a pedagogical interpretation that ends up explaining, and consequently affecting, ways of thinking and doing education today.

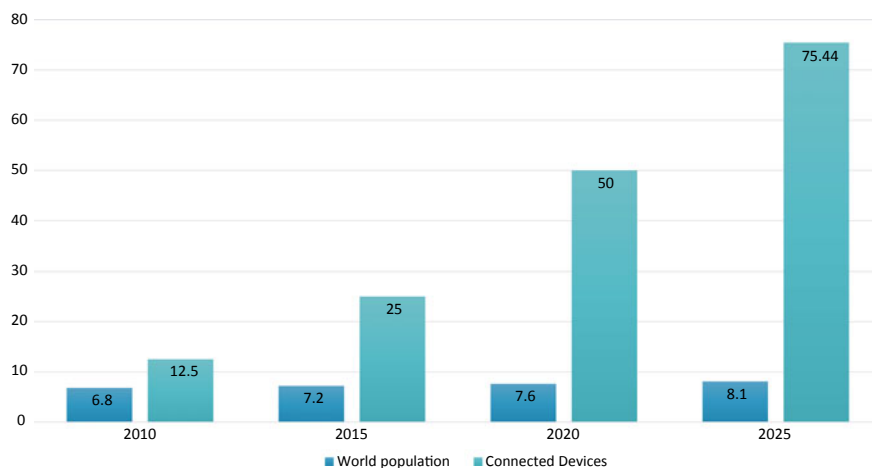
## 2 General Framework of Understanding: The Fourth Revolution

We are currently witnessing one of the fastest social transformations ever thanks precisely to the growth, development and impact of digital technology on all areas of society; no previous generation has ever experienced such a rapid technological (r)evolution with such wide transformative potential. In just a few decades, information and communication technology has changed our forms of relationship, communication, management, production, thought and action, to the point of becoming essential in a society whose dynamics pivot and revolve around information; it is responsible for the immediacy, speed and volatility characteristic of the state of hyperconnectivity in which we live and will live in the future. Information is now the raw material of all sectors of society, including the educational field, because it is here—although not only—where it is generated, transformed and transferred, where information is managed and knowledge is built, individually and collectively. It is not, therefore, out of place to believe that this informational habitat may be demanding a pedagogy that matches the potential of the technology that makes it possible, a pedagogy that has its correlation in ways of seeing—and doing education—more

in line with the reconfiguration being experienced by spaces and times of life, also those of school life, and is giving way to new educational scenarios.

All revolutions that have occurred to date—Copernican, Darwinian and Freudian—according to Floridi [2] have brought about deep changes in political, economic and social structures, which, in turn, have affected ways of doing education. In all of them, in addition, changes in the perception of the world bring about transformations in ways of seeing and understanding ourselves. In the reflection of the author of reference, this begs the question: Will information technologies be responsible for a fourth revolution? At this point in time, there is little doubt that these technologies are not only reformulating our perception of the outside world, but also doing so to our self-perception, which—we add—should have an impact not only on ways of educating but on the theoretical scaffold that we have so far obtained on educational processes; we are, in this regard, at an important time to clarify and understand if the technological artefacts of our time are demanding a reformulation of pedagogy.

Floridi understands [2, 3] that, since the 1950s and thanks to Turing's contributions to modern computer science and advances in the area, we could find ourselves again in a process of re-evaluation of our nature, beginning with a reconsideration of the artefacts that mediate our relations with the world, following that of our environment, by which we now mean natural and artificial, and ending in our own reconsideration, those, and their informational nature, ultimately being the promoters of the whole process. Until now, no society in the history of mankind has been so exposed and connected to such amounts of information in such a way that this technology makes us informational beings, surpassed only by the amount of physical devices responsible for the hyperconnectivity that characterises the contemporary world (Fig. 1).



**Fig. 1** Number of connected devices and population (in billions). *Source* Own elaboration based on Floridi [2], Evans [4], Khokhar [5], Statista [6]

This new reality leads us to think that human beings are no longer unique and independent entities, but *inforgs* [2, 7], informational bodies and entities connected by technology and with technology and information in such a way that we would have become informational bodies interconnected with—and between—other informational bodies and entities. Everything in our ecosystem—bodies and entities, individual and collective, natural and artificial—would be subject to a process of reconfiguration and resignification to the point that the changes and transformations that occur would also be of nature, fully reaching our *modus vivendi* and with the emergence of a new environment—*infosphere* in Floridi's terminology [2, 8–10]—which includes both analogue and digital. In a way, our author of reference goes on to say, we are witnessing a process of 're-ontologization' of our environment because this technology is not only redesigning or rebuilding our world, it is also transforming its intrinsic nature, whose first consequence is that we are increasingly 'inhabiting' more in the digital than in the analogue; the artefacts that at first, still close in time, were presented as instruments that purported to be useful to our way of being and acting would have ended up creating new realities, qualitatively different environments, and even educated us to live in them.

As a result of this re-ontologization, we live in an increasingly synchronised society, a society that also progressively relocates and is characterised by human experience being increasingly deterritorialised and social interaction more digital. Expressed in other words, the digital is merging with the analogue and, in the same way that many physical action spaces are migrating to the virtual world [1], new environments and action spaces are also being created and these have their correlation in the terminology used to talk about both that merger and the ways of living in the digital world. In more general terms, we would say that the progressive computerisation and digitisation generated by the artefacts and spaces that surround us are leading us to experience in crescendo an *onlife* life [2]; it is not surprising that new generations increasingly find it difficult to differentiate between online and offline activities.

And in this general framework of understanding, we situate the following reflection: it is true that the educational has also been influenced by the digital, but, although in recent decades we have introduced digital technology to the educational field, its inclusion in traditional day-to-day education is no longer enough, since, some time ago, it stopped being a mere complement, a simple facilitator of the teaching/learning processes, and became new action scenarios as real as the traditional. Pedagogy, therefore, is obliged to take this reality into account and to analyse carefully if in that new reality, made possible by the characteristics of a technology, new ways of finding, using and processing information are emerging which, we cannot forget, is the raw material in the construction of knowledge that takes place in teaching/learning processes.

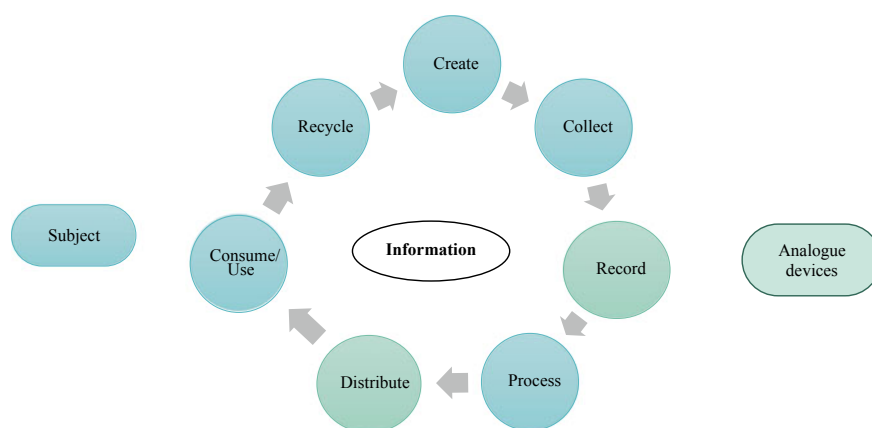
## 2.1 The Impact of Technology on Teaching/Learning Processes

It would take considerable effort to implement teaching/learning processes without these technological artefacts; the changes brought by this technology are of such size and nature that some authors [11] do not hesitate to talk about a new learning ecology, in line with the re-ontologization of the world to which we referred to earlier, let us see:

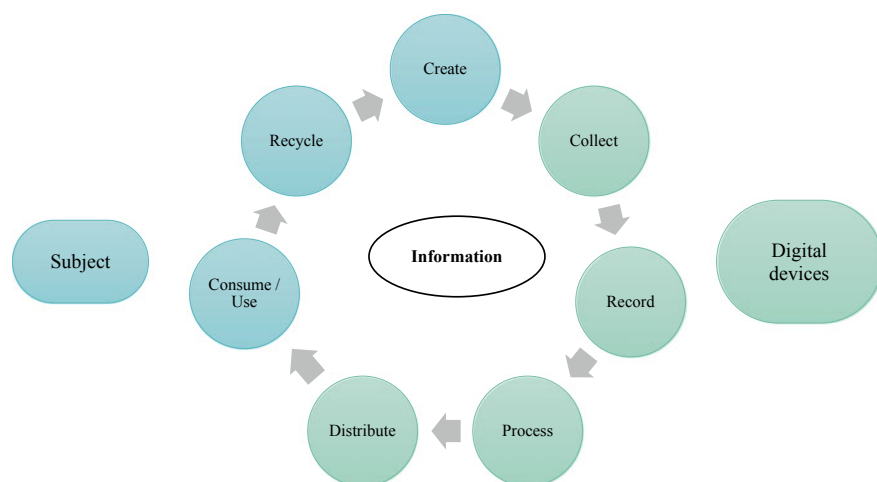
In the *infosphere*, we have new mediums that allow us to free ourselves from certain cognitive tasks, which, in turn, leads us to think that ways of doing education can be affected, redirected or, at least, enriched. For example, if a few decades ago a person had to be responsible for selecting, organising, memorising, summarising, storing, creating and distributing information, nowadays, this technology facilitates and even frees us from some of those tasks, allowing us to focus on others that are more demanding and complex, such as analysis, design and creation of information. To illustrate the assertion that we have just made, we will compare the distribution of tasks in the information life cycle [7]; we can see graphically that, until the arrival of these technologies, analogue devices—books, graphic documents, etc.—basically focused on tasks of storage and distribution of information; it was there, in those activities and phases of the information life cycle, where they fulfilled their function and did so in a way that we could call static (Fig. 2).

By contrast, the digital devices of the moment are capable of carrying out several other activities/tasks in that life cycle, which previously only human beings performed, in addition to performing traditional tasks differently; they even participate in some way in those that seemed to remain the subject's own (Fig. 3).

We have transferred to technology the performance of a significant number of physical and mental tasks involved in the learning process, which should be taken



**Fig. 2** Distribution of tasks in the information cycle in the offline environment. *Source* Own elaboration based on Floridi [7]



**Fig. 3** Distribution of tasks in the information cycle in the online environment. *Source* Own elaboration based on Floridi [7]

into account in pedagogical reflection. At the same time, technology is recomposing, expanding and enriching educational environments and does so not only in terms of reconfiguration and creation of spaces or overabundance of information, but all of this, taken as a whole, is signifying a restructuring of the ecology of educational processes, also affecting its complexity, not only its diversity. In a way, Vygotsky [12] has already warned of this scenario of increased complexity when he speaks of double stimulation as that situation in which a subject faces a problem with the help of an auxiliary artefact; to some extent, this technology, and the scenarios it creates, would work like that second stimulus, or, to put it another way, it provides not only a second stimulus, but many and very diverse when it comes to dealing with a problem.

This phenomenon of double stimulation also forces us to question how to view and categorise this technology within learning processes. We are referring to the fact that, if until now this technology has been catalogued as merely an auxiliary, mediating artefact, highlighting its instrumental character, we should consider it as a secondary or even tertiary artefact due to its technical and pedagogical characteristics and potential in an informational world; we will pause here briefly for its implications in the field of education.

From the perspective of sociocultural theory, we understand by artefact any mental or physical object that mediates our actions towards the achievement of an objective [13]. With technology considered in this way, it is easy to verify the mediating nature that is implicit in its use, since any action we carry out as human beings is mediated by these mediating instruments. Based on this mediating property of artefacts then, and taking as a reference the contributions of Floridi [2], it is possible to talk about different types of artefacts, depending on the nature of the mediated components. A primary artefact would be one that mediates between a person and an object of natural nature; an example is a coat that mediates between a person and the cold of

winter, or a stick that mediates between an olive tree and olive picker in the collection of olives. Not all actions of the human being, however, are related to natural objects, as there are numerous occasions in which we relate to another type of technology that we ourselves have created; that is, secondary artefacts that mediate the relationship between a person and a primary artefact, for example, a pencil used for writing in a notebook or scissors that mediate between a tailor and cloth. While primary artefacts mediate the relationship between human beings and nature, secondary artefacts fulfil their mediating function between the person and another artefact. And there would still be tertiary artefacts, typical of the *onlife* world [14], which would be those that mediate the relationship between technology and technology, understanding that technology can act independently of the human being, for example, a credit card that communicates with a dataphone or mobile phone, which, in turn, does so with a bank's digital platform to confirm the availability of money; another example of easy understanding is found in our famous fitness trackers that communicate with our smartphone, which, in turn, synchronises with an application that connects it to the computer and tells us if we have met our weekly exercise goal, they even compare our activity with that of other users on the application. These tertiary artefacts, despite relating to us, keep us out of certain actions and communications, which seems to lead to the disappearance of boundaries between the human being and machine.

All of this seems to point to the fact then that, on the one hand, primary and secondary artefacts mediate, influence and shape our relationships with the environment, and, on the other, tertiary artefacts are responsible for creating completely new environments that demand a rethinking of the intrinsic nature of action spaces, in our case, of educational action, and this is the main issue that leads us to rethink the role of technology in teaching/learning processes.

It is true that the promoters and defenders of new ways of organising the teaching/learning process—by the way, with great acceptance in the educational field—such as the so-called *b-learning*, tacitly consider technology there implicitly as an artefact that goes beyond the mere mediating instrument [13, 15, 16], but they also fail to clarify the nature or pedagogical potential and demands derived from it. What at first glance seems to be something merely descriptive, categorising the technology used in education as a secondary or even tertiary artefact goes beyond simple adjectivation since it involves reconsidering technology, this digital technology, not only as a useful mediating artefact and even essential in human learning, but as an artefact that can even free the human from certain tasks in the teaching/learning process and redirect attention and activity towards others. By this, we are not saying that these technologies are capable of replacing the teacher—especially if we emphasise the educational function over the instructional or formative—but they can carry out important work as a complement to the teacher whenever—we also want to emphasise—they respond to pedagogical criteria in their use and design.

The informational nature of these technological artefacts in the educational field means that many activities can be carried out in a virtual environment. Moreover, as other authors point out [17], we can consider these technologies as technical actors in teaching/learning processes, since, in many educational activities, these technological artefacts are somewhat more than mediating instruments between the subject

and the learning activity, a kind of educational assistant that, if used properly and pedagogically, not only facilitate the teacher's work, but they can act with certain independence. For Generation Z, it is usual to view platforms such as YouTube to answer questions about subjects taught in the classroom, while there are increasing numbers of YouTuber teachers who create channels to explain their subjects. It is not even strange that more and more people in the educational community talk about the remarkable possibilities that virtual assistants such as Cortana, Siri, Alexa and Google Now can offer if they adapt some of their functions to the pedagogical field [18].

If the information revolution, together with computer technology, is 're-ontologizing' our world, it is appropriate in the pedagogy of our time to pay attention to the new configuration of the environment, also to the new environments generated from virtualisation and living in the digital realm. An environment or environments that, while still under construction, evolve rapidly and where future generations will spend most of their time. A context where a good part—if not all—of educational activities will be carried out. There is no shortage of authors who assert that a day will come when it will be so natural to live in that way, to be an *infor*, that any interruption in the flow of information will cause significant deterioration in subjects and citizens' way of being and acting.

It is clear then that this technology in education has not only come to stay, but is opening a door to a different context and space, a space that goes far beyond the classroom walls, creating a new environment of learning that can be complementary to traditional settings, but that requires a thorough theoretical and methodological review of teaching/learning processes.

### **3 Learning Theories, in the Convergence Between the Technological and the Pedagogical**

We have just seen that the fourth revolution, in which we find ourselves, has brought about a reconceptualisation of relations between the human being and his environment, with unquestionable implications for the ways of approaching education, some not even foreseen yet. This new reality is demanding reflection based on issues of major importance, if what we seek is to carry out quality educational practices adapted to our time; since the beginning of this chapter, we have pointed out these two: Is this technology causing a change in the way human beings learn? Do these technologies influence the ways we process information and build knowledge? Two powerful questions that we may not be able to answer today, although we are already recognising that it will be difficult to achieve quality education if we do not have a solid theoretical scaffold that explains the processes that take place in these new environments. And much less, education.

It is true that there have already been several attempts to explain how learning occurs in virtual environments and if this technology is transforming our ways of

learning or not, but it is nevertheless the conclusions and proposals that have been made throughout the last decade that do not seem robust enough to shape that theoretical scaffold that we are seeking, with the ultimate intention of understanding how we learn through this technology; moreover, some of these proposals have been greatly criticised for not rigorously considering theories but rather pedagogical approaches, as in Connectivism [19–21]. In any event, what is discerned from these criticisms is the need to reformulate the theoretical body that we have had about learning processes, including developing a new one that responds and gives pedagogical reason to the implications of a technology whose nature and potentiality still exceeds the limits of our minds; let us get to it.

We will begin by saying that, without forgetting the valuable theoretical contributions that have allowed us for a century to sufficiently understand how learning occurs, the question we are asking now is whether these contributions sufficiently explain how technology-mediated learning occurs in our time or if they need an update according to the potential of this technology, since it is of little use to integrate technology into educational processes and environments if we are not in a position to explain how learning occurs through these artefacts and in these new environments. This is the fastest way to reduce technology to its merely instrumental nature and to make pedagogy a very secondary and even useless discipline.

We have already mentioned that, throughout history, knowledge that seeks to explain learning has taken into account, in its social version, the technological development of the time. And in this regard, and thanks to the contributions of the pedagogical theories of social constructivism, which is concerned with understanding and studying the context of human activity within social systems and their environment [17], we can continue affirming that learning is a situated, contextual, distributed, interactive process, and the result of the participation of people in the community. That said, since we are not sure that these approaches are sufficient to understand technologically mediated learning in an informational world, we will conduct a conceptual review of these theories taking into account the changes and transformations that have occurred in recent decades, in case we find any clues or direction that leads us to a better understanding.

The current conception of learning continues to owe a debt to the original work of the school of thought led by Vygotsky and Leontiev, who are ultimately responsible for many successive approaches that, since the beginning of the last century, have tried to explain the ways in which learning occurs. In this regard, we are interested in mentioning that the main elements on which that original activity theory was based, in connection with the philosophy of Kant and Hegel [22], as well as Karl Marx [23–25] and developed throughout three generations [13, 26], continue to be protagonists in the approaches that continue to seek to explain learning over the centuries, despite having been raised for a long time and in a context outside virtual technology. Consequently, our intention now is not so much to analyse these theories, as contributions in this regard abound, but to dwell on those most representative aspects on which we can support our reflection on the ways in which learning takes place in this new ecology of education that we referenced in the previous section.

From the outset, we will recognise that Vygotsky's talent was to visualise the mediating component of social, historical and cultural factors within learning processes, granting a leading role in educational processes to the interpersonal versus the intrapersonal. Through the well-known triad of subject, object and mediating artefact, Vygotsky shows that the interaction between subjects and the environment does not occur directly, but as a mediated action, in such a way that the educational action will also be mediated by artefacts—understood as signals and tools—of a physical or mental nature [24, 27]. Artefacts that arise, develop and transform into concrete contexts throughout history and as part of cultural and cognitive development [19].

Vygotsky proposed the first triad scheme, extended by Leontiev [28] and illustrated by Engeström [26, 29], with the intention of overcoming the unit of analysis focused on the individual and considering collective action instead; therefore, in the learning process, the subject, object and mediating artefact should not just be taken into account, given that rules, norms and division of work also come into play in the individual's activity processes. It is appropriate at this time to identify the components of an activity system [13, 22, 24, 30]:

- The activity, considered as a hierarchy of actions that are aimed at transforming objects.
- The subject, individual or group that is part of the educational activity and, at the same time, the subject that mediates it.
- The physical or mental artefacts, which can be catalogued into primary, secondary or tertiary artefacts, and which mediate the process and through which the subject can reach an objective and accumulate and transmit knowledge; their use is what shapes the way we think and behave. Understanding of both the world and artefacts changes continuously as a result of their interaction.
- The object or objective, the mental or physical product that is requested (subject matter, skills, abilities, competences).
- The expected results, the problems we seek to solve or products we seek to achieve.
- The community, which defines both the social and cultural reference groups in which the activity is inserted and the subject that shares the same objective as the group of individuals who will carry out the learning activity.
- Certain norms or rules explicit or implicit in a behaviour that regulate the actions and interactions within the activity.
- The division of work as the set of actions, tasks and operations that are carried out.

What we have just shown supposes that learning requires the mediation of artefacts that allow a process of dialogue between the subject and the community, and that is where technology, as an artefact, currently plays a fundamental role in that mediation and communication—as we mentioned in the previous section. In this process of dialogue between artefact and subject, both the action and the mind of subjects and communities are shaped by cultural artefacts [31], which inevitably are also transformed as a result of the performance of the activity as a whole.

Expressed in other terms, learning is a process of self-social-construction of knowledge, an action or set of actions where the subject explores from what he

knows to where he arrives in a self-regulated way, together with the community, and in which all mental processes are influenced by culture [27, 32]. The action is always orientated towards an objective, being the result of the participation of the subject in his community; therefore, the activity will inevitably be situated in a specific context, at a specific time, and marked by the history and culture of the environment where it unfolds. In his attempt to understand the complexity that characterises our society, Engeström [26], in his theory of expansive learning, concludes that reaching the goal to which the action is directed sometimes involves going through several cycles of activity, that is to say, in order to acquire new knowledge, to obtain a culturally new result in a context marked by the complexity and overabundance of information, subjects go through several cycles of activity, acquiring knowledge through the construction of a new activity [33–36]. In other words, focusing on the topic at hand, it is no longer enough to develop new learning activities since the virtual environment generated with the help and support of technological artefacts promotes the development of new forms of activity. A student is no longer only a consumer of information, but also, even without intending to be, a creator of content, information and knowledge. The virtual environment, together with the technical actors that we mentioned in the previous section, is responsible, due to its technical characteristics, for learning happening in much wider, complex and chaotic spaces.

Parallel to the progress and development of activity theory, in 1991, Lave and Wenger [37] presented their theory of situated cognition in a context where digital technology begins to spread and integrate into human activity through technological artefacts. We consider this perspective as the worthy heir to the Russian school of thought because it addresses the issue of learning by taking the main elements of the Vygotskian approach, emphasising the space in which the educational action occurs and adapting the main contributions of that to its time. This theory places the spotlight on the fact that the learning activity cannot be understood outside the context in which it takes place; without taking into account the context, it is difficult to understand why subjects do what they do or why the results are what they are. Cognitive processes, thoughts and learning need to be located in physical and social contexts, since it is in the community setting that learning actions make sense [38–41]. This approach allows us to confirm what we already stated at the beginning of this section: that learning implies a complex network of relationships between the subject, the reality of its context, time, social interaction, culture and change [42, 43]. But not only that, because, to a certain extent, the impact of technology within educational processes began to be discerned; authors such as Salomon [40], among others, relying on the potential of technological artefacts and taking into account the social factor of learning, supported the notion of understanding learning as a distributed action, that is to say, although the subject retains his cognitive identity within the community of which he is part, knowledge is distributed. Even other authors, on the grounds that no person or device is in possession of all of the information necessary to complete a task or solve a problem, agree that it is not only knowledge that is distributed, but cognition is de-localized, it is situated beyond the limits of the brain. In this regard, cognition unfolds—not divides—between the mind, body and environment [44–46]. This conception explains the impact that technology began to have on

learning processes, as it began to be the main source of information storage. The rapid evolution and technological revolution seemed to demand new ways of understanding educational action and thus emerged an approach that sought to regenerate the theory of learning today, connectivism. Siemens [21] attempted to provide an answer to how learning occurs in an environment mediated and influenced by an overabundance of information and digital technology. This approach has been the most controversial. We remember that Siemens himself, who published his theory in his personal blog, ended up deleting the original document from his theoretical proposal and any trace of it in the wake of the considerable criticism he received [19, 20, 47–49].

However, even concurring with some of the authors cited that connectivism cannot be considered a theory because of its lack of consistency and empirical evidence, we agree that, considering this approach from a pedagogical perspective, it can offer us valuable contributions when it comes to creating a theoretical construct that allows us to clarify whether the digital environment, as a new habitable environment for the human being, together with technological artefacts, is changing ways of doing education. Siemens [21], in his reflections, given the ubiquity of the virtual environment, alluded to the fact that learning does not occur by following a taxonomy, or a series of stages, but chaotically in this new digital habitat, since ubiquity and the extent of this new environment in which to build knowledge make the learning process an unpredictable action.

At this point, and in order not to deviate from the objective we pursue, we consider that the theory of situated cognition, together with some of the contributions of connectivism, constitutes the most significant current trend for interpreting educational action, which would consequently be:

- interactive, because it is the result of a mediated process in which the subject's action begins in an activity of a collective nature, mediated by artefacts that allow him to achieve an objective. Knowledge cannot be understood outside of social interaction; the relationship between thought and the world is a living process because thought is inherent in conversations with ourselves, a collaboration of our inner world [32]. Therefore, and as Salomon states [40], knowledge is socially built. The processes of social interaction of the individual with his environment modify and transform his ideas and beliefs [50].
- contextual, the activity takes place within a unique context [51], a community. Knowledge is built within activity systems understood as spaces, both virtual and physical, where people acquire their own community patterns. The activity is carried out by individual and group actions and only makes sense when interpreted in relation to the activity systems that are related to each other in that space [52]. Wertsch, however, in 1988, pointed out that situational contexts are not determined by the physical context, but are created by the participants within the context itself, a key argument to support the explanation of that sense of decentralisation of learning in a society mediated by technology and the virtual environment. Virtual spaces allow us to physically relocate that sense of community, giving rise to the virtual community.

- distributed, at a time when information flows and changes with some speed; for knowledge to be useful it has to be shared by the community. No person or device is in possession of all of the necessary information to complete a task or solve a problem [45, 53]. The web environment allows access to a large amount of information, if not unlimited; ubiquity, characteristic of this type of environment, could also situate it as a community conducive to learning processes, where knowledge would pass from the social to the individual level, always in feedback processes.
- product of the analysis and summary of information that takes place in activity systems; therefore, conscious knowledge arises from actions related to certain types of activity and goes through the same stages as the activity as a whole [27]. At a time when advances in technological and information sciences facilitate and allow access to a large amount of information at any time, our learning largely depends on the analysis and summary of many more sources of information than we had available in the analogue world.
- creative, both individually and as a community. The construction of meanings is different in each of us, knowledge takes shape in the body and mind of the individual who builds it, which means that it will always be impregnated with the prior, contextual, social and cultural experiences of each individual. To the extent that knowledge is shared, it is dialogically constructed interdependently with others and acquires truthfulness through consensus with the community [45, 51]. Thanks to their characteristics, technologies allow us to transmit, share and distribute our thoughts, beliefs and ideas with some ease, which means that we can summarise information from numerous sources and generate a more creative, original summary of the new information we create.

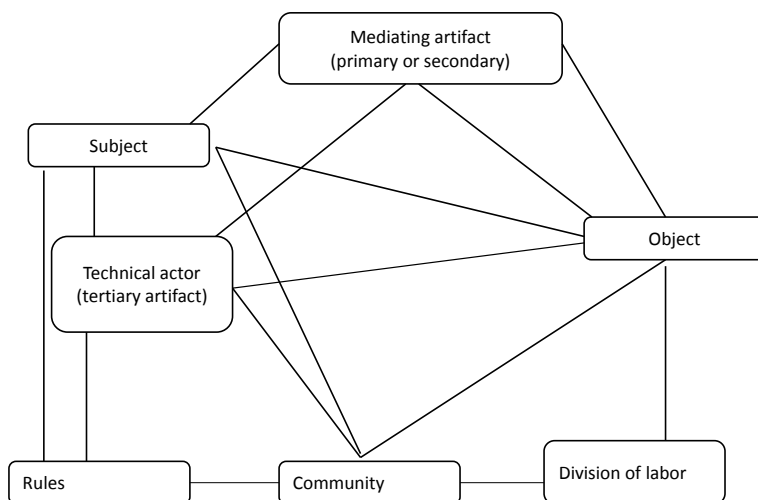
The theory of situated cognition, endorsed by the socioconstructivist heritage and reinforced by pedagogical contributions made in recent times [19, 21], provides important arguments to justify the notion that educational activity cannot occur outside the context in which it takes place; in addition, and in relation to advances in the field of artificial intelligence and neuronal exploration, it warns that they will not be useful in the educational field if they are taken in an isolated, individualised way and outside the environments in which the action takes place, even more so if we take into account the complexity of the characteristic deterritorialisation of our digital habitation, which affects educational processes. The activity of learning and knowledge construction not only depends on our capabilities as human beings, but also on the time, place and situation in which educational action occurs.

Up to now, analyses and approaches that seek to justify the technological in relation to the pedagogical have done so, on the one hand, by differentiating these two areas as components and separating our ways of working and inhabiting the online and offline, and, on the other hand, by relying on innovative practices and methodologies such as b-learning; an example of this is the thinking of Fadli, Gordon and Ellison [13], which links the celebrated triad of activity theory with the b-learning model, separating the spaces and times in the convergence between the technological and the pedagogical. Perhaps this is the time to accept the *onlife* world and, returning

to the subject, object and mediating artefact triangle, grant technology a different category as a technical actor, which could well be situated at the level of the subject.

As can be seen in the following figure, although the theoretical scaffold remains at first sight the same, its updating allows us to situate both the subjects and the technical actors as protagonists of the educational process, given the versatility, ubiquity and even autonomy that they can acquire as tertiary artefacts. This approach leads us to face a more complex, even chaotic, scenario characteristic of this hyperconnected information society; hence, in the figure that follows, educational situations could be diverse, both in the beginning and in the result. A characteristic example of the moment in which we are now would be the fact that the activity can be started on the basis of a subject that, through physical or technological artefacts, seeks an object, for example, analysing data from research through a supercomputer; we are interacting with our computer which, in turn, is communicating with the supercomputer to which they give us access and is activating, through its internal rules, the protocols and steps necessary to analyse the data. Moreover, as we have already mentioned, the role of virtual assistants can even acquire great prominence in learning processes. In the not too distant future, we may not have to type into Google the search terms that interest us or refine keywords, we will simply have to entrust all of these tasks to virtual assistants; these types of assistant could even keep track of our academic progress and collaborate in improving our weaknesses (Fig. 4).

At this point, it is necessary to recover the two major changes that technology has generated and that are affecting the theoretical rethinking that we have been talking about in this chapter: on the one hand, one of the most important transformations that our digital habitation has facilitated is acquiring and generating knowledge because educational activity does not require a community that is physically present at the time of the educational action; although a subject is physically surrounded by other



**Fig. 4** Activity theory triangle adapted to *onlife* world

subjects, he can resort to the web environment in order to share, and extend his knowledge and thought to what Glassman and Burbidge [54] call other 'realms'; the information at his disposal has been created and shared by subjects, by the virtual community. Hence Uden's [55] noting of the importance of knowing and taking into account that individuals who participate in an activity are in turn part of the activity that is being carried out in other communities. Transferring this reflection to the educational environment, it is understood that a subject who participates in an educational activity in person in the classroom, can also do so online by being connected to the Web at that moment, where he can have access to other types of educational communities or resources that may well be part of that same activity by sharing the same goal.

And on the other hand, technological development is providing us with countless artefacts, instruments and digital devices that help us to not only inhabit a virtual environment, but also to perform everyday tasks. Artefacts that are also available to us to continue to evolve and generate greater technical and scientific development. This technology offers so much ease and comfort that it has become essential for the latest generations, such as Generation Z, which already considers it a necessity [56] and it is obvious that we are increasingly dependent on it to perform many of our daily tasks, whether work- or learning-related; today, technology not only allows us to mediate and facilitate educational work, it has also become an element that enables us to interact in our everyday activities.

All of this makes us think that we have a theoretical scaffold that allows us to explain how learning occurs, a scaffold whose origin and fundamental principles are found in activity theory, since that triad—subject, mediating artefact and object—would not need drastic transformations; however, these approaches need updating and reconfiguring in order to adapt them to the *infosphere*. This reconceptualisation may well come, on the one hand, from a way of cataloguing technology as a secondary or tertiary artefact and technical actor in learning processes, and, on the other, from recognition and acceptance that we increasingly live in the online realm, which, in education, has implications in two directions: the virtualisation process not only allows the transfer and even migration of physical spaces to the virtual environment, for example, virtual repositories and libraries hosted in the web environment, but this technology also allows the creation of other spaces that do not exist in physical reality, such as worlds created in online and multiplayer video games, such as Fortnite, World of Warcraft and League of Legends.

## 4 Conclusion: b-learning in the Onlife World

Given this convergence between one and the other, the *online* and the *offline*, the technological and the pedagogical, b-learning could very well present itself as the most representative methodological model of teaching/learning in these moments and the immediate future because it is the only one that so far has been able to integrate and accept the important role that technology and information have acquired in

educational processes, the only one that has sought, at least in theory, to overcome the flaws of poor integration of technology into the classroom, by which we mean the consideration of technology as a simple instrument of and/or complement to educational action. A model that is evolving and seeking to find and integrate resources and tools that allow teaching to adapt to the demands of today's society.

As Floridi astutely advanced [8], we are probably the last generation to differentiate between online and offline; anyone born around the turn of the century is growing up and developing in a wireless, hyperconnected and superinformed world, a world in major transformation when compared to the social changes of previous decades. In addition, changes in the information society are affecting the nature of reality, also of educational realities. Instant access to information means that we can transform and reformulate it in short periods of time, with implications for forms of transmission, acquisition, creation and dissemination of knowledge. We are faced with a different, complex and, to some extent, chaotic scenario, a scenario of change that is not only permanent, since societies are accustomed to permanent changes, but also accelerated, and even hurried, which demands more flexible structures in the educational sphere and ways of thinking and action in constant revision.

Education scenarios in the future will be—they are already becoming—multiple, diverse and very different to those that we are acquainted with, scenarios that are still presented to us today as uncertain for several reasons: not only is technology allowing the migration of existing educational spaces and creation of new ones, but the information and interactions it supports, which flow in different directions, can also be split and mediated by technical actors who, in turn, have autonomy to be able to communicate with other technological artefacts without taking into account the subject. Hence, learning processes increasingly give us the feeling of being more global and de-localized. This situates us in a scenario that demands methodologies that are capable of educating for the unpredictable and the complex so that the teaching subject can achieve his own orders [52]. In short, the technological revolution demands a pedagogy that—in the first or last instance, as it may be seen—is capable of educating people with the capacity for change.

The success of b-learning is down to the fact that it is able to listen to society, properly interpreting what the technology of our time is capable of providing us at the time it demands. Moreover, it is methodology, a way of organising the teaching/learning process that adapts to the demands of the *infosphere*, eschewing the classic epistemological culture of consumers and passive recipients of information; on the contrary, relying on technology as a liberating tool for certain basic cognitive tasks, it seeks to foster a culture of educating critical subjects, producers of information and proactive people who learn the new rules of the activity in an *onlife* world; in the end, information and knowledge have become both consumer goods and raw materials that we generate and transform.

Based on the theoretical legacy of the Russian school and, more specifically, on the theory of situated learning, b-learning is also going in that direction and aims to reach that non-differentiation between online and offline [57], which means a challenge not exactly for generations to come, but for us teachers who are currently straddling the classroom and virtual fields and making notable efforts to understand

and integrate technology into our teaching methodology, although we are often far from generating a class typical of an *onlife* world, as technological development advances much faster than the theoretical and practical capacity of our education to integrate these advances. Proof of this are the different research works and meta-analyses carried out that point to the fact that many of the teachers in higher education, despite viewing digital technologies as artefacts that mediate that subject-object relationship, have difficulty implementing a b-learning methodology in its totality, that is, making the leap towards the *onlife*, a leap that would be reflected in the moment in which technological artefacts are seen in another way [58, 59], for which thought, action and training in that direction are required.

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# On Blended Learning Flexibility: An Educational Approach



José Manuel Muñoz Rodríguez and Alberto Sánchez Rojo

**Abstract** The aim of this chapter is to show that, while the implementation of the blended-learning methodology in our classrooms may represent clear improvements from an instructional point of view, it does not necessarily produce improvements from an educational perspective. Blended learning raises the possibility of carrying out certain learning activities outside the classroom that traditionally could only take place within it. This is made possible thanks to the emergence of ICT, which makes certain tools available for this purpose. It is, however, worth asking whether the carrying out of these activities inside or outside the classroom produces the same or different outcomes. It is possible that there are experiences that are not worth making more flexible, despite the fact that academic results can improve. Education is a process that pursues ends rather than results. It is for this reason that it deserves to be thought of in the long term. Blended learning can improve academic results in the short term, but we should ask whether it is also positive in the long term. This is what we intend to address here.

**Keywords** Blended learning · Education · Flexibilization · Device · Place · School

## 1 Introduction

In his book published in 2015, *The Philosophy of Living*, the French philosopher François Jullien explains his understanding of teaching, what happens in his classes and what he expects of his students. At a certain moment, he pauses briefly in his discourse to comment on something that has happened lately in the classroom and has attracted his attention. He explains that many of his students attend class with a tape recorder to record the entire lesson. The fact that they do may seem quite

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understandable. Philosophy classes are not simple, complex concepts are dealt with. Because of this, it is not uncommon to get lost at some point. It is true that, if this happens, we can always ask the teacher to repeat it again. If the teacher is good, he will certainly have no problem repeating the point and may even express himself differently to make it clearer. That said, having to raise your hand to say publicly that you did not understand something usually creates a lot of insecurity in the student. He does not want the pace of the class to slow down for him, nor does he want to stand out from the others as the only one who was not able to grasp the idea. It is for this and other reasons that many students choose not to say anything when they have difficulty understanding something.

Tape recorders would partly solve this problem. If the student records the class so that he can listen to it later as many times as he wants, the teacher will not need to repeat anything and, in turn, he may be more relaxed in class. He has a device that will enable him to listen later to the lesson as many times as he wants. He will not have to slow down the pace of the class or publicly show his lack of understanding. Our current educational systems, based on the measurement of results and competition, make us view failure as something negative and, therefore, difficult to acknowledge [1]. Therefore, everything that makes it possible to prevent us from stating that we have not arrived where we should have is usually quite well received. This is the case of recorders. However, Jullien believes that claiming that what happens in class happens again later is absurd. There are aspects that cannot be recorded, so the classroom and its recording can never be the same.

According to him, the recorder does not help, but rather it hinders the students who use it. They relax with the thought that the lesson will be eternal, they are less present and, therefore, they miss the unrepeatable class, which is what is really worth it. Following this idea, he usually recriminates them in this way: 'You are doing this to avoid being present and having to listen. You believe you will be better able to make use of this account (to listen to it again at leisure, and so on) but, in fact, you are making a preliminary arrangement in such a way that you will never listen to it, so you are never actually listening at all. Not now, since you know that you will be able to listen at your leisure, when you want to, ad libitum, as many times as you like. You are therefore given a guilt-free reason to be less attentive now and to let it pass by—you have put in place a system of security. Not later, because, if (when) you listen again, it would be in the mode of what has already formed a rut, towards which you have already prepared yourself, have become used to, and from which you are at least a little immune and indifferent—whose effects you will have taken the precaution of stifling' [2].

Thus, Jullien's students, seeking to make their presence in the class more flexible, end up missing it. If there is something that has characterised blended learning from its origins, it is precisely flexibility [3]. Aspects that previously could only be worked on face to face in the classroom can now be addressed outside thanks to the emergence of information and communication technology (ICT). As has already been observed in other chapters, blended learning mixes online learning and face-to-face learning. That is, this methodology does not entail leaving face-to-face learning behind. Nor does it have the intention of reducing the use of ICT to activities related to themes

seen in class, but in a way totally independent of this. It is rather that both the online and the face-to-face part are directly interrelated, to the point that one cannot operate without the other.

That said, time and online space is very different to face-to-face. The school and classroom space have little or nothing to do with cyberschool and the virtual classroom. When we implement blended learning in order to truly combine online and classroom learning both areas are clearly changed. They cease to be what they were separately. They become flexible to become compatible, the activities change and, therefore, also the processes, results and assessment methods. Face-to-face classes, which used to serve one purpose, are now used for another. Online activities, which in origin began to form part of classroom teaching as a complement, become a substantial part of the process. However, just as a face-to-face class ceases to be what it is once we observe it recorded, working on the theoretical part of a subject interactively at home is not the same as doing so by listening to the teacher in class. Flexibility can make us gain things, but also lose others. Thus, it is important to pay attention to how each space works separately so that, when combining them, we do not lose anything that could be essential from an educational and pedagogical point of view.

Following this purpose, we will begin by analysing the school and classroom as traditional spaces of knowledge transmission. Second, we will address blended learning in a generic way, how it arises and what it contributes to the teaching and learning process in general. Finally, we will conclude by indicating which pedagogical elements should be taken into account when introducing this methodology. While it is true that its use can improve student results and optimise the acquisition of certain learning, there will be activities, not entirely compatible with this model, which should be maintained in order to fulfil aims that are not so much instructional but pedagogical. Flexibility has certain educational limits that should not be broken. Knowing them is essential before considering implementing the blended-learning method, as it is important to avoid consequences as disastrous as the situation with Jullien's students and their recorders. This is what we will seek to highlight below.

## **2 The School and the Classroom as Educational Places**

### ***2.1 The School and Its Surroundings: Between the Institution and the Place***

If we view the school not so much as an institution, but simply as a physical space, we will see that, in itself, it adopts a peculiar character. This could undoubtedly be due to the fact that a large number of school buildings, vestiges of an age of surveillance and control, have a very similar architectural structure. The origin and extent of national education systems throughout the nineteenth century in the West coincided with an age in which the tendency was to homogenise and control individuals. It was about

disciplining them and making them adopt and follow a series of behaviours for which it was important to be able to observe, monitor them and correct their faults if they were detected. Thus, as Foucault showed, factories, hospitals, prisons and schools were built from this perspective of surveillance [4]. However, it would not be so much this architectural resemblance that gave the school this special character, but what happens in it. There are things that can only happen in schools. Thus, even if its structure is architecturally reminiscent of a factory, hospital or prison, it will in no way be comparable to them.

Indeed, there are authors who remind us that the school and what happens in it exceeds its physical limits. School time would cover not only the period that students, teachers and other staff spend in it, but also the outbound path, which leads to it, and the return, which gradually makes us leave its radius of influence. It is necessary to prepare to go to school, as well as to get out of it. The school is not any space. It has a series of dynamics and determined processes for which one must be prepared. The school bag with materials, snack for break time..., students have the duty to verify that nothing is missing so that the dynamics can follow the marked course. That said, someone might decide to deviate from the path. There are lazy students who choose to be late or even play truant, although usually remaining close to school. Being late, playing truant and wandering the streets that lead to and away from school have always been educational learnings included in that time interval that from children we are forced to spend in school. It is true, as Trilla notes, that 'for some students, such surroundings are as if they do not exist. Those children that the school bus captures near home and leaves inside the door or right at the door: for them, the surroundings of the school are the school bus and the field of vision that they reach through the window.' In addition—the author continues—'for certain schools, their surroundings do not have any significance or, if they do, it is a negative sign: the institution is conceived as an island, as a redoubt that, for various reasons, should be separated as far as possible from its surroundings' [5].

Both circumstances are interpreted by this author as negative. If we remove the surroundings from the school, we begin to lose some of its essence. If this is so, it is because the school is not simply a space, but a place. According to Casey, 'place situates time by giving it a local habitation. Time arises *from* places and passes (away) *between* them. It also vanishes *into* places at its edges and *as* its edges' [6]. A place is not simply composed of a physical space, but also includes each and every one of the relationships that occur between the subjects and objects found in it. That is why it marks time, situates it, adds a certain rhythm that distinguishes it from any other time. Studying at home is not like studying at school. Playing at home is not like playing at school. The arrangement of the furniture, the timetable and each subject, the breaks and the playground, the caretakers, the teachers and the head teacher. Everything, absolutely everything, to the smallest detail, is there to make that building a place, that is to say, a unique space.

Philosophers always knew the importance of a place. A place provides order, stability and allows the grounding of subjects. While it is true that the science of the last three centuries has sought to make us believe that the important thing is not place but space, because it is measurable and quantifiable [7], experience tells us that

places are not interchangeable: as much as two spaces have the same dimensions, are structured in the same way and even have identical furniture, they can never be interchangeable. If this is so, it is because of the human presence. Heidegger notes that ‘we attain to dwelling, so it seems, only by means of building. The latter, building, has the former, dwelling, as its goal’ [8]. We build, therefore, to inhabit, to make ourselves present in a space that will be ours from the moment we begin to make it our own. If two places cannot be the same, it is because the relationships that occur in them create foundations, a base, a history that remains and cannot be erased. It is true that there are constructions that are not made to be inhabited, such as circulation areas, lifts, buses, roads and supermarkets. Those spaces are built to be temporarily occupied, but not to be inhabited. Houses, rooms or offices, that is, spaces whose construction is essentially determined by the people who occupy them, arise to belong and to remain in time. These are places. These are spaces that are not occupied but inhabited.

From childhood, we are taught to distinguish between spaces. Although at first all of them seem to be the same because it is not our responsibility to change from one to another, little by little, we become aware of which ones are more our own and in which we are called upon to really be ourselves. According to Tuan, ‘places stay put. Their image is one of stability and permanence. The mother is mobile, but to the child she nonetheless stands for stability and permanence’ [9]. It is for this reason that our first places are people and concrete objects. Then, as we grow, we inhabit wider spaces, where several people and objects can fit, whose interrelation gradually becomes more complex. The important thing is how we are taught and how we learn to feel and move in them. ‘The childhood experience that determines spatial practices later develops its effects, proliferates, floods private and public spaces, undoes their readable surfaces’ [10], it therefore being essential to attend to it carefully.

With regard to schools, it seems that today we are still insisting that they are circulation areas. They would be intermediate places, between the private and public spheres, which serve as a link between the two areas. We are born in a specific family, where we acquire our first vital learning. Our first view of the world, which allows us to move in it with a certain sense conveyed by our family. That said, the world is plural and increasingly so, in a manner that public space is made up of the most multiple and varied private perspectives. The family is capable of conveying a very small vision of reality, so, as a result, in order to broaden the horizons that society requires of us, school is necessary. This institution prepares us for the public sphere, where we will have to live in the midst of great diversity. This diversity will sometimes suit us, but sometimes not. It is for this reason that we must know how to listen, how to dialogue, how to fight, but also how and when to yield in order to reach agreement. It is about learning to live as fairly as possible, avoiding all violence. Thus, as Fernández Enguita argues, schools must ‘fully empower all people to function as workers, as citizens, as consumers, as participants in social life’ [11]. This has to be their main function. They are spaces of transition.

There are authors, however, who, using the etymological origin of the word ‘school’ and, therefore, referring to the meaning of ‘σχολή’ in ancient Greek, assert that school is not a means but an end in itself. For the Greeks, σχολή meant free

time; that is, a time free of worldly burdens that allowed humans to devote themselves to higher matters [12]. It was a state of exception, created to experiment and put into practice thoughts, ideas and situations that had no place in the public or private spheres. A complete set of clearly defined rules govern these two spaces where, in both, the individual cannot be completely free, and where a clear hierarchy exists. On the one side, in the private space, we find the figure of the parents, who establish the rules and values that govern the house. These are followed by the grandparents if they live in the same house and, if not, the children, among whom a hierarchy is also established usually based on age. On the other side, in the public sphere, money, contacts and a set of social, political and economic variables also result in hierarchical relationships being established. Thus, in neither of the two spaces can there ever be real equality. According to Rancière, school, viewed not as a transitional space between the public and private spheres, but as a space separate from them, would come to solve this. This type of school, therefore, would bring with it the possibility of a place based on freedom and equality [13].

It is true, as Masschelein and Simons argue, that ‘of course, from the very beginning there were several operations to restore connections and privileges, to safeguard hierarchies and classifications, but the major and for us important act that “makes school” is about the suspension of a so-called natural unequal order. In other words, the school provided free time, that is, non-productive time, to those who by their birth and their place in society (their “position”) had no rightful claim to it. Or, put differently still, what the school did was to establish a time and space that was in a sense detached from the time and space of both society (Greek: *polis*) and the household (Greek: *oikos*)’ [14]. It is the place of experimentation, where you can play with the possible, because nothing is firmly fixed. Once an individual enters the school, he is in a place where, at first, elements of his identity, such as his gender, social class and race, are set aside. Those who enter school acquire as their only relevant identity that of student. Nothing else matters, all are students equally. It is true that not everyone will follow the same path because in school there are different paths, but nobody escapes the category of student. Only school management, teachers and administration and services staff could escape. However, since the functions of each of them are intrinsically related to the activity of studying, we can say that the studying is somehow part of their professional identity. In turn, to this basic equality based on the activity of studying should be added the possibility of participating freely. There will, of course, always be limits and rules. No one can act in any way. However, by following the appropriate channels, every member of the educational community that makes up the school can participate in it.

While the school as a means and space of transition is determined by the requirements of external socio-economic entities, the school as an end sets its own goals. This is what allows it to be more open and allow greater exercise of freedom of each individual on the basis of real equality. Where content and forms of education are marked by spaces with fixed principles and where hierarchies and inequalities occur at the same time, authentic equality and freedom cannot be easily promoted. Our current society, governed primarily by neoliberal values, demands a productive use of our time, also in school [15]. However, productivity is not always educational and

perhaps, if our goal is to build fairer and freer worlds, we should allow the school to experience other times away from efficiency and competition.

In fact, if many students end up dropping out, it is precisely because they are determined by inequality and lack of freedom. Belonging to a poor family, a minority culture or having certain personal characteristics, whether physical or psychic, which distinguish us from the majority, can result in us falling behind in the competition, as well as preventing us from freely manifesting ourselves as we really are. A rigidly organised school causes many students to become alienated, which results in them being driven away. Quite the opposite happens in a school whose organisation is flexible, where everyone is accommodated and feels that it is their own. We have numerous examples, some very recent [16], which show the educational advantages of moving from a competitive model to another that is not. Society continues to insist on the low profitability of this change. However, this is because it governs a short-term way of thinking, when the results of the open school model are produced in the long term. Perhaps it is time to demand patience from society [17].

Taking into account the characteristics of schools when they are viewed as places, that is, independent spaces with their own relations, principles, contents and ways of proceeding, we need to now consider the classroom, which, as a complement to the school viewed as σχολή, can be defined as an ‘empty place ready to be filled, an available space ready to be inhabited continuously; [...] a poetic space, because in it there is the entire, full presence of those who inhabit it’ [18]. We do this today by moving between face-to-face and virtual settings, opening the way to a blended-learning model that we will focus on in the next section.

## **2.2 *The Classroom and Its Characteristics: Between the Physical and the Social, the Traditional and the Virtual***

If there is a quintessential place in the school that allows us to talk about this as an enabling space for learning and education, it is the classroom. Much has been written about the classroom, including quite a lot of nonsense, but what is not in doubt is that it has been, since time immemorial, the quintessential space for learning. A place in which particular processes of social convergence are carried out, and also of influence, mediated and sometimes directed by moral purposes in order to achieve certain educational goals and learning outcomes, using a specific set of resources.

The concept of the traditional or virtual classroom can essentially be interpreted in two ways: one, physical, requiring of the virtual a similar construction in form and content, allowing the individual not to feel out of place; and the other, social, an accumulation of relational, affective and even moral processes without which learning cannot take place. These are characteristics that the virtual classroom should also promote in order to prevent distorted learning processes resulting from the technological mediation of virtual settings.

Two ways of understanding the classroom that show that not every school setting is, in itself, educational. By way of example, if we asked a parent about their child's classroom, and the child about their own classroom, the response of the first, in most cases, would be that it resembled a physical space, where the teacher teaches and students learn, and where, depending on the season of the year or the corresponding social contingency, the ornamentation changes. The description of the son or daughter, especially if in primary school, would be more along the lines of it being an educational space where they feel at home and are helped to develop as people, rather than a place where the teacher teaches.

From this example, the following questions arise: What can we expect from the classroom as an educational space? What can the teacher do within the classroom for students to foster confidence, security, excitement and interest? How should a traditional or virtual classroom be designed to promote learning? Moreover, is it enough in a virtual environment to transfer, from a virtual architecture, the elements that a classroom supports as a learning setting? As for many other professionals from different business sectors outside the world of education, the layout of the environment or space has a significant influence on those who occupy it. Both for teachers, potential leaders in a classroom, and for the students themselves, layout is not a secondary consideration. Most teachers, if not all, value the layout and organisation of the classroom as a core element in the teaching-learning process. As we saw in relation to the school, the classroom is also not simply a space where tables, chairs, virtual resources and teaching materials are placed and where there are students who learn, but a place in the deep sense of the term. It provides a significant and communicational dimension to the educational processes that take place there, to the experiences that are lived, stimulating, attracting, facilitating or inhibiting expectations, activities, relationships and communications [19]. Students who are schooled in face-to-face, non-virtual settings spend an average of five hours in the classroom, where they think, write, communicate, learn, or perhaps not, but at least they are there. Teaching-learning processes come together in these specific spaces which are not only a backdrop, an action setting, but an integral element of the educational processes that take place, connected with the aims of education, with long-term implications for identity.

The classroom, then, virtual or face-to-face, is never a neutral element, and arranging resources and actions, students and activities, in one way or another, involves students learning in a concrete and certain way. The design, layout and management of the face-to-face or virtual classroom by its users is not an action laden with naivety, but rather condenses a social meaning that is shared most of the time by its users. The classroom, for teachers and students, must not only be a physical or technological space, but also a social one, as a consequence of the relational, affective, significant or communicational codes established between users and between users and the classroom, resulting in it being conceived as a learning community [20]. And the reconstruction of these processes involves leading the construction of meanings, which means mediating and leading the construction of the culture that guides the teaching and learning processes. Otherwise, in a classroom, we will be in a closed place full of chairs, and in a virtual learning space, we will not stop being on a

website that today is valid for learning but that may be worth the same to buy. Developing learning processes in a classroom involves carrying out a situated activity for whose performance internal material elements or resources are not enough. It is also necessary to have the social fabric that is woven inside based on activities, relationships and the actions that are carried out, an aspect without which it is impossible to speak properly of blended-learning environments, as we will clarify throughout the chapter [21].

That said, we will explore the two already mentioned perspectives from which a classroom can be seen: one, the classroom as a physical space, much studied, sometimes disparaged as insufficient, difficult to transfer to the virtual realm, but that does not cease to also have been and to be an educational reality; the other, the classroom as an educational space which we believe to be essential to complement the vision of the development of teaching and learning processes in the classroom, addressing not only the physical or technological elements, but also the ultimately vital interrelational elements, without which we cannot fully understand the processes of technology-mediated learning.

### **2.2.1 The Physical and/or Technological Perspective Seems Insufficient for Both Models**

Some years ago, Augustowsky said that ‘the walls of the classroom are produced by and at the same time produce ways of working in the classroom’ [22]. It is the classroom as a physical space that covers the teaching–learning process, while giving substance to its environment or educational climate. It is, in most cases, a space that can be seen as bland, lonely and inhospitable which has been so established previously and in which the teacher and students enter and leave without further engagement with it. In it, the main objective would not be to feel as comfortable as possible, with the space of the classroom established for certain functionality criteria from which to express pedagogical ideas, if not dominant, at least in line with the status quo established.

It is a classroom model in which the teacher organises the activities, controls the process, organises the students in groups, imposes the rhythm and moments of work and definitively controls the space–time of the classroom. On the other side are the students who, spontaneously in some cases, or intentionally in others, are grouped according to the general dynamics of the class and the role of the teacher. Dynamics between teachers and students that are defined by the use, layout and organisation that one makes of the others, and that they make among themselves with respect to the classroom as a physical and/or technological space, a territory in which they inevitably have to be. The teacher gives students places and belongings, desk and work material in traditional settings, and resources and places to be and do things, in virtual settings, allowing them, in some cases, the exercise of responsibility, minimal expression, in many cases, on which the students have control and leadership regarding their resources, activities and tasks. In both cases, the layout and organisation of the classroom by the teacher can be the result of a concrete way of representing the

educational act, of communicating pedagogical preferences, ways of conceiving the teaching and learning processes, the way of capturing the cultural meaning that you want to give to the socio-educational relationships that arise within the face-to-face or virtual classroom.

We agree with Madrid and Mayorga that ‘space is fundamental in the teaching–learning process’, and that ‘an adequate organisation of the environment, including spaces, material resources and time distribution, will be fundamental for the attainment of educational intentions’ [23]. If this is the case, what variables are considered in this model whose main concern is its design?

In the first place, a model of these characteristics has to be concerned with what we can call the classroom environment, promoting in the classroom the knowledge of the people who are part of it and their bringing together. Secondly, it is necessary to make available to all users the different materials that will be used in class in order to encompass and understand a large number of learning possibilities, which combine both the autonomy and responsibility of the student and the necessary dependence of the group and the teacher. Third, the teacher must combine adaptability and flexibility in the definition of the classroom. Fourth, it is essential for it to be conceived in such a way that it allows the active participation of all of those involved, not just the teacher. And, in fifth place, the teacher must propose a space that allows the provision of multiple and varied educational actions, diverse and plural teaching and learning activities, facilitating a broad expression of development possibilities for students. An open conception of the classroom, in which the educational processes do not necessarily begin and end between the four walls of the classroom or in the virtual environment constructed, but rather manifest an openness to the surrounding world.

A model that, in our opinion, is insufficient both in one or another traditional or virtual classroom model. On the one hand, because the classroom needs a profound reform of the foundations that underlie school architecture and design because they are supported by models that prioritise uniformity and academic activity that is perhaps too traditional. On the other, with respect to the physical-technological environment, because it has been implemented following the canons of face-to-face learning. School architecture has to be at the service of the new functions that we demand from teachers and students as participants and leaders of the teaching and learning process, otherwise, we will continue teaching in spaces that were designed to accommodate and store students, thus disregarding any creative approach imposed by current times.

### **2.2.2 The Social Perspective Opens and Allows Dynamics of Interest for Blended Learning**

Together with the conception of the classroom as a physical and/or technological space, we have the other side of the coin: the classroom as a social space. The materiality of the classroom has educational, relational, affective, communicational, social and/or cultural meanings that define what happens in that physical space and

give a social character to the learning processes. The approach to the classroom as physical and material, face-to-face or virtual space arouses and proposes meanings that go beyond moving the furniture or proposing the classroom from technological functionality, transferring the approach to the use of the classroom to the interrelational fabric that is suggested between the ones, teachers and students, and the other, the classroom, as a social space.

It is about understanding the educational processes and events that occur in a classroom as a system of representation, in which the one and the other produce social representations of reality [24], thus recognising the representational character of the pedagogical act. ‘What we decide to let into our classes is sifted through the filter of our position as teachers, in such a way that we select it, structure it and communicate it in a certain way’ [25]. We want to show that the classroom can also be seen from the perspective of communicative dialogic action, where the three fundamental axes of the classroom are put into play as an educational space: the psychogenetic axis—the classroom as a mental space; the sociogenetic—the classroom as a social and historical space; and the topogenetic—the classroom as a physical or cosmic space. And at the same time, teachers and students articulate themselves from their three existential axes: as a bio-physical reality, as a psycho-logical reality, and as a socio-logical reality [26]. With both the face-to-face classroom and virtual classroom seen in this way, we can conceive blended learning in educational terms.

Beyond toxic pedagogies [27], where the teacher simply accepts the classroom, or uses virtual classrooms in a similar way to face-to-face classrooms, as they are marked from the technological market, we must think of dialectical pedagogy and its educational value, where the teacher creates, because he understands that the classroom is not only a physical, but also a social space; not only a rational, but also an emotional space; not only an impersonal, but also a personal space, although we are compelled to take pedagogy to ‘somewhat inappropriate’ places [28]. It is not about putting resources and activities in the classroom for the sake of it, it is about highlighting them, allowing us the expression, about giving meaning and reason to them with the students. From a chronotopic perspective, the classroom has a polyphony of voices and polymorphologies of diverse points of view. What it is about is going beyond the physical, impersonal, rational, external space, seeking other points of view that more greatly adhere to the educational process, which have to do with the classroom as an affective, personal, internal, etc., space. Showing the social nature of the classroom not so much from the perspective of the dominance by the teacher or even technology, but from belonging to a vitally necessary common environment, however standardised and schooled it may be.

It is the classroom seen not only as an external space—in the eyes of a parent—but also as an internal space—in the eyes of a student; not only an objective but also a subjective space, which can and must be constantly shaped and reshaped; a space not so much impersonal, but personal, a meeting point of experiences, concerns, hopes, games, relationships, etc.; rational, but above all affective and emotional. Without emotion, there is no possibility of learning [29]. It is the conception of the classroom as conflict or communication, as isolation and relationship, as marginalisation or exchange. The step towards communication, relationship and exchange in collective

and shared classrooms will be signs of the exercise of covert leadership by the classroom. Evidencing the capacity that classrooms can be conceived as 'educational leaders' means finding the presence of a language different from the traditional one, presented in terms of sharing, in which not only information and orders directed towards students are issued, but we are also faced with a negotiation setting in which the classroom, in addition to being modified and retouched as appropriate, transmits, empowers and promotes education.

The classroom, we stress, is not something neutral in either the face-to-face or virtual classroom. They are significant spaces because they bring together not only physical and technological meanings, but also social, emotional and relational. Meanings that represent a social and cultural value, educational, in short, which we have to decipher to understand the classroom in all of its complexity. We seek to show the interest in meaning through the significance and social representation of the classroom, disregarding teachers as a starting point, opening a new range of possibilities for learning processes, not supporting them only in the subjectivity of users or objectivity of the classroom but, rather, in the interdependence of teachers, students and the classroom. It is a way of understanding combined, mixed learning models, where face-to-face and virtual are linked, complemented, interrelated.

### **3 The Pedagogical Meaning of Blended Learning and the Limits to Flexibility**

According to Horn and Staker, the definition of blended learning consists of three essential aspects. 'first, blended learning is any formal education program in which a student learns at least in part through online learning, with some element of student control over time, place, path, and/or pace. (...) The second part of the definition is that the student learns at least in part in a supervised brick-and-mortar location away from home. (...) The third part of the definition is that the modalities along each student's learning path within a course or subject are connected to provide an integrated learning experience' [30]. That is to say, that part of the knowledge is acquired synchronously, with the simultaneous presence of students and teachers in the same space, whether physical or virtual; another part is achieved by oneself asynchronously, through certain materials that allow the student to work autonomously; and, finally, both parties must be interrelated to such an extent that one could not function without the other.

Thus defined, this methodology does not seem very different from the traditional one. The teaching-learning process that has been widespread in schools since its origins consists of the teaching of a series of face-to-face lessons that are complemented by homework carried out autonomously by students at home. Thus, according to this method, learning is achieved through a mixture of synchronous and asynchronous activities that together are part of the same process. This is clearly not too different from current blended learning, and is therefore not as innovative as it might at first

seem. Indeed, there are authors who question this innovation and see this model as simply an evolution of the previous one adapted to new times. For these authors, there are didactic differences in the media and materials used, but not in the methodology and pedagogical principles that underpin their use from a theoretical point of view [31].

That said, technology, like the classroom, is not neutral. We argue here, following the thought of the French philosopher Bernd Stiegler, that technology is an essential part of the human being. Depending on what the technology is, this will be the way in which human beings inhabit the world. Technology influences us, therefore, decisively [32]. Thus, the fact that there has been a change in the resources used in education cannot under any circumstances keep basic pedagogical principles unalterable. Although the ways we use certain resources and the objectives pursued may seem identical, they are not. The pedagogical possibilities of each type of resource are very different. In this way, by changing the resources, we are also necessarily changing practices, and, as a result, the theoretical educational model that we can infer from them.

If there is one thing that distinguishes blended learning from more traditional methodologies that also mix synchronous and asynchronous activities, it is the possibility of being able to work on any aspect of the subject in one way or another. In the traditional teaching–learning model, there were a number of aspects that, due to their complexity, needed to be worked on face-to-face and not at distance. In contrast, there were others of lesser difficulty, or those previously worked on in class, that could easily be practised individually and autonomously at home. The difficulty of certain subject matter and lack of material means determined the division of class-work and homework. This was so often the case that, on many occasions, homework ended up being a mere complement to the activities carried out in class which had much more weight in the teaching and learning process. Nowadays, however, the possibilities offered by ICT mean that the most difficult and complex aspects can be studied without a problem autonomously from a distance. This is where the great power of current blended learning lies and this is what is being used to a greater extent [33].

Most education professionals usually understand that what blended learning should do is ‘use time more effectively and flexibly by extending instruction time out of the class walls’ [34], within which it was confined, until the proliferation of ICT. It is for this reason that this learning approach is often related to the didactic methodology called flipped classroom [35]. This strategy consists of using ICT and all of the possibilities that it offers to enable students to autonomously learn the most theoretical and complex aspects of subjects, leaving classroom time to either deepen understanding, answer questions or work on and discuss more practical aspects [36]. This methodology moves away from tedious lectures or dense explanations by teachers, making face-to-face time a more active and dynamic time where the students, rather than receiving content, make personal contributions from their own findings. The flipped classroom, therefore, not only allows distance work to be more than just a complement, but also, at the same time, respects the different learning styles students may have.

Indeed, not everyone learns in the same way. Our rhythms and ways of approaching reality differ. We could even say that, although different learning styles can be established in a generic way, deep down, there are as many styles as there are people. The uniqueness of each individual makes their discovery of reality also unique and, therefore, differs from every other human being. Thus, from the same moment that, through ICT, one can look for the medium that best suits their specific and unique way of learning, we can talk about a highly flexible learning approach [37]. This flexibility allows programmes that are much more open to diversity. In fact, this is one of the great attractions of institutions that implement blended learning in their establishments. It is a type of learning that facilitates inclusion [38]. Students dedicate to the theoretical part of the subject the time that each one needs at home and use the audiovisual and interactive tools that best suit their learning style and then, with each one taking with them this basic knowledge learned autonomously, they can interact in class more easily.

However, although it is true that blended learning can contribute to greater accessibility of knowledge thanks to its eminently flexible nature, it is necessary to strictly comply with a set of requirements for the process to be truly successful. These requirements encompass three areas: the context, the teacher and the student. In the first place, in order for blended learning to work, a major economic investment in technology and education is needed, because, if the teachers and students do not have the tools or proper training, blended learning will not work. It is for this reason that policies in this direction are needed. Secondly, teachers, as we have pointed out, must have the appropriate technology and be well trained for its educational use. They must also have an open attitude that allows them to truly recognise the diversity of their students. This will make their use of technology precisely adapt to their students. Thirdly and lastly, students, who must also be trained in these technological resources, need to meet a much more important prior requirement. This requirement consists of a commitment to strictly carry out the activities that have to be completed at home. While not doing homework in the traditional system meant falling slightly behind in the classroom, failure to do homework in a programme that follows the blended learning approach means disrupting the entire process, making both the distance and face-to-face parts lose all of their meaning [39].

If all of this is accomplished, the learning results can become clearly effective. In the first place, the fact that students have a certain degree of freedom when managing their learning of the most complex subject matter means that there is less unevenness in knowledge among students for the face-to-face classes. With each student having dedicated at home the necessary amount of time and tools for their ability and learning style, they all come to class with a similar knowledge base. Because of this, the class can focus on performing practical dynamics where knowledge is strengthened or what is learned is applied. This means that, secondly, and as a consequence of the above, there is greater involvement by students in the face-to-face lessons. When the aim is not the acquisition of knowledge being transmitted, but sharing or applying it, it is difficult to disengage someone if they have done the work that they needed to do at home. Everyone can participate if they are necessarily required to

be more involved, given that they know what they are talking about and can certainly contribute something. Thirdly and lastly, this dynamic consisting of acquiring knowledge at home and consolidating or applying it in class makes student assessment continuous, enabling them to measure their achievements and face any test or exam with greater confidence [40].

However, although the improvement in learning outcomes is important, it is not essential. The essential aspect is that blended learning enables students to acquire a set of competences that today are considered socially fundamental to operate in the labour market [41]. On the one hand, students acquire greater autonomy, discovering their own learning style and the tools that best suit it, and gradually find out how they can optimise their use of study time [42]. On the other hand, students increase their collaborative capacity. Indeed, interaction with others is a fundamental part of blended learning, since face-to-face classes are dedicated to sharing with others the learning acquired autonomously from a distance. 'Social presence is very important for learning motivation, information exchange and a sense of connectedness to be maintained' [43]. With this in mind, the connection of the students with the teacher and the students with each other does not cease once the classroom has concluded, but extends beyond the walls of the classroom through ICT. We live in a globalised world where, on the one hand, we are required to have the capacity to adapt to an uncertain world that is constantly and unpredictably changing [44]. Because of this, it is important to acquire a significant amount of autonomy. In turn, this uncertain world unfolds on the Internet so it is essential to learn how to communicate, collaborate and reach agreements. Autonomy and community blend, therefore, in a learning approach clearly adapted to the times.

However, the fact that this learning approach better suits the demands of our society does not mean that it is always the best option from an educational point of view. It is true that the fact that students have tools that allow them to autonomously learn all kinds of knowledge at home is an advantage. Being able to dedicate face-to-face classes to more practical questions, without having to spend excessive amounts of time transmitting knowledge that, due to its degree of complexity, never seems to be complete, is also extremely positive. That said, just like manual writing made an essential educational difference in the construction of the person who is developing [45], as did transmission, listening, attention span, etc., acquiring knowledge by watching videos on the Internet is not the same as listening to a teacher. We cannot equate the necessary attention to be able to understand a masterful explanation with that which we need when it is not about listening but about interacting. There are certain kinds of learning that require a slow pace, boredom and even waste of time. That is why it is essential to clearly set out the conditions under which blended learning will be enhanced because it cannot take us away from essential educational purposes, which go far beyond the objectives that may be set by the social and labour fields. We will see below, in more detail, some of the dimensions that must prevail for a blended-learning model to be really educational and not merely instructive. This will be necessarily marked by a certain limitation to flexibility.

## 4 The Time-Social Space on the Web as an Argument for Blended Learning

Being used to living with technology in classrooms and various education processes, we need to assess the extent to which the construction, introduction and use of technology in the world of education are supported by an educational foundation that strongly supports the suitability of the relationship established between technology and education, as well as between face-to-face and virtual learning processes. The novelty that it represents, ease of use that it allows, motivation that it produces and attractive presentation with which it manifests itself make us, on more occasions than desired, use it without it having passed through a minimum educational filter. If we do not have variables or dimensions that allow us to unite, relate and, above all, complement and interrelate the face-to-face and virtual settings, we will soon end up serving blended learning models.

From the discourse we bring, justified from the language of the school as a place and the classroom as a social space, the vital dimensions of the human being, space and time, can and should serve as an endorsement to justify educationally the virtual setting within mixed learning models. All instructional and/or educational activities that we carry out in the virtual environment are space–time activities. In them, the student has not been deprived of the basic identity variables, space and time. Any educational experience that we can have in virtual environments must be explained in terms of space–time, seen as a social and cultural place where there are relationships, feelings, communications, etc. Behind the network space is the places space. And in order for a combined methodology to really make sense, for there to be prolongation and not disruption of the student between face-to-face and virtual settings, we need to show virtual settings from a chronotopogenetic perspective, that is, explain and justify them from the genesis of space and time in virtual settings, understanding the deep sense of social space–time on the Web.

Let us explain it with an example. Years ago, Gineste, analysing the case of Victor, the wild child, wrote the following: ‘(...) deprived of discernment, denied of memory, devoid of any imitative aptitude to such an extent with the resources of the mind obstructed, even relative to his own interests... not even capable of using a chair to capture a delicacy within reach to steal. He was finally devoid of any communicative resource and with no gesture or movement of his body could any intentionality or expression be detected; without the appearance of any motive, he would suddenly go from the most melancholic apathy to overflowing explosive laughter... all of his inclination and pleasure were limited to the pleasure of the organ of taste... His entire existence was reduced to a purely animal life. (Assimilated to other cases of incurable idiots) (...), our child would not be capable of sociability or learning’ [46].

When comparing this description of a monkey exemplar with others by primatologists, Victor does not present the typical condition of an animal because in groups of primates there is communicational behaviour, emotionality, cooperation, imitation and even bonds of dependency. Víctor’s problem is deeper: he lacks, among

other aspects, sociophysical topological sensibility and experience. Human faculties are not only harmonised in a social space–time, but are fully developed and instituted in that context. In this way, wild children do not exist, there is only abandoned or socialised, related or austere, communicated or isolated childhood. The human being is built within a social mediation whose instruments are the actions of relationship, affection, belonging, or communication, among others. And those same dimensions, which justify the space–time variables of the human being, are those that have to argue the potential of virtual settings as educational settings because, otherwise, those who move there from face-to-face settings may feel strange, lost and lonely beings. The experience of people when they are educated on the Web is a space–time experience that can be satisfactorily explained in terms of a conception of space as a place, thus connecting with the fundamental dimension that explains the relationships established between students and spaces and times in face-to-face contexts.

It is true that throughout history, it has been shown that the way technology evolves depends on users' uses, practices and representations of it. We have already mentioned that technology is not neutral, and less so in education. The use and development of a technology are not determined by the technical characteristics that define them but by the way people individually or collectively appropriate it. In the field of education, two basic interpretations coexist: one is the interpretation and predominant use of these technologies as instruments, tools for access, processing, storage and retrieval of information and communication; and the other, which we have been advocating as a basis for blended learning, is a vision of these technologies as generators of spaces of action, relationship and interaction, authentic communities of practice [47].

In the field of pedagogy, there is no doubt that the consideration of these technologies as information tools is crucial, but we believe that it is insufficient in order to realise all of their educational potential for our field of knowledge and for the development of blended education models. We have to overcome the merely instrumental conception of ICT and understand it as a generator of spaces that allow people to do things, move, express themselves and share opinions, feelings, values, handle and exchange objects, etc. It is about progressively creating groups, communities of action, identified and meaningful from the sense of the space–time that the environment brings. It is a way of opening lines of research on the functioning of the mind and body in these new settings, on the limits of theory and technology for the understanding of the activity carried out through blended learning, on the agents involved in the activity and, notably, on the study of the traditional coordinates of human action within these technologies, that is, on educational space and time in new blended contexts.

In order for technological mediation to really take effect in the parallel process between virtual and face-to-face settings, we need the dimensions that we have previously pointed out—social, cultural, personal—to be combined in the virtual space, transforming it into a place, that is, adding the space and time reference of belonging that every student needs. Technology does not give rise to a single social space–time model, but, as has always been the case, it depends on the way

in which it is used, occupied, traversed by students. Entering and leaving a virtual classroom, using and transforming the Web based on education interests, involves putting into practice a social process: the establishment of authentic communities of virtual coexistence and relationship as the basis of learning, social and cultural space–time communities.

Physical proximity is replaced by the flexibility associated with a cluster of interests, affinities, emotions and meanings, where distance does not represent an educational limitation, but simply a change of perspective, a new dimension. Put simply: if the Web makes sense in education in general and in particular, it is because students and learning groups also move, live, coexist, interact and communicate there, creating and re-creating heterogeneous and always complex identities. All of this is possible if their educational activity addresses the space–time dimensions of traditional face-to-face settings.

Having outlined the approach, we will briefly describe some of the coordinates that make the presence of space and time dimensions visible on the Web, and allow us to highlight the potential of blended learning as an education and training model, which does not only address short-term utilitarian criteria, but also long-term educational aims. Firstly, one of the characteristics that the virtual environment must possess is the ability to arouse a feeling of territoriality in the student. In a virtual environment, there should be no disappearance of traces, of territorial signs, of busy places or of the blurring of places. Our proposal begins precisely there, where it seems that everything ends, in the territorial feeling that the virtual classroom can arouse in students, in territoriality as a process by which the student acquires a notion and feeling of situation—space—and moment—time—which leads to a feeling of identification with a specific place. At first, the virtual space is conceived as a hole, a void. What it is about is showing that this void is occupied and frequented by a group of students, and that this occupation involves a position that, in turn, can cause the development of identity as a result of a feeling of identification and attachment awakened in the student body.

By way of an example: If we observe a group of children playing on the Internet and compare it to another group that does it in a town square, we see that many of their movements, comments and attitudes are similar because both groups are looking for territorial meanings, references, significance, security and stability, and physical and symbolic, social and cultural points of reference that support their experiences, feelings and motivations. The Internet, as a virtual education setting, must be built as a cluster of places and moments, heterogeneous in ideas and stimuli, capable of avoiding fragmentation in educational processes, as well as generating solidarity and encounters. This is the basis of the conception of the virtual classroom as an educational space within the blended learning model.

Along with territoriality, another characteristic that should promote the design of an educational environment within the blended model is affectivity. We have pointed it out a number of times throughout the chapter, and many researchers have also mentioned it: without emotion there is no possibility of learning [48]. When students move from the classroom to the virtual environment, they need to begin to learn about its characteristics, environments and meanings, and develop an emotional and

affective feeling about the place that leads them to feel present in that educational setting. When students enter the virtual environment, they need to continue to be passionate, affective and emotionally invested beings. We refer to the need to design virtual classrooms as emotional places and moments, where affective relationships can be established between students and places as the basis of education practices, with mechanisms similar to those implemented in classroom spaces.

We believe that the possibility of education, not only instruction, exists in virtual settings, as long as these settings are capable of setting in motion an entire emotional relationship with students, beyond the affective tone that characterises the relationship with an isolated object. In fact, here lies the difference between the computer as a telematic tool and the computer as a new place of education. In this affective relationship, students can activate, move, interact, get excited, even in virtual spaces and not just be mere spectators, which makes us think about educational actions, activities and resources from another perspective, and the construction of virtual spaces more in line with reality: spaces full of life where emotion has a leading role.

And if there is a feeling of territoriality and capacity for emotion in these spaces, no less important is that they are designed to promote relationships and interrelationships between students and between students and their own virtual environment, being aware that a person's space-time reality is always a relational reality. Student autonomy and sociability are two sides of the same coin that are always highlighted in a situation and in a relational moment. If this is the case, blended learning will allow a basic principle of any educational process: that the place and moment of learning is not so much the mind of the student but, rather, the patterns of personal and social relationships. Designing virtual education environments requires seeing students as integral parts of a place that recognises and transforms them by experiencing it together with other students. A result of this transformation of individuals, the place, in itself, will also develop in a unique way.

What does an architect do when designing a building? For them, the design and/or construction of a building and the social relationship are two parts of the same object. Building a virtual space whose objective is that of education inevitably involves the notion of populating, inhabiting with others. We have to propose virtual spaces based on their ability to project interaction and communication with others and not just with oneself, as a telematic tool that is pleasant to the eye. Architecture of virtual education spaces involves considering the behaviours of individuals as intersubjective constructions, with others in relation to me within places and moments of reference.

And ultimately as a core feature of virtual classrooms, communication, communicability. After affection and relationship, communication. A student is, by nature, a communicating being, with the capacity and need to communicate. Educational practices, resources, activities, forums, etc., to a large extent, must be characterised by the communicative processes that justify them. We are compelled to characterise virtual spaces in communicational terms, otherwise we would lack one of the strongest pillars with the greatest presence in the chronotopic conception of the Web that we have been advocating as an argument for blended learning.

It is about perceiving communication as an action or interaction symbolically mediated by the social-time space of the Web, guided by a set of basic rules that

equally affect the student and the virtual environment, and that define a number of expectations in terms of the behaviour of students and the organisation and order of the virtual environment. These rules must be understood and recognised by the students, arranged in situations and moments of learning, as well as designed for educational practice. This being so, the actions carried out in virtual environments appear as dialogic actions, and not only enunciative, since we have the emission, reception and situation—space and time—as integral parts, promoting circular and communicational processes. It is a way of perceiving online education not only as the kind that encourages or relies on community interaction processes, but also based on processes of creating communicational situations, just as it is done in face-to-face environments.

## 5 Conclusions

At this juncture, it is worth referring back to precisely the point where this chapter began, bringing up again the example that served as our starting point. In view of what we discussed above, we have a somewhat clearer idea of the reason why the students who attended François Jullien's classes and recorded the lessons could not take advantage of them in the same way later when alone using their electronic devices to reproduce them. The fundamental reason is that these lessons were designed to be experienced within the walls of the physical classroom space. Jullien's gestures, glances, relationship between him and his students developed through his word, as well as between the students, had a clear limit. This limit was the classroom, a closed face-to-face environment that could not be extended beyond. Thus, no matter how much the lesson was recorded, when it was reproduced outside, in another environment, in another context, it lost all of its meaning. Education is based primarily on the relationship between individuals around certain objects. If we break the mechanisms that facilitate this relationship, we destroy the educational process completely. This is precisely what happens to Jullien's students. Since the mechanisms that sustain the relationships around the object of study have been set by Jullien to create and maintain spatially limited ties, it is impossible for them to take advantage of the repetition of the lesson in contexts where these ties cannot occur.

In the 1990s, the anthropologist Marc Augé created the concept of non-place to refer to types of spaces that were increasingly common at the end of the twentieth century and that, today, do not stop increasing in size. According to the author, these are spaces 'in which neither identity, nor relations, nor history really make sense; spaces in which solitude is experienced as an overburdening or emptying of individuality, in which only the movement of the fleeting images enables the observer to hypothesize the existence of a past and glimpse the possibility of the future' [49]. The examples that he presents in this regard are fundamentally spaces through which people 'pass'. Motorways, transport stations, supermarkets and shopping centres are some of these examples. Through them, individuals move with a specific personal

aim, usually related to some aspect of their personal well-being, but not in order to shape any element of their identity.

The relationships that occur in these spaces are usually transactional, but, by not contributing to the development of any truly intimate identity characteristics of individuals, they do not leave traces, sustenance or memory in them. All they leave is awareness of passing through, but nothing else. They are 'spaces of anonymity', which have little or nothing to do with education. Spaces that have to do with subjects that are unidentified, not socialised or located more than 'at the entrance and exit'. Spaces that rather resemble a large parenthesis that welcomes individuals, thus forming sets of parentheses, heterotopias. By contrast, if we can decipher the virtual environment from the notion of place, this will allow the student to acquire a feeling of situation and identification in a specific place, and, in turn, the virtual classroom will provide cultural elements translatable into systems of meaning that can, in turn, empower an educational language, an educational purpose. In short, it is about recovering, also in blended learning, the cultural pattern that unites and relates a place with a student or group of students.

Just as we saw in the second section, dedicated to pedagogical analysis of the school and classroom, to make sense, these spaces need to be places. What this means is that they need to be created on the basis of a set of relationships that under no circumstances can be transactional, but free, between human beings who, as such, gradually build their uniqueness by working with others around certain objects. The instructional objective of the school and classroom can be the technical education of subjects who know how to adapt to the needs of the socio-labour context of the time. The educational purpose of these places, however, does not have so much to do with the knowledge and skills to acquire, as with the development of an own and autonomous personality that allows each individual to live in a unique way, while respecting and taking responsibility for a world full of diversity. While instruction has specific objectives of direct and short-term applicability in certain areas, education serves more abstract purposes of indirect and long-term application in every area in which human life takes place.

We have been able to verify the extent to which the blended-learning model makes the teaching-learning process more flexible. Complex theoretical subject matter that previously required a significant investment of classroom time to be learned by the majority of students, today, thanks to ICT, can be studied individually at a distance. There are numerous tools that adapt to the rhythm and capacity of each one that, in turn, can be organised by devoting more or less time to the subject, also depending on these factors. Thus, classroom time can be dedicated to more practical and dynamic issues, of application, which is the most important aspect when we address a type of education that will have to serve for the future performance of certain professional work. And the teacher becomes more a designer of contexts than a subject who asks for silence, ensures maintenance of the established order and controls and leads learning times and spaces.

The possibilities of blended learning, above all, through the flipped classroom, guarantee us, therefore, clear improvements at instructional level. We will save time

in the acquisition of basic knowledge and we can invest it in its practical application, which from a labour point of view is the most important aspect. If, however, what we are looking for in our school education programmes is the comprehensive development of the person, beyond their work performance, we will have to be careful when implementing this model. Even more so when many teachers are not able to take advantage of the flexibility, ubiquity and complex functionality of virtual environments.

We used to say that any educational process worth its salt needs to be based on a territory, whether physical, virtual or a mixture of both, that allows the appropriation of those who participate in the process. That is to say, it is necessary to create a space that is transformed in place, with a set of specific relationships around an object, but where one can feel emotionally involved, creating a social learning community with others with whom one can autonomously truly communicate. Territoriality, affectivity, autonomy and communication are, therefore, the basis of any educational process that must necessarily be relational. If we do not have that base, there may be instruction, but no education. It is what explains that the technology classroom, as such, has not had a path and is an unsustainable model even when we talk about instruction, but especially if we talk about education. They are boring and irrelevant classrooms.

The fact that we can optimise the use of teaching time, and that it is easier to continuously assess the student thanks to the amount of technological tools we have, as well as another set of instructional advantages that blended learning seems to directly offer, can make us implement it forgetting the importance of having a prior basis from an educational perspective. For this model to work pedagogically, it is necessary to previously create strong bonds of commitment sustained in a common space, which belongs to all of us who are part of it and for which, for this same reason, we must take responsibility. In turn, if part of the process is going to be carried out at distance, we must lay the foundations of these relationships in such a way that it is essential that they remain outside the walls of the school.

The educational possibilities are many, but they require a high degree of commitment and the creation of a real learning community, both physical, in the classroom, and virtual, in the distance part. Otherwise, some students will end up advancing, but others will become disengaged, we will have to dedicate face-to-face hours to what was not foreseen and technology will return to being a mere complement and not a substantial part of the process. Taking all of this into account then, we must conclude by highlighting the educational limits of flexibility. The blended-learning model should only be implemented if we have that previous relational basis. If we do not have it, it is better for us to use other models, even though they seem more rigid and evidently involve a greater investment of time.

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# The Policy Approach of B-learning. The University Model of Education in the Public–Private Binomial



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**Abstract** The purpose of this chapter is to carry out a study of the relations of convergence-divergence established in the blended-learning programmes offered in the public sector (university institutions) and in the private sphere (training in organisations). The main thesis of this chapter is that, in a scenario of academic capitalism, the widespread promotion of virtual training policies and the growth of blended learning is giving rise to similarities between public and private systems, resignifying institutional structures and creating new formulas in approaches to training processes. The work establishes a policy framework from which to study the formal instrumentalisation that is being made of new learning approaches, introducing elements of analysis so far scarcely explored in the educational context. Aspects such as the professional functionality attributed to the university lecturer in this educational model and the implications of geoterritoriality in the dissemination of blended learning constitute essential patterns of study in an approach whose convergence between public and private organisations is building a new policy of university knowledge.

**Keywords** Blended learning · Public–private partnerships · Instrumentalization of knowledge · Social responsibility · (Geo)territoriality

## 1 Introduction

The expansion of digital training in recent years has become a key aspect from which education has begun to be managed, both in pre-university pathways (bachillerato [*in Spain, the last two years of high school (Years 16–18)*], vocational training) and in higher education contexts (undergraduate and postgraduate). The data show new scenarios in which non-face-to-face learning has progressed well above forecasts (900% since 2000). This fact is reflected in the substantial increase in master's courses offered (up to 26%) and the exponential growth in degree courses (5%) as evidenced in a report produced by Gad3 [1] for the International University of La Rioja.

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This new reality is not alien to the public sector that has increasingly positioned itself as an active actor [2] in the shaping of academic marketing, with which, paradoxically, it legitimises strategies and discourses close to productive paradigms [3, 4], which distance it from the democratic values and critical thinking that has defined educational systems.

Along the same lines, the application of educational reengineering theories to universities, as addressed by different authors [5, 6] is contributing to normalising the processes of programmatic convergence in virtual learning, consolidating partnerships between sectors (public–private) with, at first glance, highly differentiated conceptions, aims and methods of training. It is precisely this synergy that is so accepted within the public–private sphere that leads us to closely examining the digitisation of education and its institutional vision.

Hence, this chapter aims to examine the blended-learning model using a policy approach in order to analyse the convergences that occur between areas that have divergent management. The idea behind the work is that the development of virtual training policies in a context of academic capitalism is generating dynamics of confluence in training systems, both public and private. In turn, these learning approaches (blended learning) would be blurring the boundaries (previously well established) between different university formats (online, distance, face-to-face). It is not, however, only a structural issue; the blended-learning system may be triggering a change of such magnitude in the university model that pedagogy should not remain excluded from the mechanics that are taking hold in this field of study.

In that regard, we address the influence that the theories of post-new public management and international economic policies are having on the expansion of educational digitisation, as well as on the homogenisation of trends in the governance of universities. We understand, as Gómez [2] points out, that digital convergence not only affects the institutional organisation, but also the tools and methods used in teaching management and the criteria that determine the actions of the teachers themselves.

Following the changes that represent the transition from new public management to post-new public management, there are three structural points on which the focus of attention has been centred: one is related to the social instrumentalisation of blended learning, another is the technocratic value of blended learning, based on the numerous partnerships that are established between actors and with implications for the role of university teachers (their legitimacy in this model) and the third aimed at taking a tour of the geoterritorial aspects of digital training in order to attempt to explain the mediation of contexts subject to its dissemination.

## **2 The Social Instrumentalisation of Blended Learning**

Under the premises of innovation and economic internationalisation of knowledge attached to the discourses of neoliberal globalisation [7] and the post-new public management approach [8–10], public universities have initiated a harmonised policy

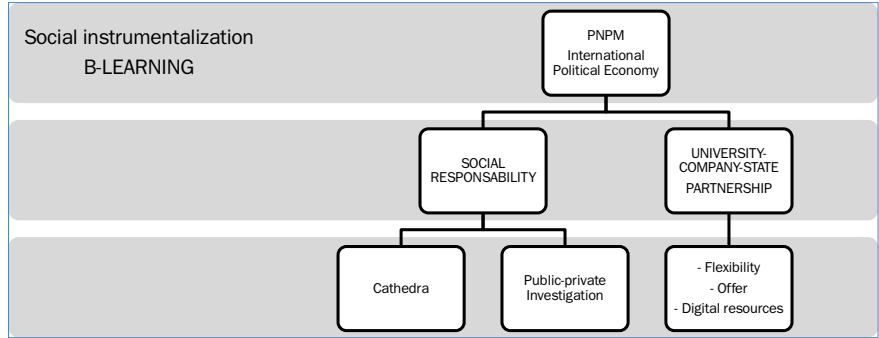
[11] of digital immersion aimed at virtual training through a highly varied educational offer (university master’s, own master’s, specialisation diplomas, specific training courses, MOOCs, etc.).

Several issues are notable in this regard. On the one hand, that in many cases there is no institutional project defined, regulated and shared by the entire educational community about the pedagogical conditions required by the new learning approaches, as has happened in the case of blended learning [12–14].

On the other hand, it is striking that, under these virtualisation policies, market strategies that empty the academic digitisation of educational content are concealed. And so Noble [15] predicted by highlighting the fact that universities were not only undergoing a transformation at the hands of technology, but, at the same time, and linked to it, were also engendering what is now a fact: the commercialisation of higher education. The automation of learning [16] connects directly to the market, production system and commercialisation.

In that regard, it is perfectly verifiable that many of these semi-face-to-face training projects that are developed within the framework of highly advanced technological contexts lack the digital tools necessary for their implementation, either because teachers do not have the technological skills, or due to the absence of academic and institutional control to accredit the levels of stringency in these learning models. The aims do not seem to be educational [17], although they are justified from social patterns that, through their contribution to the improvement of society, manage to be embedded in academic values.

This appearance of the social dimension of educational technology on the scene is increasingly notable. We can focus on two lines of research that are contributing to consolidating the digitisation of training from a social perspective, in which the theories of post-new public management and the international political economy take centre stage (Fig. 1). One key area of research is the field of study related to the social responsibility of organisations, and the second element of work is the analysis of the relationships that have been established between university, government and



**Fig. 1** The social instrumentalisation of blended learning. *Source* Own elaboration

industry around the productive internationalisation of knowledge. In both cases, there is a shared concern to optimise university-company technology transfers.

## **2.1 Universities in the Face of the Challenge of Innovation: From Social Commitment to Social Responsibility**

The transition from new to post-new public management theories is based, among other foundations, on the marked political nature of collaborative culture. The search for spaces and tools that allow the collaboration and participation of different actors becomes a main objective in the open government model that seeks to make co-responsibility effective in decision-making regarding the design, management and performance of actions [18].

Under the paradigm of collaborative governance [19], associative tools emerge to promote social innovation in different areas of public policy. Technology and digitisation of education are active instruments in this model of open and participatory management. The bringing together of universities and companies has connotations for the management of and approach to the educational offer of universities.

### **2.1.1 Corporate Social Responsibility and University Social Responsibility**

According to the ILO [20], ‘*Corporate social responsibility (CSR) is a way in which enterprises give consideration to the impact of their operations on society and affirm their principles and values both in their own internal methods and processes and in their interaction with other actors,*’ but the characteristics of university entities force us to rethink the term and thus we arrive at university social responsibility (USR) as ‘*the reconceptualisation of the whole university institution in the light of the values, objectives, forms of management and initiatives that represent a greater commitment to society and contribution to a new model of more balanced and sustainable development*’ ([21], p. 11). Based on this device cloaked as social change, collaboration and research [22], companies have found an opportunity to fulfil their interests by fostering teaching and research agreements with universities through the development of virtual policies that promote the semi-face-to-face model.

Moreover, the blended-learning approach begins to be seen by the university community itself as an important element in the machinery of social responsibility. Thus, according to the work of Jiménez, Jiménez and Reveco [23], students in semi-face-to-face settings notice the development made by universities in their USR even though their education is not completely face-to-face. These authors argue that ‘*higher education is a space that can promote education in which students, from their ethical commitment, can respond to the realities they will face, with critical capacity and social sense*’ ([23], p. 10). Contrary to what one might think, b-learning does not

prevent the development of a social responsibility in students, nor, therefore, the fulfilment of the social responsibility of each university. Be that as it may, through this type of virtual policies, corporations find their way into university academic spaces as strategic partners to cover training and specialisation competences [24], orientated towards innovation and the market. It is still striking that, in light of the social commitment of universities, we end up proclaiming the economic and business-focused function of university education. We should break with structuralist logics and start talking about the policy responsibility of universities. However, instead, as Wee and Monarca argue [25].

Universities have taken an essentially functional model which preferentially links them to the world of work and the market in a linear, business-focused and uncritical way, distancing themselves more and more from their traditional functions related to the critical transmission of scientific knowledge and higher cultural and human education (p. 118).

It is notable and we understand that the idea that social parameters themselves should serve as a means of support for building universities whose policy and critical functions are blurred in utilitarian discourses deserves some reflection from pedagogical fields.

## 2.1.2 Blended Learning and University-Business Relations

In this paradigmatic shift for universities, privatisation processes have entered fully with the varnish of ‘innovations’ with the support of virtual education policies where blended learning has been conceived as an opportunity to update pedagogical models. This is the case with the incorporation of private companies into the university field.

University-company chairs are a territory that has been widely explored by universities in their search for funding. You only need to look at the websites of universities to find that all of them have a section dedicated to this purpose and containing more or less extensive lists of agreements signed with companies and the amounts of these agreements. Their role has been fundamental in the consolidation of relations between universities and companies. The formula allows the transfer of knowledge and the creation of a greater educational offer in strategic areas based on the use of new technology. The best reflection of these connections are R&D and innovation activities, as well as the offer of master’s courses, which are articulated within the framework of these chairs and are carried out using a hybrid methodology that combines face-to-face and virtual learning.

A model example is that of Telefónica, which, through two initiatives (one recent and one well established), is becoming one more university agent. The most recent is the establishment of a university linked to the Telefónica Foundation (known as 42) which claims to be an institution ‘with no teachers, no books, no timetables and no fees’. There are no teachers, there is a pedagogical team. There are no books, timetables or costs because it does not certify either. An educational model that, in our opinion, after claiming innovation, conceals a contempt for teaching and subject matter. The most well-established initiative is Telefónica’s Network of University

Chairs. Through university-company chairs, Telefónica has signed numerous agreements with Spanish public and private universities with which it seeks to dominate the country's technological, social and environmental research. These agreements promote initiatives in both the educational and research fields. By way of example, we include the case of the Telefónica Foundation with the European University. The semi-face-to-face tool has facilitated the development of the postgraduate programmes of Expert in Means of Payment, Bitcoin and Blockchain and of Expert in Languages for the Analysis of Data, both semi-face-to-face courses on Fridays and Saturdays, from the 2016–2017 academic year. Another example with a public university is the Master's in Governance and Human Rights offered by the Autonomous University of Madrid in conjunction with the Santillana Foundation in the Jesus de Polanco Ibero-American Studies Chair, where 28 out of the 60 credits of the course are face-to-face. University-company relations can also be established outside the frameworks offered by chairs. A good example is the recently signed agreement between the Universidad Oberta de Catalunya (UOC) and EADA Business School through which they undertake to jointly offer four master's courses in executive education in a format that the UOC itself defines as having 'high demand in the business sector': blended learning. These examples illustrate how blended learning has contributed to the development of processes of privatisation, virtualisation and economic internationalisation of knowledge.

We can also find evidence of the exponential growth of blended learning in universities from analysis of methods in undergraduate and postgraduate courses. Without needing to include companies into these processes, universities offer their students blended learning. The aim of these initiatives is to enable access to students who are unable to attend university courses in person. These are students who, on the one hand, have a previous university degree and wish to expand their education with other degree and postgraduate courses and, on the other hand, students who wish to make their studies compatible with work and professional commitments. A source of information on official qualifications is QEDU [26] (*Qué Estudiar y Dónde en la Universidad*)—[*What and Where to Study at University*],<sup>1</sup> an application developed by the Ministry of Education which contains information about all official qualifications that have been verified by the Council of Universities.

According to this source, for the 2018–2019 academic year, Spain had 303 official non-face-to-face or semi-face-to-face undergraduate degrees out of its total of 3364 (9%) and 950 official non-face-to-face or semi-face-to-face master's degrees out of its total of 4639 (20.5%). According to QEDU, in Castile and León, the percentage of official non-face-to-face or semi-face-to-face degrees is 15.3% (45 out of 294) and the percentage of official non-face-to-face or semi-face-to-face postgraduate degrees is 27.6% (80 out of 290). Figures solely for semi-face-to-face courses could not be extracted because the application does not allow it and the autonomous community does not provide this information, but the figures provided for the Community of Madrid (18.3% for undergraduate degrees and 24.2% for master's degrees) closely

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<sup>1</sup>Consult at: <https://www.educacion.gob.es/notasdecorte/busquedaSimple.action>.

resemble the figures that the Community of Madrid itself<sup>2</sup> provides and in which it differentiates between semi-face-to-face courses and the rest (12.7 for undergraduate degrees and 13% for master's degrees), so it can be assumed that the percentages in the other situations are similar. This without counting own degrees, in which we assume that the percentage of blended-learning courses will increase due to the lack of curriculum requirements that allow this type of degree to no longer require ANECA (National Agency for Quality Assessment and Accreditation) evaluation.

These figures reinforce the idea that semi-face-to-face is more present in postgraduate than in undergraduate degrees, which is supported by the need for specialisation of education (there is more educational and thematic diversity as the level of studies rises) and the profile of the students indicated above.

## ***2.2 Multiple Partnerships Under the Denominator of Technology: When Technology Becomes Education***

The study of interactions between university, government and industry sectors is justified both from the national political framework (National Science and Technology Strategy 2007–2015, National R&D Plan 2008–2011, State Innovation Strategy 2010–2015, Spanish Strategy for Science and Technology Innovation 2013–2020, among others) as well as from the international one [27, 28]. Its analysis is of interest in this work because the economic impulse that underlies the scientific, technological and innovative development of knowledge is benefiting the policy actions of digital education and has become the academic vanguard of blended learning [29–31].

On the basis of what has been one of the theoretical paradigms of reference, the so-called triple helix model [32, 33] and the theory of the four helices [34], a network of responsibilities between university, company and the State has been created (now also with the theory of the four helices, civil society) around the regeneration of scientific knowledge. This fact has led governmental higher education policies to focus on the design of strategies, structures and instruments aimed at promoting the two-way mobility of these institutions.

A report published by the Conference of Social Councils of Spanish universities corroborates the idea that 'the university of the twenty-first century is being called upon to be an entrepreneurial university with an economic development mission' ([35], p. 60). A precept that, paradoxically, was assumed during the years of economic crisis almost solely by the country's public authorities and has been reflected in a greater budgetary presence for public authorities in the face of the withdrawal of company investment over these years in the field of collaborative research [35].

Under this institutional digital transfer project in which university government participates very actively, however, the utilitarian nature [36, 37] of the modelling of university technological innovation is notable. An analysis of the recommendations made by the Conference of Social Councils and addressed to universities allows

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<sup>2</sup>Consult at: <https://www.emes.es>.

us to highlight three lines of action built around the consolidation of partnerships between companies, the government and universities in which educational knowledge has been displaced by a strategic and commercial product-selling discourse. In operational terms, we highlight the importance that it attains:

- The delimitation of a technological institutional policy adapted to the University of reference, which should take as its starting point the offer and structure of the university, the financial resources available to it, or the identification of mechanisms in line with the potential of the university, among other aspects.
- The commercialisation of technology with all of its elements (support of commercial agents, marketing and sales techniques, system of incentives for researchers, internationalisation of the offer of universities and benefits of company open innovation strategies) and with a clear purpose of convergence between academic interests and commercial or market interests, which minimises the so-called ‘valley of death’ which appears when the academic result is not attractive to the market.
- The last component in this sequence, once there is a technological project adapted to universities and market procedures have been put into operation in the construction of technological policy, is the transnationalisation of knowledge between authorities, and between public–private collaborations on the basis of a compact policy orientated towards incentive actions (Fig. 2).

In this same direction, the post-new public management theory, from which the orientation of many of the institutional documents emerges [38] shows a reductionism in the conceptualisation of the social dimension of university policy that makes it sometimes have a nature that is more orientated towards production (or what is the same, towards the instrumentalisation of social capital) in order to generate real channels of collaboration between technological innovation and social participation.

Furthermore, the idea of production linked by its connotations to the private sector would be justifying a greater presence of the blended-learning method in privately owned universities. This is evident in the study conducted by Simon, Benedí, Blanché, Bosh and Torrado [39], in which analysis of blended learning in the university system



**Fig. 2** The design of technology policy as a commercial strategy. *Source* own elaboration

of Catalonia during the 2016–17 academic year evidences an offer of degree courses that is much higher in private universities (78%) than in public universities (0.4%).

Also notable is how semi-face-to-face is identified with certain branches of knowledge. Blended learning is mostly used in the field of knowledge of social and legal sciences (73%) and is almost non-existent in other fields of study such as engineering (0), arts and humanities (1%).

This presence of semi-virtuality in educational degrees is paradoxical due to the absence of social and educational interest shown by university governing bodies towards the digitisation of education, as well as the scarce repercussions of the issue derived from blended learning. For example, it is still striking that, as Simon et al. ([39], p. 9) point out, ‘there are no specific documents on organisation and strategy related to semi-face-to-face learning’, a fact to which we should add the lack of teaching requirements to offer this method and the scarce recognition of teachers who implement it. There is a clear tendency of blended learning to be installed in higher levels of education (master’s) for the opportunities it represents for the group of people who need more flexible study formats.

And in terms of structures, universities have been equipped not only with spaces such as scientific and technological parks, centres, platforms and technological incubators, but also with specific services aimed at digitising education and promoting the development of new non-face-to-face and blended learning approaches. CRUE ([40], p. 6) uses the term *digital university* to refer to the set of digital services related to management, administration, teaching and research. One of these resources is that of the unit for digital production that receives similar denominations within the framework of universities (Innovation and Digital Platforms Unit at the University of Murcia, Resource Production Centre for the Digital University of Granada, Technological Support Unit of the University of Córdoba). In the case of the University of Salamanca, which is one of the seven universities (Carlos III of Madrid, Ramón Llull, Pompeu Fabra, Nebrija, European of Madrid and Autonomous University of Barcelona) highlighted by the CyD Foundation for the internationalisation of knowledge, support is technological in nature, is produced from the Digital Production and Innovation Unit and is aimed at providing advice to teachers in the virtualisation of knowledge, promotion and management of open initiatives and production of multimedia materials, but there is no strategic line established by or integrated into university policy.

The 4th edition of the Universia International Meeting of Vice-Chancellors was recently held in the city of Salamanca (Spain). The event, which took place in May 2018, brought together leading academic experts from 26 countries to discuss the challenges that universities face in the twenty-first century. Some of the conclusions of the meeting, which were reflected in the Salamanca Declaration, focused mainly on the challenge of university institutions to adapt teaching to the digital world and the new work context. Their responsibility to make flexible and establish innovative educational methods, as well as the reconceptualisation of organisational and administrative processes in accordance with the possibilities of the digital era, would be some of the aspects that stand out as key aspects in this process. Thus, they aim

directly at certain actions to be incorporated, such as partnerships, courses and certifications with companies from different industries and hybrid education offers and education and refresher programmes in the workplace.

It would perhaps be interesting to initiate a line of research on the directionality that is being given to blended learning by qualifications, by levels (undergraduate/master's degrees) and/or by educational accreditations of teachers. What do public and private universities understand by blended learning? Under what conditions is it being used? As a mere support that enables the generation of new sources of funding? At present, we observe with some concern how semi-face-to-face approaches are blended, such as university degrees with an international dimension in which blended learning is associated with computer-enabled physical spaces and work activities that are limited to online readings. Where are the academic control mechanisms of universities?

### **3 Blended Learning Beyond Methodological Innovation: Controversies Over the Role of the University Teacher**

The implications that blended learning can have from a policy approach reach the professional development of teachers and processes of university teaching and learning. If blended learning is an inescapable reality, if it is here to stay in university education, it is necessary to know some of the risks that come with this methodology. The questions that we must ask ourselves in order to address from a policy perspective this reality combined with the inescapable public-private binomial that we pointed out in the previous section serve to generate spaces for reflection around this methodology. What does a teacher in the classroom contribute?, does a discrediting of the work of teachers lie behind blended learning?, is course content transmitted with the same success (understood as student permeability)?, can blended learning guarantee the cultivation of the four virtues indicated by Esteban [41] in the course of university life: effort, prudence, authenticity and elegance?, is there a student profile in this type of education?, should we promote the work-family compatibility of students from the design of education?, is there not a fundamental deep-seated disdain towards university education? These are just some of the questions we must ask ourselves when dealing with policies that legitimise the incorporation of methodologies such as blended learning in university education.

The eagerness of incorporating companies into university education has led to the adoption of processes that were far from a scholastic conception of universities. But it is not necessary to go to such medieval references to realise that companies did not find their place in the university ecosystem and had to incorporate somewhat more than their opportunities to feel at ease. If today we have a *light* university, as Professor Esteban [42] argues, it is partly the merit (or demerit) of processes and styles linked to the practicality and immediacy that the business and labour world requires. The eternal debate about whether or not universities should respond to the requirements of work is perfectly exemplified in this debate about the use of blended

learning in the education and virtual policies of university institutions. Esteban and Román [17] set sensible limits to the debate.

A university education that places new generations of university students in academic limbo, so that, sooner rather than later, they will realise the uselessness of their learning is not logical. Nor is it sensible to have education that, by being chained to the urgencies of reality, becomes another spring in the bureaucratic machinery that is at the service of business or state organisations (p. 61).

It can be posited from another perspective. The idea of ‘being a university student’ attending classes and passing evaluations should not be the sole responsibility of the student, life around an attitude and values that require ‘being in the university’ should also be enhanced. In this regard, effort should be made to turn universities into ethical communities [43], and without face-to-face learning it becomes very difficult to strengthen coexistence and university life (one of the reasons why universities should be ethical communities). Face-to-face learning, as a methodology, is a means, but also an end.

Seminars, group work or case studies are more than a means, they are also an end in themselves. To conceive university practices only as a means is not to conceive them in their entirety and it therefore means not extracting their full potential. Attentive listening to voices of authority, the ability to retain the best possible information, effort, critical reading, intellectual prudence, etc., are assets that are acquired by participation in certain practices and in certain formats of university coexistence ([43], p. 86).

We have already pointed out the advantages of blended learning, but they do not provide enough to replace face-to-face learning. If virtual environments provide personalisation (and therefore flexibility) to learning and this takes on a more constructivist nature, it is positive, but for this it is necessary for the teacher to get to know the student better to be able to personalise the education process more [44]. Contrary to what it may at first seem, being a guide or tutor involves a greater commitment to the task by the teacher. Can virtual environments get to know students better in order to propose more personalised learning? Vygotsky’s zone of proximal development had very clear face-to-face learning connotations. There are those who advocate that this proximity can exist in virtual environments, but distancing students from direct and face-to-face experiences with their teachers is like closing the Prado Museum and condemning visitors to seeing *Las Meninas* in a 3D visit to the museum.

From the point of view of the student, it is true that the methodology has some important advantages [45]. This face-to-face learning, however, requires greater autonomy on the part of the student, but do they have it? Can a student analyse a text or do a dissertation autonomously? Likewise, the role of students also changes from being a receiver to being a builder, but can they build their own learning without the presence of a teacher? Do they have enough elements to do it? It is a fact that the teacher cannot be so close to the student to reorientate, correct or guide their learning. As pointed out by Kozan and Richardson [46], deep and meaningful educational experience is found in superimposed intersections of cognitive presence, teacher presence and social presence. That is to say, learning is derived from the

interaction of students in a sociocultural context through a process of creating feelings in the face of other frameworks that focus on learning outcomes. In the case of the training of teachers, the issue is even more sensitive. While we accept that blended learning could be used for the ongoing training of teachers, its use in initial teacher training would be more detrimental. In the first case, it can be useful for short courses. In the exemplarity and communication between the teacher and the students, we can find many of the 'secrets' of teaching practice. This is how Plato, Rousseau and Freire were understood, by referring to teaching as a relationship of friendship, selfless affection that strengthens and flourishes with personal attention. In the initial training of teachers, it is also important to develop the ethical dimension of the teacher, something that becomes difficult in virtual environments.

The implications of blended learning for teachers are not negligible. Behind blended learning is the discrediting of the practice of teaching and the risk of contributing to the loss and weakening of the essential functions of teachers [47]. Returning (if we ever left) to technological, positivist models of curriculum design in which the teacher is a mere executor brings with it a low regard for the work of teachers. In addition, the lack of face-to-face learning means the elimination of the figure of the teacher, with it being possible to incorporate educational technicians behind the screens that provide digital resources to students through virtual platforms. We can, however, hold out some hope if we can maintain the freedom of teaching and the freedom of professorship among university teachers [48]. If the design of curricula continues to depend on teachers, we have room for action and vindication. If we talk about blended learning, in the design we play for everything. In this design, it is essential to have a sound educational theory and not remain in mere methodological or practical design [49]. In curricular design, in our opinion, it should not be the methodology that defines the other curricular elements. The content (whatever its nature) and the teacher are those who must choose the methodology that can be most successful in the development of competences. And what if a teacher decides not to use ICT? Because of its cultural and economic bias, because universities (and schools) must be spaces of resistance, for the reason that the teacher deems appropriate. Agreed that design is important if we want to take advantage of the best of virtual environments and the best of face-to-face environments, but support is not so important. The education process will continue to depend largely on the quality of the teacher and, above all, on their knowledge and content management. Methodologies without content are empty vessels.

In short, the debate is not closed and blended learning brings some benefits and carries some risks, as does ICT or the huge amount of screens that surrounds us, which we must explain and know, but as the philosopher points out.

It is very possible that, despite modified social structures and profound changes in the communication of information and messages, education has to remain within those personal limits, in which the elementary principles of life and society remain established. It is very possible, then, that, like essential human relationships, knowledge must be engendered like children in an irreplaceable personal relationship in a kind of loving bond, also a mixture of admiration and desire ([50], p. 236).

Even so, Lledó himself ([50], p. 240), at the end of his reasoning, accepts that ‘in a society fought over today by the mass media and, therefore, besieged by *other improvised educators*, perhaps the challenge of education lies in this other wider, more imprecise territory’.

#### **4 Geoterritorial Implications of Educational Virtualisation: Its Dissemination in the Latin American Scenario**

In this development that we have been carrying out in relation to the construction of virtual education policies in higher education in general, and to the institutionalisation process of the blended learning approach in particular, it is worth mentioning the phenomena of expansion of university digital culture that are occurring. The Spanish trend of incorporating semi-face-to-face and non-face-to-face educational approaches, through the use of technology, extends not only across the European continent—where this reality is consolidated and manifested through success rates—but also to Latin America, where it is becoming a pattern to follow [1].

The case of Colombia is significant in the Latin American context due to the specificities it presents in the conceptualisation of learning systems. Particularly notable, for example, is this country’s development of a distance education policy, following the guidelines, since the end of the last century and at the present time, of the Spanish distance education model [51] (through the University of Distance Education, UNED, and the Open University of Catalonia), which has helped to shape a mixed paradigm of education in convergence with those incorporated into the Spanish university system.

But, without any doubt, the most revealing element about Colombia in this scenario is, above all, its evolution towards a very strong and determined commitment to virtual education, which has counted on statewide mediation throughout this process, as reflected by Yong, Nagles, Mejía and Chaparro [52], when they talk about the ‘development of virtual-distance and virtual-face-to-face hybrid models that have been promoted by high government’ (p. 90). Thus, the creation of semi-face-to-face models introduces a variable into the framework of education that will influence the transformation of university systems. Not only is a space for the expansion of the private educational offer contemplated—due to its direct incursion into this academic model—but, at the same time, for public university spheres, and this represents an economic shake-up, as noted by authors such as Rama [53]: ‘While public universities introduced entry restrictions, access opportunities were opened in parallel at a lower cost per student’ (p. 98).

In this regard, Colombian institutions consider educational virtualisation as a potential offer when it comes to providing greater quality educational coverage [54], as long as it is conceived in terms of inclusion and flexibility, in terms of time and space. From these premises, virtual education is presented as the optimum tool and

an equitable alternative to overcoming the problems of mobility and access to higher education in the country.

However, there is no lack of voices that remind us that many of these institutions see, in the execution of these academic spaces, a direct solution to their financial problems and their coverage needs, ‘flatly losing their social, cultural and knowledge building work’, adds Parra ([55], p. 101).

Why in certain countries is this learning format being transferred as a tool for economic growth? Can we talk about a business-focused, policy-based intent or is it rather an alternative strategy that aims to add value to educational processes?

Recently, Teixeira, Bates and Mota [56] have noticed the overcrowding of the online learning offer and called it a national and cross-border educational market, unregulated and based on the idea of education as a product. Thus, the development of higher education becomes a scenario like that of Latin America in the hope of boosting productivity and economic growth from the education and training of skilled labour to generate knowledge and innovation [57]. Rama [53] describes the South American university landscape and notes, among other aspects, the growth in the last decade of distance education which ‘(...) will do so in the form of blended learning (...)’ (p. 93), an aspect that will mark the beginning of a completely virtual higher educational offer at the same time as representing the unleashing of the computerisation of both education and management processes.

Academic development and the offer of virtual distance programmes in Colombia have skyrocketed in recent years, especially since 2015, when government strategies began to support this process. Higher education studies include undergraduate (technical-professional, technological and professional) and postgraduate (specialisations, master’s and doctorate) courses and all of them can be taken virtually, especially those of a postgraduate nature. The following table shows the growth of virtual education (Table 1).

In this regard, the Colombian landscape allows us to observe that the great interest in implementing virtual higher education is being effective in terms of levels of demand. Consulting the statistical data released by the Ministry of National Education

**Table 1** Offer of higher education programmes according to methodology

| Level of education               | Methodology  |                        |         |
|----------------------------------|--------------|------------------------|---------|
|                                  | Face-to-face | Distance (Traditional) | Virtual |
| Professional technician          | 582          | 44                     | 92      |
| Technological                    | 1285         | 121                    | 115     |
| Academic/University              | 3621         | 167                    | 150     |
| Professional technical specialty | 9            | 1                      | 1       |
| Technological specialty          | 327          | 5                      | 19      |
| University specialty             | 2607         | 90                     | 152     |
| Master’s degree                  | 1578         | 21                     | 64      |

Source Own elaboration from Ministerio de Educación Nacional [54]

[54] regarding the number of students enrolled according to methodological offer, a considerable increase in demand for virtual distance education over the last six years (2010–2016) can be seen in all departments. In some of them, the sum of distance education (they call it traditional) and virtual education far exceeds the figures for face-to-face education. A very graphic reflection of this situation can be seen in the case of the city of Bogotá where the growth in the number of students who opt for virtual learning has increased significantly, from 2400 students in 2010 to 60,000 students in 2016.

It seems clear that the educational path is tipped in favour of the achievement of objectives focused on, among others, the promotion and creation of virtual postgraduate, undergraduate and extension programmes where the offer of blended-learning academic spaces is envisaged as complementary to the face-to-face approach. We recall that the Ministry does not expressly differentiate between the different types of virtual education, and blended learning is not recognised as a formal approach; however, all higher education institutions are aligning their academic development with the premises of increased coverage and entry of new providers. In this regard, virtuality also means the possibility of increasing research contingencies and this is reflected in the development plans of the universities themselves. The path towards the flexibilisation of Colombian university institutions brings them closer to, among other aspects, factors of commercialisation, competition and collaboration. The liberation of time- and space-related factors promote the opening of education to the global market and the appearance of new entities participating in this commercial space, intensifying the competition between them. In parallel, ‘collaboration and strategic partnerships will be imposed as responses adapted to changes on the part of universities’ ([52], p. 96).

## 5 Conclusions

The impact of the technological revolution is a fact. Different sectors, including education, have been forced to reorganise their organisational structures and models to take account of technological and social trends. Higher education is no exception to this as it finds itself constantly needing to review its organisational paradigms in the search for a harmonious and sustainable balance between technological advances and its role as a social entity.

The semi-face-to-face educational approach is becoming established globally as an attractive route thanks to the economic viability of access to knowledge. Although it is true that the academic literature that exists around the analysis of the repercussions of this type of learning on education is abundant, an insufficient number of studies have been carried out on blended learning from the perspective of the organisation of virtual knowledge policies in universities. There is a macro framework that promotes and encourages its use, there are actors that facilitate interaction, but there is a lack of educational development of the conditions, effects and implications.

That is why, throughout the work, it has been shown that the construction of virtual education policies, among which is the blended-learning model, is the result of an increasingly formalised institutional process in which university governing bodies, companies and society in general participate.

There is no doubt that blended learning is being supported by frameworks that establish lines of action in virtual policies and technology transfers that are increasingly subject to public–private partnerships, and whose consolidation in the university context is contributing to projecting market culture to public administration (through the translation of procedures, language, purposes), as well as instrumentalising university knowledge in public and business organisations.

The line of research based on corporate social responsibility is leading to new learning approaches, such as blended learning, providing relations between public and private contexts with greater agility and more dynamic partnerships. Formulas such as company chairs and much of the academic activity that results from it constitute an example of this instrumentalisation of virtual learning tools.

In that same direction, the work carried out shows how the study of the interactions between university, government and business sectors introduces us to a more productive aspect of university learning that would justify situations such as the presence of these formulas in branches of study, such as the social sciences, in which face-to-face knowledge and the teacher's role become essential to learning.

However, throughout these pages, we have sought to generate reflections on the knowledge that the university community has about the intent and commercial identity that underlies these structures on which blended learning rests. There is no doubt that the versatility and educational opportunities that digitisation brings to university governing bodies and State administrations, as in the case of Colombia, is blurring the commercial face of the knowledge that is required in times of economic globalisation. This confusion around the institutional guidelines that virtual education follows contributes to the construction of a policy agenda of university education that in few cases has any relation to the true scenario in which learning occurs. We also wanted to reflect that ignorance of this situation does not exempt any of the bodies that make up university institutions from responsibility.

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# Blended Education Systems: In Search of Deep Learning



Antonio Víctor Martín-García

**Abstract** This chapter presents some theoretical fundamentals that can help in the design of courses or training programmes based on blended learning. This foundation is articulated around the concept of deep learning as the main purpose of the BL system in higher education. Three fundamental theoretical elements are established to understand this type of learning: activity, collaborative social interaction and reflection based on experience. The second part of the chapter describes the main instrumental design models that can serve as a guide for the implementation of BL courses by university teachers.

**Keywords** Blended learning · Deep learning · Higher education · Instructional design

## 1 Introduction

In the context of artificial intelligence and systems programming, large technology companies strive to develop increasingly sophisticated algorithms to allow machines to perform deep learning. The idea essentially consists of having powerful hardware and designing computer software to calculate an enormous amount of information presented as successive layers. The ultimate goal is for machines to be able to identify a series of operating patterns and develop automatic learning with autonomous task resolution. In the world of education, programming and pedagogical planning is very different. This is essentially because human beings, endowed with minds that are much more unpredictable, intervene, as do other complex systems (behavioural, affective and emotional) that work in changing social frameworks with rules and norms, organisational, physical and environmental aspects with different and varied learning content and methodologies.

Despite these differences, it is possible to establish a certain analogy between the software programmer and the teacher who organises his teaching. Both seek the same

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objective: the improvement of learning. In both cases, different types of individual operations (mathematical or mental) are activated and actions of relationship and interaction with the other elements that act in the system are also exercised. All of this to finally reach a stage in which the subject (human or machine) can rework the previous knowledge acquired and activate and fix in time autonomous processes of generation of new knowledge and transfer to new situations.

In the particular context of university education, the type of learning students do cannot be understood without also considering the type of teaching proposed by the teacher, the setting in which it occurs, the sequence of procedures and activities planned and also the system of assessment required to verify the effectiveness of learning outcomes. Because of this, the implementation of an integrated BL system which proposes a route from the face-to-face classroom to the virtual classroom and vice versa, based on a planned system of activity, both of teachers and students, all in one training process involves at least three fundamental elements: a solid pedagogical starting theory from which to understand learning in higher education contexts, a clear instructional design based on that and competence and organisational support necessary for its implementation.

In contrast to superficial, merely repetitive and basically rote, reproductive and routine learning, or strategic learning [1–3], in which the student seeks to make study tasks efficient and adapts to the assessment criteria set by the teacher in order to achieve academic success as a fundamental part of external reward, deep learning (DL) is based on the development of critical and dialectical, relational and reflective thinking. It is a type of learning that seeks to solve problems based on the analysis of patterns and principles, group collaboration and self-directed learning. DL involves activating a complex process that significantly links what we already know with the new material to be learned, connecting it as far as possible with real, experiential situations, that is to say, endowed with meaning, not only personal but also technical and professional, so that it becomes consistent and long lasting. The methodological foundation of this learning is based on principles such as activity, reflection, interaction, articulated in a sequence of rationally planned teaching actions. The expected result of DL is for students to be able to make clear connections between what they know in the classroom (face-to-face or virtual) and the real world, and understand the impact of their new knowledge and skills in the professional practice concerned in each case.

## 2 Approaches to Deep Learning

Our pedagogical proposal, which seeks to achieve deep learning as we understand it here, is theoretically based on the notions of mediated activity, experiential learning, interaction, reflection, intersubjectivity, collaboration and intrinsic motivation. Most of these elements can be found in the main theories about adult learning developed during a tradition of study that dates back at least 50 years. Given the obvious

impossibility of covering all proposals, models and theoretical approaches to learning, we take a particular cross-cutting look at only those theories that seem to be of most interest for underpinning the design of a BL system, taking the features that we believe best define deep learning and summarising them in three fundamental pillars: *activity, collaborative social interaction and reflection based on experience*.

## ***2.1 Deep Learning is the Result of the Subject's Activity***

### **2.1.1 Deep Learning Arises from Social Action Seen as Meaningful and Intentional Activity**

Both from the perspective of the history of philosophical and sociological thought, human activity has been fundamentally seen as social action. The concept of action originates from Aristotle (who saw action as an object of practical or moral knowledge and defined it as the active use of reason directed at achieving the good of man, making the distinction between *praxis*—or action—and *poiesis*—or activity). From an eminently sociological consideration, and especially from the work of authors such as M. Weber, T. Parsons and J. Habermas, human actions are always social actions. Weber sees social action as a significant activity and it therefore has to be interpreted or understood significantly. According to Weber, for an action to be social, it must be meaningful and he defines as ‘action’ human behaviour that its own agent or agents see as being subjectively significant, and to the extent that it is. Such behaviour may be internal or external and may consist of the agent doing something, refraining from doing something or allowing something to be done. He defines social action as ‘behaviour in which the meaning attributed to it by the agent or agents involves a relationship with respect to the behaviour of another or other persons and in which such a relationship determines the manner in which such an action is undertaken’ [4, p. 11].

Therefore, for Weber, social action differs from the idea of behaviour because it is endowed with meaning, and also exceeds the idea of bodily or physical movement (natural causality). This idea of significance and intentionality or, in other words, rationality differentiates the behaviour action observable from outside and is also present in other great sociologists belonging to very different traditions. For example, T. Parsons maintains Weber’s main tenets on the concept of ‘*action*’ as intentional behaviour and, therefore, significant, however, introduces language as a fundamental element of action. Deep down, language refers to the idea of culture. For Parsons, a pre-established cultural system in the processes that institutionalise the behaviour (action) of individuals and groups is always being presupposed [5].

From the systemic theory of society developed by N. Luhmann, the fundamental element of the social is *communication*, and not action, or better, of the social system, formed in turn by functional subsystems closed through specialised codes. In a very similar line, language also constitutes the essential dimension of the theory of communicative action of J. Habermas, and the foundation of social interaction as a

hallmark of the human species. For Habermas, any social action is made up of both speech and teleological activity. Speech for Habermas is an activity that is orientated towards understanding, while teleological activity is one that is orientated towards success. Both can be distinguished at analytical level, but they are inseparable in real life. So, since other actors always participate in social action, for Habermas, it is necessary to talk of social interaction, in which the expectations and practices of various subjects participate. Social phenomena, according to this interpretation, are always linguistically mediated. For his part, Giddens [6] defines human action based on the competence of individuals to act, perform things and, in particular, influence the behaviours of other actors and transform circumstances and contexts in which interactions occur. It is here where the connection for him is found with the idea of reflexivity, from which the actor or agent understands the conditions in which he acts, has objectives and intentions on the basis of which they can guide his behaviour and has expectations in relation to the rest. According to Giddens, reflexivity encompasses both discursive consciousness and practical awareness (p. 90). For Giddens, discursive awareness is the ability of people to comment on what they do and explain the reasons for their actions.

In summary, we can observe how contributions of interest can be extracted from analysis of sociological thought to underpin or identify the *essence* of the learning activity within the framework of the educational action conceived as a type of social action. This essence can be conceptually operationalised from principles based on intentionality and significance (rationality), intersubjectivity, communication, interaction, modification or transformation.

### 2.1.2 Deep Learning is the Result of Complex and Mediated Activity

Excluded simple learning, based on the stimulus-response association or contingent response-consequences association (Thorndike, Skinner, etc.) or cognitive constructivism (J. Piaget, W. Perry, Ausubel, and Bruner, etc.), explanatory theories on learning with wider acceptance today are based on social constructivism (Vygotsky, Luria, Vygotsky, Leontiev, Bandura, Engeström, Wenger, etc.)

In the socio-constructivist paradigm, human activity is seen as a set of processes socially mediated by certain symbols, signs, artefacts or instruments that are historically and culturally manufactured. Through this mediated cultural activity and its own interaction with others, the subject constructs and reworks his conscience, as well as his vision of the world and, consequently, access to and understanding of it, in a process that turns out to be mediated and, therefore, indirect to reality. From this approach, the learning possibilities of a subject will depend not so much on their level of cognitive development, but above all on the personal and mediational context in which they are found. This includes motivational aspects, hypotheses and expectations, depending on his personal goals and life plan, the possibilities offered by his physical and especially sociocultural environment. It is from this position that social interaction and discourse are seen as basic elements for the development of higher cognitive processes. That is to say, learning is a social phenomenon (social

action) that allows students to acquire the necessary elements to appropriate knowledge through interaction with peers, teachers and learning materials and content. This idea is, to a large extent, the basis of Vygotsky's activity theory, which analyses the mediation between *subject-object-mediating artefacts*. The second generation of this theory basically proposed by Alex Leontiev emphasises the importance of context and collective action in learning processes. Activity, or 'activity systems', is thus seen as a collective and systemic formation with a complex mediating structure: community, rules and division of labour, interactions, conflicts and contradictions that are produced within it. The recent revision and reformulation of the theory by Yrgö Engeström (third generation) largely in its application to organisational and professional contexts proposes the development of certain conceptual tools to understand dialogue, multiple perspectives, and the interaction networks of activity systems [7].

In particular, from the theory of learning by expanding, he goes one step further in the theory of cultural historical activity and emphasises the importance of the object of the activity as an engine of learning and development. For Engeström [8] in the process of theoretical reconceptualisation of the concept of activity, it is necessary to consider five central principles: the activity system as a unit of analysis, the multiplicity of voices in the activity, the historicity of the activity, contradictions as an engine of change in the activity, and expansive cycles as a possible way of transforming the activity.

### **2.1.3 Deep Learning is the Result of Situational, Distributed and Contextualised Activity**

Within the framework of the CSCL paradigm, the works of authors such as Engeström [7], as well as other traditions of more sociological content based on ethnography, cultural and cognitive anthropology, interactionism and, above all, ethnomethodology, which emphasise the importance of the influence of contexts on any social activity of individuals, the approach of situated cognition emerges and distributed cognition [9].

The increased perspective on the concept of activity introduced by the theories of situated learning and distributed cognition, raised from professional and organisational settings, also allows us to observe educational processes as systems or spaces of activity in which interaction is seen as an integrated and distributed process among all of the elements present in the situation: space and time, the artefacts of the environment, as well as the perception and joint cognition that is established in the communication or interaction of teachers and students. The concept of situated learning, proposed by Brown et al. [10], based on Vygotsky's sociocultural theory, refers to a form of activity that assumes the importance of the context, of culture in which it is carried out, without which such behaviour or activity cannot be abstracted. The substantive thing here is that the activity and, in fact, any social practice, is perceived to be located in a specific context and also the knowledge that arises or is present in that context is socially distributed. That is to say, from the idea of distribution of cognition or intelligence, the resources that shape the activity and

make it possible are distributed in configurations among people, environments and situations; in other words, intelligence is conceived not as an individual attribute, as a thing that is possessed or is a property of the being, but as something that is exercised, manifested in activity, in action. In this regard, digital technologies are conceptualised as reorganisers of mental functioning and not merely as amplifiers of cognition, providing people with resources to guide the activity and increase it. The way to guide and increase activity situated and distributed in the virtual environment, when implementing a training model of interaction, which allows the group to explore, analyse, reflect, propose, act and, above all, share, provides meaning to the teaching-learning relationship, enabling the basic principle of transfer of knowledge to the real-life/professional situations of the participants.

In short, we are referring to the fact that a basic feature of the b-learning system must be contextualisation. In this regard, another contribution that is of interest is *connectivism*, which introduces as a fundamental element the technological component and especially the idea of social network learning. According to this theory, learning is a process of connecting specialised nodes, systems or sources of information, which are distributed and reside in non-human devices.

From a conception that integrates principles explored by theories of chaos, networks, complexity and self-organisation [11], connectivism maintains that learning, defined as actionable knowledge, can reside outside of us. In this way, it seeks to explain the connection of the whole with the whole, assuming that the way that people work and function is altered when new tools are used. For Downes (p. 16) [12] connectivism proposes the thesis that knowledge is distributed through a network of connections, and therefore, this learning consists of the ability to build and cross those networks. In short, for connectivism, learning takes place in communities of subjects that share and exchange ideas, images, texts, dialogue and think together mediated and connected in different networks or nodes of interaction. These networks constitute sources of information through which knowledge stored in different spaces, platforms and digital and neuronal formats flows and is distributed in a broader framework which is the community, as a whole in which knowledge is ubiquitously distributed.

#### **2.1.4 Deep Learning Involves Individual Responsibility and Autonomy. It Is Orientated by Student Motivation**

From the basic principles of the theory of andragogy and adult education, contributions of great interest can also be taken to underpin the instructional design that promotes deep learning in BL contexts. In this case, the optics focus on highlighting the role of the subject in their own learning process, emphasising the ideas of autonomy, independence and personal development. The perspective of individual self-direction in learning thus becomes a central aspect. As much as learning situations are and should be contextualised, situated and social, it is also necessary to contemplate the role of the individual subject within it. We basically refer to the

importance of cognitive and motivational aspects, for example when making decisions, autonomously defining certain learning goals and/or metacognitively analysing the results and learning process itself [13, 14].

For Brockett and Hiemstra [15], self-direction is not just a form of learning, it is a way of life, framed in the context of continuous learning, throughout life, in which the individual who learns, assumes his own process of learning in a self-planned way. For example, the so-called personal responsibility orientation (PRO) model proposed by Brockett and Hiemstra [15: 44 et seq.] is offered as a framework for the understanding of self-direction in learning in higher education, in which the two dimensions present in this type of process are combined: self-directed learning itself, as an instructive method, and self-direction or better self-regulation of the student as a personality characteristic. Both dimensions lead to the idea of personal responsibility to initiate, guide and maintain his own learning process over time. Some researchers in this field, such as Guglielmino [16], have pointed out some positive aspects that self-directed learning (SDL) provides, such as greater openness to new learning opportunities, initiative and independence, love for learning, creativity and risk taking, positive orientation towards the future, etc.

Data on SDL in virtual learning environments has also been provided, showing that the possibilities of accessing multiple sources of information, media and meeting spaces are greatly expanded for the student. Self-direction in learning here involves the student becoming effectively aware of the importance of control in the process of identifying and solving problems, as well as making decisions through the development of critical and management skills, development of creative thinking, cooperating effectively as an individual in a team, organising and managing activities and personally taking responsibility for learning activities, collecting, analysing, organising and critically assessing information, etc. [17] All of these characteristics are part of deep learning. And also the development of the 'learn to learn' competence, which involves activating mechanisms to critically reflect on the process and results of learning itself. This second aspect leads to the question of self-regulation and motivation in learning.

In the case of self-regulation, there is sufficient evidence that shows that subjects who are better orientated towards deep learning have a more positive self-concept, value their own learning abilities more, and are more involved and committed to the learning process. But orientation towards deep learning also influences aspects related to the type of tasks chosen and the way students access content. One way of understanding this fact is presented by the theory of andragogy, which, in addition to adult self-direction, describes two other fundamental principles such as the constituent nature of the experience and the need of adult students to learn things that are relevant to them. These principles are fundamental to helping guide the curriculum and methodology of working with students in higher education. Aspects of interest derive from them, such as adult students wanting to immediately apply what they have learned and learning best through an approach centred on problems and not on the subject [18, p. 162].

Regarding the case for motivation, for the self-determination theory (SDT) proposed by Deci and Ryan [19, p. 182], much of deep learning, creative problem

solving or even psychological well-being depends on the quality of the motivation. With this in mind, several types of motivation are distinguished. On the one side, there is autonomous motivation and controlled motivation. The first includes intrinsic motivation (whose value lies in the individual's interest in the activity itself) and extrinsic motivation (the value is outside of it). *Controlled motivation* consists of both external regulation, in which behaviour is a function of external contingencies of reward or punishment, and introjected regulation, in which the regulation of action has been partially internalised [20, 21]. According to this, a student motivated towards deep learning guides his behaviour by intrinsic motivation and introjected regulation, which involves generating a learning setting with a high degree of interest and involvement in what is being learned, orientated to discover the meaning of what is to be learned and establishing relationships with previous experiences and knowledge [22].

## ***2.2 Deep Learning is the Result of Reflective Activity Based on Experience***

In line with the last idea, the basis of the educational process is to make all students act, but also think and reflect on what they learn. This involves introducing a second fundamental element to understand the deep learning process. That is to say, to value the role that experience plays in learning and the importance of reflection on action. In the field of education in general and of adults in particular, experiential learning has been widely discussed from different points of view, constituting in itself a psychopedagogical tradition supported by a significant number of authors such as John Dewey (for whom education must be conceived as a continuous reconstruction of the experience, process and objective of education) [23], Kurt Lewin, the perspective of andragogy of Malcolm Knowles, the transformational theory of adult learning by Jack Mezirow, Donald Schön's theory on reflection in action and Reginald Revans's learning action approach.

In the early 1980s, authors such as Mezirow, Freire and others emphasised that the heart of all learning lies in the way subjects process experience, in particular, their critical reflection on this experience. For these authors, learning is defined as a cycle that begins with experience, continues with reflection and later leads to action, which in itself becomes a concrete experience for reflection.

Experience is thus fundamentally conceived as the way we build knowledge through a process of reflection and 'making sense' of our actions related to teaching or learning. In the first case, in the field of teaching and teacher training, the idea has been raised primarily in terms of seeing teachers as reflective researchers. That is, practice based on questioning and permanent dialogue between theory and practice, which has a wide and interesting bibliographic development (Dewey, Freire, Schön, Elliott, Carr and Kemmis, Perrenoud, Stenhouse, etc.). A key aspect to understanding

this position is to accept that reflection on action fundamentally involves incorporating the idea of research (action research) into the work of educators, teachers, and also higher education students. It is about replacing a classic intervention approach, based on the idea of technical, positivist and enabling rationality (planning, identification of needs, objectives, strategies, etc.) with a critical rationality [24] that induces reflection on the action itself, assuming that the student (future professional) becomes a thoughtful practitioner [25]. In all cases, the educational action involves promoting a committed and critical professional attitude which seeks the solution of social, scientific or technical problems through a process in which reflection is applied to obtain knowledge of real practice, based on own experience about that practice, both at the time that action is performed, and after it has occurred. Deep down and in this way, the learning action is transformed into *praxis*, as a social act that creates the relationship between theory and practice by making reflection (individual and collective) part of the same practice in a critically informed and committed action. This is precisely the idea of action research, which uses as a method the *self-reflective spiral*, consisting of successive cycles of planning, action, observation and reflection [25: 13]. In this self-reflective spiral process, *planning* is prospective with respect to the action and retrospective with respect to the reflection on which it is built. For its part, the *action* is guided retrospectively by reflection and prospectively towards future observation and reflection, which will assess the problems and effects of the action. *Observation* is retrospective regarding the action taken and prospective towards the reflection on which it is to be considered. Finally, *reflection* is retrospective regarding the actions undertaken so far and prospective in terms of new plans. The self-reflective spiral links the reconstruction of the past with the construction of a concrete and immediate future through action [24].

Transferred to the field of activity carried out by the student who learns, this approach coincides with the last step of the expansive cycle proposed by Engeström in his theory of transformative learning and also with the theory of experiential learning proposed by Kolb [26–29].

### 2.2.1 Experiential Learning

As we have pointed out, considering the learning activity to be the result of an act of thought, of knowledge about practical action, that is to say, conceiving it fundamentally as a reflective act, has been part of the fundamentals of experiential learning since J. Dewey and D. Kolb, and is used today as a theoretical foundation and applied in instructional design and training in numerous universities around the world.

Action and reflection are the core attributes of experiential learning to the extent that, for learning to occur, a reflection on an action must take place. This reflection, as something inherent to all human activity, must be a conscious effort and a planned activity. Reflection is thus considered a deliberate and active cognitive process which involves sequences of interconnected ideas that take into account beliefs and knowledge [30]. In the educational field, reflection consists of recursive processes in which

students capture, note and reassess their experiences. From the idea of deep learning, it is understood that the reflection process must be activated after each learning experience and in some cases during the learning act itself.

In the experiential learning theory (ELT), the role that emotional and cognitive factors play in learning is emphasised. In particular, it values the importance of critical reflection to the way we learn through the transformation of experience. Thus, the basic foundation of the theory lies in the emphasis given to experience as a defining characteristic of that reflection and consequently part of the fundamental principle of which this learning should have as its main resource the action itself.

Kolb, in his works, has sought to examine these basic ideas in greater detail in order to determine and define the concept of reflection precisely. He divides it into two learning activities that are related but different to each other: perception and processing. The first case refers to the way we take information in a sensory or emotional way when we face new situations, that is to say, the way we acquire the experience. The second refers to the way we handle or transform that new information, which is by now experience, and we make it part of ourselves, creating meaningful connections. It is also understood that some people perceive information better using concrete experiences (such as feeling, touching, seeing and hearing), while others perceive information better in an abstract way (using conceptual, visual or symbolic representation). And some people 'transform' or process information better through active experimentation (doing something with the information), while others process it better through reflective observation (thinking about it). These two distinctive but interconnected synergistic learning processes allow learning through the dialectical movement of action and reflection and form a learning cycle that has four stages. Each of these stages involves a different way of experiencing reality (of perceiving and processing the experience) and defines the learning preferences of the subjects.

Experiential learning is therefore a process of knowledge construction that involves a creative tension between four learning modes that respond to contextual demands. This process is presented as an idealised or spiral learning cycle in which the student 'touches all of the bases': he/she experiments, reflects, thinks and acts in a recursive process that responds to the learning situation and what is being learned (quote, Kolb). Thus, the learning process follows a series of cyclic stages that begin with a direct experience ('concrete learning'), which is followed by reflection ('reflective observation'), the reflection is then assimilated into a theory ('abstract conceptualisation') and finally this new (or reformulated) hypothesised theory is tested in new situations ('active experimentation'). The theory points out that in order for deep learning to occur, it is necessary to work on all four categories. Or, in other words, according to the experiential learning model, optimal learning is the result of working on information using the following four types of learning [26, 27].

- *learning by 'thinking'*: Generalisation or *abstract conceptualisation* () defines the ability or skill to create concepts and develop models to integrate and internalise the observations made. Subjects with this orientation prefer impersonal and

structured learning situations that allow logical and systematic analysis of theories, things or symbols. Specifically, these types of students learn best through didactic strategies based on case studies, theoretical readings and exercises that involve the use of reflective thinking.

- *learning by 'experimenting'*: Concrete experience. This is the ability or skill to get involved in a given experience. It consists of a preference used by active subjects who enjoy situations that offer opportunities to try, experience new things and put their own criteria into play.
- *learning by 'reflecting'*: Reflective observation. This defines the ability or skill to reflect on the experience using different points of view. This type of orientation is typical of subjects who like to observe objectively and carefully in learning situations to try to understand the meaning of things. These are primarily visual and auditory students.
- *learning by 'doing'*: Lastly, active experimentation, which defines the ability or skill to make decisions and solve problems based on theories. It is characteristic of intuitive, affective and 'kinaesthetic' subjects. These students learn best when they participate in projects, tasks, or poorly structured group discussions. This type of subject likes to see everything and determine their own criteria about the relevance of the materials used.

## 2.3 Deep Learning Needs Collaborative Social Interaction

*Collaborative learning* permeates most theoretical approaches in which collaboration and interaction in education have been analysed. In part, this is because cooperation and especially collaboration are considered the most integrative and valuable features of training design in any learning environment [31]. Collaboration etymologically alludes to the idea of 'working together or with others'. This notion involves the idea that several people with different levels of competence carry out one or more activities in order to obtain a mutual benefit and try to achieve a common goal. In the educational field, collaboration is seen as an interaction structure that leads to learning and knowledge building through a synergistic process of group support and interaction, whose effectiveness necessarily rests on individual commitment, mutual responsibility and positive interdependence between group members [32]. The objective of any interactive training environment, therefore, is to seek the active involvement of the subject in the joint tasks proposed in the system. This active relationship established between the participants themselves and between them and the learning content in either face-to-face or virtual systems requires an adequate design of technical tools that allow a fluid exchange of information, experiences and knowledge. In addition to adequate learning materials and activities, interaction in a BL environment is achieved through the development of a communication process based primarily on dialogue and argument. It is, therefore, necessary to articulate an instructional sequence that allows the acquisition of knowledge through this discussion and the

exchange of perspectives among group members. In short, the exchange of views, negotiation of perspectives, and reconstruction of meanings are the basis of learning in the semi-face-to-face environment, above the transfer of information or the storage of documents. This exchange of information and reflection of individuals in social interaction leads then to the modification of schemes of interpretation, producing the necessary cognitive conflict that enables deep learning and the assimilation of new knowledge.

In addition to learning *with* others, the concept of collaboration also refers to learning *from* others. Seen from the perspective of socio-constructivist theory, knowledge is not an object that is passed from one subject to another, but something that is constructed through cognitive operations and abilities that are induced in social interaction. In educational practice, this involves having a system of relationships between the members of the group in which there must be an exchange of roles and tasks that allow the co-construction and appropriation of knowledge, enabling the subjects to construct and jointly interpret reality, giving meaning to the content to be learnt.

The Computer-Supported Collaborative Learning (CSCL) approach developed from the mid-1990s [28, 33–35] has opened new perspectives for the analysis of collaboration in e-learning and b-learning environments, combining social, psychological, and organisational aspects, and their effects on learning. More specifically, the CSCL perspective has been primarily interested in determining how technology-assisted collaborative learning can improve peer interaction and group or team work; that is to say, how collaboration, as well as technology, facilitates shared and distributed knowledge, in addition to the development of skills and abilities among community members [36].

But what does interacting in blended learning environments mean in pedagogical terms? According to Vygotskian theory, interaction is usually explained from the concept of the zone of proximal development (ZPD) and, by extension, can be applied to the relationship established between the different zones of different participants, from the moment that any subject makes use of knowledge, information, data, reflections, etc., accumulated in the system by other users. In order to achieve an adequate interaction, some authors explain that it is necessary to determine the extent to which the zones of proximal development must coincide in order for the work of the group to be effective; that is to say, that the group must be sufficiently homogeneous for its ZPDs to have points of coincidence and for knowledge sharing to take place, but also sufficiently heterogeneous for some subjects to learn from others. This is a basic aspect that refers to the idea of mutual trust between the participants, which allows ‘entry’ into the zone of development of others, while also ‘opening’ their own area so that others can benefit from this help; in short, to facilitate the appropriation process. For pedagogical theory, this is a key question. It is expressed in concerns about how to generate zones of collective development, also known as common zones of intersubjectivity.

We understand that in b-learning contexts the way to generate this type of collective learning environment or to share this intersubjectivity is the big question. The use of strategies and methodologies based on dilemmas, cognitive conflicts, dialogic

activities and conversational methodology can be a good instructive resource, aware that the use of this type of methodology in favour of intersubjectivity in the system involves generating a dual system of activity mediated by computer, interaction and interactivity. If interactivity affects the computer-user relationship and, ultimately, that of student-content, the interaction seeks to generate a virtual social community.

On the one hand, *interactivity* breaks the narrative linearity of text systems, providing the user with the possibility of establishing their own navigation itineraries through the hypertextual structure presented by the interface. The idea is that, the more interactive the teaching materials are, the more enriching and higher quality the collaboration will be and, consequently, the better the relationship between the recipients in order to promote the process of social construction of knowledge and learning. To the extent that the system is 'warmer', more attractive to the subject, the relationship between the subject and the computer will also be greater and better. When the dialogue between the user and technology is established, perceptual visual, cognitive, attitudinal and motivational mechanisms are activated, in addition to the physical interaction itself with the device or platform, which together cause a more or less positive reaction by the subject towards the system with a notable effect on his decision to continue or not on it. That is why system interactivity is provided by the quality of the interface and the computer application used in each case, as well as by the intentionality of the designer to seek such interactivity or not.

For its part, *social interaction* requires an adequate environment of participation, which generally occurs within the framework of work teams orientated by common goals or tasks. Lave and Wenger [37] created the term '*community of practice*' to describe a group of students who share common goals, common language, beliefs and values and ways of doing certain things. From a pedagogical point of view, the concept of community of practice is interesting for promoting the participation of students in organised groups in order to foster contextualised social learning through shared activity and tasks taken from real, social, professional and/or educational life.

This involves promoting a group support system in which a friendly relationship between members is encouraged, creating an atmosphere of trust. It should be noted that this is one of the most difficult aspects in the practice of collaborative work in BL environments, particularly regarding the virtual component. As a result, it is necessary for the technical structure designed for communication in the virtual environment to have tools such as discussion groups, chat rooms and leisure spaces, whose main purpose is precisely to promote this type of interpersonal reinforcement component and, ultimately, increase the quality and quantity of participation by those involved. Interaction in these spaces, therefore, requires a new communication system that mitigates the effect of the loss of the nonverbal communication found in face-to-face contexts. The absence of body language or body-to-body communication which arises naturally in face-to-face situations requires other types of substitute elements that make it necessary for instructions and tasks to be more explicit. The inclusion of personalised images, photographs and personal information of users is relevant and necessary, although perhaps not sufficient, so adequate instructional materials and personalised teaching resources that facilitate the process of participation, interaction and mediation are required.

In short, in both face-to-face and virtual spaces, it is necessary to promote structured work systems to articulate an instructional sequence that allows the acquisition of knowledge through this discussion and the sharing of perspectives between the members of the group. It is therefore useful to always start the learning process through guided discussion, where the subject is encouraged to participate actively in discussion groups or forums directly or vicariously, and observe and reflect on interventions by other participants. To achieve this, it is essential to have an adequate instructional design.

### 3 The Instructional Designs for the BL System

There are a large number of instructional design models. Below we describe very briefly some that seem to be most useful for guiding the design of b-learning training. Most of these approaches identify a series of steps or stages but differ in the emphasis given to them, and, above all, to the order or sequence followed when making the instructional process more efficient (see also Table 1).

#### 3.1 *4MAT Model by McCarthy and McCarthy [38]*

Derived from the pedagogical approaches of Dewey, the experiential learning theory of D. Kolb, and Jung's theory of personality types, the 4MAT model presents a proposal for explaining the natural learning cycle for the improvement of motivation and academic performance based on the development of perception, processing, understanding and communication strategies adapted to the different types of preferences or learning styles of subjects and involving the two cerebral hemispheres (*whole brain teaching*). The 4MAT model assumes that true and deep learning can only occur in the interaction between experience and thought. The first has to do with the way we perceive and the second with the way we process information from the medium. It identifies two axes in the process of perception and processing of experience to give rise to learning. At one of the poles of the first axis is sensory perception (sensing/feeling/experience) and, at the other, abstract thought (thinking/abstracting experience). At the poles of the second axis, there is reflection on new experiences (watching/reflection) and action (doing/action). All of them complement each other and act alternately in each of the domains of the right and left hemispheres, giving rise to the 4 learning styles: (1) innovative, (2) analytic, (3) common sense, and (4) dynamic.

An interesting aspect of this model is that it is intended to be applied to any student without it being necessary to identify their learning style in advance and having to specifically adapt the teaching for each particular style. The instructional sequence derived from the 4MAT learning cycle follows 8 steps:

**Table 1** Summary of some models of instructional design (Prepared by the author)

| Models of instructional design                           | Phases/learning cycle                                                                                                                                                                                                                                       | Example of activities                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4MAT Model [38]                                          | <p>Sensing/feeling/experience</p> <p>↓</p> <p>Thinking/abstracting experience</p> <p>↓</p> <p>Watching/reflection</p> <p>↓</p> <p>Doing/action</p> <p>1. Connect → 2. Attend → 3. Image. → 4. Inform → 5. Practice → 6. Extend → 7. Refine → 8. Perform</p> | <p>Motivational activity and activate interest and prior knowledge, participant observation, search for information, Audiovisual material, Group activity, Activation of senses, emotions: personal experience, Personal student journal, brainstorming, gamification, timelines, exhibitions, demonstrations, jigsaw, jigsaw, puzzles</p>                                                                                                                                                                                                                                                                  |
| Understanding by Design UbD— <i>Backward Design</i> [40] | <p>Identify the desired results</p> <p>Transfer → Understanding → Essential question → Knowledge → Skill</p> <p>↓</p> <p>Determine the desired evidence</p> <p>↓</p> <p>Plan learning and experiences and instruction</p>                                   | <p>Essential questions, case studies, puzzles, teamwork ABP, research teams</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| The R2D2 model                                           | <p>Reading/Listening</p> <p>↓</p> <p>Reflecting/Writing</p> <p>↓</p> <p>Displaying</p> <p>↓</p> <p>Doing</p>                                                                                                                                                | <p>Online readings, group, discussions, and presentations, explorations, listening to online lectures and podcasts, Chat, Webquest, reflective activities ( online blogs, reflective writing tasks, self-check exams and e-portfolios, role play online or presental debates, portfolio/e-portfolio, Online brainstorming or discussion with peers Webquest, virtual tours, timelines, animations and concept maps, podcasts, real-time simulations, scenarios and case studies, self-study, personal, freelance real activity, collaborative group paper, Writing, Case, simulations and manipulations</p> |

(continued)

Table 1 (continued)

| Models of instructional design                                    | Phases/learning cycle                                                                                                                                                                                                                                                                                                                                                      | Example of activities                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VARK Model [43]                                                   | Types of learners and learning styles<br>1. Visual (V)<br>2. Auditory (A)<br>3. Reading/writing (R)<br>4. Kinesthetic, tactile, or exploratory (K)                                                                                                                                                                                                                         | Graphic representations: maps, diagrams, symbols, audiovisual material debates, recordings and tutorials, web chat, oral explanations of the lecturers and by listening to presentations, reading and writing activities, textbooks, PowerPoint presentations, demonstrations, simulations, multimedia presentations, etc. |
| The Dick and Carey model for systematic instructional design [45] | Identification of the instructional goal<br>↓<br>Instruction Analysis<br>↓<br>Analysis of students and context<br>↓<br>Writing objectives<br>Development of evaluation tools<br>↓<br>Elaboration of the instructional strategy<br>↓<br>Development and selection of instructional materials<br>↓<br>Formative and summative evaluation<br>↓<br>Review of final instruction | (continued)                                                                                                                                                                                                                                                                                                                |

Table 1 (continued)

| Models of instructional design                                                                                      | Phases/learning cycle                                                                                                                                                                                                    | Example of activities                                            |
|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| Modelo ADDIE                                                                                                        | Analysis (A)<br>↓<br>Design (D)<br>↓<br>Development (D)<br>↓<br>Implementation (I)<br>↓<br>Evaluation (E)                                                                                                                |                                                                  |
| Mayers-Briggs                                                                                                       | Fase 4: Dinámico                                                                                                                                                                                                         | Simulations, ABP, visits to centres, professional reality, games |
| IPISD<br>Interservices Procedures for Instructional Systems Development<br>Branson, Rayner, Cox, Furman and Wallace | Systematic analysis of operational tasks<br>↓<br>Design of contents and activities<br>↓<br>Development: categorization of learning objectives<br>↓<br>Implementation<br>↓<br>Internal (students) and external evaluation |                                                                  |

(continued)

**Table 1** (continued)

| Models of instructional design                           | Phases/learning cycle                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Example of activities                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ASSURE Model [47]                                        | Analyse (A)<br>↓<br>State objectives (S)<br>↓<br>Select, modify or design materials (S)<br>↓<br>Utilize materials (U)<br>↓<br>Require learner response (R)<br>↓<br>Evaluate (E)                                                                                                                                                                                                                                                                                                                                                                                 | Text, images, video, audio, and multimedia<br>Collaborative and active activities apprenticeship contracts, the readings, exchanges of opinion, the self-directed learning, the est<br>In order to be able to hear specific cases, they must be notified to the Commission.and forums |
| A Model for Developing Multimedia Learning Projects [49] | Define the instructional goals, objectives, and audience<br>↓<br>Review and investigate existing options<br>↓<br>Determine format, budget, and timeline<br>↓<br>Determine the content, activities, and assessment strategies<br>↓<br>Develop evaluation strategies, criteria, and instruments to determine the effectiveness of project<br>↓<br>Develop the flowchart, site map, and/or storyboard<br>↓<br>Develop a prototype<br>↓<br>Perform a formative evaluation<br>↓<br>Complete the design<br>↓<br>Perform a summative evaluation of product and process |                                                                                                                                                                                                                                                                                       |

1. **Connect** and relate. This aims to arouse the student's interest in the content. What is sought is a symbolic connection with the main theme, concept or problem addressed in each learning unit. The connection is made symbolically or experientially (individual observation and group discussion about own experiences).
2. **Attend**. A relevant example is usually presented on an aspect of the topic or experiences from the previous step. The students analyse it, look for similarities or differences with similar situations taken from their personal experience or previous knowledge, and express their feelings and opinions.
3. **Image**. An activity is proposed in which students can symbolically represent information through imagination or opinion about images.
4. **Inform**. New information is provided, with emphasis on the basic parts of the concept (conceptual knowledge) and details, for example, doing definitions tasks, glossaries, etc.
5. **Practice**. This involves putting into practice some of the concepts defined above.
6. **Extend**. This step is about experimenting with aspects related to the topic or concepts defined above, seeking to integrate different aspects of it.
7. **Refine**. This step seeks to examine and assess the knowledge acquired throughout the previous process.
8. **Perform**. Finally, the cycle closes by trying to transfer and share knowledge with new situations or contexts.

### 3.2 *Understanding by Design (UbD) (McTighe and Wiggings [39])*

Based on the work of Grant Wiggins and Jay McTighe in 1998, the fundamental objective of this model is to develop a type of deep and long-lasting learning based on understanding and the transfer of classroom learning to significant real-life and/or professional situations. Understanding seeks to provide students with the ability to understand ideas, fundamental concepts or the functioning of things in greater detail so that they can transfer that knowledge to new situations and realities.

The UbD approach is based on what they call a 'backward design' in which the planning and development process of a particular subject does not follow a classic linear or sequential process usually beginning with the selection of content, but involves firstly determining the fundamental achievements or goals of learning (goal learning). It proposes three main stages in which three basic elements are integrated: content, learning results and assessment. It is therefore about identifying the desired results, determining the desired evidence, and planning the instruction and experiences to achieve the results.

- In the first stage, the *essential aspects (concepts, ideas, etc.) to be learnt are selected* based on diverse criteria related to specific needs and goals set by each

teacher for their particular subject, or by the institution, with learning evidenced through the fulfilment of certain learning goals or standards. These standards (or the Six Facets of Understanding) are the following: Explanation, interpretation, application, perspective, empathy, and self-knowledge (transfer, understanding, essential question, knowledge, skill [40].

- In the second stage, the necessary *evidence* is sought to assess achievement of the expected results.
- Finally, in the third stage, the key *learning activities are designed* to achieve the learning objectives of the students.

### 3.3 *R2D2 Model (Bonk and Zhang [41])*

The R2D2 model is basically designed for distance learning and is also derived from the basic approach of the experiential learning theory of D. Kolb, with special attention paid to the importance of reflection in learning. The model is very similar to the VARK method by proposing an integration of four types of learning activities: (a) Reading/Listening; (b) Reflecting/Writing; (c) Displaying; and (d) Doing, for which it suggests a variety of online activities for each type of student for active and effective learning [42].

### 3.4 *VARK Model (Fleming and Mills [43, 44])*

This identifies four types of learners and learning styles based on how subjects process the information captured through the senses sensorily: (a) visual; (b) auditory; (c) reading/writing; and (d) kinaesthetic, tactile, or exploratory. For each of them, different types of activities are established that can better promote their learning.

### 3.5 *The Dick and Carey Model for Systematic Instructional Design [45]*

Part of a systemic approach with behavioural influences that uses the following sequence:

1. Identify Instructional Goals.
2. Conduct Instructional Analysis.
3. Identify Entry Behaviours.
4. Write Performance Objectives: the objectives are defined for each unit of content.
5. Develop Assessment Instruments: creation of assessment materials and instruments.

6. Develop Instructional Strategy.
7. Develop and Select Instructional Materials.
8. Design and Conduct Formative and Summative Evaluations regarding the design of the course and instruction.
9. Revise Instruction.

### ***3.6 Grow's Staged Self-directed Learning (SSDL) Model***

This is a self-directed learning model in stages that establishes a typology of students based on the level of self-direction they need to achieve the expected learning outcomes. Four SDL styles are identified: dependent, interested, involved, self-directed. The more the teacher's teaching style matches the self-direction, the better the end result of learning. That is to say, each of the four styles of student self-direction will require specific teaching support strategies, hence the importance of reinforcing the presence and the close role of the teacher in environments where part of the activity is carried out at a distance, such as e-learning or BL, through supervision and a tutoring plan, in particular, in cases of students with low self-direction learning.

### ***3.7 ADDIE Model***

This is an interactive model in which each of the stages can be modified based on the formative assessment of learning outcomes. The stages are the following: STAGE 1: Analysis (seeks to identify educational or training needs based on the characteristics of the students, course content and context or environment where it is applied); STAGE 2: Design (tries to define the didactic approach and organisation of the content, choice of strategies, type of content and learning activities required: declarative knowledge, procedural knowledge, attitudinal knowledge. STAGE 3: Development (in this stage, it is a question of generating the plan of activities and materials, selection of the pedagogical strategies, materials and means that are going to be used (storyboard). STAGE 4: Implementation and STAGE 5: Evaluation.

## **4 Other Instructional Models**

### ***4.1 IPISD Model (Interservices Procedures for Instructional Systems Development)***

Created by Robert Branson, Gail Rayner, J. Lamar Cox, John P. Furman and Wallace H. Hannum, it consists of the following stages: (1) Systematic analysis of operational

tasks with measurable results; (2) Design of content and activities; (3) Development: consists of the categorisation of learning objectives in order to optimise their fulfilment and application; (4) Implementation; (5) Internal (students) and external (process and system) evaluation.

#### **4.2 *ASSURE Model (Heinich et al. [46, 47])***

An instructional model derived from the theoretical approach of R. Gagné and behaviourism, designed primarily for distance education. It has the following stages:

1. Analyse: knowing the profile and characteristics of the students and their previous knowledge on the subject
2. State objectives: defining learning objectives and evaluable student behaviours
3. Select, modify or design materials and strategies
4. Utilise materials: organisation of the setting and undertaking the course
5. Require learner response. Student participation
6. Evaluate: evaluate the achievement of learning objectives, the instructional process and the impact on the use of technological means.

#### **4.3 *MRK Model. Instructional Design Models (Morrison et al. [48])***

This model proposes the following stages: (1) Instructional problems and learning goals are identified; (2) Characteristics of the students are evaluated in particular those that deserve more attention during the training process; (3) Content and tasks related to the learning goals and objectives are selected; (4) Learning objectives are established; (5) Content of each thematic unit is planned and sequenced; (6) Instructional strategies are designed, if possible adapted to the profile of the students; (7) Messages and instructions for the participants are proposed and sent; (8) Evaluation instruments are developed to allow achievement of the objectives to be assessed; (9) Finally, technological and didactic resources are selected for carrying out the activities and supporting the entire training process.

#### **4.4 *Model for Developing Multimedia Learning Projects (Frey and Sutton [49])***

This is a variant of other instructional models conceived primarily from the perspective of project design with application to the development of multimedia programmes.

This model was proposed by Frey and Sutton [49] from an Expert Delphi Panel, and has the following main steps: Step 1: Define goals, objectives and participants. Step 2: Determine format, budget and schedule. Step 3: Determine content, activities. Step 4: Develop assessment strategies, criteria and instruments to determine the effectiveness of the project. Step 5: Create a flow chart, site map and/or storyboard. Step 6: Create a prototype. Step 7: Perform a formative evaluation. Step 8: Complete the design. Step 9: Perform a summative evaluation of the product and process.

## 5 Conclusion

A review of the specialised literature on learning theories and instructional design serves to lay the conceptual foundations that define our BL system design proposal. This proposal consists of developing a b-learning environment that involves the integrated combination of face-to-face and virtual methodologies in the same training process. From a theoretical point of view, the design takes contributions from 3 main theories: the cultural-historical activity theory (learning based on student activity, with contributions also from the theories of situated learning (Lave and Wenger; Wenger) and distributed cognition (Hutchins); the collaborative learning theory and computer-supported collaborative learning (CSCL) (learning based on group and social collaboration); and the experiential learning theory (learning based on experience and individual and joint reflection (D. Kolb, J. Piaget, J. Dewey, K. Lewin and B. McCarthy).

On this basis, the different methodological strategies that affect the selection, definition and sequencing of objectives and content, the organisation of groups inside and outside the classroom, and the planning of activities consisting of the development of dynamic tasks carried out in face-to-face and virtual classroom contexts, which require the resolution and development of practical cases and design of projects based on the reality on which the intention is to act in the professional future, must be extracted.

In all cases, the planning of the training model based on blended learning needs to consider the relationship of these components: the learning objectives and results, the *content to be learned*, which makes the learning material available to the student; *communication*, that is to say, interpersonal exchange between students, teachers and the technology used (supported by training platforms or course and learning management systems (CMS, LMS) and *individual activity* and collaborative activity in the development of tasks that pedagogically integrate the teaching-learning process around face-to-face and online activities, articulated and sequenced in stages of increasing complexity.

The b-learning training model also involves adapting the work space (classroom and other environments) and learning time (class hours and previous study time outside the classroom), making spaces more open and dynamic, allowing group interaction, both within the classroom and on the online platform used and, ultimately, the construction of knowledge.

Some of these elements are presented in Chap. 10 of this book .

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# Evaluation of Quality in Blended Learning Training



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**Abstract** One of the fundamental aspects needed so that training based on B-Learning systems in universities is widely accepted and holds a permanent place in time, is to guarantee some bases that are consistent in design and ways of implementation, but at the same time it is also necessary to be capable of instrumentalising the entire evaluation process of the quality of this type of training. This brings us to ask ourselves: what is educational quality? How do we determine whether a teaching-learning process based on Blended Learning is of high quality? What dimensions and indicators of quality can be adequate for its evaluation? Some of these questions will be answered in the following chapter.

**Keywords** Blended learning · Constructivism · Educational quality · Dimensions of quality · Indicators of quality

## 1 Introduction

The modality of Blended Learning (B-Learning) has gained importance and is becoming normalised across many universities worldwide, now identifying as an increasingly relevant and in-demand didactic model [1]. Since its birth and throughout its development it has received many different names and definitions; however, they are all primarily based on the combination of varying degrees of traditional classroom learning and virtual learning, presenting a new model as an educational process and intervention that looks to promote the construction and co-construction of meaningful learning amongst students in a context that makes both the training space and time more flexible, in this way achieving quality training. Achieving this requires a redesign of a new instructive configuration, which implies a real pedagogical and technological mediation in order to improve learning. The concept of

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B-Learning that we defend here is that which blurs the dividing line distinguishing between face-to-face and virtual learning, in this way building a single product in which in-person learning would not make sense without online learning, and neither would online learning make sense without in-person learning, eventually managing to achieve an integration and convergence of both modalities, until the expansion and continuity of both time and space in the learning environment [2–4].

The design of B-Learning based training presents obvious methodological changes, but also requires the revision of each and every one of the elements involved in the system, related to the teaching and student role, activity design, interaction, the changing process between environments, temporal organisation, students' autonomous work, etc. In specialised literature there is an increasing amount of studies that present data on the positive effects of the B-Learning methodology. Some of these effects are to do with the positive impact on general student motivation and performance [5], how this model aids teachers in the development of diverse skills [6], institutional improvement through a more flexible and greater student recruitment [7], etc. Together with the advantages there are also some inconveniences such as the absence of an shared institutional vision regarding B-Learning, the possible gap in the development of teachers' digital competencies or the lack of teacher motivation to transform their courses from face-to-face to combined learning [8], as well as the absence of a model that evaluates the effectiveness and quality of hybrid learning from many universities [9].

Precisely in this last line of thought, we consider increased research on the factors and criteria that can describe quality training processes based on B-Learning to be fundamental. This is a matter that is not so simple to address, as we are talking about new environments where significant changes are being made regarding communication, collaboration and the construction of student learning. B-Learning also requires a redesign of the curriculum, more resources and infrastructures that are capable of withstanding the new requisites of combined learning, and a greater commitment by teaching staff and institutions [10].

These previous ideas bring us to highlight the necessity of evaluations that guarantee and assure the quality of a B-Learning based education [11], an evaluation that results in an improvement in education, a quality assessment system that is transformative is really essential, one which has the capacity to offer relevant information about the functioning and the development of teaching-learning processes, taking into account and encompassing all the implied dimensions [12].

One of these central aspects has to do with the theoretical perspective from where the training process is based. From the main pedagogical and educational discourses and narratives it is assumed today that the use of digital technology has transformed to a large extent the semantics of the verbs teach and learn, acting as mediating resources in the mental and constructive activity in students [13]. This mediational perspective is assumed here as part of the constructivist paradigm that, for us, constitutes as the framework on which the design and posterior evaluation of the B-Learning system is based.

## ***1.1 An Approximation to the B-Learning System from the Socio-Constructivist Approach***

The constructivist perspective contemplates the teacher with a role of facilitation, planning and as a guide in activities and experiences that promote the reflection, autonomy, self-regulation and learning construction in their students, in both individual and collaborative contexts; for this reason it is essential that they have the adequate skills to combine the different curricular and technological elements in a determined environment in a balanced and coordinated way. Regarding the students, it is understood that they have to be active agents and the protagonists of their own learning processes. In educational environments mediated by technologies, students have to—to a greater or lesser extent and in the most effective and efficient way—use some of the skills related to self-regulation of learning, the construction of knowledge through skills such as the searching, identification and selection of information, abilities to build and communicate constructed and co-constructed knowledge, as well as social interaction skills and group work, amongst others [2, 4, 14].

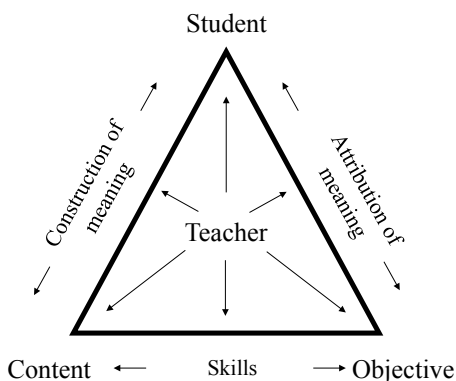
According to socio-constructivism, human beings relate to and interact with people in their environment since their birth, in a determined space and sociocultural context. In this relational process, the subject experiences situations that are later transformed into mental processes [15], in this way it is understood from a socio-constructive perspective that these processes, and thus knowledge, are the product of a dynamic and shifting construction that is produced in a social context, that allows the subject to internalise socially constructed knowledge [16], through communicative and linguistic processes and other systems of representation [13, 17].

From the constructivist approach, both this dynamic process and interaction process are explained by an interactive triangle made up of three interrelated elements: teacher, student and content—each of these components occupying a different corner of the triangle [17–19]. This way of representing the main elements of the training process has incorporated new elements and relationships between them over time. In this way content, student and teacher elements are maintained in this new model, but a fourth component is added: objectives or aims. This new incorporation brings with it the modification of the position of the other elements in the triangle; student, content and objectives occupy the corners, whereas the teacher is situated in the barycentre of the Fig. 1 [19].

As one can observe, the interactions between the elements that form the Instructional Triangle are diverse, these relations are essential to establish the necessary components in the construction of knowledge, these components are the [20]:

1. Cognitive Component, which is reflected in the Student-Teacher-Content relationship, with the objective of constructing shared meanings;
2. Affective Component, which shows the interaction between Student-Teacher-Objective, established with the purpose of attributing an affective sense, a motivational sense and a sense related to learning;
3. Competence Component, which corresponds to the interrelation between Content-Teacher-Objective, with the purpose of determining and establishing a

**Fig. 1** Instructional triangle.  
Serrano and Pons [19]



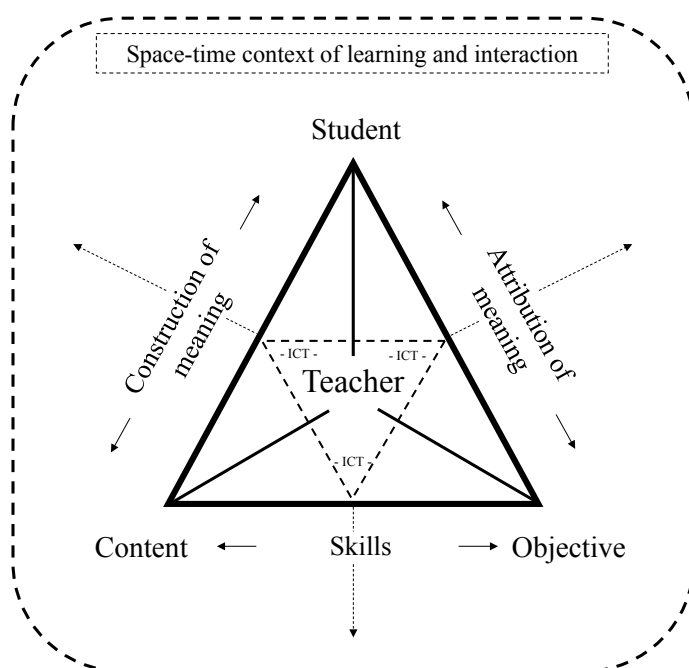
congruency between what is learnt (content) and what it is learnt for (objective), which will delimit and indicate the skills-related nature of learning.

The incorporation of the technological element adds an important change of approach to B-Learning systems. Although the relationships between students, objectives, content and teacher are similar to those of the instructional triangle, and the cognitive, affective and competence components are maintains, the incorporation of ICT adds two new perspectives. On the one hand, as merely instrumental resources and, on the other, as psychological tools that encourage the construction and co-construction of learning (Fig. 2).

In this second case, the key aspect is the mediation and interaction that is carried out in the learning space (face-to-face–virtual) and time (synchrony–asynchrony, chronological–kairological). Both aspects characterise and modify the educational process, making it more flexible. Learning in a face-to-face context allows the quicker generation of chains of ideas through student interaction, while learning in virtual contexts provides a great flexibility with regard to the moment and place of knowledge construction [21].

Focusing on this temporal characteristic of technologies in the educational scenario, time in the face-to-face classroom extends to virtual space and autonomous work [2], establishing temporal rhythms that allow students to enter and leave the learning process without the necessity to adapt to an established timetable, therefore the idea of synchrony and asynchrony begins to become relevant and take centre stage. However, it is also necessary to bear in mind the notion and sense of time that pupils experience and perceive in the virtual context of learning, as this can have a marked influence on teaching and learning, either by creating a limitation or supposing an enrichment of these processes. Taking relevancy and time-space relation into account, and the impossibility of understanding one without the other, it is fundamental to study them thoroughly when carrying out every educational and evaluative process [22].

Ultimately, we consider the idea that constructivism is the suitable foundation for the edification of pedagogical models based on B-Learning to be a reasonable one,



**Fig. 2** Techno-instructive triangle

since that in this methodology digital technologies appear combined and in balance with the other elements and agents implicated in education, looking to generate a meaningful learning in each and every student. Taking this into consideration, we seek to fix a position in respect to the evaluation of quality in B-Learning environments in the following sections.

## 2 Evaluation of Quality in the Blended Learning Modality

### 2.1 Educational Quality and Its Evaluation in Higher Education

Interest in educational quality in higher education has been driven by different agreements across Europe—from the Sorbonne Declaration to the Leuven Declaration—signed by the Ministries of Education, members of the European Higher Education Area. This space has promoted a change in the higher education system, seeking to strengthen learning in pupils based on the development of skills that prepare them for

an effective incorporation and adaptation into the working world [23, 24], strengthening this learning through educational processes which demand a label of quality and/or excellency.

The revision of the literature on what an educational process of quality means inevitably leads us to a polysemic, complex, intangible and non-static term that depends, to a large extent, on ideologies, theoretical reference points and even on the objectives from which quality is interpreted and defined [25–28]. Some authors point out that approaching the concept of educational quality is entering in a scenario of vagueness and controversy, which is due to two factors: (a) the lack of concreteness or relativity that revolves around this term; and (b) the present difficulty in finding a consensus on what to evaluate to determine what a quality education is and on which measures are needed to achieve it [15, 17].

With a desire to define educational quality, different authors affirm that it is related to the relevance of knowledge, on the basis of and guaranteeing that the recipients of this education acquire a series of relevant know-how selected by society, which should be transmitted and produced by the educational system with the final objective of students incorporating into society and a work environment [12, 29–32]. According to this, quality education is that which promotes and encourages integral personal development from cognitive, ethical-moral, emotional, physical and creative perspectives in an efficient way, including resources and appropriate educational models [12, 29–34].

Although aware of the difficulty of defining what is educational quality, some authors such as Harvey et al. [35], Cardona et al. [36], Rodríguez Espinosa [37] and Centurión [38], defend a series of approaches from which quality can be analysed. These approaches allow us to understand quality in different ways such as: exception, perfection, adequacy, efficiency, transformation, satisfaction or innovation.

In the case of *quality as an exception*, this approach can be understood through three variants: (a) quality as something distinctive and exclusive, recognised in absolute terms, excellent universities embody quality and excellency, and do not have the necessity to demonstrate this because of that; (b) quality connected to the attainment and exceedance of very high standards, these standards being impossible for the majority to achieve; and (c) quality as a complement to minimal standards based on criteria, which are achievable.

With respect to the second approach, that is to say, *quality as perfection*, this is understood at the attainment of an impeccable, coherent or perfect result. In this case, quality becomes the institution's responsibility, who should guarantee the fulfillment of a "zero error" policy in the transformation process of the inputs (students) and outputs (graduates).

On the other hand, *quality as adequacy of meeting objectives* focuses the interest on the output, that is to say, on the result and not on the process. In this case, we find two variants: (a) quality is understood as the meeting of the requirements, necessities or desires of the client and (b) quality as being fit for purpose, in other words, the fulfillment of the objectives established by the institution.

Fourthly, the approach of *quality as efficiency* reinterprets quality as if it were the performance assessment of an investment. Education would be of quality if

educational objectives were reached with a minimal loss of student talent and using minimal resources.

In relation to *quality as transformation*, this is achieved if the educational process generates an overall progress and development in students, producing a them a transformation in their capacities, knowledge and skills, involving them in the act of decision making and in the participation of the processes that affect them.

The sixth approach is focused on *quality as user satisfaction*, this is due to the fact that, in the field of education, quality is considered to be related to the measure in which the services offered by the educational institution satisfies the requirements and expectations of the students, due to this, the decisions made on priorities and quality assessment answer user interests and needs.

With respect to the last approach, *quality as organisational innovation* refers to the capacity that a university has to plan and adjust both their resources as well as their teaching and educational process to new societal demands or situations.

However, none of these approaches are sufficient enough to precisely and integrally account for the definition of quality, because of this perhaps it would be better to renounce the idea of employing one single approach to or concept of quality, which means that it would be better to talk of qualities in its plural form and not in singular [36]. This perspective of understanding educational quality in an integral way obligates us to consider, at least, three factors: socio-cultural context, taking cultural and axiological aspects into account, as well as the necessities presented by the society in which the university is located; institutional and organisational context, comprised of the educational community, which should fulfil a series of obligations and responsibilities that translate to indicators of quality; and the last factor, didactic and pedagogical context, corresponds to the way in which the actual teaching-learning process develops [38].

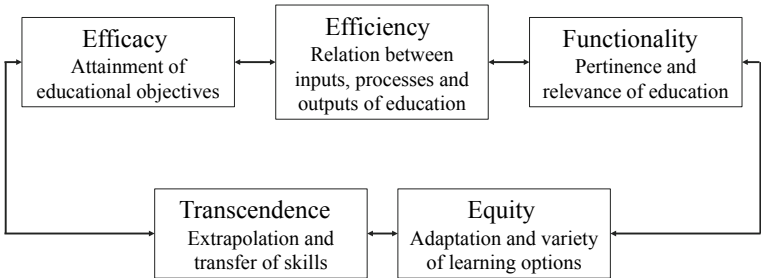
Nevertheless, regardless of how we define or understand quality or the interpretation or approach from which it is analysed, to affirm that an educational process is of quality, what appears to be evident is that it should be assessed, assuming that quality and its assessment are two sides of the same coin, as quality demands assessment and this, in turn, is necessary to guarantee quality [39]. This brings us to affirm that all assessment brings with it a value judgement based on a series of theoretically fundamental and established principles with which the data obtained in the assessment process will be compared [40].

These principles, considered from a multidimensional perspective, have been identified, in literature on its use, in terms of efficacy, efficiency and functionality [37, 39, 41, 42], to which others could be added, as does Cardoso et al. [34], incorporating transcendence and equity (Table 1), alluding to an integral educational quality (Fig. 3).

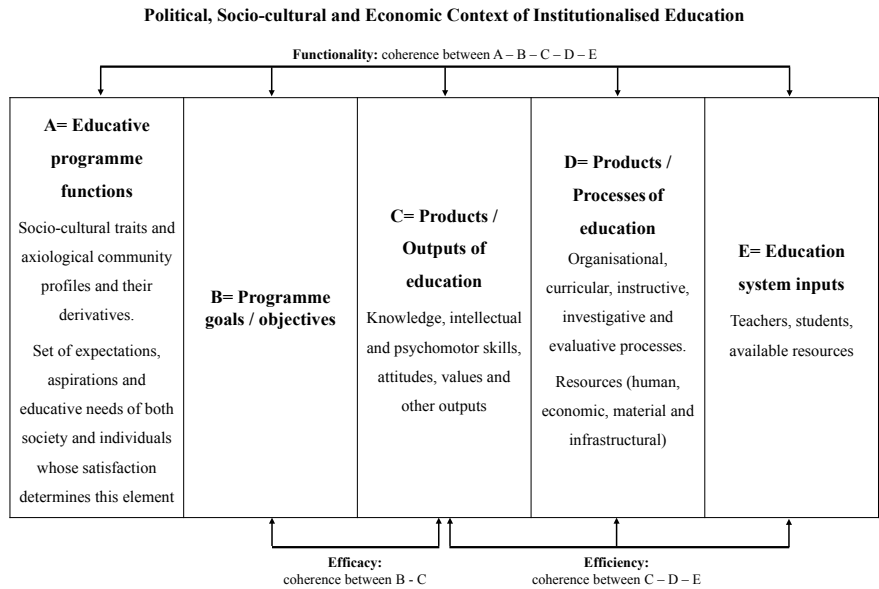
Many processes and facets of education can be considered, analysed and assessed from a systematic approach (Fig. 4), from which we should expect that their different elements are interrelated and synchronised coherently in order to fulfil the established educational aims. From this idea, the quality principle of a training action would be objectified through the evaluation of coherence relations between each one of the components present in the system. In the same manner, any rupture in the network of

**Table 1** Dimensions of educative quality. Cardoso et al. [34], Rodríguez Espinosa [37], De la Orden [39, 41], Tiana Ferrer [42]

| Dimensions    | Definition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Efficacy      | The educational process is effective if its product, understood as student achievement, shows coherence with the established objectives, as and when these objectives are in line with an appropriate and relevant education for students                                                                                                                                                                                                                                                                                                                                                                           |
| Efficiency    | The educational process is efficient if coherence exists between the inputs and the necessary processes regarding the obtained result, that is to say, with respect to the achievement of objectives on both the part of students and the institution. In other words, education is efficient if there is coherency between inputs and processes (costs) and if those in turn are coherent with the educational products (benefits)                                                                                                                                                                                 |
| Functionality | Functionality corresponds to the educational institution’s capacity to adjust its objectives, products, actions and tools at its disposition to the functions, expectations and necessities reflected in society. In this dimension we are able to distinguish two subdimensions: appropriateness and relevance<br>Appropriateness, educational action is appropriate if the learning acquired by students is adjusted to their expectations<br>Relevance, education is relevant if the knowledge and skills acquired by pupils facilitates their integration and performance in both society and the world of work |
| Transcendence | Education is considered to be transcendent if it generates useful skills to apply in different areas across the subjects’ lives, training people who are capable of generating their own learning and with the capacity of extrapolating when transferring solutions from one situation to another                                                                                                                                                                                                                                                                                                                  |
| Equity        | The educational process is equitable if it offers different options that adapt to different circumstances of the users, being more accessible to people who present economical, time, schedule and mobility restrictions, amongst others                                                                                                                                                                                                                                                                                                                                                                            |



**Fig. 3** Dimensions of educative quality. Cardoso et al. [34], Rodríguez Espinosa [37], De la Orden [39, 41], Tiana Ferrer [42]



**Fig. 4** Educative quality as a system. De la Orden [39, 41], Centurión [38]

relations established between the functions of the educational programme (the aims or objectives of the programme, the educational products or results, the products or processes and the inputs in the system) would result in limitation—to a greater or lesser extent—in the assessment of its quality [38, 39, 41].

Accordingly, and as De la Orden affirms [39], in order to guarantee the validity of an educational quality assessment, three conditions are necessary: (a) that the functions and the objectives of the programme are clearly identified, defined and formulated, to avoid in this way a deviation in the assessment; (b) that the assessment criteria, that is to say, what is demanded (dimensions) and how it is demanded (indicators) should adequately detail or describe the phenomenon of assessment; (c) that the assessment is reliable and objective. All of this leads to the necessity of not only in-depth knowledge of the educational aspect to assess, but also a precise description of each of its aspects and the different relations established between these aspects [37, 39]. In other words, any assessment process that has its aim to validate educational quality should provide a series of clear and precise indicators, that allows us to both measure the dimensions that the object to assess consists of, and to improve it [42, 43]. The establishment of these will make it possible to reduce its very complexity that is present in learning and assessment processes, providing a set of significant data that facilitates the interpretation of what is assessed and the attainment of results.

2.2 *Measuring the Quality of a Blended Learning System*

The training modality based on B-Learning is understood as a complex process of interaction in which different elements interrelate and interact (student, content, teacher, objective and technology), these can establish different relationships to determine in this way the different levels of quality in learning, seeking to promote the construction and co-construction of knowledge in the student that allows them to answer the established educational objectives [44]. We must add that this is a system in which in-person and virtual learning are converged, because of this they cannot be assessed separately. Aspects related to learning objectives, learning content and materials, communication and interaction, a pedagogical theory in which educational intervention is based, etc. intervene in both processes. All of these aspects can be considered as categories or dimensions that can be further divided into more specific indicators that can eventually be measured in the assessment process.

Diverse B-Learning models, such as those of Khan [45] and Wang et al. [46], offer in a explicit and substantiated way not only a series of dimensions with their corresponding elements (Table 2), but also the interrelations produced between them, describing in this way an integral perspective as a base and reference in order to compare and identify dimensions they have in common and to determine in this way the categories that allow their assessment.

On the other hand, Horn et al. [47] and Graham et al. [48] establish other combinations to analyse in B-Learning models, based fundamentally on three models: modalities of content distribution, didactic methods used and the combination of face-to-face and virtual spaces. These elements and the consequent combinations that can

**Table 2** Blended Learning models Khan [45] and Wang et al. [46]

| Model                                                               | Description                                                                                                                                                                                                                                                                                                                    | Dimensions                                                                                                                  |
|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Khan’s Octogonal Blended Learning Framework [45]                    | Model adapted to e-learning, in which eight dimensions are established that, when taking them into account in the B-Learning design, help to organise the planning of the educational programme, improving the learning experience and focusing it towards the construction of meaningful learning on the part of the students | Institutional<br>Pedagogical<br>Technological<br>Interface design<br>Assessment<br>Management<br>Resource support<br>Ethics |
| Framework of Complex Adaptive Blended Learning Systems (CABLS) [46] | In this model six dimensions are established, each one of these has a series of components, which establish between them diverse connections, creating an interdependence and a dynamic interaction between the dimensions, this aspect differentiates this model from others                                                  | Teacher<br>Learning<br>Technology<br>Learning support<br>Institution<br>Student                                             |

be carried out from them provide us with the necessary indicators to describe the assessment dimensions.

To determine the elements, and thus the dimensions that are necessary for and make up the quality assessment in B-Learning, we have decided to adapt it to a systematic model, based on what we presented in the previous section, in order to establish its components and the existing relationship between them with greater precision (Fig. 5), with the posterior aim of delimiting the indicators that are adequate and necessary for its assessment.

Based on the consideration of B-learning as a system, we can assign a series of categories or dimensions to the established elements, that help us to define a tool for its assessment. As we can see, the categories corresponding to pedagogical, technological, institutional elements and elements related to the teacher’s role, student needs, satisfaction, perception and valuation of results obtained all coincide with some of the dimensions of the previously explained models (Fig. 6), this allows us to affirm that said categories have the capacity to describe the B-Learning model and its totality. Regarding the dimensions of the B-Learning models that do not coincide, these will be equally considered in the composition of some of the indicators that will be assigned to the categories subject to assessment.

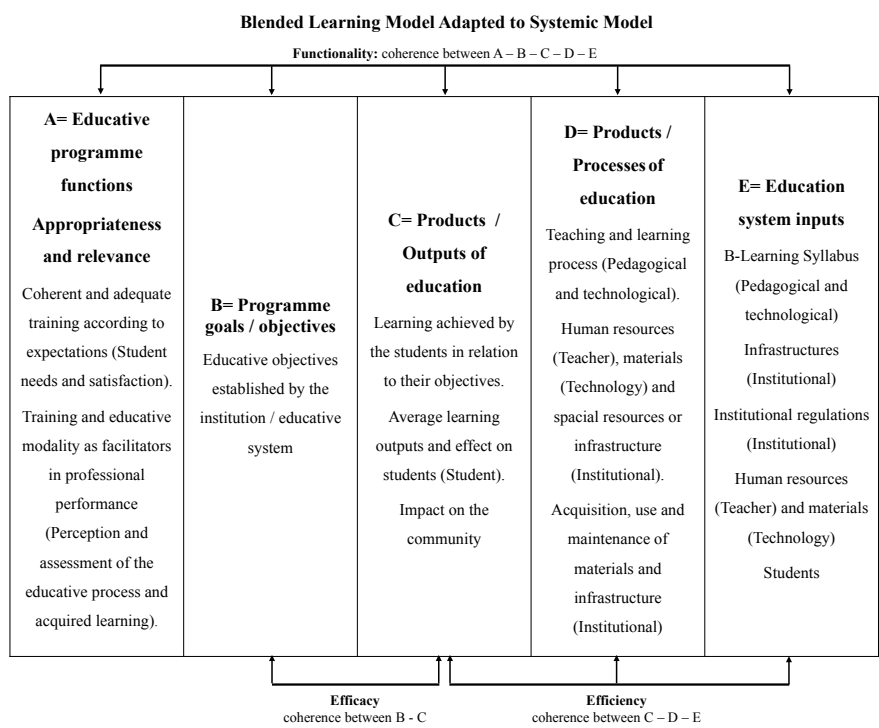


Fig. 5 Blended Learning model adapted to systems model

|                            | Dimensions |            |                |                  |          |                  |            |             |                  |         |         |                  |
|----------------------------|------------|------------|----------------|------------------|----------|------------------|------------|-------------|------------------|---------|---------|------------------|
|                            | Ethical    | Evaluation | Institution-al | Interface design | Learning | Learning support | Management | Pedagogical | Resource support | Student | Teacher | Technology/-ical |
| Khan’s octogonal framework | ✓          | ✓          | ✓              | ✓                |          |                  | ✓          | ✓           | ✓                |         |         | ✓                |
| CABLS                      |            |            | ✓              |                  | ✓        | ✓                |            |             |                  | ✓       | ✓       | ✓                |
| B-Learning as a system     |            |            | ✓              |                  |          |                  |            | ✓           |                  | ✓       | ✓       | ✓                |

**Fig. 6** Dimensions of Blended Learning quality evaluation

Once the previous comparison was executed, we identified five dimensions that we considered to be necessary to assess the quality of B-Learning, which are the following: institutional, pedagogical, students, teacher and technology. Once these were established, we had to give them meaning and establish the indicators that will determine in which measure the quality of each one of these is met.

**2.3    *Dimensions and Indicators of Quality in the Blended Learning System***

Throughout the last decade, many authors have designed tools meant for assessing the educational quality of diverse courses based on the B-Learning system, such as García Mestanza [49], Rothman et al. [50], Ralston-Berg et al. [51], Lim et al. [8] and Matosas-López et al. [52]. In Table 3, some examples of the most representative ones are summarised.

However, given the characteristics related to quality that have been previously mentioned and the different approaches from which it can be understood, we consider it relevant to not only establish the meaning of each one of these dimensions, but it is also important that each one of the series of established indicators is scrutinised. Although the objects that each of these will assess are different, there should be a harmonised and coherent interrelation between them, so that the description that this provides is as precise and detailed as possible, accurately describing what the quality of each category consists of.

Based on the revision of knowledge and of the theoretical foundations of B-Learning, and from a socio-constructivist perspective, we have finally identified five dimensions that allows us to assess the quality of a B-Learning system, that we will describe hereafter.

**Table 3** Examples of quality assessment systems in Blended Learning modalities

| Author                                                         | Factors assessed                                                                                                                                                                                                                      |
|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| García Mestanza [49]                                           | Subject planning; Subject content; Teacher activity; Interaction; Technological skills of the students; Telematic environment; Complementary services of the Virtual Campus                                                           |
| Rothman et al. [50]                                            | Appropriateness of reading and assignments; Technological tools; Instructor feedback and communication; Course organisation; Clarity of outcomes and requirements; Content formal                                                     |
| Ralston-Berg et al. [51]—Quality Matters Rubrics and Standards | Course overview and introduction; Learning objectives (Competencies); Assessment and measurement; Instructional materials; Course activities and learner interaction; Course technology; Learner support; Accessibility and usability |
| Lim et al. [8]                                                 | Vision and philosophy; Research and evaluation; Partnership; Policy and institutional structure; Infrastructure, facilities, resources and support; Learning support; Professional development; Curriculum                            |
| Matosas-López et al. [52]                                      | Course introduction; Evaluation system description; Time management; General availability; Organisational consistency; Evaluation system implementation; Dealing with doubts; Explanatory                                             |

**2.3.1 Quality in a Pedagogical Dimension**

This seeks to measure the specificity and coherence of educational intentions related to each one of the curricular elements that intervene in the teaching-learning process, basing them on the theories of learning linked to B-Learning. This dimension consists of nine indicators (Table 4) [53–55].

**2.3.2 Quality in the Technological Dimension**

Quality of technological elements supposes the assessment of in which measure an adequate selection of technological tools and resources is produced, analysing its possibilities and limitations, both technological and pedagogical (Table 5) [54, 56].

**Table 4** Indicators of pedagogical quality

|   | Indicator                       | Description                                                                                                                                                                                                                                                                                                  |
|---|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Objectives                      | This measures the fulfillment and coherency of training needs in the recipients, due to this, its formulation should be clear and precise                                                                                                                                                                    |
| 2 | Content                         | With this indicator the congruency with the objectives, its logical sequencing, its didactic and theoretical validity and the diversity and reliability of its sources are assessed                                                                                                                          |
| 3 | Activities                      | It values the congruency of the activities with the teaching-learning model that is being developed and the objectives and content. It also takes sequencing, development and activity type and variety into account, as well as its influence on learning construction, both in an individual and group way |
| 4 | Methodology                     | It determines whether pedagogical strategies are directed to the construction and co-construction of knowledge in both face-to-face and virtual environments, encouraging an active, autonomous and self-regulated learning in students                                                                      |
| 5 | Assessment                      | This indicator seeks to measure both whether the assessment type and criteria and the process are adjusted to the teaching-learning model and equally whether they are congruent with the previously mentioned didactic elements                                                                             |
| 6 | Communication and interaction   | It measures the efficacy of the communication and interaction in the collaboration and the construction of learning both between students and teacher-student, as well as the efficacy of the communication channels available                                                                               |
| 7 | Tutorial action                 | The objective of this indicator is to assess the role of the teacher and of the fulfillment of the resources and conditions in which tutorial action is offered, which should be directed at tracking, supervision, orientation, galvanisation, company and help in the teaching-learning process            |
| 8 | Temporal organisation           | It assesses whether the temporal structure of the training process is adequate, determining whether the assigned time to different educational activities is appropriate                                                                                                                                     |
| 9 | Organisation between modalities | Due to B-Learning's main characteristic of convergence between face-to-face and virtual learning, this indicator should assess the organisation and sequencing between the educational processes developed in each one of these modalities                                                                   |

**Table 5** Indicator of technological quality

|                        |   | Indicator                 | Description                                                                                                                                                                                                                                                                                                                                           |
|------------------------|---|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Didactic efficacy      | 1 | Pedagogical function      | With this indicator the pedagogical and didactic potential of online resources and digital materials is assessed, determining whether they fulfil their function as learning promoters, developers and connectors (previous and new ones; conceptual, attitudinal and procedural; higher and lower ordered learning), and in which measure it is done |
|                        | 2 | Accessibility             | It evaluates in which measure the users have access to the training resources and spaces and to their content                                                                                                                                                                                                                                         |
| Technological efficacy | 3 | Aesthetic characteristics | Regarding the assessment of the aesthetic design of virtual resources and spaces, it takes aspects such as homogeneity, uniformity, consistency, organisation and format variety into account, just as with content, the design should be adequate to its presentation                                                                                |
|                        | 4 | Adaptability              | It assesses the resource capacity to adapt to different learning objectives, contexts, situation, time and rhythms as well as the educational process                                                                                                                                                                                                 |
|                        | 5 | Navigation                | It assesses the functioning of resources and the virtual space, as well as the facility both in use and access to different options and/or elements that they possess                                                                                                                                                                                 |
|                        | 6 | Interactivity             | With interactivity the measure in which the user can interact with teachers, students and even with the very technological resource is measured, taking synchrony and asynchrony into account                                                                                                                                                         |

**Table 6** Indicators of institutional quality

|   | Indicator                             | Description                                                                                                                                                                                                                                                                                                    |
|---|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Infrastructure and material resources | This indicator intends to measure the availability, state and maintenance both in material resources (tangible and intangible) and infrastructures corresponding to both face-to-face and virtual spaces                                                                                                       |
| 2 | Technological support services        | It assesses the availability and efficacy of the technological support services to facilitate help before difficulties and problems with the use and functioning of technological resources, as well as of the educational virtual platform                                                                    |
| 3 | Policies                              | With this indicator it intends to establish the existence of institutional regulations and policies in which processes, procedures, strategies and actions focused on B-learning are established, and in what measure these promote the adoption and development of said modality in their academic programmes |
| 4 | Training                              | It determines whether the institution offers, and in which measure, efficient permanent training programmes directed at teaching staff, with the objective of improving their pedagogical and digital skills, which will give an answer to the demands and expectations of society                             |

### 2.3.3 Quality in the Institutional Dimension

To assure the quality of B-Learning, it is necessary to have support mechanisms in place at the institution, this support can be provided through strategies, policies, teacher training, service, material and infrastructure availability [46]. Focusing on these last ones, institutions should have the necessary infrastructures and technological and didactic resources in place to guarantee the attainment of the established objectives. To measure the quality of this dimension, four indicators have been established (Table 6) [57–59].

### 2.3.4 Quality in the Teaching Activity Dimension

In this case, quality is found in the didactic skills based on the teacher's technological pedagogical knowledge of the content, these skills allow them to detect the pedagogical value of technological resources, allowing the generation of appropriate conditions for the development of the B-Learning modality, carrying out, if necessary, an attitudinal, pedagogical, conceptual, disciplinary and methodological rethinking

**Table 7** Indicators of the quality of teaching activity

|   | Indicator                          | Description                                                                                                                                                                                                                                                                                 |
|---|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Content organisation and knowledge | This indicator measures how the organisation, structuring and mastery of subject content delivered by the teacher is met, assessing in which measure the said criteria are fulfilled                                                                                                        |
| 2 | Pedagogical Skills                 | This assesses the capacity that the teacher possesses to plan, structure and develop the teaching-learning process, taking into account pedagogical, theoretical, methodological and didactic aspects in the development of their teaching work                                             |
| 3 | Technological skills               | With this indicator, the measure in which the teacher integrates and makes use of the different spaces and technological resources is measured from an educational perspective, the integration and use of these different spaces has to be coherent and adequate in the academic programme |

of the curriculum. In this case, the following three indicators would measure this dimension (Table 7) [60–62].

### 2.3.5 Quality in the Dimension of the Student and Their Learning Process

The quality of the teaching-learning process is determined, in part, by the relevance and appropriateness of the proposed objectives and the existing relationship between them and the achievements attained, as well as the satisfaction of students' needs and expectations, which is considered to be an indicator by various authors, taking all educational programme assessment into account, as the student satisfaction data can demarcate those aspects susceptible to improvement. Three quality indicators correspond to this dimension (Table 8) [21, 42, 63, 64].

## 3 Conclusion

The quality assessment of all educational processes, and consequently those based on B-Learning, should be reliable and objective. The number and type of elements to evaluate can be debated, but its justification based on a theoretical framework on learning and on the very idea of educational quality will always be necessary. In this chapter we have finally been able to identify five dimensions of quality, corresponding to pedagogical, technological, institutional quality, the quality of teaching

**Table 8** Indicators relating to students and their learning process

|   | Indicator    | Description                                                                                                                                                                                                                                                                                    |
|---|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Skills       | This assesses the measure in which the student has acquired the necessary skills established in the academic programming to develop in their academic, personal, social and work environments                                                                                                  |
| 2 | Results      | Each indicator determinates in which measure the results obtained by the student coincide with the objectives proposed by the academic programme, establishing in the same way which aspects and/or elements that intervene in the teaching-learning process influence the attainment of these |
| 3 | Satisfaction | This measures student satisfaction with respect to the different elements and people that integrate the educational process, establishing to what level their needs are satisfied and how their necessities are covered                                                                        |

activity and the figure of the student and their learning process; in the same way a series of indicators assigning each one of them to their corresponding dimension was established. Concretely, we have obtained a total of twenty-five indicators, that we consider to serve as a means to verify and assess the quality of a B-Learning system.

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# Instructional Design in Blended Learning: Theoretical Foundations and Guidelines for Practice



Jesús Valverde-Berrocoso and María Rosa Fernández-Sánchez

**Abstract** This chapter highlights the need to base blended-learning (b-learning) teaching activities on models and pedagogical approaches validated by educational research. The most relevant theoretical models in publications about the instructional design of b-learning in the last few years are selected and described. Firstly, the theoretical foundations for b-learning are identified, with theoretical-explanatory models (CoI, TPACK) and theoretical-applied models (UDL and ARCS). Then, several generic models of instructional design are classified and described (ADDIE, ASSURE, MRK and DDD-E), based on standards (iNACOL and Quality Matters) and specific for b-learning environments (BLC and IDM-BHE). To end with some didactic orientations for the development of pedagogical designs in b-learning.

**Keywords** Blended learning · Instructional design · Educational technology · Instructional innovation · Educational strategies

## 1 Introduction

In the last few years, research has shown significant interest in the design and development of pedagogical models of blended learning (from now on; b-learning) that respond to the needs of teachers and students in this hybrid teaching-learning environment. There is a need for the creation of a theoretical corpus or a pedagogy of b-learning that can offer a solid foundation on which to support the effective design of b-learning environments, as well as the need for explanatory theories on b-learning based on empirical evidence [1]. Although most of the studies on b-learning identify its underlying theoretical framework (constructivism, for example), how this theory is materialized in real design principles is often not clearly defined. Research on these hybrid learning environments (face-to-face/online) should be more explicit

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about their design, as well as introducing more rigor in the pedagogical justification of the teaching practices in b-learning. This mixed modality has proven to be a potentially effective learning approach if the pedagogical design is made with care, before its implementation [2–5].

A review of the research on b-learning developed through doctoral theses revealed that one-third of the studies deal with issues related to instructional design. More specifically, a greater emphasis on «models, strategies and good practices» themes were seen, which is reasonable, bearing in mind that it is a new environment that requires greater knowledge about applicable principles and approaches [6]. Even so, the conclusion is a need for more research in this field, as educational institutions have problems to conceptualize and implement an effective combination of face-to-face and online teaching [7]. In this respect, and as a result of a systematic review of the literature, several challenges that students participating in a b-learning environment must face in the online part were identified [8]: (a) Self-regulation (procrastination, search for online help, self-regulation skills, preparation before face-to-face classes, time management skills, use of peer learning strategies); (b) digital literacy and skills (use of interfaces, resistance to technology, distraction caused by excessive technological complexity, weaknesses in the use of digital technologies); (c) isolation (feeling of loneliness, problems with synchronous communication); (d) access to technology (lack of technological devices and infrastructures, obsolete technologies, inadequate internet access) and (e) Technological complexity. These variables should be taken into account in any pedagogical design for b-learning.

Successful b-learning experiences underline the importance of institutional support for redesigning and planning a course [9, 10]. Therefore, the impact of b-learning on educational institutions is the result of a series of factors that are directly related to the instructional design [11]: (a) An educational approach based on the identity and shared vision of the organization. (b) A differentiating educational factor, which adds value to the learning process and offers a competitive advantage compared to other institutions. (c) Prior experimentation, in the form of pilot projects that generate knowledge and institutional commitment. (d) A learning ecosystem that transforms educational practices within a technological environment with subject, pedagogical and technical support. (e) A cultural change in the conception of teacher-student roles for transforming the educational model. And (f) a didactic design that takes into account modes of interaction, type of educational resources and assessment of the learning and the process.

The pedagogical design of blended-learning environments faces four challenges [12]: (a) *incorporating flexibility*, i.e., giving the students some level of control on the time and space of learning, curricular organization (sequence of contents and pace of learning) and even the possibility of choosing the type of modality for specific learning (online or face-to-face).; (b) *Stimulating interaction*, i.e., developing a dual channel (face-to-face and virtual) for communication between teachers and students, which makes the most of both channels of educational relationship. (c) *Facilitating students' learning processes*: in a b-learning context where self-regulated learning is a factor of academic success, it is necessary for teachers to use strategies to plan the learning (difficulty of the task, expectations and goals, prior knowledge, time

required), control of the process (continual feedback), adaptation based on results obtained (change in the development of the process) and self-evaluation of the learning. And, finally, (d) *affective learning climate*, i.e., creating an environment that offers the student security, positive attitudes and the feeling of belonging to the group to favor intrinsic motivation, creativity and subjective wellbeing.

These four challenges offer a pedagogical framework that is useful for: (1) Designing new b-learning environments, (2) communicating and sharing b-learning designs and (3) evaluation of existing b-learning practices.

A series of relevant studies led by Graham have filled a great void in research on b-learning, by providing a pedagogical framework and a series of guidelines for its development in educational institutions. On the one hand, they have defined three stages in the adoption of b-learning by educational institutions [13]: (a) *awareness-exploration*: of the need to improve learning results and address the challenges of growth, the institutions consider the possibility of introducing b-learning in their academic offer; (b) *redefinition-restructuring*: once b-learning is adopted, institutions modify the organizational structures and establish programs for training teachers and teaching incentives; (c) *implementation-development*: institutions have assimilated that educational innovation and b-learning is a routine process which is worked on for continual improvement through an emphasis on the evaluation and decision making based on data (*learning analytics*). On the other hand, they analyzed the research themes on b-learning and discovered that the issue producing the most scientific production was «instructional design» (models, strategies and good practices, process design, implementation and structure of the learning environment). And they identified four habitual usage patterns of these models of instructional design [14]: (1) *A framework to guide the design*: the specific components that teachers should take into consideration in the design of b-learning are identified. (2) *An evaluation tool*: principles and standards that should be included in the b-learning evaluation process are identified. (3) *A design process model*: guidelines on how to carry out b-learning planning. (4) *An instruction model*: description of a course or teaching practice with all the elements that have been put into action (dissemination of contents, communicative interaction and organization model). With regard to factors that favor the adoption of b-learning, the following were identified [15]: availability of sufficient infrastructure, technical and pedagogical support, evaluation data on b-learning and a consensus on the vision of the management team and teachers regarding the adoption of b-learning as an educational modality. Finally, as a result of the analysis of different case studies of educational institutions that use b-learning, a series of recommendations were made [16]: (a) to develop an infrastructure that is sufficient and robust, to facilitate the adoption of b-learning, as well as to provide pedagogical and technical training for the transformation of face-to-face teaching practices into b-learning educational experience integrating the best elements of both contexts and (b) to implement a continuous and scalable system of pedagogical advice and technical support, both for teachers and students, who do not have sufficient competences to effectively teach and learn in a b-learning environment.

## 2 Theoretical Foundations for Designing b-learning

Good instructional design requires a solid theoretical base on which to justify its didactic proposals. The current status of pedagogical knowledge offers us different theoretical frameworks that are backed by educational research and the acknowledgment of b-learning experts. The following describes two global models that offer a theoretical-explanatory structure of the b-learning phenomenon (Community of Inquiry) and the integration of technology in teaching practices (TPACK). A theoretical-applied model on the principles of a universal instructional design for learning (UDL) that takes into consideration individual differences in b-learning. Finally, a theoretical model of the affective-motivational component (ARCS) that introduces us to the emotional component of learning in b-learning contexts.

### 2.1 *Community of Inquiry (CoI)*

The relationship between b-learning and constructivist collaborative approaches has an essential reference in the «Community of Inquiry» (CoI) [17] theory, backed by abundant scientific literature, which has made it the most commonly used theoretical model by b-learning researchers [18–21]. CoI is a process of design and development of significant and deep learning experiences, through three interdependent elements [22]: social presence, cognitive presence and teaching presence.

Social presence is the capacity of participants to identify with the group, communicate openly in a context based on trust and progressively develop personal and affective relationships, projecting their personality. Social presence in an educational context creates a climate that supports and encourages the formulation of questions, skepticism and the contribution of ideas explaining phenomena and processes. There are three indicators of social presence: (a) Affective communication, that is materialized in the use of iconic elements for communicating feelings, an inclusive and empathic language, as well as personal openness to express moods. (b) Open communication, based on a climate of trust, which permits questioning but protects self-esteem. And (c) Cohesive responses, a cohesive group is able to build knowledge collaboratively. In any case, the goals of a community of inquiry are focused on the achievement of results and, consequently, sharing feelings is not an end in itself.

Cognitive presence represents the degree to which students are able to build meanings through reflection and dialogue in a community of inquiry. It is associated to the development of critical thought (reasoning, evaluation and judgment) and it is carried out in «practical inquiry», which is articulated in four phases: (a) Triggering event, which is a dilemma or problem that the students should study from their prior knowledge and experiences. (b) Exploration, that tries to understand the nature of the problem and look for relevant information and possible explanations. (c) Integration, which is a phase of construction and creation of knowledge, where asynchronous

communication tools (v.gr. forums) can play a highly relevant role in b-learning. And (d) Resolution, that offers a plausible answer to the dilemma or problem proposed. Nevertheless, the resolution is rarely achieved entirely and, as a result of this phase, new questions and issues arise, which give rise to other search and research cycles, encouraging continuous learning.

Finally, teaching presence offers a structure and orientation in the design and development of the learning community. Coordinating, stimulating and classifying the social and cognitive processes to achieve learning results that are personally significant and valuable from an educational point of view. It is a process that does not exclusively involve the teacher (it is not the presence of the «teacher», but rather the «teaching»), as in a community of inquiry, the roles and responsibilities are shared between all members. It is composed of three elements: (a) Design and organization, in a b-learning context, curricular planning requires that before starting, the objectives and competences expected to be developed, have been clearly established, sequencing knowledge, teaching methodology, time organization, selection of the technological resources to be used and the atmosphere of the group. (b) Facilitating discourse, as a result of reflection and debate, areas of agreement and disagreement should be identified; looking for consensus and understanding accepted by the group, continuously reinforcing the contributions of group members, taking care of the learning climate and evaluating the efficacy of the process. (c) Direct instruction, to resolve specific content issues or overcome possible mistaken understanding of concepts or procedures. Here, the teacher should show a pedagogical capacity to anticipate the difficulties of learning, organize learning activities for deepening knowledge, moderate debates, offer additional sources of information and offer structured content when necessary to advance in learning.

## ***2.2 Technological, Pedagogical and Content Knowledge (TPACK)***

In any b-learning educational practice, three basic components of knowledge can be identified: Content Knowledge (CK), Pedagogical Knowledge (PK) and Technological Knowledge (TK). Additionally, the relation established between the three. These three knowledge bases (CK, PK and TK) form the core of the TPACK [23, 24] model. Content Knowledge (CK) is the knowledge about the area of knowledge, subject or discipline being taught and learnt. The differences between different degrees of competence about knowledge of the curricular content reflect different strategies to integrate digital technologies in the teaching activity and define the degree of a good b-learning educational practice. Pedagogical Knowledge (PK) is in-depth knowledge about the processes and practices or methods of teaching and learning. It includes knowledge about didactic methodologies, student profiles or techniques to evaluate the learning. Technological Knowledge (TK) is more than just technical knowledge about the digital devices and it requires the teacher to have a global comprehension of

ICT, to be able to apply them effectively in the teaching activity; to recognize when technology can contribute or limit the achievement of a goal and be able to adapt to changes in these technologies continuously. The interactions between these three types of knowledge give rise to three typologies: PCK, which is concerned with the identification of the most common conceptual errors; the importance of establishing connections between different ideas of the curricular contents; the pupil's prior knowledge; alternative teaching strategies or flexibility to explore alternative ways to understand the same idea or problem. TCK is a comprehension of the form in which technology and the curricular contents mutually influence and limit each other. The teacher needs to understand which specific technologies are the best to use in their learning content and how the curricular content determines the technology, and vice versa. TPK is an understanding of how teaching and learning change when certain technologies are used. Teachers need to develop skills that overcome the technology itself and «reconfigure» it creatively for their pedagogical purposes.

This theoretical approach is coherent with other research and theoretical proposals that have tried to expand Shulman's idea about PCK (Pedagogical Content Knowledge) to the domain of educational technology [25]. TPACK is a model based on extensive empirical research that has been applied in b-learning environments [26, 27]. It is a model that is focused on pragmatic knowledge, closely linked to the teaching practice and, therefore, with the intention of immediately applying its principles to b-learning models. In this regard, it enables us to define and assess good educational practice with digital technologies. It facilitates the exploration and explanation of educational phenomena linked to the use of digital technologies, find new questions in the development of educational research on technology and design training programs for teachers.

### ***2.3 Universal Design for Learning (UDL)***

The presence of Universal Design for Learning (UDL) in the education sector and, especially, in teaching with technologies, has gained significant interest, being defined in the Higher Education Opportunity Act of the United States as «a scientifically valid framework to guide educational practice that: (a) Provides flexibility in the forms information is presented to students, the forms of responding or proving knowledge and skills, and in the forms in which students can be involved in this process, and (b) Reduces barriers in teaching, offers appropriate adaptation, support, challenges and maintains high expectations of achievement for all students, including disabled students and students with a limited command of the English language» [28]. The «National Center on Universal Design for Learning» (<https://www.udlcenter.org>) developed the principles, criteria and indicators of the UDL. The approaches of the UDL are based on progress in the architectural design, the evolution of technologies for education and results of research on the brain. Taking concepts from neuroscience and cognitive psychology as a reference, influenced by

authors such as Bruner, Piaget and, very especially, the Zone of Proximal Development and the framework, proposed by Vigotsky. Studies carried out on the UDL show three fundamental principles in the application of this model to teaching, to which a series of principles are associated, for their application in blended learning educational practice [29]: (1) Provide multiple means of representation. This principle implies three guidelines: Offer options to drum up interest, provide options to maintain effort and persistence and provide options for self-regulation. (2) Provide multiple means for action and expression. They suggest three guidelines: provide options of perception, provide options for language and symbols and provide options for comprehension. (3) Provide multiple forms of involvement. The three guidelines offered are: To provide options for physical action, to provide options for expressive skills and fluency and to provide options for executive functions.

The b-learning models that follow this model with the use of digital didactic materials are characterized by the following attributes [30]: (a) Versatility: The capacity to easily and quickly adapt to different functions, enabling the same content in digital format to be presented and viewed in different formats. (b) Capacity for transformation: double possibility that the same content moves from one format to another, without the conversion meaning a change in the content. (c) Marking: Label the contents so that they can be reorganized or reconstructed in versions based on selections determined by the user. (d) Connectivity: These media enable one content to be related to another, incorporating hyperlinks that enable text navigation and connect to other elements in the text. These characteristics contribute to design and development of b-learning models under the Universal Design for learning, the application of which, specifically, enables barriers to be eliminated, diversity acknowledged, and education made accessible for all.

## 2.4 *The ARCS Model*

The ARCS [31] model is appropriate to design b-learning models that encourage motivation to learn. ARCS is based on an elaborate synthesis of the research on motivation to learn, and it is structured around four categories: Attention, Relevance, Confidence and Satisfaction [32]. The starting point corresponds to the category of «Attention», which contains motivational variables related to stimulating and maintaining the curiosity and interest of learners. The next step consists in ensuring that the student believes that the learning experience is personally relevant, i.e., that it is linked to significant personal goals. Then it is necessary for adequate success expectations to be generated, that the student holds no fear or mistaken perceptions about their capacity to achieve the learning or overestimates their competences regarding the demands of the knowledge. Finally, to maintain their desire to learn, they must experience personal satisfaction in the process developed or the results obtained, either through extrinsic or intrinsic reinforcement. The following table contains the orientations to apply the ARCS model (Table 1).

**Table 1** Categories of Keller's ARCS model [31]

| Category     | Definition                                                                                             |
|--------------|--------------------------------------------------------------------------------------------------------|
| Attention    | Arouse the interest of the learner. Stimulate curiosity for learning                                   |
| Relevance    | Find the learners' needs or personal objectives, to obtain a positive attitude                         |
| Confidence   | Help learners to believe and perceive that they will be successful and will control their achievements |
| Satisfaction | Reinforce achievements with rewards (internal and external)                                            |

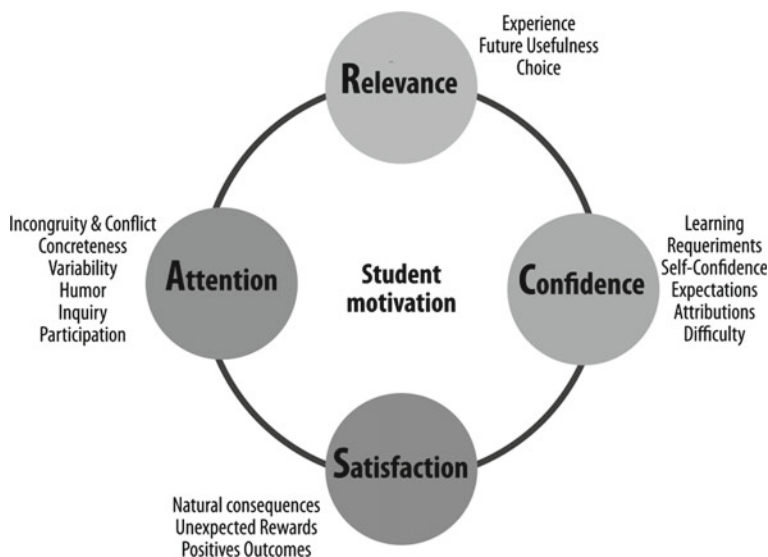
Source Prepared by the author

Each of the categories includes a series of subcategories that are useful to estimate the motivational profile of students and create strategies to overcome motivational problems. For the «Attention» category, the ARCS model includes three subcategories:

- *Perceptual arousal*. Responding to the question: What to do to capture interest? It is a type of curiosity that refers to the reflex reactions to stimuli. In a blended learning model, we need to think up strategies to capture the initial attention of our students. This is the first step in the attention process, but it is transitory, as human beings quickly adapt to a situation.
- *Inquiry arousal*. Is related to the question: How can I stimulate an attitude of inquiry? This is a deeper level of curiosity, which can be activated, showing the problem situation that can only be resolved by an active search for knowledge.
- *Variability*. Is a requirement for maintaining attention. Stimulus profits from a frequent change of stimuli, small variations in the presentation of information or different forms of encouraging thought, reflection or action (Fig. 1).

The «Relevance» category is an influential factor in the design of b-learning models because, if the user perceives that the material can satisfy personal needs or desires, they will be more motivated to use it. The subcategories of this dimension are the following.

- *Goal orientation*. People feel motivated to learn when they perceive that the learning will help to achieve an objective that they value personally or professionally. In b-learning models, we must look for strategies that help to improve understanding of the relations between concepts and practical applications of this knowledge in a specific personal, social or work activity.
- *Motive matching*. Some people prefer to learn by the definition of goals that enable them to determine the means to achieve them individually, others are more comfortable in competitive environments that stimulate their effort in comparison with others and, some people are more motivated if there is collaboration and cooperation in a work team.



**Fig. 1** Keller's ARCS Model [31]. *Source* Prepared by the author

- *Familiarity*. Although novelty is a motivational factor, we are indeed more interested in contents that have some connection with prior knowledge. It is essential to provide success experiences in the learning process, to generate sufficient confidence and reduce feelings of failure or frustration.

The subcategories identified in this «Confidence» category of the ARCS model, are the following:

- *Learning requirements*. A b-learning mode student should know what is expected from their learning. In this respect, it is very useful to incorporate evaluation headings with the criteria and levels of attainment of the goals.
- *Success opportunities*. Once the achievement expectations have been generated, the student must obtain results perceived as successes in their learning process. Challenges should be graded, so that they are adapted to the level of development of the desired competence.
- *Personal control*. The educational model should offer the perception that the learner controls the learning experience, so that their autonomy is increased, as well as the sensation of self-control of the process.

The final step in the motivational process is to create satisfaction, so that the interest in learning continues and the pedagogical qualities of the educational material are evaluated positively. ARCS defines the following subcategories:

- *Natural consequences*. The most motivational experience takes place when a person can apply their new knowledge at the end of the learning process and experience, by themselves, that they have competences they did not have before.

The b-learning model should provide opportunities for the user to obtain their own evidence of progress (e.g. simulations, case studies, etc.)

Positive consequences. A final reward materializes, before oneself and others, a recognition of the effort carried out. The use of gamification mechanisms may be highly appropriate for b-learning environments.

### **3 Models and Pedagogical Approaches in Blended-Learning**

Once the theoretical foundations for designing b-learning have been described, the different models applied for instructional design that are used for the combined teaching-learning (face-to-face/online) contexts are analyzed. Firstly, generic models that are used for the pedagogical design of b-learning (ADDIE, ASSURE, MRK and DDD-E) are identified. Secondly, models that use educational standards for online education and which, consequently, have an evaluative character (iNACOL and Quality Matters). Finally, specific design models for b-learning environments (BLC and IDM-BHE) are described.

#### **3.1 Instructional Design Models**

In the scientific production of the last few years, the instructional design models in b-learning are diverse. However, generic models such as ASSURE and ADDIE are still predominant, due to their versatility in different educational contexts, even used combined. Although other models are also identified in the b-learning context, which are described below, and which can contribute to building, in a combined manner, a theoretical-practical corpus for the design and implementation of b-learning in educational contexts.

##### **3.1.1 The ADDIE Model**

ADDIE is a sequential and iterative model, characterized by encompassing the principal phases of instructional design [33]. Being a general model, it constitutes the basis of the current instructional design model due to its versatility to adapt to any educational context, including the training program in b-learning. The acronym ADDIE refers to the processes that comprise the development of instructional design [34]:

- **Analyze.** The analysis phase involves the initial collection of information and evaluation of the needs of the environment, definition of the problem or objectives,

identifying their causes or modes to achieve them. From these analyses, the inputs for the next phase are derived.

- **Design.** This process should determine how to achieve the educational goals obtained during the analysis phase, and present the pedagogical foundations of the training activity.
- **Develop:** Generate the units, modules and didactic materials.
- **Implement:** Put into practice the instructional program, efficiently and effectively.
- **Evaluate:** Carry out a formative evaluation (throughout the whole process) and summative (at the end of the training process).

The ADDIE model is backed by its usefulness and good results in comparison to traditional instruction models in the latest research carried out. The research of Durak et al. [35] obtains interesting recommendations in the application of the model in a b-learning course at the university level. Firstly, following the design model has enabled them to resolve problems found during the process and the duration of the training, showing finally that the planning was adequate. The fact of selecting synchronous and face-to-face, and asynchronous and virtual materials and resources, makes thinking about how to use them in both environments fundamental to enhance their efficacy. They also include, as an added element to educational support, the social support that should be offered to students during the training process. In this respect, they recommend taking into account all the dimensions of the interaction and communication, so it will be effective from the beginning. On preparing a training activity, all the elements found in the analysis phase should be taken into account, paying particular attention to needs analysis, analysis of pupils, technical analysis and structural analysis. Following the phases, they recommend developing a pilot action that helps to determine and overcome any shortfalls before the real application. Finally, they provide the need to generate a strong bond between the evaluation of each phase and the redesign, noting how iterative and recursive the model is, with the possibility of developing it in a non-linear sequential manner, the design process offering a clear advantage. The importance of the creation of interaction processes, participation and feedback with the students to generate meaningful learning in training activities designed under the ADDIE model in b-learning environments has also become evident [36].

### 3.1.2 The ASSURE Model

The ASSURE model [37] (Analyze Learners; State Standards & Objectives; Select Strategies, Technology, Media & Materials; Utilize Technology, Media & Materials), is based on the instructional principles of Robert Gagne and it is widely used in designs that integrate technologies in teaching-learning environments, with a clear vision towards student learning. The creators of the model aimed to help teachers integrate technologies, resources and materials in the classroom simply and effectively. The model is focused on the selection of tools and resources to achieve the learning goals from a perspective of student communication and participation. For

this purpose, when considering designs in b-learning, it is necessary to define which technological resources work better for the context in which the training will take place and how these resources will be used to improve the learning experience. To answer these questions, the ASSURE model suggests six procedures that must be followed in the design of blended-learning training models [38].

- Analyze learners. To know the characteristics of the students and their learning styles.
- State standards and objectives. The model requires establishing objectives clearly oriented towards learning results.
- Select strategies, technology, media, and materials. Selection of methods, resources and materials considered most appropriate for achieving the learning objectives.
- Utilize technology, media, and material. Use of technologies, media and resources with evidence of an effective implementation plan.
- Require learner participation. Student participation, planning strategies that make students active during the entire process
- Evaluate and revise. Referring to the evaluation of student learning and academic performance.

Through these six steps, the model shows how to select, use and evaluate technological and didactic resources, as a fundamental part of the systematic design of the teaching-learning process. Having a highly practical approach, ASSURE is one of the most commonly used models in the sphere of instructional design in b-learning. The model has a positive influence on student learning, especially if the communication, support and encouragement of student participation are designed effectively [39].

### 3.1.3 The Kemp Model (MRK)

Kemp's model or MRK [40] is a framework of instructional design very widely used in the design of training in online and b-learning modality. It is based on a systematic process that takes into consideration the key factors of a teaching-learning environment, that can be extended to designs for training in digital environments in three broad iterative phases: Analysis, development of strategies and evaluation, represented cyclically. The process of systematic design suggested by Kemp's model consists of nine steps that are interrelated, interdependent and non-linear: (1) Identify instructional design problems and specify relevant goals. (2) Examine the characteristics of the pupils. (3) Identify the contents of the subject and analyze the components of the task that are related to the learning objectives. (4) Establish and set learning objectives that the students should know. (5) Sequence the content within each unit or theme to respond to logical learning. (6) Design didactic strategies so that each pupil will achieve the learning objectives. (7) Plan the didactic delivery. (8) Develop instruments of evaluation to verify that the objectives are achieved. (9) Select the resources to support the learning activities.

This non-linear and interrelated nature of its components (systems approach) makes the design process cyclical and flexible. This vision places emphasis on the management of the design process and evaluation of the process itself, involving all factors that could interfere in a learning environment [41]. An adaptation of the model to b-learning was carried out, based on self-regulated learning and the design of learning activities that activate the cognitive processes of the students, to achieve effective involvement in their own learning. The best teaching model is considered to be that which offers a variety of activities and procedures to stimulate individual cognition, using a self-regulated learning strategy [42].

### **3.1.4 The DDD-Model E**

The DDD-E model (Decide, Design, Develop and Evaluate), is a constructivist approach based on the design of multimedia training [43]. This model offers a general framework on which to base the development of b-learning projects, from a systematic and flexible perspective. It consists of three principal phases that comprise the three “D”s, surrounding the Evaluation phase. According to the authors of the model, it can improve creativity and attitudes of the students and promote a more in-depth experience and a greater understanding of the content.

- **Decide.** The decision phase focuses on establishing objectives and the main program, contents, learning standards and student roles.
- **Design.** The design phase is the fundamental phase of this model, considering that it is necessary to invest 50% of the total time used in the process to this. It is the phase where what is going to be developed and how it is going to be done is specified.
- **Develop.** The development phase is the moment when the resources needed for the project are produced.
- **Evaluate.** The evaluation phase focuses on formative and summative evaluation implemented during and at the end of the project. This includes assessment of student progress through the task throughout the process, completed student work and the levels of student participation, the success of the project as a whole and the development of plans for change, if necessary.

## **3.2 Standard-Based Models**

### **3.2.1 iNACOL**

The International Association for K-12 Online Learning (iNACOL) developed the «National Standards for Quality Online Courses» [44]. The purpose of this standard is to provide a set of quality guidelines to generate b-learning models, from Primary to

Secondary education. It is focused on teachers, the education administration and Governments that formulate educational policies. The standards encompass the content of the training activities, the instructional design, the technology, student evaluation and course management. It is focused on emerging models of blended learning, generating processes with multiple stages that establish, in time, high-quality b-learning models.

iNACOL's assessment rubric consists of 52 specific criteria that define the expected action and recommendations, so, evaluators look for the evidence of the presence of the mentioned criteria in the training activity. The evidence has five levels on a scale of 0–4 (absence, unsatisfactory, moderately satisfactory, satisfactory and very satisfactory). It is divided into five dimensions or sections, which in turn encompass several sub-dimensions:

- **Content.** The description indicates that the course provides online learners with multiple ways of engaging with learning experiences that promote their mastery of content and are aligned with state or national content standards. It includes sub-dimensions: Academic Content Standards and Assessments, Course Overview and Introduction, Legal and Acceptable Use Policies and Instructor Resources.
- **Instructional Design.** This dimension describes that the course uses learning activities that engage students in active learning; provide students with multiple learning paths to master; the content is based on student needs; and provides ample opportunities for interaction and communication student to student, student to instructor and instructor to student. The sub-dimensions are Instructional and Audience Analysis, Course, Unit and Lesson Design, Instructional Strategies and Activities, Communication and Interaction and Resources and Materials.
- **Student Assessment.** Describing that the course uses multiple strategies and activities to assess student readiness for and progress in course content and provides students with feedback on their progress. It includes the sub dimensions: Evaluation Strategies, Feedback and Assessment Resources and Materials.
- **Technology.** Describing that the course takes full advantage of a variety of technology tools, has a user-friendly interface and meets accessibility standards for interoperability and access for learners with special needs. The sub-dimensions of this section are: Course Architecture, User Interface, Technology Requirements and Interoperability, Accessibility and Data Security.
- **Course Evaluation and Support.** This dimension describes that the course is evaluated regularly for effectiveness, using a variety of assessment strategies, and the findings are used as a basis for improvement. The course is kept up to date, both in content and in the application of new research on course design and technologies. Online instructors and their students are prepared to teach and learn in an online environment and are provided support during the course. Its sub-dimensions are: Assessing Course Effectiveness, Course Updates, Certification and Instructor and Student Support.

### 3.2.2 Quality Matters

Quality Matters is one of the best-known quality standards models, and it is specifically focused on Higher Education. QM consists of an assessment rubric of 43 standards, grouped in 8 categories to assess the quality of training already designed and create peer review processes, in university studies. They are currently the most commonly used standards in USA universities for designing wholly online courses or in b-learning. The eight categories are [45]:

- Course Overview and Introduction (9 specific standards). A specific criterion to address the introduction of each course.
- Learning Objectives (Competencies) (5 specific standards). The criteria of this dimension are focused on the formulation of objectives of each training activity, including items that are related to specific objectives to organize student learning according to their prior knowledge.
- Assessment and Measurement (5 specific standards). Includes the standards related to assessment, from providing constructive feedback to helping in the design of evaluations appropriate to encourage student learning.
- Instructional Materials (5 specific standards). The items constitute principles for designing learning experiences that promote comprehension, regarding the materials that will be used, and the learning objectives established previously.
- Learning Activities and Learner Interaction (4 specific standards). The standards referring to interaction are related to the promotion of the learner's feeling of belonging to a community of learners that are supported and motivated through learning and communication activities.
- Course Technology (4 specific standards). Criteria referring to the technology used for communication with the student.
- Learner Support (4 specific standards). These items are related to the constant availability of a help system when the students need it.
- Accessibility and Usability (6 specific standards). Are the standards related to accessibility and usability, so disabled students can use the training with equal opportunities to their classmates.

It includes notes that contain examples to find evidence that can help evaluators (3 in each process) and recommendations for improvement if the standard is not fulfilled. In a complementary manner, it strives to guarantee internal consistency in the training actions through the alignment of their most important components: learning objectives, activities, materials, tools and evaluation. The training should reach 85 over 99 points to obtain an assessment of the course with the QM seal.

This assessment rubric has enabled higher education institutions improve the confidence of teachers in the development of b-learning training, especially in the incorporation of the online part [46]. Other studies show good results in the application of QM to the design of quality training by teachers, in contrast to other design models [47, 48].

### 3.3 *Specific Design Models for b-learning*

#### 3.3.1 The Blended Learning Curriculum (BLC) Design

The BLC design model [49] is based on Merrill's instructional principles [50], constructivism (deep learning, community of practice) and an updated vision of constructivism. It aims to provide a conceptual framework and a practical guide for designing b-learning environments. The model has three main components: (1) pre-analysis; (2) design of activities and resources; (3) evaluation of the learning.

The pre-analysis phase determines the appropriateness of the b-learning by analyzing three factors: (1) The characteristics of the students (prior knowledge, learning preferences, etc.); (2) the analysis of the learning objects, i.e., what should be taught based on knowledge taxonomy (v.gr. Bloom); and (3) Analysis of the b-learning context, with the aim of determining the degree of competence of the students and explain, in detail, the learning activities for correct organization of the teaching process. The second phase of the model is destined to the design of activities and resources, and it includes three subcomponents: global design of the b-learning that identifies the learning activities, the strategy of dissemination of the knowledge and the support that the teacher will give to the students. The most important feature of this phase is that the attention is focused on defining which are the activities and resources best adapted to the non-face-to-face context and which to the face-to-face context. The third phase deals with the design evaluation, and it is based on the objectives, the expected learning results and the pedagogical approach of the b-learning environment. The most common strategies are e-portfolios and online knowledge tests.

Development of the teaching process in a b-learning environment according to the BLC model is organized in three modules. The function of the first module (Curriculum Lead-in) is to show the students the objectives of learning, describe the tasks that they must carry out, identify the materials for studying and establish the communication channels to be used. The second module introduces a series of teaching and learning activities. The teacher must choose a classroom activity that will involve the student, either individually or in a group, in a self-regulated activity developed online. The results of this task return to the traditional classroom to receive feedback from the teacher and the students. This process should consolidate the learning, promote progress in the knowledge and carry out transfers of what has been learnt. Alternatively, the development can begin with autonomous activities of the students on-line and be enriched with subsequent face-to-face activities until the task is completed. Finally, the third model develops the evaluation of the results of learning, by different techniques focused on formational evaluation that encourages deep learning.

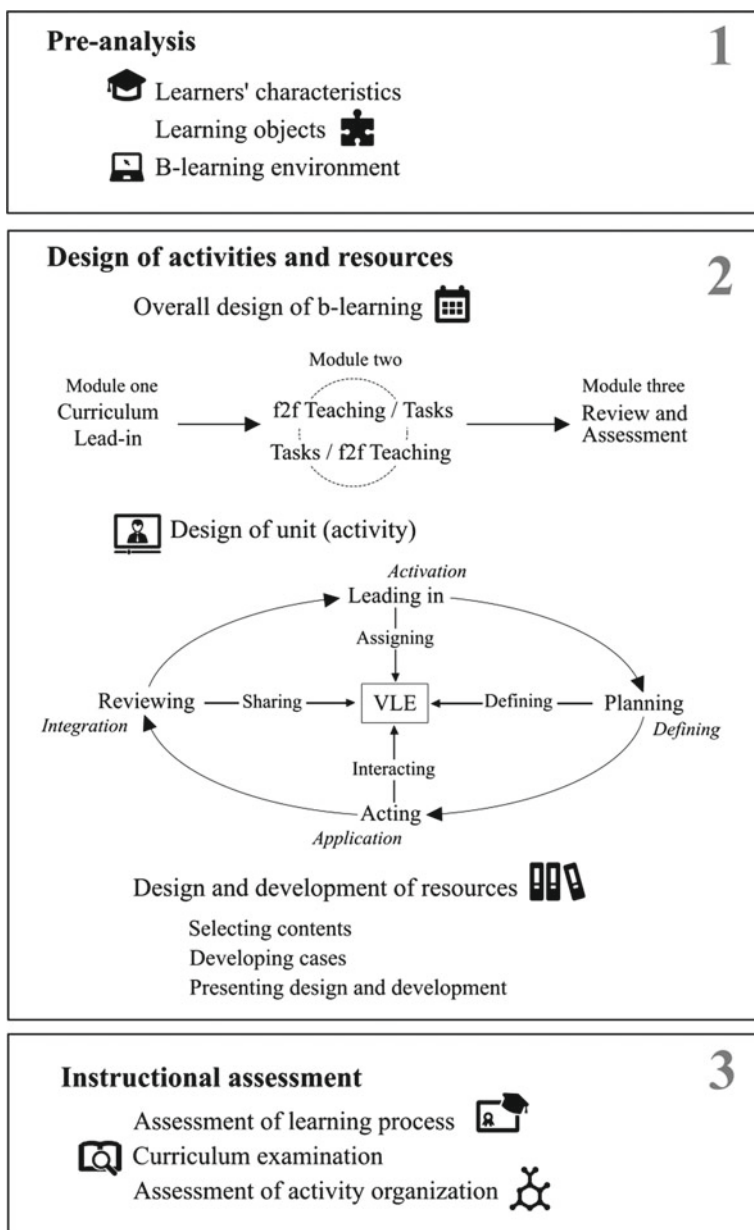
To design b-learning activities, the BLC model defines four main components: (a) *Lead-in*, which aims to show the learning activity to the students, which implies describing the purpose of the task, exemplifying the activity, informing of the resources needed for its implementation and offering a clear organization about how

to carry out the whole process. (b) *Planning*, the aim of which is for students to define the task by their own knowledge and using brainstorming, definition of the problem, identification of the factors involved and establishment of the steps to follow. (c) *Acting*, the aim of which is to carry out the learning activity, according to the requested requirements, in a virtual teaching-learning environment and it implies the search for and selection of information and the creation of products in different formats (text, audio-visual, graphic). (d) *Reviewing*, which aims to transfer the knowledge built by the learning activities and sharing the results with colleagues. This component of the model implies the presentation of products, revision of the process and feedback from the teacher. The model is cyclical, with the virtual teaching-learning environment in the center of the four stages. Moreover, each of the four components is related to Merrill's instructional principles (Lead-in/Demonstration; Planning/Application; Acting/Activation; Reviewing/Integration).

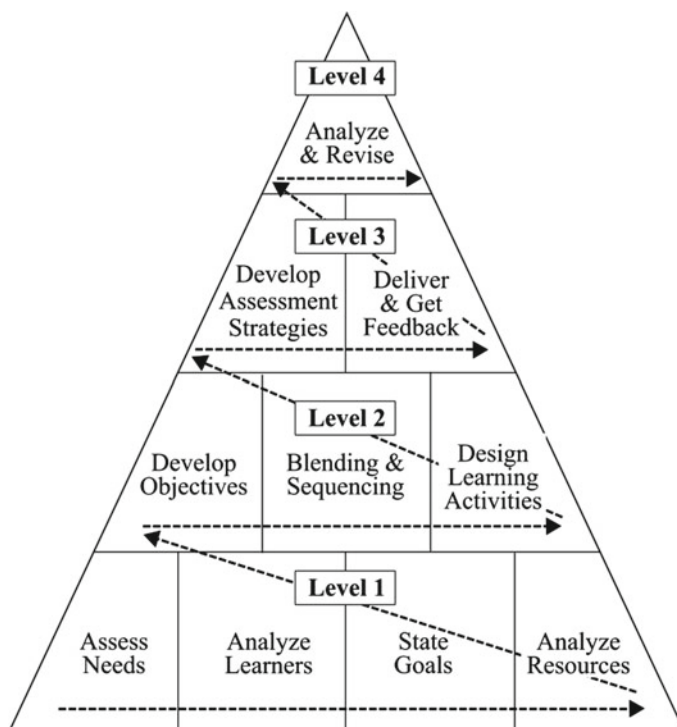
### 3.3.2 Instructional Design Model for Blended Higher Education (IDM-BHE)

This instructional design model [51] is characterized by a pyramid structure which, in comparison with the circular-cyclical models (e.g. CoI) or linear (e.g. ADDIE), is considered more appropriate to offer a process defined in levels and specifically oriented to pedagogical design (objectives, activities, evaluation). The pyramid-shaped presentation of the model enables identification of what the temporal development of the design process should be, by reading left to right and top to bottom (See Fig. 2). Each level requires having carried out the previous, as they are interdependent. Four levels are defined with a variable number of components (Fig. 3).

*Level 1.* On this level, a series of basic aspects for the design are defined, so the information collected should be rigorous and relevant. For its development, documentation and data from the education organization should be used. It includes four components: (a) *Assess Needs*. Using different techniques (e.g. Delphi), training needs of different nature are detected. From these studies, the need to develop new competencies arises, to certify specific knowledge, train for the use of emerging technology or deepen certain disciplinary content. In general, the aim is to identify gaps between the training offered and current social demand. (b) *Analyze Learners*. There are different sources of information to obtain relevant data: Admission interviews, questionnaires before the course, direct observation, academic reports, observations made by other teachers or learning analytics of a Learning Management System (e.g. Moodle). For b-learning to be successful, students should be the focal point of the design. Many variables must be taken into account (prior knowledge, experience, attitudes and skills, etc.) that can affect the correct development of the teaching-learning process. (c) *State Goals*. The formulation of goals is fundamental to define the purpose and goal of the b-learning. (d) *Analyze resources*. To identify the resources needed is an essential step in order to check if they are adequate to the planned goals, to the design of the activities the evaluation, as well as the possibilities



**Fig. 2** Components and subcomponents of the BCL model [49]. *Source* Prepared by the author



**Fig. 3** Pyramid model of the IDM-BHE [51]. *Source* Prepared by the author

of development of the b-learning. It is essential to know the limitations under which the teaching activity will be developed.

*Level 2.* Has three components: (a) *Develop objectives.* The formulation of goals are important for different reasons: They provide a plan for designing the teaching activity, enable an efficient assessment of the quality of the teaching-learning process, offer criteria for the selection of the educational resources, contribute to determining the most appropriate didactic methodology or defining the sequencing of the contents. They communicate what should be learnt and establish expectations for teachers and students. In this respect, they are a relevant element for evaluating the results of learning. (b) *Blending and Sequencing.* The implementation of b-learning can be carried out with different strategies. The most common consists of digitizing all the exhibition activities using videos, slide presentations or texts for sharing online and carrying out practical activities in the face-to-face sessions. Another method consists in classifying the learning objectives according to their position in the Bloom's taxonomy [52]. Those situated at the lower levels (e.g., remember, understand) are developed through virtual teaching-learning environments and for those corresponding to higher levels (e.g. evaluate, create), face-to-face classes are used. In this manner, the face-to-face activities are reserved for complex problem resolution activities, case studies, guided professional practice or construction of

knowledge, among others. A third option consists in the design of learning activities that encompass different objectives, and which are developed in the online environment as preparation for the face-to-face sessions, that are dedicated to activities of deepening in the knowledge by open problem resolution or high dialectical level and argumentative debates. Regardless of the approach adopted, the information obtained in Level 1 of model about needs, resources, objectives and profiles of the students contribute to decision-making on the best methodological choice. For sequencing of the knowledge, some basic guidelines should be respected that recommend starting by initially presenting the less complicated concepts, principles or procedures. Teach in an integrated manner concepts that should be understood jointly; or begin by affirming prior knowledge before introducing new. (c) *Design learning activities*. Must be coherent with the objectives and contents defined previously. Their level of difficulty should be established according to the defined sequence, so that complexity increases as prior competencies are developed. If we go by Bloom's taxonomy, types of activities for the upper levels would be case studies, learning based on projects, learning based on problems, learning-service, learning by discovering or role-playing, among others. In the case of lower taxonomic levels, individual reading activities are designed, demonstrations, video-presentations or information collection work, among others.

*Level 3*. Has two components: (a) *Develop Assessment Strategies*. Its function is to select the methods and techniques to be applied to evaluate learning. Additionally, to estimate the degree of attainment of learning results, it offers information about the appropriateness of the instructional design, establishing improvement plans that affect all the components of the design and identifying the principal weaknesses concerning the intended objectives. If an evaluation strategy is not defined, the data collected through the learning activities cannot be interpreted effectively. (b) *Deliver & Get Feedback*. A b-learning environment requires rigorous control of the feedback offered to the students, both online and face-to-face, so that it is ensured that the learning difficulties are not caused by an absence of coordination between both contexts. In b-learning, it is habitual for the student's workload to be excessive in certain moments of the process and this affects their performance and the teacher's capacity to manage the demands of the pupils through forums and evaluation of activities. On the other hand, it is very relevant to control the degree of self-efficacy of the students, so that their expectations of success remain at adequate levels.

*Level 4. Analyze & Revised*. Once implemented, any design requires revision to modify components that do not work as desired. To carry out this process, it is fundamental to have ample and updated information. It is vital to consider the teacher's assessment of the strengths and weaknesses of the b-learning experience and prioritize the most critical elements. Needs and objectives change with time, and each context has its own particularities, so it will always be necessary to carry out adjustments and improvements in the instructional design.

## 4 Orientations for Developing Pedagogical Designs in Blended Learning

There are four basic questions that any instructional designer should ask and answer to create and develop a b-learning education experience. The first question is: «How do we globally focus on pedagogical design in b-learning to achieve good learning results?» When designing b-learning, it is adequate to start with systemic approaches, which combine several design models and theoretical approaches, emphasizing the student's activity to achieve the learning objectives. This orientation forces us to consider decisive factors such as learning strategies to maintain attention and motivation of the students, the communication processes that maintain a proactive learning process in all directions, the role and the presence of the teacher in each environment (face-to-face and virtual) and the evaluation processes of the learning results. Alonso et al. [53] developed a pedagogical design model for a b-learning environment that incorporates different learning theories, from which the central factors and related implications for its design are extracted. Later, they use the ADDIE model to organize and view the result graphically [53]. Other designs [54] also combine generic models such as «Kemp's Model» and ADDIE with a constructivist theoretical approach to generate systemic processes in b-learning. These proactive approaches that combine self-managed learning, learning online and face-to-face learning determine that these types of systemic and flexible designs produce a more efficient b-learning experience, with positive learning results.

Analyzing the materialization of the process, the second question to answer is: «how to get the students to commit to the learning activities?» The key factor is to identify relevant factors that affect the motivation and interest of our students. In this respect, it is necessary to create plausible situations for factors such as: atmosphere (security and a feeling of belonging to the group), stimulus (feedback, acknowledgment and support), autonomy (options, control and flexibility), interactivity (collaboration, cooperation and community), relevance (significance, authenticity, interest), commitment (effort, involvement and dedication) and tension (challenge, dissonance, and controversy). To facilitate the answer to this question, the «TEC-VARIETY» design principles for online education [55] are useful, as they include 100 types of activities, on the foundations of model R2D2 (read, reflect, display, and do) [56] to which 10 motivational components are added: (1) Tone/Climate: Psychological Safety, Comfort, Sense of Belonging. (2) Encouragement: Feedback, Responsiveness, Praise, Supports. (3) Curiosity: Surprise, Intrigue, Unknowns; (4) Variety: Novelty, Fun, Fantasy. (5) Autonomy: Choice, Control, Flexibility, Opportunities. (6) Relevance: Meaningful, Authentic, Interesting. (7) Interactivity: Collaborative, Team-Based, Community. (8) Engagement: Effort, Involvement, Investment. (9) Tension: Challenge, Dissonance, Controversy; and (10) Yielding Products: Goal Driven, Purposeful Vision, Ownership.

The third question is: «how to approach the transmission/construction of the knowledge?» To answer this question, we must value the relevance of the resources to be used for transmission/construction of knowledge in the students. From this

perspective, we must value the suitability of a type of educational resources for transmission/construction of knowledge in a b-learning modality and reflect on the ideal pedagogical approach to promote deep learning, i.e., comprehensive and not merely memory-based. Thus, we should analyze the importance or relevance given to the following resources and the most adequate way to use them: contents created by the teaching staff by subjects or slide presentations, external contents with copyleft licenses (Open Educational Resources), asynchronous video-classes, synchronous video-classes (videoconferences, micro-activities such as exercises or tasks about specific themes in a subject, for short-term resolution (2–3 days) or macro-activities, which are tasks about global issues of one or more subjects for medium-term creation (2–3 weeks). Justifying the reasons why we give them this valuation, we can answer this question.

Finally, the question to be answered is: «how to design and apply the evaluation of the learning to the b-learning model?» To answer this, it is necessary to evaluate the adaptation of the educational techniques for the evaluation of learning in a b-learning modality. Our analysis proposal starts from an assessment rubric in which the efficacy of each technique is assessed as an instrument of evaluation to assess the development of the learning (competencies). Starting by analyzing the difficulty to create (for the teacher), usefulness for the teacher, usefulness for the student of each of the techniques most commonly used in b-learning (Table 2).

## 5 Conclusions

Educational institutions face new challenges to develop digital education, and their success depends on a series of conditions that must be met [57]: (1) Increase the integration of digital education through blended learning. (2) Carry out important investments in pedagogical design, educational research and tools/ digital competencies; (3) provide support for students (24/7); (4) fully involve the teaching staff and provide adequate development and training, encouraging a culture of innovation in teaching; and (5) strengthening learning analysis for training assessment.

Some emerging technologies are beginning to take a leading position in the development of b-learning models and should be considered in future instructional designs. We are referring to virtual reality and augmented reality, games and gamification or technologies based on cybernetics and nanotechnology [58]. The progress in artificial intelligence, the evolution of learning analytics, among other emerging technologies, will bring a panorama of new epistemologies, theoretical approaches and pedagogical models in training systems. This fact shows that instructional design is a corpus of theories in movement that advances towards training models that offer learning experiences in b-learning educational contexts with more sophisticated digital technologies. B-learning requires a new vision of pedagogy, as it is modifying the nature of didactic communication, traditionally anchored in excessively long and student-passive presentation classes. B-learning is a disruptive technology that is transforming the concept of the teaching-learning process in educational contexts.

**Table 2** Scale for assessing evaluation techniques in b-learning

| Evaluation techniques                                                               | Efficacy as an instrument for evaluation (validity to assess competencies) |   |   |   |   | Difficulty to create (teacher) |   |   |   |   | Usefulness for the teacher |   |   |   |   | Usefulness for the student |   |   |   |   |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------|---|---|---|---|--------------------------------|---|---|---|---|----------------------------|---|---|---|---|----------------------------|---|---|---|---|
|                                                                                     | 1                                                                          | 2 | 3 | 4 | 5 | 1                              | 2 | 3 | 4 | 5 | 1                          | 2 | 3 | 4 | 5 | 1                          | 2 | 3 | 4 | 5 |
| Rubrics                                                                             |                                                                            |   |   |   |   |                                |   |   |   |   |                            |   |   |   |   |                            |   |   |   |   |
| Portfolio                                                                           |                                                                            |   |   |   |   |                                |   |   |   |   |                            |   |   |   |   |                            |   |   |   |   |
| Application of knowledge (simulations, case studies, resolving practical cases ...) |                                                                            |   |   |   |   |                                |   |   |   |   |                            |   |   |   |   |                            |   |   |   |   |
| Creation of products (demonstration of competencies by the creation of a product)   |                                                                            |   |   |   |   |                                |   |   |   |   |                            |   |   |   |   |                            |   |   |   |   |
| Questionnaires and objective tests (multiple choice)                                |                                                                            |   |   |   |   |                                |   |   |   |   |                            |   |   |   |   |                            |   |   |   |   |
| Self-evaluation exercises                                                           |                                                                            |   |   |   |   |                                |   |   |   |   |                            |   |   |   |   |                            |   |   |   |   |

(continued)

Table 2 (continued)

| Evaluation techniques           | Efficacy as an instrument for evaluation (validity to assess competencies) |  |  |  |  | Difficulty to create (teacher) |  |  |  |  | Usefulness for the teacher |  |  |  |  | Usefulness for the student |  |  |  |  |
|---------------------------------|----------------------------------------------------------------------------|--|--|--|--|--------------------------------|--|--|--|--|----------------------------|--|--|--|--|----------------------------|--|--|--|--|
| Peer evaluation (co-evaluation) |                                                                            |  |  |  |  |                                |  |  |  |  |                            |  |  |  |  |                            |  |  |  |  |
| Use of blogs and wikis          |                                                                            |  |  |  |  |                                |  |  |  |  |                            |  |  |  |  |                            |  |  |  |  |

Source Prepared by the author

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# The Blended Learning Pedagogical Model in Higher Education



Mario Vásquez Astudillo

**Abstract** The adoption of Blended Learning has been growing actively in higher education across the world, becoming the new traditional model, or the new normality in the teaching-learning process, optimising the use of face-to-face and online environments. It is presented as a modality that is effective in the attainment of skills and academic results. This chapter presents a pedagogical Blended Learning model implemented ten years ago in higher education, which pedagogically structures the teaching-learning process surrounding face-to-face and online activities, articulated and sequenced in stages of increasing complexity, based on the contributions of various theories. The model promotes the prolongation of a face-to-face class with the use of technologies and technological platforms. The model's activities offer various opportunities of guided coursework online and in-person with the purpose of developing increasing degrees of autonomy, with the student playing the role of an active protagonist and the teacher fulfils the double role of designer of learning situations and mediator, facilitator and manager. Planning outlines are offered in a B-Learning course and in the design of e-activities, as well as didactic and pedagogical suggestions for its implementation and progressive experience by the teacher.

**Keywords** Blended learning · Pedagogical model · E-activity · Higher education

## 1 Introduction

Since the first European universities appeared in the eleventh and twelfth centuries, the basic principles of the university have changed very little; while new technologies have come and gone, the form and function of the university have remained the same. In universities that have been using technology for more than two decades, the figure of the teacher has been strengthened with new roles and competences since students present new needs for the new tools and methodological strategies.

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The adoption and intensive use of digital technologies, particularly web-based ones, are transforming universities worldwide [1–3]. Media-rich digital learning platforms, personalised or adaptive courses and web conferencing tools capable of connecting students to synchronous distance activities are becoming common solutions for blended learning (BL) designs [4]. Technology has the potential to increase access to education, improve learning experiences and reduce the cost of providing high-quality post-secondary education [5].

The adoption of BL has been actively growing in higher education worldwide [6, 7]. Some authors conclude that BL would become the *new traditional model* [8], or the *new normality* in higher education [9], it being almost impossible to find a teaching and learning system not involving BL teaching methods [10]. Martín-García et al. [11] confirm that many universities and higher education institutions are designing strategic plans to implement and disseminate the use of BL. This trend is endorsed in Alexander's study [4] in that BL designs have constantly increased as a favourite modality, valuing their flexibility, ease of access and the incorporation of sophisticated multimedia. Several experts assert that blended was an 'inevitable conclusion' and not necessarily just a trend, identified as such in the last fifteen years in the Horizon study (2005–2019) [4].

## 2 Framework of Understanding

### 2.1 Use of the Blended Learning Concept

A recent study verifies that in the academic literature between 1995 and 2016, the English term blended learning has finally prevailed in Spanish publications [12]. Similarly [13, 14] Furletti and da Costa [13] and da Roza et al. [14] conclude that the Brazilian academic community has adopted the use of the term BL, over all other terms and expressions such as hybrid teaching, hybrid education, hybrid learning or semi face-to-face modality.

Regarding its meaning, publications in different parts of the world offer a series of uses and meanings of BL with emphasis on different focuses and bring together many educational initiatives, with different degrees of use of technology, such as the combination of traditional classroom teaching methods and online or distance teaching [15–17]. Other meanings highlight learning activities that involve a systematic combination of face-to-face interactions and technologically mediated interactions between students, teachers and learning resources [18–21], optimising resources in both the classroom and virtual environments [22] in the words of Monteiro [17] a classroom learning model enhanced by technology; the confluence of pedagogical and technological mediation, with learning activities that give continuity to the classroom through the virtual [23]; or the simple use of virtual spaces for students to carry out individual and/or group activities in support of the classroom, from which all of them are administered [24, 25].

The blending of different learning approaches is not a new idea, for example, lectures, seminars, tutorials, case studies, role plays, learning groups, etc., are heterogeneous methods and techniques which were used simultaneously in the same educational scenario. The difference between BL and that situation is that, in this case, the classroom is combined with variable applications of digital technology, even as complex as ‘digital learning platforms’, generating an instructional continuum blending both modalities.

In summary, coinciding with Martínez [26] and Picciano et al. [27], although there is no consensus on a clear definition for BL, in all cases of use, the common theme, as already noted by Vaughan [28], is the combination of face-to-face and non-face-to-face educational modalities based on information and communication technology (ICT) whose common denominators are classroom or face-to-face interaction and online support through the use of various technologies. The objectives and pedagogical aspects in the integration of both components mark the difference between one or the other conception, which reflects the multiform nature of the BL modality according to how it is used by users, teachers and students. Therefore, as da Roza et al. [14] concludes, BL does not exclude one educational modality over the other; on the contrary, it proposes that we use the potential of each modality more and better for meaningful learning to occur through effective practices.

## 2.2 *BL Effectiveness*

Regarding the effectiveness of BL, good academic results in terms of lower dropout rates [29, 30] and higher academic performance can be seen, with different degrees of statistical significance of the BL modality compared to traditional face-to-face learning [30–39]; although the positive perception of students towards BL courses does not always reflect an improvement in learning outcomes [40]. Assessment of these results tends to be carried out through traditional tests, which do not always value other skills that could be achieved in BL, which are not achieved only with classroom learning. The power of the new tools and modalities should be measured according to their particular natures. As noted by Bigum and Rowan [41], it is like testing the pulling capacity of cars by attaching ploughs to them.

In its particular nature, we can see BL as a highly complex communication process that promotes a series of interactions that incorporate technological resources into face-to-face and non-face-to-face moments, which integrates social and educational components [10]. Therefore, for the adoption of BL as an instructional continuum between face-to-face and non-face-to-face learning, certain conditions are required in the combination of different teaching approaches: (a) an instructional design that integrates face-to-face and non-face-to-face spaces, (b) interactive and accessible educational materials, (c) a continuous support system and (d) a continuous assessment system [1, 11].

The outbreak of the BL revolution has heralded the appearance of a new world of interactivity for educational relationships, in which new forms of teaching and

learning need to be designed, studied and understood in their interactions with new media and learning contexts [12]. These new learning contexts and environments generate learning communities that facilitate and sustain learning while promoting interaction, collaboration and the building of a sense of belonging among members, key elements of BL's success, in which it must occur in a dynamic, flexible and adaptive process [42].

### ***2.3 Strengthening of the Figure of the BL Teacher***

Although we have a changing environment made possible by the broad technological development of recent decades, which in some cases sought to replace the teacher with great optimism, the classroom has proved to be a lasting system for communication. It is a cornerstone of society for the transmission of culture and the preparation of people for proper performance in society. Face-to-face learning has benefits that are difficult to match in a technological environment. In this regard, information and communication technology (ICT) does not threaten the function of the university, what is discussed is the need for a new pedagogy, based on interactivity, personalisation and the development of the ability to learn and think autonomously. We accept that ICT is an opportunity and can be used in face-to-face learning tending towards a BL modality, as a resource and means that enables, on the one hand, the educational offer to be made more flexible, thus serving the diverse educational needs of the population, and, on the other, teaching/learning methodologies and communication modalities to be innovated and diversified.

An element of great pedagogical interest, which we have drawn from our experience of applying MoSal-b since 2009, is that, far from thinking about the disappearance or gradual replacement of the teacher as an effect of the introduction of technology into educational processes, an aspect that has been accentuated at certain times in the last century, the inherent technological component of BL strengthens the role of the teacher as a designer and curator of learning activities. These technologies do not have educational or pedagogical qualities in themselves, therefore, the figure of the teacher is fundamental, because he supports, guides and reinforces the communication and interaction system that gives a sense of belonging, generates a rhythm of work and provides a scaffold of support, as intrinsic teaching values that have not been undermined by technology.

The test on the importance of the teacher devised by Hattie [43], who after 15 years of research through the completion of more than 900 meta-analyses corresponding to more than 60,000 research works, which include more than 240 million students, concludes that the factors that most influence students' learning and academic performance are the following, by order of incidence: the teacher, the curriculum, the teaching methods, the student, the family environment and the education institution. The teacher articulates the curriculum and BL as a teaching method for the achievement of student learning, and the pedagogical design itself fosters in the student the development of academic skills.

For its part, the potential capacity of ICT is more than mere artefacts or instruments, it is capable of generating new contexts, different scenarios [44], learning environments adapted to the characteristics and levels of people in education, it provides their character as mediators in learning processes and even with their possibilities to modify the interactivity generated [45], but computer tools on their own will not automatically change teaching methodologies.

### 3 BL Pedagogical Model

Our best works were never recorded

*John Lennon*

In the technological context described above, in which our pedagogical practice and student learning are developed, we have designed a BL pedagogical model called MoSal-b [46] based on the premise that each subject course group becomes a learning community organised around classroom and online learning and assessment activities geared towards helping students achieve results for which they use tools (technological, procedural, conceptual), define rules and carry out a division of work.

The theoretical and practical components that make up and interrelate within the MoSal-b model are the following (Fig. 1):

1. **Didactic organisation** of units and learning expected from **activities** [47–51]. The relevant activities are defined by the teacher according to the teaching of the discipline of the subject. The activity encompasses a set of human actions to achieve a purpose and obtain a result.

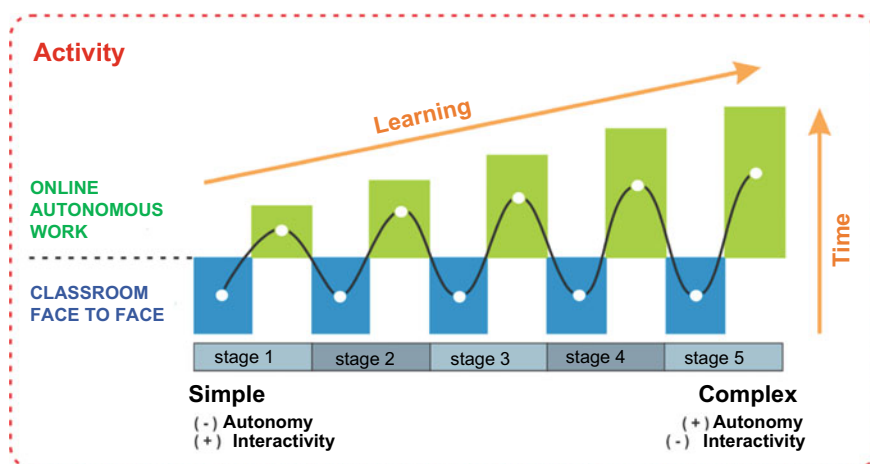


Fig. 1 Pedagogical model BL MoSal-b Vázquez [46]

2. **Articulation of classroom and online activities.** The class gradually becomes a plenum in which students report progress and results [52, 53]. The teacher provides feedback and offers strategies and tools for effective and efficient academic work, through web 2.0 tools and/or technological platforms [20, 28]. Weekly classroom time dedicated by students is constant, while time spent outside of class is variable, but gradually increases.
3. **Sequencing of classroom and online activities** in five stages with increasing degrees of complexity [54, 55] and autonomy. The greatest interactivity occurs at the beginning to move towards individual synthesis. The learning curve increases since the first activities prepare students to increase their performance in more complex activities.

The first element around which the model is organised is an activity or activities designed according to the teaching of each area of knowledge. The activity encompasses the entire course and may relate to a situation or problem to be solved or a project to be designed or implemented. In the activity, the result that students need to achieve, with respect to the objectives established in the curriculum, is defined and tasks that they have to perform outside the classroom with the support of web 2.0 tools and/or institutional technology platforms are organised and assigned. Each activity is a system in which cognition, behaviour and motivation are merged and organised by a mechanism of self-regulation geared towards the achievement of a conscious goal.

The role of the teacher as a mediator in the context of MoSal-b is, firstly, to provide students with the conditions for learning, opportunities to practise existing models, that is to say, ways of acting and controlling operations better, the possibility of automating a certain part of what has been learned; and secondly, to develop new models, that is to say, new conceptualisations, new rules of action, objectives and tasks that are still unusual. Every time students act, they are not only doing something, but also becoming something.

With the contributions of Engeström [47, 48], Vaughan [28], Graham [20] and Fink [52, 53], class and out-of-class activities are planned with ICT support. The Salmon model [54] contributes to the sequencing of online and classroom activities in five stages, ranging from the simplest to the most complex. The first stages ensure motivation towards the use of technology and the social and academic integration of students. The intermediate stages are geared towards the processing and application of information collected by students. In the final recapitulation stage, students summarise their entire learning process throughout the academic period through the presentation of a product, such as the design of a project, the writing of a report or essay or the creation of a multimedia production. The teacher in his role as mediator generates guided practice for the students (scaffold) in order to gradually achieve autonomous practice and develop self-management skills from their learning.

## 4 Theoretical Foundations of MoSal-b

### 4.1 Activity Theory

The first component on which MoSal-b is based is the activity theory (AT), which offers a conceptual framework in which we can situate the social, pedagogical and technological elements of MoSal-b in the same didactic and pedagogical design unit, called activity. The concept of activity helps to group the necessary elements to explain how a work group or learning community learns in the context of higher education [47–51].

Every course group becomes a learning community organised around classroom and online learning and assessment activities that require students to achieve a result, for which they use tools (technological, procedural, conceptual), define rules and carry out a division of work (Fig. 2).

The subject of the model is the individual or group that is at the centre of the educational activity, and at the same time, the mediating subject (teacher, tutor, classmates), according to the functions and tasks they assume during the performance of the activities. To achieve the results proposed, this subject uses tools, either physical (machines, devices) and/or mental instruments, which mediate the process, such as key concepts, methods, languages, theoretical and heuristic models. So far, we have a subject using physical or mental tools, historical behaviour of the human being, which would be disjointed elements if we do not take into account that the object to be appropriated or the objective to be achieved, the physical or mental product requested (skills, abilities, competences), regulate the activity. This is one of the

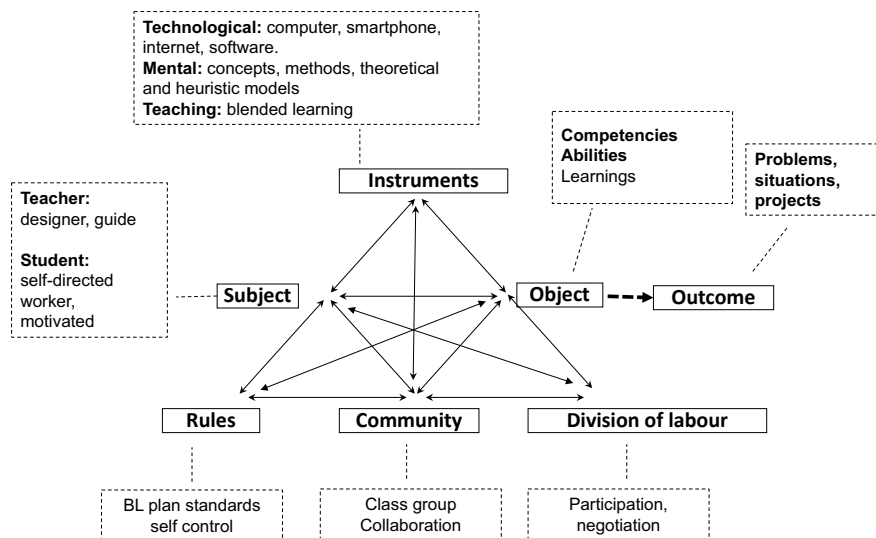


Fig. 2 Activity theory applied to BL Engeström [50]

main contributions of the Activity Theory to MoSal-b, organising an educational activity based on the object (the curriculum), from which we direct all actions to achieve results of mastery of this object (learning evidence) using tools, including the traditional cultural content of the curriculum.

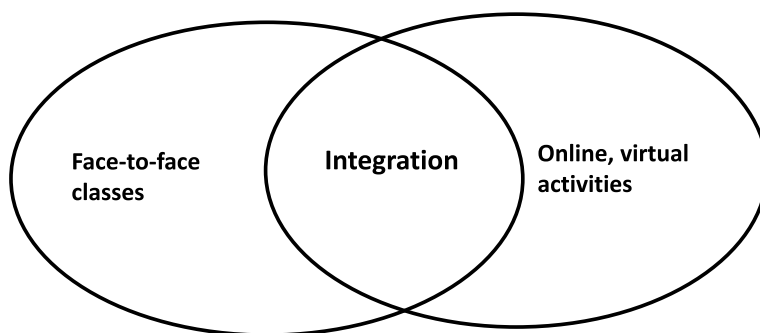
From the above, a relevant conclusion is derived regarding cultural content, which is conceived as a resource, medium or tool for the interaction of a community, a group of individuals who are going to carry out a learning activity (collaboration) and who, to do so, define certain explicit and implicit rules of behaviour to regulate actions and interactions within that activity (autonomy) and establish a division of work, that is to say, a division of tasks and functions among members of the community, in which the divisions of power and status (self-control) are assumed.

The role of the teacher as a mediator in the context of MoSal-b is, firstly, to provide students with the conditions for learning, opportunities to practise existing models, that is to say, ways of acting and controlling operations better, the possibility of automating a certain part of what has been learned; and secondly, to develop new models, that is to say, new conceptualisations, new rules of action, objectives and tasks that are still unusual. Every time students act, they are not only doing something, but also becoming something.

An orientation guide for the teacher within the framework of the AT is presented by Jorba [56] according to the mechanisms that lead to the self-socio-construction of knowledge in BL for this, students need to reach agreements on aspects such as:

- The clarity of the problem, recognising where it applies, where it is projected and some idea of the possible solutions (diagnostic assessment plus the representation of the objectives).
- The plan (through classroom and online stages), to address the solution accepted as possible to be executed by group members.
- The execution of the plan, continuously verifying (monitoring with the use of technology) if the actions executed provide a solution structure for the problem (relating and restructuring the known concepts with the new concepts).
- The development of feedback processes to correct and ensure approximation to the solution. That is to say, ensuring that the assessment criteria used to regulate the application and generalisation of what is learned in the partial solution of the current stage are shared, compared to what is expected to be learned in the next stage.
- Coordination of the linking of the stages defined in the plan until the end is reached in a self-regulated and successful way.

The set of guides and orientations described reflect the main interest of the AT in the mediation of the activity by a particular type of artefact known as a mental model. All people have beliefs and opinions about their world and they understand the mental models of the individual [57, 58]. From these mental models, the teacher can articulate the students' commitment, which according to Halverson and Graham [37] correlates in BL with important educational results, including academic achievement and satisfaction.



**Fig. 3** Components of blended learning Graham [20], Vaughan [28]

## **4.2 Technological Interaction Spaces**

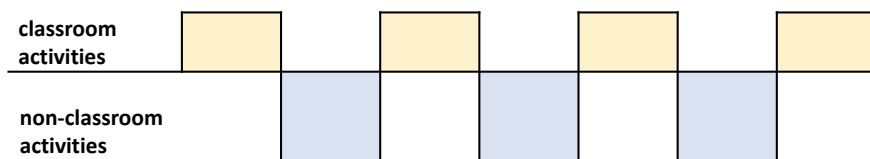
We incorporate as a second component of MoSal-b the contributions of Graham [20] and Vaughan [28] regarding the new interaction spaces generated by current information and communication technology, keeping a record of the interactions between students, students and teacher and students and the object of learning (competences, expected learning, assessment criteria). Classroom and online activities are given continuity as activities are formalised outside of class, thereby extending the class through interaction and collaboration that occurs between students in the virtual environment (Fig. 3).

Students and teachers' mass ownership of technological devices makes it possible to implement one of the current trends in classroom renewal, known as BYOD—bring your own device—sometimes known as BYOT—bring your own technology. According to Stumpenhorst [59], we must take advantage of the positive potential it can have for student learning. Each student with his device can generate autonomy and independence, which requires the diversification of teaching and learning.

## **4.3 Articulation of Classroom and Online Activities**

One of the central contributions that Fink [52, 53] provides to MoSal-b is the need to plan classroom and out-of-classroom activities (Fig. 4). These activities address various types of knowledge, with tacit knowledge, consisting of higher levels of complexity, being reserved for the classroom with the presence and guidance of the teacher, both when assigning tasks and providing feedback on the process and results of using the subject matter. For their part, activities outside the classroom should address simple knowledge that students can learn to tackle with increasing degrees of complexity and autonomy.

In the classroom, students acquire technological, methodological and conceptual tools to perform activities in the virtual environment, either individually or in groups



**Fig. 4** Castle-top model Fink [22]

without the help of the teacher. The results of the online work are presented and other classmates and the teacher provide feedback during class. Activities outside the classroom are part of the model. The time required by students to carry out activities outside of class (Fig. 1) is gradually increased, for which we use the contributions of Salmon [54] presented in the following section.

#### ***4.4 Pedagogical Sequence of e-activities***

To organise the personal and/or group work performed outside of class, we have incorporated into the MoSal-b model Salmon's five-stage model [54], which, together with the sequencing of out-of-class activities, provides elements for the design of e-activities. Although the Salmon model is based on e-learning, in MoSal-b, it is used for the design of pedagogical activities since the Salmon model [54, 55] addresses the need to create a cognitive scaffold in BL processes. The stages are those that gradually expand students' experience. According to Salmon [54, p. 27] 'assembling a scaffold refers to gradually expanding the experience of the participants. A structured learning scaffold offers essential help and development to participants at each stage while expanding their technical training online.' At each stage, activities are performed that are composed of learning strategies that allow the student to perform tasks and, in turn, generate new knowledge that will allow them to 'build knowledge' and develop their own knowledge:

The first stage (access and motivation) seeks individual access and induction of participants into online training. In the BL model, the guidelines for accessing the online environment, as well as the motivation to work in these virtual spaces, are initiated and monitored in the classroom. In the second (online socialisation), participants establish their identities online and then look for others to interact with. Summary of this stage is carried out in the classroom and it is explained how virtual spaces outside the classroom allow participants to socialise in a short time, which is not usually achieved in classroom time and space. In the third stage (information exchange), there is mutual exchange of information and cooperation to support the achievement of the objectives of other participants. From the classroom, strategies for searching, processing and applying information are offered. For its part, the purpose of the fourth stage (knowledge construction) is to discuss, as a group, issues related to the group's activity or project, and interact more cooperatively. The teacher

helps students to organise themselves in the classroom to work online later and then to report progress in the classroom, gradually transforming the traditional classroom into a plenum. Finally, the fifth stage (development) endeavours to seek the greatest benefits of the system to help them achieve personal goals and reflect on learning processes. The students individually report their findings, conclusions and the changes that have been generated in it, at cognitive and affective levels gradually.

## **5 BL Course Planning and Design of e-activities**

As we have already pointed out, according to Fink [53], one of the fundamental elements that the teacher must design is the autonomous work of the student outside the classroom, whether individual or in group. Since the classroom has the presence of the teacher, who designs his activities and those of the students, in this synchronous meeting space, he can provide instructions and clarification immediately, unlike e-activities, in which, given their asynchronous nature, the student will not normally have the presence of the teacher, which requires a careful design of the e-activities. Because of this, the focus of the analysis of the example we present is on activities outside of class or e-activities.

The practical and theoretical components of MoSal-b will be illustrated below on the basis of a generic example of structured application over 15 weeks, several examples of e-activities and two face-to-face classes per week.

### ***5.1 Overall Planning of the Course***

The course that we present as an example on this occasion is effective communication, which is commonplace in several degree courses taken by students in their first semester. Its purpose, therefore, is to help students with social and academic integration, along with the development of the academic skills of selecting, assessing and using information available on the Internet (Table 1).

The aim of the planning is to generate a learning community to support each student's learning, with the first three weeks devoted to the early stages of the model: access, motivation and online socialisation to work in virtual learning environments integrated with classes and activities. According to the different experiences of application of MoSal-b, we have verified that these first three e-activities, in the case of the course that we are presenting (1: send a greeting message, 2: personal introduction, 3: learning style), although very simple from the perspective of dealing with course content, are central to involving the student and generating a work rhythm. For the teacher, they require a short amount of time for support and monitoring, which can be done during classroom activities. In addition, each of them occupies a short amount of time in each class, so the teacher conducts the class as normally planned or carried

out in the traditional classroom modality with which the teacher becomes involved and appropriates the model with gradual implementation.

E-activity 4: working in group online is usually an assessment of whether students participated properly in the three previous e-activities. The competences of teamwork and collaborative work are complex, so they require systematic practice based on an intentional didactic design by the teacher. From a curricular perspective, the skills developed by students in this course will be used by them in all others.

From E-activity 5: selection of websites and databases, e-activities and classroom activities geared towards a situation, problem or project are organised, in this case the individual writing of an essay, which in previous stages will be worked on collaboratively. The essay is the product or evidence of the objectives (object) (Fig. 2) to be achieved, that is to say, skills, competences according to the curriculum defined for the course. Taking into account this result to be achieved, the previous specific e-activities were defined (5 to 9), using tools for collaborative work: technological platform, blog, wiki, etc.

In this example of course planning, we highlight the specific elements that articulate classroom activities and e-activities. The teacher publishes each e-activity a week before so that students know the details of the activities in advance and can proceed at their own pace, scheduling their time and creating the space to request teacher support. In classroom activities, the teacher makes a framework for the subject or course, which has three main purposes: to generate high expectations for students and convey the confidence that everyone can learn; agree with the students the rules and regulations of coexistence and course work; inform students about the objectives, scheduling and assessment method (Table 1).

During the classroom lessons, the teacher offers tools for academic and technological work, organisational strategies and feedback on the process and results. In the design of the activities, the classroom space is transformed into a plenum for the work done outside of class, with the teacher gradually devoting an increasing amount of time to the classroom because the e-activities become more complex, requiring more time for initial support, process feedback and assessment.

## ***5.2 Didactic Design of the e-activities***

The activities are different actions that the students carry out in relation to the course content and information provided to them. If these activities are presented, performed or transferred through the Web, then they can be considered as e-activities.

The characteristics and functionalities are the same as those carried out in classroom contexts, but differences will be found in the possibilities offered by the Internet to promote an interactive context, both with the information and among the different participants of the training activity, teachers and students. The importance of Internet-based training activities is not so much in the course content and information presented to students, which have their importance, but also in the interactivity that is

**Table 1** MoSal-b planning overview

| Stages                   | Week no | E-activities                                                  | Classroom activities                                                                                                                                                                                                                                                                                          |
|--------------------------|---------|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Access and motivation | 0       | Greeting, welcome video and work method                       | <i>NOTE: The teacher publishes the e-activities one week before the start of each one</i>                                                                                                                                                                                                                     |
|                          | 1       | E-activity 1: Send greeting message                           | <ul style="list-style-type: none"> <li>• Subject or course framework: generate high expectations and confidence, inform about the objectives, scheduling and assessment method</li> <li>• Inform about E-activity 1 and 2</li> </ul>                                                                          |
|                          | 2       | E-activity 2: Personal introduction <sup>a</sup>              | <ul style="list-style-type: none"> <li>• Make an assessment of the greeting messages, ensure that all students have accessed the platform</li> <li>• Inform about E-activity 3</li> </ul>                                                                                                                     |
| 2. Online socialisation  | 3       | E-activity 3: Learning style <sup>a</sup>                     | <ul style="list-style-type: none"> <li>• Form the <b>work groups</b>, choose a <b>leader</b> and a <b>secretary</b> for E-activity 4</li> <li>• The teacher meets the leaders</li> </ul>                                                                                                                      |
|                          | 4       | E-activity 4: Group work online <sup>a</sup>                  | <ul style="list-style-type: none"> <li>• Respond to and analyse the Test of Factors Associated with the study</li> <li>• Comments on the results of the learning style and study strategy test</li> <li>• The course group produces a study strategy guide</li> <li>• Checklist to assess websites</li> </ul> |
| 3. Information exchange  | 5       | E-activity 5: Selection of websites and database <sup>a</sup> | <ul style="list-style-type: none"> <li>• The secretaries present a summary of E-activity 4: Group work online</li> <li>• In a wiki, the entire course group creates a list of the most important recommendations</li> </ul>                                                                                   |

(continued)

**Table 1** (continued)

| Stages                    | Week no | E-activities                                                 | Classroom activities                                                                                                                                                                                         |
|---------------------------|---------|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                           | 6       | E-activity 6: Group article selection                        | <ul style="list-style-type: none"> <li>• Presentation of the websites selected by each of the groups</li> <li>• Ranking of the best sites</li> </ul>                                                         |
|                           | 7       |                                                              | <ul style="list-style-type: none"> <li>• Review of selected articles</li> <li>• Creation of a shared folder</li> <li>• Highlighting techniques and digital tools for highlighting and annotations</li> </ul> |
| 4. Knowledge construction | 8       | E-activity 7: Reading and strategic highlighting of articles |                                                                                                                                                                                                              |
|                           | 9       |                                                              | <ul style="list-style-type: none"> <li>• Selection of new leaders and secretaries</li> <li>• Progress in reading and highlighting</li> </ul>                                                                 |
|                           | 10      | E-activity 8: Concept map or graphic organiser of articles   | <ul style="list-style-type: none"> <li>• Review of E-activity 7</li> <li>• Review of basic elements and digital tools for making concept maps or graphic organisers</li> </ul>                               |
|                           | 11      | E-activity 9: Essay writing plan                             | <ul style="list-style-type: none"> <li>• Students share articles with highlighting and annotations on the platform</li> <li>• Review of E-activity 8</li> </ul>                                              |
| 5. Development            | 12      |                                                              | <ul style="list-style-type: none"> <li>• Essay writing plan models</li> <li>• Essay examples</li> <li>• Review of E-activity 9</li> </ul>                                                                    |
|                           | 13      | E-activity 10: Essay writing                                 |                                                                                                                                                                                                              |
|                           | 14      |                                                              |                                                                                                                                                                                                              |
|                           | 15      |                                                              | <ul style="list-style-type: none"> <li>• Publication of essays in the course blog</li> <li>• Essay feedback</li> <li>• Creation of a digital journal</li> </ul>                                              |

<sup>a</sup>These e-activities are described in detail in the following section

**Table 2** Type of e-activities according to the objective

| Type          | Objective                                                                                                                                                       |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Knowledge     | <ul style="list-style-type: none"> <li>– Clarify the content presented</li> <li>– Transfer information</li> <li>– Acquisition of specific vocabulary</li> </ul> |
| Understanding | <ul style="list-style-type: none"> <li>– Think about and reflect on what they have studied</li> <li>– Delve deeper into the content</li> </ul>                  |
| Application   | <ul style="list-style-type: none"> <li>– Check to what extent they are able to put into practice what they have learned</li> </ul>                              |
| Analysis      | <ul style="list-style-type: none"> <li>– Demonstrate understanding and integration</li> </ul>                                                                   |
| Planning      | <ul style="list-style-type: none"> <li>– Design an activity based on the knowledge acquired</li> </ul>                                                          |
| Assessment    | <ul style="list-style-type: none"> <li>– Analyse and make a judgement about a given situation</li> </ul>                                                        |
| Socialisation | <ul style="list-style-type: none"> <li>– Share the results obtained</li> </ul>                                                                                  |

created in order for the learning process not to become a passive and memory-based activity, but one that is active and constructive (Table 2).

In order for the e-activities to be perceived as useful by students, it is necessary to consider some of the important guidelines:

- Design based on the overall objective of the course and adapting them to the purpose of the MoSal-b stage in order to generate guided practice for the development of increasing degrees of student autonomy (see E-activities 2, 3, 4 and 5).
- Students perceive them as interesting and useful to resolve the situation, problem or project. From our experience in applying MoSal-b, it is necessary for students to have an overview of all of the e-activities from the beginning so that they understand how they relate to each other. For this purpose, it is useful to provide students with a plan that shows the integration and relationship between the activities, the whole and their parts.
- Detailed planning of the activity in such a way that it allows the autonomous work of the students and the relationship with the objectives and expected results in the course, clearly indicating the purposes in direct language, describing in detail the steps of the task, indicating the guidelines to share the process and results with the work team and the entire course group.
- Enough time to ensure that they can be completed and that everyone is actively involved. Consider the time for students to review individual and group contributions of their classmates.
- Present a varied typology of e-activities throughout the course, considering the stage of the pedagogical model, complexity of the task, development of skills for group and collaborative work.
- The teacher must support the students, guide, encourage participation and conduct assessments, for which the classroom, as the complexity of the e-activities increases, is transformed into a plenum in which the teacher provides feedback, assesses, offers tools and resources, suggests work strategies, mediates the typical disputes that arise in collaborative work between students.

- Use of appropriate technological tools.
- Know the competences, expected learning styles, assessment criteria, guidelines or rubrics to be used for assessment.

In the creation of e-activities, a series of aspects to help, guide and orientate students when completing them should be considered (Table 3). In the selection or design of the e-activity, the first aspect is to consider the **stage**, according to our model, in which it is applied, since the same e-activity, for example ‘selecting web resources for the project or course itself’, depends on the stage in which it is located (1: Access and motivation; 2: Online socialisation; 3: Information exchange, etc.) and will have different purposes and the degree of complexity and autonomy required by students varies from one stage to another. Information about the name of the stage may or may not be provided to the students since it relates to the didactic design applied.

Each component of the e-activities has pedagogical intent in order to create an orderly work environment in which the student accesses the instructions and resources to guide their practice, therefore, the teacher’s design offers a scaffold that guides the development of the skills of the students. For example, the **descriptive title** of the activity provides information about what is expected to be achieved and the **numbering** provides a chronological guide (we usually find in the learning environments generic names such as task 1, task 2, etc., without giving more information to students, wasting the opportunity to model communication and manage information sources).

The other components to consider in the design of the e-activities are described in Table 3, such as the purpose, the spark, number of participants, structure, student actions, student time, rules, time and actions of the teacher, assessment, tools and resources, link of e-activity to classroom activities.

Based on the above described components for the design of e-activities, we present and analyse four of those that appear in the planning overview (Table 1). The format of presentation of the e-activities to students (Table 4) contains a prototypical structure in order to familiarise them with an orderly environment and practice of the skill to read comprehensively and follow instructions. Each e-activity is identified with a sequential listing and a title. As for the content, the first element is a ‘**spark**’, which consists of a brief motivational introduction to the e-activity. Then the **purpose** is indicated in direct, task-orientated language. Later, the task is described in detail, with a step by step guide. Finally, students are told what they need to do to respond and comment on the contributions of classmates, the deadlines and the nature of the activity, if it is voluntary or compulsory (Table 4).

Next, we present the text of E-activities 2, 3, 4 and 5 that appear in the planning overview (Table 5). The first component of the content of the e-activity is the ‘spark’, the initial introduction. They can see four different examples, depending on the nature of the e-activity. Then, the purpose focuses on the aim of each e-activity, stated in terms of what the student needs to do, expanding the information provided in the title, geared towards the task.

**Table 3** Components of e-activity design

| Component                       | Description                                                                                                                                                                                                                                                                                                          |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Stage                           | Select the stage: 1: Access and motivation; 2: Online socialisation; 3: Information exchange; 4: Knowledge construction; 5: Development                                                                                                                                                                              |
| Number and name of the activity | Descriptive title of the activity, which will go in the subject field of the message<br>Listing following the sequence of the five stages                                                                                                                                                                            |
| Purpose                         | Grouping of the objectives into a specific message in terms of the results they should achieve, what they should be able to do individually and/or in a group                                                                                                                                                        |
| Spark                           | Cause the stimulus or the principle for interaction, rather than as the objective of the activity. The main types of 'sparks' are composed of a piece of information, a model, a concept, an example that causes a reaction or motivation to question opinions, information or experiences                           |
| Number of participants          | Determine the number of members and the criteria to form the working groups as necessary according to the objectives of the stage                                                                                                                                                                                    |
| Structure                       | Specify whether individual responses, responses between participants, between groups and teams, plenums are required                                                                                                                                                                                                 |
| Student actions                 | Guide the division of individual tasks, roles: leader, secretary, and other roles if necessary, for example, technological support, information search, etc                                                                                                                                                          |
| Student time                    | Start and end date and time of the e-activity<br>Time required for the performance of each e-activity task: individual work, cooperative work, so that others can see, review and comment on individual contributions and discuss and agree (collaborative work)                                                     |
| Teacher time                    | Calculate the required work time of the teacher in each activity, not including classroom time for e-activity feedback                                                                                                                                                                                               |
| Rules                           | The way the group works and how agreements have to be finalised<br>Define roles (rotating): Leader, encourages and ensures everyone participates; secretary, summarises the group work based on individual contributions; all participants assume specific tasks with deadlines. Other roles that need to be defined |

(continued)

**Table 3** (continued)

| Component                                     | Description                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Teacher actions                               | Depending on the publication date of the e-activity: <ul style="list-style-type: none"> <li>• Before: send messages, materials that must be available, provide guidance in the classroom</li> <li>• During: types of programmed feedback and motivation, emerging help.</li> <li>• After: assessment, publication of comments, plenum in the classroom</li> </ul>                                           |
| Assessment: Expected results                  | Requirements, assessment criteria<br>Define guideline and publish it                                                                                                                                                                                                                                                                                                                                        |
| Technological tools                           | Tools that will be required, for example: chat, forum, wiki, sites, groups, whether they are available on the technology platform or are freely accessible<br>Check operation and upload the information in a timely manner                                                                                                                                                                                 |
| Linking of e-activity to classroom activities | Define which of the e-activities will be addressed in the classroom<br>The way to approach them must be according to the objective of each stage, without replacing the e-learning or virtual work space and time, so that they progressively develop work autonomy<br>In the classroom, it is suggested that students present results that serve as a basis or input in one of the stages of the classroom |

**Table 4** Presentation format of e-activities to students

| Structure                                                                                                                                                                            | Content                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| Number and name of the activity                                                                                                                                                      | E-activity 4: group work online                 |
| ‘Spark’, Motivation, Introduction To The E-Activity<br>Indicate the purpose, description of the task and how students need to answer or comment on the responses of their classmates | Purpose<br>Task<br>Share<br>Nature<br>Deadlines |

The description of the task in each e-activity is presented in an increasingly detailed way, even the listing of the steps, given that the level of complexity increases. Considering the various MoSal-b implementations, the task incorporated clarifying and instructional elements, for example, in E-activity 2, personal introduction, it is indicated that the link that they must share can be referred to as URL. In the same activity, according to previous experiences, in order to fulfil the purpose of personal introduction, clarification is provided to prevent them from sharing generic sites such as Google, Facebook and Twitter.

The complexity of the task increases, from sharing a link; visiting a website and answering a questionnaire; searching and sharing information to make an agreed summary; to the assessment and selection of information sources. From E-activity 4, group work is incorporated, defining group leaders who coordinate the way of working and ensure that everyone is participating and also define the role of the secretary, who drafts the summary that is published in the online work space defined and presented in the classroom.

The formalisation of the role of leader, from the classroom, allows students to have the opportunity to develop leadership skills and improve the effectiveness of group work. The teacher provides guidance and support to the leaders during class, generates meetings, as these will support the management of the teacher's classroom to offer suggestions on how to solve possible difficulties or disputes, how to motivate participation and contributions from all members of the group. In MoSal-b, we have discovered that the figure of the leader brings together groups, motivates leaders and facilitates teacher communication, since it focuses on the support of the leaders.

**Table 5** E-activities

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>E-activity 2: Personal introduction</b></p> <p>Dear students</p> <p>We will be together during the course this semester sharing academic experiences. Sometimes in the classroom, we do not have the opportunity to find out about each other or for others to find out about some aspects of our lives. To find out about our interests, we will carry out the following e-activity:</p> <p><b>Purpose:</b> reveal something online about yourself.</p> <p><b>Task:</b> provide an URL (web address) or link that says something about you or about your life, one of your favourite pages, rather than your own web page. Write some lines about why you chose it. Try to be brief and just offer a glimpse of yourself rather than the story of your life and try to keep the reader from using the scroll bar. If you want, you can prepare it beforehand on a word processor and then copy it.</p> <p>The idea is not to use generic sites like Google, Facebook, Twitter, etc.</p> <p><b>Share:</b> respond to and comment on the message of at least two classmates.</p> <p>This activity is <b>compulsory</b> and must be finished by xxxxxxxx at 11:50 pm.</p> <p>Interaction and dialogue favour the appropriation of knowledge.</p> <p>Teacher's name</p> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

(continued)

**Table 5** (continued)

| E-activity 3: Yours and your classmates' learning styles                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Dear students</p> <p>Honey and Mumford wrote about four types of learning style. These are:</p> <ul style="list-style-type: none"> <li>– <i>Activist</i>: these tend to learn better when they work with new problems and experiences.</li> <li>– <i>Theorist</i>: these need to explore the relationship between ideas and situations.</li> <li>– <i>Pragmatist</i>: these need to see obvious links between what they are learning and the problems and opportunities involved in their work.</li> <li>– <i>Reflector</i>: these think deeply about concepts and activities, and tend to offer thoughtful answers.</li> </ul> <p>Do you recognise yourself in any of them?</p> <p>Among the participants of this course, it is very likely that we would find all preferences and styles. When planning the activities of the subject, we intend to offer different learning experiences. E-activities will provide action to the pragmatists and activists and reflection to the reflectors and theorists of this course.</p> <p><b>Purpose:</b> describe your learning style and find out the style of your classmates.</p> <p><b>Task:</b> answer the Honey-Alonso Learning Styles Questionnaire available at <a href="http://www.estilosdeaprendizaje.es/chaea/chaea.htm">http://www.estilosdeaprendizaje.es/chaea/chaea.htm</a></p> <p>Send a brief reflection on this first part of the course, sharing with others what you have found useful and what has been harder to do than you expected, indicating how it could be explained by your learning style.</p> <p><b>Share:</b> a message from two colleagues that you believe illustrates how different learning styles appear in the online world.</p> <p>This activity is <b>compulsory</b> and must be finished by xxxxxxxx at 11:50 pm.</p> <p>Teacher's name</p> |

(continued)

Table 5 (continued)

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>E-activity 4: Group work online</p> <p>Dear students</p> <p>New technologies make our work and online collaboration easier in an asynchronous way. Our learning can be increased significantly if we manage to form real teams.</p> <p>Purpose: Research the best way for a group to work online, sharing ideas and assessing them.</p> <p><b>Purpose:</b> identify the recommendations and conditions that allow an online group to work adequately.</p> <p><b>Task:</b></p> <p>1. Individually research on the Internet the recommendations and conditions that allow an online group to work adequately.</p> <p>2. Your contributions should be left on the page of your group formed in the classroom. Thoroughly check the group you belong to. They will use the Microsoft OneNote notepad.</p> <p>3. <b>Each participant publishes the three conditions that they consider most important</b> to work properly online in the comments of E-activity 4.</p> <p>4. By common agreement, the group selects the five recommendations that it believes to be the most important and explains why. Then the secretary publishes them under the title ‘Summary’.</p> <p>5. Roles of the leader and secretary:</p> <p>The <b>leader</b> of the group should coordinate the work and make sure everyone is involved.</p> <p>The <b>secretary</b> writes the summary that will be published and presented in the classroom on xxxxxxxx.</p> <p><b>Share:</b> comment on the contributions of all group members to agree on the most important conditions for working online.</p> <p>This activity is <b>compulsory</b> and must be finished by xxxxxxxx at 11:55 pm.</p> <p>I hope your work goes well!</p> <p>Teacher’s name</p> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

(continued)

**Table 5** (continued)

| E-activity 5: Selection of websites and database                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Dear students</p> <p>A warm greeting.</p> <p>On the Internet, there are millions of websites, some good and some bad, and sometimes when we surf, we are inundated by the amount of information that exists. We will carry out a collaborative task to identify the most useful websites for the degree course you are studying.</p> <p><b>Purpose:</b> select useful websites and databases for your field</p> <p><b>Task:</b> Each member of the group</p> <ol style="list-style-type: none"> <li>1. Choose two different websites and databases useful for your degree course. You must indicate the subject(s) for which they are useful.</li> </ol> <p>To assess the websites, complete the checklist available at:<br/> <a href="http://www.eduteka.org/pdfdir/ListaChequeo1.pdf">http://www.eduteka.org/pdfdir/ListaChequeo1.pdf</a></p> <ol style="list-style-type: none"> <li>2. Publish the two sites with their assessments, according to the checklist. I suggest you do so on a Word or Excel document.</li> </ol> <p><b>Share:</b> Visit <b>ALL</b> of the sites chosen by the other members of the group. The group selects the five most relevant for professional education in different subjects. Discuss why they are useful for your field.</p> <p>The <b>leader</b> of the group should coordinate the work and make sure everyone is involved.</p> <p>The <b>secretary</b> writes the summary that will be published and presented in the classroom on xxxxxxx.</p> <p>This activity is compulsory and we have until <u>xxxxxxx at 11:50 pm</u>.</p> <p>All right, get to work!</p> <p>Carefully check the sites to make sure they are good quality!</p> <p>Best wishes</p> <p>Teacher's name</p> |

## 6 Conclusions

Although the initial concern of higher education institutions was the installation of technological platforms (their technical functioning and the adaptations and perceptions of teachers and students), they are now part of the structure of these institutions and the concerns are changing; they are moving towards methodological and pedagogical aspects in order to make an impact on the achievement of committed learning and respond to the need to design innovative educational approaches in new technological contexts and adapt to changes in educational demands against a backdrop of national and international agreements through which higher education is influenced.

Computer tools alone do not automatically change teaching methodologies. In this technological context, the teacher in higher education continues to have a leading role in motivating students to use technology in academic activities. Students recognise the value of technology, but they need the guidance of the teacher to be able to use it effectively for academic purposes, and in this perspective, they prefer BL learning environments [60]. In turn, students have to adjust their expectations regarding their and the teacher's roles, towards an active, self-directed and motivated student role, for which the teacher needs to design activities to be carried out in the classroom and online with the help of technology.

Although MoSal-b is supported by a technological component, we note that current technologies quickly become obsolete, so a relevant conclusion is that the implementation of MoSal-b it is not about winning a technological race by delimiting particular uses for each technology, but making a critical analysis of the most appropriate pedagogical frameworks for technologies to make sense in academic contexts of action in higher education, since technology, as a tool, enhances or amplifies the didactic and pedagogical intent of the teacher. Because of this, the model is based on the articulation of several effective theories that provide pedagogical intent to each of its components, responding to the new contexts and educational demands of higher education.

MoSal-b offers a pedagogical model that provides continuity to classroom and online activities, as well as a gradual increase in student participation, accountability and autonomy, and enables the teacher to cede power and focus on students in the completion of learning activities. In so doing, MoSal-b presents itself as an opportunity for the teacher to be able to experiment with simple activities in the first weeks of class and increase their complexity over the duration of the course, allowing him to regulate, support, guide and progressively monitor the activities of the students, and, without a doubt, his own performance.

MoSal-b has been applied in various study programmes or areas, such as social sciences, computer science, telecommunications, computer science and basic sciences, which demonstrates that it can adequately address the didactic needs of each area of the curriculum, offering a pedagogical model for the integration of technology and virtual spaces with classroom activities.

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# Guidelines for Instructional Design for Teaching in a Blended Learning Course



Vanessa Izquierdo Álvarez

**Abstract** The design of training actions in blended learning mode raises doubts among teachers. Questions such as the choice of learning method, the choice of platform, the set of resources and activities of which they are composed, among others, generate uncertainty in the design of effective educational practices. This text is intended as a guide to clarify some of the basic aspects that must be taken into account when planning the design of training practices with an online component.

**Keywords** Blended learning · Pedagogy · Instructional design · Educational technology

## 1 Introduction

The digital transformation we are experiencing is an unprecedented event in today's world. Technology erupts into our lives and changes the way we interact, transforming our way of living in society. Digital transformation affects all sectors, standing out as a disruptive element [1]. It is interesting to know about the consequences and opportunities offered by this new digital environment [2]. Digital transformation is allowing new ways of processing information and in turn has become a priority for organisations [3]. It is not surprising that this is the case for the education sector, which is fixing its gaze on the changes that are occurring in the way students learn and how the information around us is consumed. Digital transformation, for its part, can be seen as a process in which digital technologies are studied to significantly improve the performance and scope that an organisation can have [4]. Some authors consider that digital transformation is directly involved in the cultural and technological variables of an organisation to respond to specific demands [5].

According to data from the annual report of the ONTSI (National Telecommunications and Information Society Observatory) on the digital content sector [6], the turnover of Spanish industry related to digital content increased by 16,3%, amounting

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to 11.467 billion euros, according to January 2019 data. The number of companies, employment and investment also grew, reaching 9.785 companies, 105.760 people dedicated to the sector and an investment for the digital business of 655 million euros. In addition, digitisation has continued to rise worldwide in sectors such as video games, video, and music with rates of 88%, 68% and 66%, respectively. In which we can highlight that both games for smart devices and tablets are becoming prominent leaders in the gaming industry.

The data shows the penetration of information and communication technology in society. This is a paradigm in which the education sector cannot be detached, given the evidence. The information society creates changes in teaching and learning models, affecting the ecosystem completely, intervening in issues such as teacher training, design of materials and learning experiences, among others. Digital transformation, therefore, opens up new avenues for the generation of educational models and approaches that incorporate digital technology, which will be a challenge for educational agents [7]. Some authors emphasise that these challenges in the educational landscape generate changes that directly affect virtualisation processes [8].

Educational technology is promoting the reconceptualisation of teaching and learning processes, generating changes in means, materials, resources and traditional teaching roles. Technological processes are helping to enhance day-to-day educational practice. One of the main challenges facing educational technology is researching and understanding what we can do with technology in new learning environments [9]. Some authors emphasise that we must use these new spaces as ecosystems where technological aspects perfectly combine with the construction of knowledge by students [10]. We must, in turn, orientate educational practices mediated with technology towards pedagogical improvement [11], prioritising the training of students as critical citizens who are innovative and digitally competent to function in the future changing society in which they live [12–14].

## 2 Framework of Understanding

Some studies show that the impact on education of information and communication technology (ICT) has not been as explosive as expected, despite having strong support from educational institutions [15]. There has, however, been a gradual integration of technology into official programmes, in which we often find organisational and pedagogical inconsistencies related to instructional design processes [16]. The inclusion of technology in educational practices, therefore, does not alone guarantee that it is fully taken advantage of [17], nor does it, by extension, ensure improvement in student performance [18]. In line with this question, it is clear that technological tools are not enough to improve learning experiences. Nor is the repetition of face-to-face practices in virtual environments [19]. Some authors [20] point out that teachers play a central role in educational processes, responsible for integrating all of the necessary elements for the optimum implementation of educational practices. Teachers put themselves forward as guides for student learning [21].

Some authors have pointed out that technological changes have generated new realities in teaching-learning processes [22]. These new virtuality-based settings require a rethinking of training processes [23], focusing attention on the characteristics and processes associated with virtual educational practices. New ways are opening up for the construction of knowledge and these require substantially different learning styles [24]. New pedagogical models are, therefore, generated which are specific for distance learning [25]. Among the benefits that we can highlight with respect to pedagogical models in virtuality, we can point out that there is an immediate response to users' interaction with the resources at their disposal, a question that contributes to increased effort in students and, by extension, greater intrinsic motivation towards learning [26, 27]. Some authors even argue that these virtual practices generate more motivation than traditional practices [28]. However, others point out that these learning styles reduce student effort in tasks related to the search and scope of information [24].

However, pedagogical models that involve the use of new technology are supported by the use of technology and computer resources, such as websites and educational software, among others, which will allow students to carry out activities with a greater number of repetitions, with the possibility of reviewing their mistakes, which contributes to the improvement of academic performance [29]. By extension, some authors show that these pedagogical activities used in virtual contexts promote student study and learning [30] due to the great possibilities that they generate, and sometimes, thanks to the use of more complex activities that make the development of higher level learning processes possible [30, 31].

In any learning context, it is essential to have academic activities that contemplate all possible educational options [32] that help form an optimum learning ecosystem. In this regard, educational practices must be generated in educational contexts of a structured type, combined with content and activities adapted to the student's stage, in which the level of knowledge of the recipients is considered, which are aligned with learning objectives and where, in addition, there are facilitators that help foster significant learning situations [33]. When learning environments are not generated taking these recommendations into consideration, learning experiences are formed by educational materials and computer tools that are taken as mere elements of the system, without these contributing to significant learning achievements [34].

Success in the use of educational technology lies, among other aspects, in the experience that the student receives at the time of consuming the content and also in the influence of previous experiences of the student [35]. Other authors highlight as fundamental the digital competences that students possess when they face educational contexts that incorporate ICT for the development of teaching [36]. The incorporation and integration of educational technology in formal educational contexts contribute to constructivist-type models where student-centred educational practices are encouraged [37].

The creation of didactic materials in virtual environments requires a focus on both pedagogical and computational aspects, which allow maximum use of technology at the service of education [38, 39]. In turn, these materials for virtual training are made up of variables of a technological and aesthetic type, where elements such as

the instructional process, the teaching strategy itself and the design configuration [40] should not be neglected. Therefore, standing out as crucial is the shaping of learning environments that take into consideration both the design and development of teaching materials such as the configuration of the virtual classroom itself or learning management system (LMS) in which the training experience takes place.

### 3 Design of Training Actions

#### 3.1 *Instructional Design*

The concept of instructional design was introduced by Robert Glaser in 1960, and the term stands out as an essential element in any learning process that requires the use of technology at the service of learning [41]. Instructional design is responsible for questions such as planning, preparation and design of resources and environments that are available for students to carry out their learning process [42]. For other authors, it is a discipline that is responsible for determining the most appropriate ways to instruct students to acquire knowledge and abilities [43].

Instructional design, therefore, helps us define, develop, implement and assess specific learning situations, regardless of whether they are large or small content units [44]. Instructional design is responsible for creating learning spaces comprising of understandable and effective materials for training processes [45]. Some authors see instructional design as a process that combines technology at the moment of creating learning resources [41].

Some authors indicate that the design and implementation of educational strategies is directly related to teachers, who are responsible for designing the educational material and determining its didactic orientation [46]. It will be essential for the design and development of materials to implicitly have a specific educational intention reflecting the theoretical conception that is pursued with the instructional process [47]. While it is true, it is also compulsory for instructional designs to be flexible to include the most relevant or appropriate aspects to the characteristics of the students and the learning process itself [48]. As well as considering the type of student it is aimed at [49].

Over time, instructional design applied to the educational field has shown that pedagogical and technological components stand out as inseparable elements, whose combination ensures improved quality of teaching and learning processes [50]. Some authors also argue that the psychology of instruction allows connections between the theoretical and conceptual dimension and the technical and practical dimension, making an improvement in the orientation of students' educational processes possible [51, 52]. In short, instructional designs facilitate the creation of connections between the learning theories themselves and their implementation [53].

The instructional design processes applied to educational practices contribute to the analysis of educational needs, facilitating the fulfilment of educational objectives and, by extension, the choice of strategies, activities and resources that allow the established learning goals to be achieved [54]. Some authors point out that instructional design facilitates the effectiveness and efficiency of the design and development of learning experiences that help to improve student performance [55]. Although it is true, we continue advancing in the knowledge of the theories and components necessary in the design and creation of didactic materials and in how these help in the design and implementation of elements that are more attractive for the educational field [56].

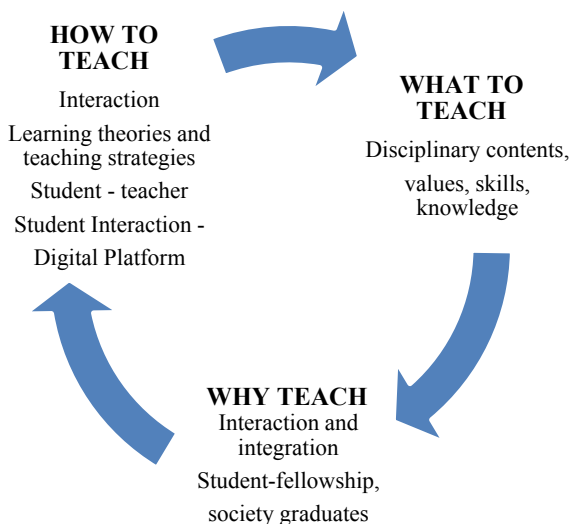
### ***3.2 The Pedagogical Model***

With the changes produced in the information society and, by extension, in the educational field, it is necessary to address the new forms of interaction and learning [57, 58] that are taking place. We cannot continue to adopt obsolete pedagogies that hinder the learning of the new type of students who live in the information and communication era [59]. The perspective obliges us to carry out pedagogical innovations that involve technology with the aim of designing alternative teaching models [60], which must give rise to critical and collaborative spaces, where, in turn, special importance is given to practice over theory [61].

In this regard, instructional design stands out as an essential process, regardless of the method with which we are going to work, as it helps us systematically organise the teaching and learning of students [62]. Instructional models enable the design of instruction that incorporates ICT to achieve active learning environments [63]. To generate significant learning environments, we must take into account what students already know and what we want them to learn. By doing so, we can generate cognitive bridges that ensure the success of the instruction [64]. Therefore, the materials we generate should activate students' prior knowledge, for example, through questions, case analysis or other strategies [65].

As for the design of activities, they should encourage self-learning, with the aim of our students becoming increasingly autonomous [66, 67]. Sometimes, it will be interesting to incorporate activities that encourage learning with others [68]. Some authors, with this question in mind, point out the relevance of social constructivism, seen as the knowledge generated as a result of the individual's interaction with his environment [69]. Online learning is conceived by some authors as a network learning process, highlighting that knowledge is found in the connections between people [70].

In short, in technology-mediated learning experiences, technology should be considered as a resource and not as an end in itself; its use should encourage active and collaborative learning [71]. We must also take into consideration that these learning environments must be ubiquitous, allowing students to learn when and where they need to, without space and time limitations [72].



**Fig. 1** Components of the b-learning pedagogical model [73]

The pedagogical model, seen as a limited vision of the complexity of pedagogical practices, offers clues about the most relevant elements [73] and also helps us define what to teach, how to teach, what to assess and why [74] (Fig. 1).

Students have become individuals capable of managing information and producing knowledge in virtual environments [75]. According to some authors, they have adopted a new role of prosumers [76], characterised by actively participating on the Web, going from being consumers of information to generating content that helps them build knowledge. This makes it possible to develop continuous learning throughout life [75, 77]. Within these Web experiences, it is important to find a balance between the quantity and quality of content made available to students [78]. Some authors point out that the information we find in the virtual world can be presented in different formats, such as text, hypertext, audiovisual, iconic or multimedia, among others [79].

For their part, educational platforms, also known as learning management systems (LMS), are forms of hardware architecture that offer us support for hosting virtual courses in which we can also run software programs that improve or enable learning. Also called managed learning environments (MLE) or course management systems (CMS), among others, they help the administration, distribution and control of content and activities that make up teaching and learning processes [80]. According to some authors, these systems enable us to design and create courses effectively, without the need for deep technological knowledge [81]. Educational platforms make it possible to record access to materials and activities by users, as well as to plan, develop, monitor and assess what happens during the student learning process [82, 83]. We can even highlight that current trends are directed towards the inclusion of new technologies, such as the introduction of big data, to find out how knowledge

is experienced and built, so that the impact of learning processes on students can be measured [84].

We can highlight that the virtualisation of education is a process that optimises the strengths of technology, pedagogy and the institution in which it is implemented, with the aim of generating learning experiences that include the use of ICT to offer virtual learning environments that benefit the educational actors that integrate them and all of their processes [85]. With respect to this question, the development of educational virtualisation aligns three components: the technological dimension, the pedagogical dimension and the organisational dimension.

### ***3.3 Guidelines for the Design of Online Courses***

The design of courses associated with virtuality should be the result of good planning of learning and, by extension, good balance and organisation of materials. Courses are made up of a collection of materials and resources that will shape the learning experience and must be carefully selected. We must take into consideration aspects relevant to the choice of each element, that is to say, the learning objectives or goals, subject matter to be developed, recipients, context, platform to be used, etc. It is about making sense of the learning ecosystem so that it is balanced and can lead to successful educational practices.

There is a training model called technological pedagogical content knowledge (TPACK), which is effective at any educational level and teaching environment [86]. This model suggests that teachers should reflect on what they need when incorporating ICT with significant effects on the instruction of their students [87]. Our focus should be on making a perfect combination of three elements: content knowledge (CK), pedagogical knowledge (PK) and technological knowledge (TK). Some authors also emphasise that these questions alone are not enough, but also that aspects such as the interrelationship between the three components must be understood, that is to say, pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK) and technological, pedagogical and content knowledge (TPACK) [88] (Fig. 2).

Another interesting reflection refers to the idea that integrating technology, pedagogy and content without considering an added component is an incomplete process [89]. In this regard, it should be noted that technology and pedagogy cannot be understood without communication with the student, therefore, it is complex to conceive the educational model without the intervention of the communicative component with and between students (Fig. 3).

Below, we offer a guide to the elements that are necessary for the shaping of learning experiences involving virtuality and can be adapted to any educational platform. First, we need to respond to some of the questions that we noted above, that is to say, what to teach, how to teach, what to assess and why. The teacher must respond to each of them to obtain an own model of the course, subject, degree or training programme to be implemented. It is important to note, in relation to this question, that from a

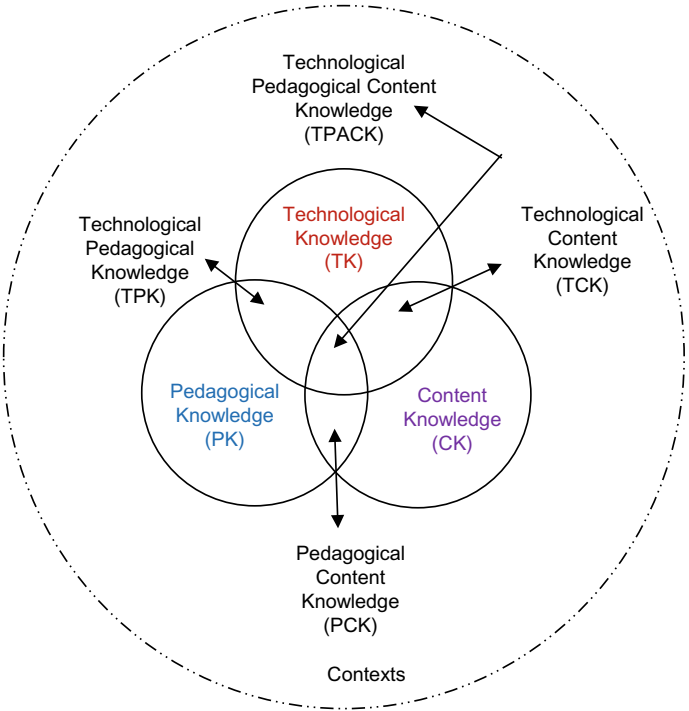


Fig. 2 TPACK model [87]

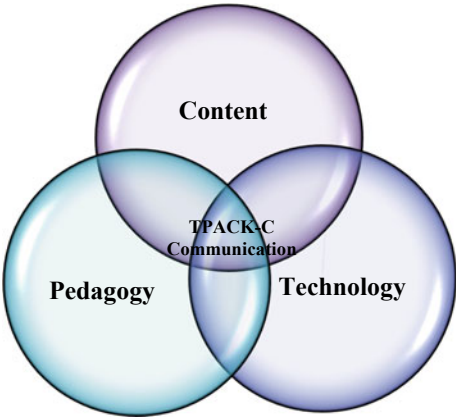
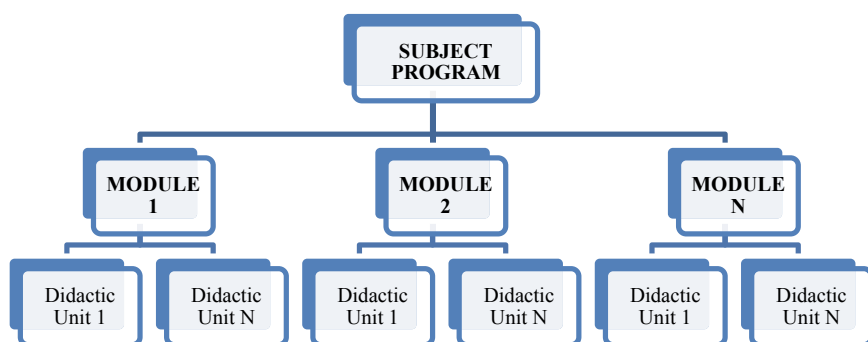


Fig. 3 Proposal to adapt the TPAAK model to the TPAAK-a model, including a communication component as an articulator of the content, pedagogy and technology components [89]



**Fig. 4** Structure of a subject or programme (compiled by the author)

structural point of view, training programmes should be organised through knowledge modules and units. In this way, the student is allowed to have the information in a structured way, which facilitates the organisation of the study (Fig. 4).

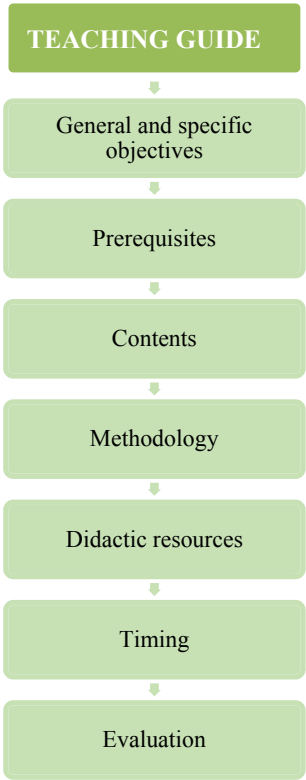
The modules make up the highest level of the structure, the first level of content and correspond to the blocks in which we organise the material. Its scope varies depending on the subject under study, as well as the general objectives proposed for the subject or programme designed. When a thematic module is started, it is advisable to offer general information to students, for example, a didactic guide that includes the most relevant aspects to take into account. The didactic guide should be a reference document for the student that indicates what they will find in their learning process, where aspects such as the general and specific objectives of each didactic unit are included, the necessary prerequisites, the course content, the methodology to be used in the learning process, the teaching resources available, the timing, as well as important dates and how the student's assessment will be carried out (Fig. 5).

The modules, in turn, are made up of smaller structures organised using didactic content units. These units address the specific objectives that exist in each thematic module. These didactic units will be characterised by containing the materials and resources that the student needs to achieve the learning objectives.

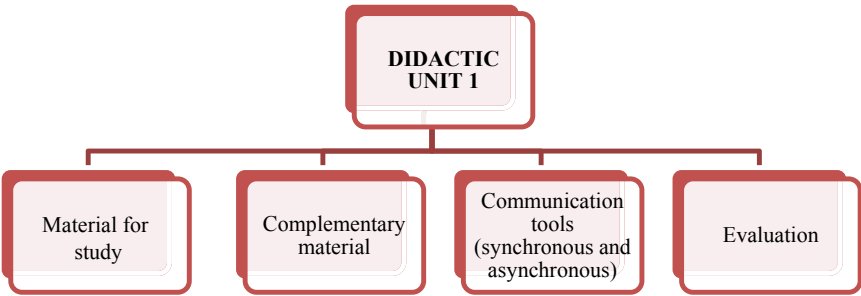
It is important that all didactic units are structured in a homogeneous way to ensure that students know the training model that they will encounter during the course. In this regard, we recommend the use of a structure like the one shown in Fig. 6.

The didactic unit will consist of several parts, standing out among which is the study materials section consisting of all compulsory study materials for the student to achieve the learning objectives. The materials may be presented in different formats, PDF, power point presentations, videos, HTML, SCORM, scientific articles, software, web pages, simulators, etc. (Fig. 7).

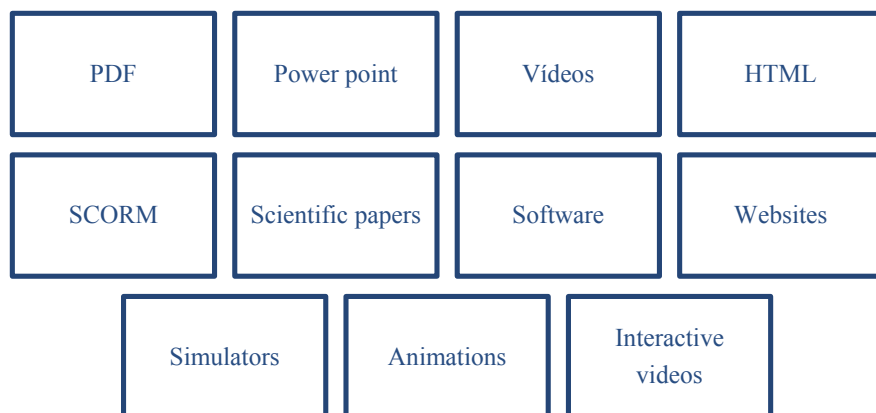
Secondly, it is highly recommended to offer students a section to complete or expand the information offered, thereby addressing the different levels of prior student knowledge and/or interest in the subject. These materials may also be presented in different formats depending on the characteristics of the subject and the teacher. Thirdly, it will be of vital importance, taking into account all of the above, for there



**Fig. 5** Basic elements of the didactic guide (compiled by the author)



**Fig. 6** Didactic unit materials (compiled by the author)

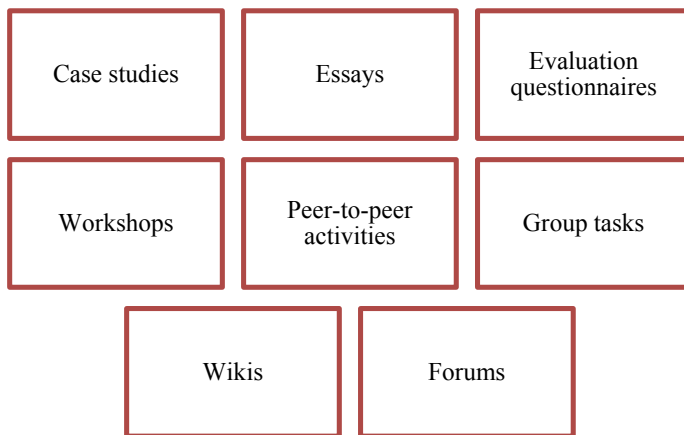


**Fig. 7** Teaching material formats (compiled by the author)

to be a space for communication between teachers and students, as well as between the students themselves, in which the sharing of learning experiences, knowledge construction and/or collaborative work will be encouraged. For this, it is necessary to have a space within the virtual classroom or platform for communication tools. The set of tools for interaction that we have at our disposal will depend largely on the type of platform we are using to support learning. It will be possible to have synchronous communication tools, which allow interaction at the same time, that is to say, in real time, or asynchronous communication tools, which do not require participants to be connected in the same time frame. Videoconferencing and chat rooms, among others, are synchronous tools. Forums, wikis and blogs, among others, are asynchronous tools. Finally, we present the assessment tools, which will be instruments that allow us to determine the degree of achievement of the objectives established at the beginning of the course. In this regard, there are many options for assessment that will also be determined by the type of platform we are using to host the programme or course. In a general sense, we can plan the assessment through case studies, essays, questionnaires or assessment tests, workshops, peer activities, group tasks, etc. (Fig. 8).

## 4 Conclusions

The information society has brought numerous changes in the educational paradigm that have demanded and nowadays require a rethinking of the educational models used in daily teaching practices. These changes force teachers in all educational stages to rethink the way events take place in both physical and virtual classrooms. In addition, the proliferation and implementation of educational technology in all aspects of our lives require new pedagogical designs. Today, it is necessary to focus on



**Fig. 8** Types of assessment (compiled by the author)

the technological tools for teaching and articulate the teaching and learning processes without losing sight of them.

Scientific evidence indicates that we must seek a balance between technology and pedagogical practices to achieve effective and efficient educational practices for our students. It will be equally necessary to address learning theories, paying special attention to instructional design in our educational practices to enable us to make a good selection of the most suitable materials, resources and platforms to ensure significant learning takes place. We cannot forget that we live in a hyperconnected society which, by extension, is going to require much more education than what we have become used to. Our students live in a new social reality and demand more and more learning experiences in online and blended learning settings, for which we must be prepared.

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# Design of Blended Learning Personalized Itineraries for Higher Education



Rosalynn Argelia Campos Ortuño and María José Hernández Serrano

**Abstract** Adapting the ADDIE model from instructional design, which encompass five phases (Analysis, Design, Development, Implementation and Evaluation) the chapter offers pedagogical guidelines for university teachers to develop personalized learning itineraries, with exemplary combinations of online Lesson Plans designed with Symbaloo (<https://learningpaths.symbaloo.com/>). Didactic uses of this tool are provided in the chapter, such as the opportunity to create different paths in the same itinerary, which can be used to adjust to different learning preferences; also the possibility of visualize the interaction of the student within the itinerary by a virtual record; and finally the potential to evaluate the design impacts on the contents and activities.

**Keywords** Blended learning · Personalization · Learning preferences · ADDIE · Symbaloo lesson plans

## 1 Personalization as a Paradigm in Education

If it were possible to define where would be the excellence of an educational program or course, a broad consensus would lay in the possibility of ensuring that each student benefits from personalized learning that covers specific needs, considers interests and allows the development of their competences. This refers to personalization, devised as a paradigm of quality in the way to deliver instruction that trying to fit and engage a diversity of learners.

Confronting the criticism towards homogeneous syllabuses for a group of learners a personalized learning approach states the possibility to address the singularity of each learner [1]. When this approach started [2] during the seventies it was a period which special education-related legislation became to develop. It was the moment for

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demanding and pondering the need to consider all kinds of differences, as there are variances not only in starting levels, both cognitive and emotional, but also because needs, interests and expectations differ among learners resulting in multiple levels, paces, or preferences.

Accordingly, the standardization in knowledge or methods would confine the vast amount of situational and individual factors [3], by making an allowance for the same final goals. The latter entails a covert rationality based on the competency model, where the student is expected to achieve exactly the predictable learning results, with evidence and evaluation criteria that cannot diverge from the estimated standards of efficiency [4]. As a result, teaching and learning are devalued in favor of a technical interaction which also leads to hindering trust [5], because the critical sense of action is lost, and only practical effectiveness worries about accountability and consume of knowledge, but not the engagement in learning and lifelong learning.

Along with the standardization, other structural factors within the educational systems worldwide are challenging the personalization potentials. One of the most incisive factors is the classes massification, overcrowded with students that makes difficult, even to know, and further, to address specific needs or concerns. Also, global societies are more and more diverse in cultural, socioeconomic or political issues and diversity is higher in every educational level, making complex the very concept of diversity and, therefore, to guarantee adequate measures for treating diversity and promise personalization [6].

Under these circumstances, personalization could have been relinquishing to a second place, or at least prioritizing the provision of specific aids only for learners with needs in accessibility or inclusion. Undeniable, those learners need to be provided with dynamic aids, nevertheless any learner could be provided with specific assistant during the learning processes which benefit her success and engagement. Indeed, personalization could be encompassed in each process of learning, as learning is always individual, or at least it is self-process which results always differs among learners. This is to say that learning is subjectively influenced by the learners and the individual emotional and motivational value ascribed to it [7, 8], where learning outcomes are the result of subjective experiences [9].

From contemporary educational theories learning is experienced as a personal involvement, engagement or change [10]. Therefore, providing opportunities of personalization would entail, explicitly, offering such experiences. When referring to personalized processes in education the focus is on the instructional exchange where a teacher, educator, or guide provides paths or itineraries to accomplish the individualization. Not only for addressing learners' diverse learning needs, but also by allowing them to advance according to different starting levels, in knowledge or speed, via different learning pathways and objectives.

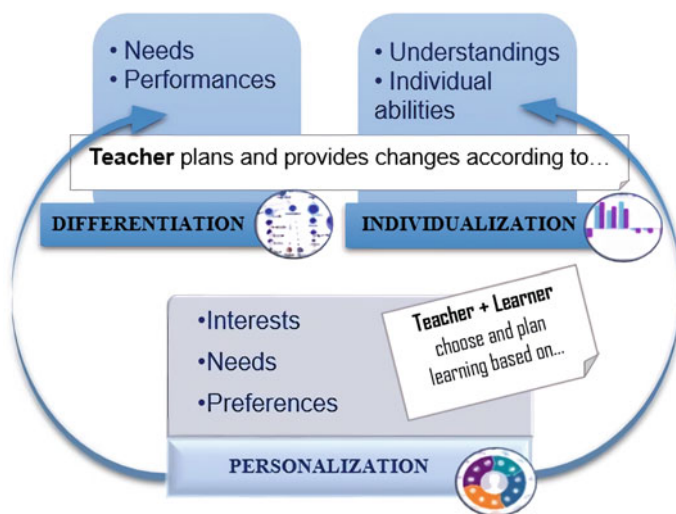
The concept of personalization offers different meanings [11–14]. As stated by Mincu [11], personalization is seen as a compatible version of individualization, where learning is personalized and at the same time instruction is individualized. Therefore, both processes of teaching and learning are involved; because learners are reflective, goal-oriented and able to regulate their own process of learning, and teachers provides opportunities for all students, not only those targeted with particular

disabled needs. A transversal concept of personalization and a universal concept of diversity are at a stake in the understanding of personalized process of learning and training.

The concept of personalized learning has been evolving, especially because of the introduction of educational technologies, without a widely accepted definition. In fact, the concept is in confusion with other terms with which is related. As depicted in Fig. 1, personalization is related to differentiation and individualization, and the three are related with the processes of teaching or learning by involving the teacher or the learner. For some authors [11–14] personalization includes both differentiation and individualization. The main difference focus on the inclusion of the learner as a decision maker of the teaching and learning processes, which would be representative of the personalization approach. While in differentiation and individualization, is the teacher who plans and offers the proper adaptation to the learner, without giving her a voice [15].

In the personalization approach, what can be subject to decision by including the learners' voices are: the goals, the contents, the instructional sequence (order of development, assessment activities), the pace, the depth, the sources (for generating or producing knowledge or learning products), among the most relevant. Teacher would provide opportunities for learning via pathways or itineraries, flexible or open-ended, so that the student can plan the route according to her needs or preferences.

The aim of personalization is twofold, increase learner engagement and the possibilities of maximum achievement. More importantly, opportunities of choosing or planning the itineraries would boost the learner responsibility for their own process of learner, learning to learn. Learners are not only customizing the elements or



**Fig. 1** Differences among personalization and other concepts. Adapted from: Bray and McClaskey [12]

resources for instruction; they are able to plan and regulate the process. Opportunities of self-regulation facilitate that learners gain better knowledge of their own level of competence, reflecting on what they can do to solve the training tasks and by becoming aware of all those skills that must be improved to face the new learning challenges that arise [16–18]. Thus, learner autonomy can be enhanced through the design and development of self-regulation processes that also promote opportunities of lifelong learning in different contexts.

## **2 Personalization and Blended Learning Possibilities in Higher Education**

One of the core competences for teachers in the European Framework for the Digital Competence of Educators (2017) [19] is: to allow for different learning pathways, levels and speeds when designing, selecting and implementing digital learning activities. This competence applies to all educational levels, although the higher levels provides upper opportunities for seizing the digital possibilities via the blended learning.

In the context of Higher Education, where the autonomy of learners is acknowledged, personalization is underpinned as a paradigm for a new era of education that, with the support of technologies, is able to leverage the individualized potentials of any learner. Blending instruction has been associated with attempts to combine media and technology tools in an e-learning environment so that traditional learning is enhanced with web-based learning, [20] as learners are given the opportunity to access materials online and work at their own pace or receive additional materials [21]. Several studies refers to these opportunities of personalization in the context of higher education by examining the relationships with self-regulation [22], deep learning [23] and satisfaction or intrinsic motivation [24] or the development of creative and innovation skills [25].

Adopting the blended learning method implies the use of technologies in the different stages of the instructional process. It is not only that the teacher chooses technologies to support learners (differentiation), or select technologies, digital sources or applications for each learner considering contextual, physical or cognitive constraints (individualization), moreover teacher is able to offer access to different technologies for each learner selecting the best pathway and offering support or feedback (personalization). Thus, personalization is an along the length purpose during the learning process; in the initial stage for analysis and planning, in the developmental stage for the design and use of pathways, and in the final stage for the evaluation and feedback.

As well, the three elements of the blended learning methodology (see Fig. 2) acquire several functions in order to assure personalization in learning: technology, learner and teacher.

Firstly, more and more advanced technologies are able to obtain and analyze data from the learner to adjust the learning process. Big data may collect many millions of records of learners' data, which pulling together to identifying knowledge gaps

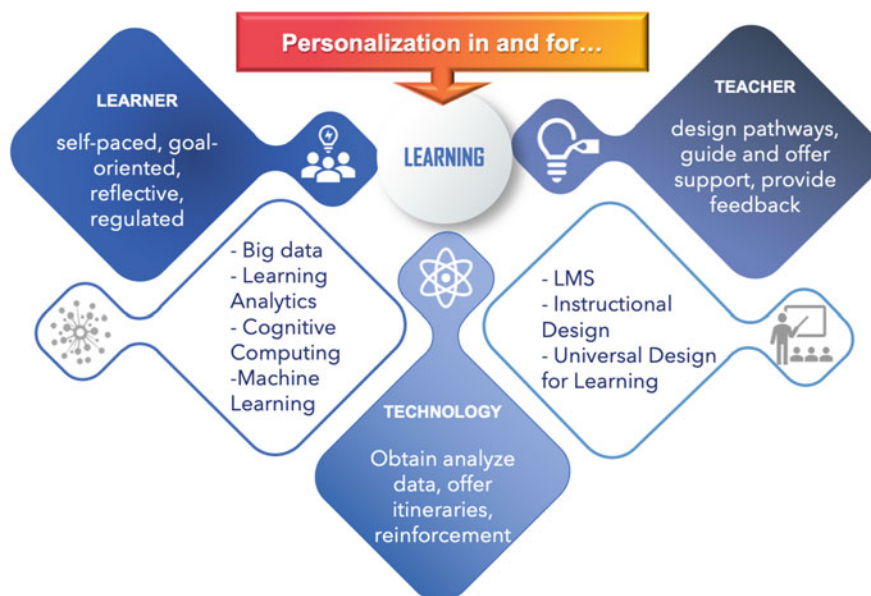


Fig. 2 Blended learning elements for the personalization in learning

in learners [26]. This data can be obtained either through learners giving it (voluntarily or otherwise) or through the mining of existing data sets [27]. Also, the use of algorithms generated from large data sets for the purposes of learning analytics presents the convergence of big data for actionable intelligence [28]. Nowadays, Artificial Intelligence is advanced the analysis of data towards cognitive computing, which refers to technology, usually virtual platforms, that learns from human interactions, replicating how the brain works by suggesting pre-programmed responses [29]. Similarly, machine learning use the collected evidence to derive a model for predicting future learning events via new algorithms [30]. Probably, among the possibilities offered by technology, the superior advances for the personalization in learning are expected from the reinforcement learning [31], where technology is able to decide whether to estimate the learners' engagement level and the suitable feedback, persuading learners to make meaningful change in their courses or lessons.

As can be expected, technologies will have probably a decisive role in the future of personalization, meanwhile the teacher and the learner need to be provided with effective skills to assume the personalization in learning.

Secondly, the teacher role is related to specific tasks in order to plan, design, develop, assist and evaluate the personalized learning. In higher education contexts, teachers assured the excellence in academic content, but also the competences acquisition, in which students not only receive knowledge but manage or apply it to different situations. In this regards, teachers would need to provide itineraries for each learner find the best that suits with needs, abilities or preferences. Grading in levels or offering several media channels would increase the learners' choices, and together

with this their engagement and the successive opportunities to demonstrate their mastery. All that means to plan with enough flexibility in several elements of the learning processes, such as in times and places (to initiate or continue a lesson, using the blended learning possibilities either online or class), in pace (by using a range of task for newcomer or advanced learners), or in sources (with several multimedia resources, for rehearsal, appraisal...).

For teachers, the opportunities of blended learning and personalization are hand by hand with the Learning Management Systems (LMS), via different instructional design models in which the teacher mix the stages of the learning process in online or in-presence scenarios. Itineraries are planned for different or same goals and contents assuring the technology offers the continuity of the blended learning. Teacher, then, can feedback the process, monitor the learning progress and be ready to offer support or alternative paths.

Nowadays there is a formal method that provides teachers with principles for personalization in learning, also in higher education, this is the Universal Design for Learning (UDL) [32]. This method emphasizes the quality and inclusion of all learners by adequately challenging levels, cultural responsive attitudes and variability in teaching methods, among the most relevant. So, the UDL framework is used by teachers to revise the curriculum design and development, no matter the learners' variability might be. Some studies showed the drawback of this framework, as the impact on the learning outcomes are not clearly demonstrated [33], while other studies collect a number of best practices in which UDL can effectively address the needs of widely differing learners, essentially by building systems that are fully inclusive [34], or at a micro level, the improvement of the executive ability of learners as long as their encouragement to develop the affective dimension [35].

And thirdly, once explored the role of technology and teachers, the key point is on the learners' ability to personalize their own processes. Not every learner has learnt to make efficient choices, and this is not only a matter of lack in supporting the gradual autonomy [36]. Learners are adapted to the teaching proposals, without defining goals or deciding activities for learning. If learning is a self-process, the learner would need to be clear of how, what, when or why she learns best, in order to create more personalized learning paths or achievements. Learners need to be trained to develop self-paced processes adapting their own needs and preferences. And they need to be scaffolder to make decisions about goals, times, sources or contents for learning. These claims assume that teachers need to build learning conditions leading them learning to learn, in a progressive autonomous way. Self-reflective and self-regulated learning are on the core of higher competences for learning, and teachers can support or facilitate the planning, regulation and reflection of the learners about their learning processes.

As a result, for a personalization in learning, teachers and learners with the support of technologies, would have the opportunity to devise itineraries and choices for tackling diversity. Under the model of blended learning, teachers could assist learners in identifying areas for improvement or goals according to their preferences by develop learning plans that allow learners to progress at different levels and speeds. Hence, individual learning pathways, previously designed by the teachers would

require for them at least two key points: to consider personalization in the stages of the instructional design, and to know how to use technologies that can facilitate and support the itineraries and pathways building. Next sections focus on both points, from the practical application with guiding examples.

### **3 ADDIE Model for a Pedagogical Design**

#### ***3.1 Instructional Design and Principles for Personalization***

The instructional design focuses on individual student learning, on facilitating and motivating their educational experience to achieve a meaningful understanding of the content, through the development of high quality academic courses, lessons and materials. The development of learning experiences has a comprehensive and systemic approach, since its implementation previously involved a process of analysis, design, development, implementation and evaluation, to ensure that knowledge and skills are acquired more efficiently and effectively [37, 38]. At the same time, in order to design such educational experiences, it is necessary to describe the learning activities and the support activities (teachers, tutors, peers) in a context of a learning unit, such as a course or a lesson [39]. Therefore, one of the objectives of instructional design is to create learning environments and products, not to describe how students acquire knowledge and skills with these environments or products [40].

In order to work the instruction in the development of a proposal for the creation of personalized learning itineraries with the Symbaloo Lesson Plans tool, to be used in the b-learning modality, we considered the foundations of two perspectives, the objectivist and the constructivist. From the objectivist one (knowledge/reality/truth—as independent and external to whom it knows) since its interest is focused on the contents of the plans and programs of study established through the educational administrations, which decide the objectives that indicate what the student should learn [41].

One of the most representative ideas of this training approach is the instruction program of Skinner of 1968 [42], of which Smith-Gratto [43] (1995), proposes the following principles for its application in training environments in virtual space and its modalities as b-learning, which we consider as a basic route that influences both the vision of development of digital educational resources as learning itineraries, and its application: (a) to focus on the formulation of learning objectives for the students; (b) to emphasize the elaboration of the contents that the teachers want to transmit and that are subject to what the student requires; (c) to offer a continuous evaluation of the students' answers, to ensure that they master the knowledge and feel confident that they will be able to move on to the next level; (d) to reinforce the desired answers; and (e) to control the rhythm of the progress of each student.

Considering the educational objectives involved, programmed instruction is considered more effective when it helps students to memorize, content can be structured,

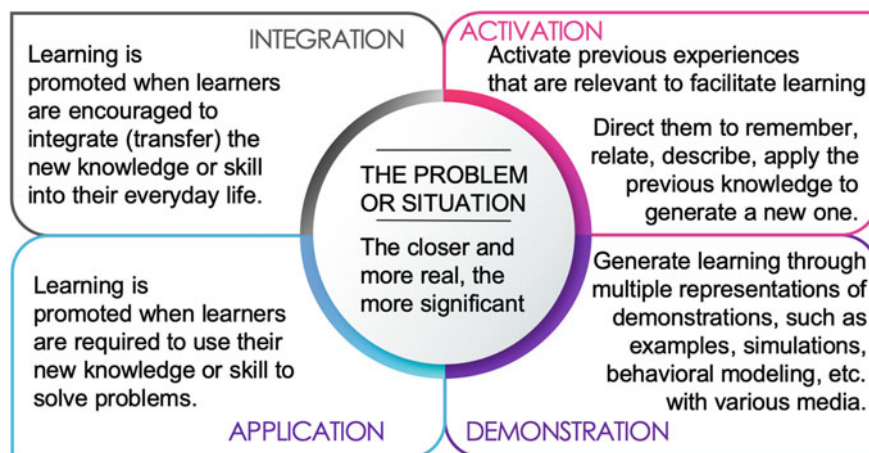
and activities are implemented in clearly sequenced time frames [43]. The vision of this theory and the behavioural perspective based on the development of the individual has contributed to the foundation of how instruction for learning should be in the process of developing the digital learning paths that we propose; establishing the structure, objectives, evaluations and feedback, and the necessary information for the content.

Another vision on which we rely, the constructivist one (knowledge is a subjective construction) based on Jean Piaget's theory, considers that learning means an interpretation of reality based on the process of accommodating internalized knowledge with the new objects of learning; the appropriation of the object, and the adaptation of past knowledge with current knowledge. In this case, instruction consists of making students face new experiences so that they can change their cognitive structures and thus be able to elaborate new interpretations [41, 42, 44]. In this respect, Smith-Gratto [43], focuses its foundations towards online training through: (a) creating opportunities for students to face situations that conflict with their previous experiences; (b) offering activities that favour the restoration of knowledge acquired in different formats; (c) formulating problem-solving activities that refer to real cases; and (d) promoting activities that require interaction at different levels and collaboration with both their teacher and other students.

We consider that the principles of constructivism are more suitable for the individual understanding of complex information and cognitive processes, such as those required for problem solving [44]. This vision is applied to define the interaction strategies, the most appropriate activities for both a student and a group, the supports for learning such as graphics, diagrams, mind maps, images and videos to solve problems or expose content; and which are the areas that need to be reinforced with the support of a tutor; during the development of personalized digital learning paths.

In addition to the above perspectives for creating the personalized learning path, a set of principles mentioned by Merrill [40] that are necessary for effective and efficient instruction is considered as a basis for developing instruction, since they focus on a learning problem, situation or content and involve students in four instructional phases for learning: (a) activation of previous experience, which can be the basis for generating other knowledge; (b) demonstration of skills, using representations of procedures and guidance on what to learn; (c) application of skills, with emphasis on everyday tasks or problems; and (d) integration of skills into the real world, when promoting transfer of acquired learning. Each of these phases gives importance to teaching the relationships and interactions between objects or events, and at the same time, complies with the principles of effective instruction [38], adaptable to any level, interest and educational requirement (see Fig. 3).

As mentioned, the main idea of this chapter is to show a design proposal for the creation of a digital educational resource (since it has an educational intention and is composed of digital elements or media) in a learning itinerary format (since it is a series of routes where the student will navigate to have personalized learning experiences) that can be used in blended learning models. For this purpose, we recommend keeping in mind pedagogical perspectives as a guide to create learning experiences; relying on the principles of an instruction to recognize when and how



**Fig. 3** Principles of effective instruction. Adapted from: Merrill [40]

to promote learning; placing an instructional theory as a basis to relate instructional events to cognitive processes; and an instructional model that facilitates the design management (described in the next section) of a product or an instruction, which in our case is a personalized digital learning itinerary.

### 3.2 ADDIE to Create Learning Pathways

ADDIE is an instructional design model whose name is the acronym for Analyze, Design, Develop, Implement and Evaluate, processes that it integrates (see Fig. 4). It has become a generic recipe for the development of digital educational resources [45], educational experiences focused on the student [37] in such innovative modalities Massive Open Courses (MOOC) [45] because of its cyclical, interactive and flexible character. It is a tool that encourages constant revision and change to ensure continuous learning, and to meet its educational objective [46, 47]. Application of this model is useful in instruction that meets the specific needs of students and facilitates more active learning [46, 48]. We consider it for its simple application that allows adjusting the elements expected to use in the customized digital learning paths with the Lesson Plans tool.

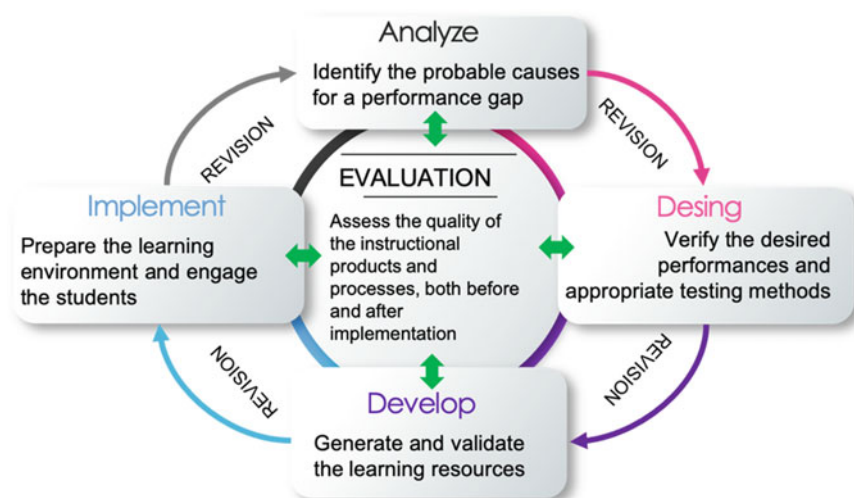


Fig. 4 Phases of the ADDIE instructional mode. Adapted from: Branch [37]

## 4 Analysis Phase for the Personalized Instruction

In order to create an instruction, a series of data and empirical evidence are required, such as educational level, academic performance, content provided, methods, activities, educational context and even social context, with the idea of identifying what are the starting point gap to be covered by the instruction, and what is the state to be reached. In the ADDIE model, this first step is called “Analysis”, and the expected result is the writing of a project management plan that allows with the instruction, to improve the detected educational situation. Considering the questions raised in this phase [37, 49], a proposal for implementation is presented below:

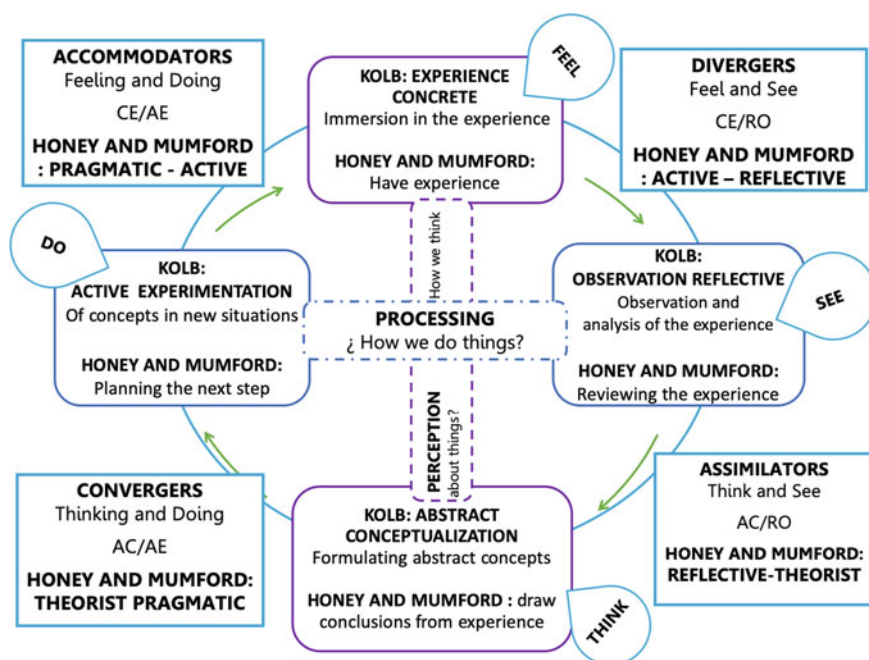
**Who?** To know the characteristics of the students who will use the itinerary. Example: course; interests regarding the topic we consider initial; or the identification of learning styles.

The latter is of interest for the development of the personalized digital learning itinerary, since knowing the ways our students perceive, process information, and react when faced with a learning experience or process allows us to adjust the instructional events and even present a content in one way or another. For the higher education level we consider appropriate the use of the learning styles theory of Kolb (1984) and Honey and Mumford (1986), since they are based on the processes of learning through experience and the assimilation of information [50–52].

Both theories offer us a definition of the knowledge construction process through a cycle of four phases (Kolb: experience, reflective observation, abstract conceptualization and active experimentation/Honey and Mumford: having experience, reviewing the experience, drawing conclusions from the experience and planning the next steps) and with their respective tests (Kolb: Learning Inventory (KLIS) [53]/Honey

and Mumford: Learning Styles Questionnaire (LSQ) and its adaptation to Spanish CHAEA: Honey-Alonso Questionnaire [52, 54]) have classified the students' learning styles (Kolb: Divergers, Assimilators, Covergers and Accommodators/Honey and Mumford: Active, Reflective, Theoretical and Pragmatic [50]) offering an approach to describe their skills and preferences when facing a process, educational experience, or instruction (see Fig. 5). Both theories allow us to easily recognize the learning preferences of a group of students, and from this information we can design the instruction (for example, through phases: active, reflective, theoretical, pragmatic) and adapt the elements that compose it (concepts, processes, activities...).

**For what?** To define the contents to be taught and to formulate the desired results. It will depend on the learning objectives or competences, which describe the tasks the students will achieve at the end of the course. They answer the question: What will the students be able to do as a result of their participation in this course? [37]. At the same time, it is essential to identify what new behaviours, knowledge structures, skills are intended to be developed [48]. In this sense, we consider Bloom Taxonomy [55–57] to identify through the cognitive domains (factual, conceptual, procedural, and metacognitive), how the learner should remember information (recognizing, remembering), comprehend information (interpreting, exemplifying), use



**Fig. 5** Representation of Kolb and Honey and Mumford Learning Styles theories. Adapted from: Kolb [51], Honey and Mumford [52]

what is learned (executing, implementing), see solutions and patterns (differentiating, organizing), evaluate a statement (checking, criticizing), and put together a new set to create information (planning, producing) [56, 57].

*For example:*

- Theme: Academic Plagiarism.
- Content: (a) Academic plagiarism cases (factual, metacognitive); (b) Meaning and types of common academic plagiarism (conceptual, factual); (c) How to avoid plagiarism? (procedure, metacognitive); and (d) APA standards and their applications (procedure, metacognitive).
- General Objective: At the end of the itinerary, the student will be able to apply the APA rules in an academic document in order not to commit academic plagiarism.
- Specific Objectives: (a) To recognize the consequences of plagiarism in the academic environment; (b) To distinguish the characteristics of academic plagiarism; (c) To apply the APA standards in order not to commit academic plagiarism; (d) To analyze the importance of the use of the APA standards in the academic environment; and (e) To evaluate the application of the APA standards in different cases.

**Why?** Need(s) for instruction due to lack of performance, understanding or interest. Diagnostic questionnaires can be conducted to identify possible limitations in relation to the difficulty of learning; conduct a specific needs analysis; recognize the need for learning through the importance of the subject matter or the competence to be achieved; analyze reports or accounts.

*For example:* Needs to develop informational skills; students do not have notions of the application of APA standards and therefore will be prone to academic plagiarism during the development of their research work.

**How?** It is the instructional strategies, the technological resources, the materials, the platforms that will be used. For the planning of instructional strategies we consider Gagné theory [55, 58], since it recognizes the existence of different types of abilities that we consider can be learned with the digital route (cognitive strategies—executive control processes; intellectual abilities—process knowledge; verbal information—declarative knowledge; psychomotor abilities; and attitudes); considers that both internal conditions (prior knowledge to learn new content, interests, learning process) and external conditions (motivations, teacher instructions) are required to obtain those learning outcomes; during eight phases (motivation, comprehension, acquisition, retention, recall, generalization, performance and feedback); and that for this purpose it proposes a series of instructional events that allow us to organize the itinerary.

*For example:*

- Instructional Strategies: (a) facts: statements of fact; (b) concepts: definitions, examples; (c) process: scenario table; (d) procedure: demonstration; and (e) principle: specific guidelines, examples in different contexts.
- Digital elements for design: texts, graphics, images, computer graphics, photographs, videos, audios, animations, links to web pages, simulations, interactive

practical and self-assessment exercises, dynamic examples and games. It is important that they are clear, concrete, coherent and relevant as possible; at the same time, good quality of both images and fonts used.

**When?** Time available to complete the instruction or instruction timeline. It will depend on the level of difficulty of the content, the objectives set to work on the itinerary, and the materials available (for example, consider the time the student will be watching the videos or doing the exercises). We consider it important that the student knows the time and the level of difficulty so that he can organize his process of autonomous learning.

*For Example:* Duration 25–30 min depending on the contents related to academic plagiarism and the identification of good practices to avoid it.

**Where?** The context or environment that the students will need in order to work with the itinerary.

*For Example:*

- Face-to-face. Possible actions: (a) computer laboratory, with the use of their computers or devices so that they can carry out the itinerary in a way that is supervised and supported by the teacher at the time; b) it can be used as reinforcement material for a master class or seminar on the subject by offering it as a practical activity.
- E-learning mode. Possible actions: (a) it can be used with any LMS; (b) the student can organize his learning time with the itinerary and his doubts can be covered by the teacher through the communication channels of the platform.
- Blended Learning mode. Possible actions: (a) it can be integrated in any LMS, and Blended Learning tools such as Google Classroom and Edmodo; (b) the student can organize your learning time with the itinerary individually or the teacher can work it as a practice, and his doubts can be covered through the communication channels or in a face-to-face way.

What is expected from this first phase of the ADDIE model is a series of instructional proposals based on the type of content that will be presented to the student, which is related to a strategy generated for each specific learning objective [37]; all this to start the next phase, that is the instructional design (see Table 1).

## 5 Design Phase of the Personalized Itineraries

Among the goals of this phase are the verification and implementation of the method of instruction, and the identification of the logical way to organize the content so that students can build knowledge and develop skills necessary to achieve the objectives set out in the previous phase [37, 58]. What is finally expected is a structure of the environment and the learning processes foreseen; along with the personalized tasks necessary to achieve the instructional objectives defined, finally presented in an inventory or a diagram form.

**Table 1** Inventory of instruction and relationship to educational theories used

| Desing model/parts of the itinerary | Learning phase-Gagné                                                       | Learning styles phases/Kolb/Honey and Mumford                                            | Learning domain-Bloom/Task                                               | Instructional events/Gagné                                                                                                                                                                                   |
|-------------------------------------|----------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Orientation</b>                  | <b>Motivation</b><br>Expectation                                           | <b>Activate</b><br>Immersion in the experience                                           | <b>Remember</b><br>– Watch events<br>– Recognize, describe               | <b>Gaining attention</b><br>– Directing attention to what you want to teach (reception)<br>– Inform the student of the previous objective to be achieved in order to provoke motivation (purpose—usefulness) |
|                                     | <b>Recuperation</b><br>Learning prior to working memory                    | <b>Theoretical</b><br>-Abstract conceptualization<br>-Formulation of abstract concepts   |                                                                          | <b>Stimulate</b> the recovery of previous knowledge (remembrance)                                                                                                                                            |
| <b>Theoretical representation</b>   | <b>Comprehension/Apprehension</b><br>– Attention<br>– Selective perception | <b>Theoretical</b><br>– Abstract conceptualization<br>– Formulation of abstract concepts | <b>Understanding</b><br>Interpreting facts, comparing, inferring         | <b>Presenting</b> the information (external stimulus) to be taught (selective perception)                                                                                                                    |
|                                     | <b>Acquisition</b><br>Incoming coding-Storage                              | <b>Theoretical/Reflective</b>                                                            | <b>Analysis</b><br>– Component identification<br>– Organization of parts | <b>Guide</b> learning by giving instructions on how to learn (semantic coding)                                                                                                                               |
|                                     | <b>Retention</b><br>Storage in memory                                      | <b>Theoretical/Reflective</b>                                                            | <b>Application</b><br>Use new information, solve problems                | <b>Provoke</b> performance or actions by planning and designing tasks and exercises to be solved with the information taught (response-practice)                                                             |

(continued)

**Table 1** (continued)  
Desing model/parts  
of the itinerary

|                                            | Learning phase-Gagné                                         | Learning styles<br>phases/Kolb/Honey and<br>Mumford                                                       | Learning<br>domain-Bloom/Task                                                       | Instructional events/Gagné                                                                                         |
|--------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>Evaluation and<br/>self-evaluation</b>  | <b>Feedback</b><br>– Affirmation<br>– Academic reinforcement | <b>Reflective</b><br>Observation and analysis of the<br>experience                                        | <b>Evaluation</b><br>Checking the results,<br>comparing ideas                       | <b>Provide</b> feedback on<br>performance correction<br>(reinforcement)                                            |
|                                            | <b>Execution</b><br>Emission of the response                 | <b>Pragmatic</b><br>– Active experimentation of<br>concepts in new situations<br>– Planning of next steps |                                                                                     | <b>Evaluate</b> the performance<br>or actions taken on the<br>proposed tasks (recovery)                            |
| <b>Representation of<br/>understanding</b> | <b>Generalization</b><br>Transfer                            |                                                                                                           | <b>Synthesis</b><br>– Use previous ideas to<br>generate other<br>– Relate knowledge | <b>Improve</b> retention and<br>transfer<br>– Promoting to other<br>contexts (keys and<br>strategies for recovery) |

## 5.1 *Structure of the Environment and Learning Processes*

In addition to Gagné instructional theory [58], for the development of this phase we considered the instructional model developed by Campos [45] for the creation of digital educational resources that present a minimum learning objective associated with a type of content and concrete activities for its achievement, called a Learning Object (LO) [59], since it takes into account learning style theories, in the search for pedagogical strategies that favor each learning preference. Regarding the presentation of the elements, Campos [45], takes into account the theory of styles of Honey and Mumford [52] (Active, Reflexive, Theoretical and Pragmatic) and generates a proposal (see Table 1) that we will use, which we have related to the instructional theory of Gagné and the taxonomy of Bloom [57, 58]. This model identifies four parts:

- Orientation: where the objectives to be achieved with the resource are presented, the justification of the learning and the key words that identify the route. The purpose is to attract the student's attention and inviting her to continue navigating. It would be related to the motivation phase of Gagné [57]. Campos [45] mentions that it represents the active phase (based on Honey and Mumford theory [52, 54]) where students gather the information they expect to learn; and the Bloom dimensions of knowledge that can be connected are the factual, conceptual and metacognitive ones. As a means of presenting this part there are texts, images, photographs, videos and audios.
- Theoretical representation: composed of concepts, theories, processes, case studies, related to the selected topic. They can be presented through videos, animations, images, audios, texts, and Web pages. The purpose is to offer information, stimulate memories and previous learning, and propitiate the analysis and understanding of the information offered; it is related to the phase of apprehension and acquisition of Gagné [55, 58]. For the theory of learning styles this would be the theoretical phase, where the information is structured and synthesized. The dimensions of knowledge that can be connected are the factual and conceptual.
- Representation of understanding: this presents the preparatory activities (solving problems that may be of interest and that require previous experience) and main activities (allowing the integration of new information with existing information), which may vary depending on the learning style, type of content worked on (conceptual, procedural or attitudinal) and the educational objective set. Its purpose is to reinforce the information captured, reflect on and analyze their actions in the face of the activities and perspectives on their knowledge and skills initially proposed; it is related to the retention and recall phase of Gagné [55, 58]. The dimensions of knowledge that can be connected are procedural and metacognitive. It focuses on the reflective phase of the learning process according to the theory of learning style, where the analysis of documentation is encouraged. In addition to the above-mentioned means, didactic examples, virtual games, augmented reality elements and any multimedia can be used.

- **Evaluation/Self-assessment:** students are expected to apply the information acquired, relate the contents to real aspects that invite them to solve problems, and compare information to generate criteria; it is composed of self-assessment exercises, reflection, collaborative and practical activities that allow to measure the achievement of competence, learning or understanding of the contents. Its purpose is for students to be able to remember, relate and compare the knowledge acquired in order to transfer it to practice; it is related to the learning phases of recovery, transfer, execution and feedback of Gagné [55, 58]. The dimensions of knowledge that can be connected are the metacognitive and the procedural. It can be presented through texts, videos, images, audios, or animations, and web pages.

## 5.2 *Instructional Tasks and Inventory*

Once the relationship between the structure and the foreseen learning processes has been defined, it becomes necessary to structure the tasks or activities that will allow the achievement of the instructional objectives; Branch [37] mentions that the final result, the task inventory, is essential for a successful instruction since it specifies the performance required to achieve the previewed objectives. There are three types of performance tasks that represent different types of learning and several levels of learning: (a) knowledge: cognitive tasks, which involve thoughts, ideas and perceptions; (b) procedure: order tasks, which involve a sequence of tasks; and (c) skill: motor tasks, which involve physical effort. At the same time, Bloom's taxonomy [56] and learning domains need to be consider in the definition of the tasks.

Following Branch [37] guidelines for the development of task inventory focus on the following steps:

- *Reaffirm the goals of instruction based on the stated purpose*; for example: The purpose of the personalized digital path is to develop skills and incorporate a change regarding the use of fonts to create academic work so as not to commit plagiarism.
  - *Goals of instruction*; for example: (a) teach concept of academic plagiarism; (b) explain forms of academic plagiarism; (b) promote use of APA standards; (c) raise awareness of academic plagiarism; and (d) evaluate application of APA standards.
- *Identify the performance tasks*; for example: in this case we will work with two types of request and cognitive considering the learning domains:
  - *Knowledge*, observing news events;
  - *Understanding*, interpreting facts, comparing, inferring;
  - *Application*, using new information, solving problems;

**Table 2** Example of registration of elements for the itinerary

|                                                                               |                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Orientation</b><br><b>1. Presentation</b><br>– Motivation<br>– Expectation | <b>Video 1.</b> Title: News of academic plagiarism cases<br><b>Objective:</b> To recognize the consequences of plagiarism in the academic environment<br>Author, A. A. [User’s name]. (Year, month, day). Title of the video [Video file]. Recovered from <a href="http://xxxxx">http://xxxxx</a><br><b>Text:</b> In the next video you can learn the consequences of plagiarism ... |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

- *Analysis*, identification of components, organization of parts;
- *Synthesis*, using previous ideas to generate others, relating knowledge;
- *Evaluation*, verifying results, comparing ideas.

These tasks can be presented throughout the course and are combined with the type of content which is related to the instructional strategies. We refer to them by considering the perception of Bloom taxonomy and the dimensions of knowledge described above [45], but considering their relevance to each learning style, for example factual knowledge is preferred for the reflective learning style; procedural knowledge is more suited to the active or pragmatic styles; attitudinal knowledge, or subjective experiences that involve some kind of evaluative judgment, such as role-playing, discussions, or decision-making exercises are more suited to the active and reflective styles.

Before continuing to the next phase for the creation of the personalized itinerary, it is recommended to register (title, URL, format...) the multimedia elements, resources or material (accompanied by texts with instructions) that will be used in each of their parts. By describing the objective of each of these elements, we will be able to recognize their potential to favour a learning style, or the understanding of a specific content. At the same time, we should record the exercises and activities with their respective objectives, questions and answer options that will be used. This information will allow me to work effectively in the next phase (see Table 2).

## 6 Development Phase with Symbaloo Lesson Plans

The purpose of this phase is to shape the ideas and results of the analysis and design phases by addressing the tools and processes that let us to create the instructional material for creating personalized blended learning pathways For this aims, the tool chosen to create the itinerary is *Symbaloo*, as a multiplatform tool, free and online, with a personalized learning approach based on the consideration of each student’s pace. The tool collects and integrates various multimedia elements and online resources in an interactive space.

This first service, called *Webmix* [60], is in the form of a desktop with customizable blocks (such as color, symbol, text and position) and organization of favorite web pages. Several researchers [61–63] have used it with their students as a support for the creation of *Personal Learning Environments* (PLE), since it allows the generation of

knowledge from a timely processing and analysis of the information that is organized. As it is connected to social networks (Facebook, Twitter), it allows the application of teaching strategies with a collaborative and game-based approach, which have suggested improvements in emotional competences, the development of creativity, and at the same time, autonomy in learning specific academic skills and a greater perception of students' work [64].

The second service is *Lesson Plans* [60], which allows the creation of personalized digital learning itineraries or *Learning Paths* through the incorporation of content and elements such as images, videos, video games, simulators, documents, and multimedia material, presented on a board or environment that simulates a game where students are guided through the aforementioned educational elements and content. The itineraries can be elaborated by the students as part of some research, gamification or PLE activity. And by the teachers, to guide the learning process, evaluate and check the effectiveness of the educational plans applied. Floréz [65] that its application encourages the personalization of the student's learning and therefore the educational quality (see Fig. 6).

Among some of the advantages of *Lesson Plans*, is the development of a learning itinerary formed by several routes, and incorporate different elements (computer graphics, images, videos, simulation, etc.) for the same content that is worked on a topic or subject, offering different ways to understand and work on a content; reinforcing the idea that not everyone learns the same.

At the same time, it allows the teacher and the rest of the users of the platform, to share their itineraries through various social networks, and in the *Marketplace*; the *Symboloo Repository* where inspiration is found in other teachers' itineraries and can even be added to the personal account to edit and reuse. Like *Webmix*, *Lesson*



Fig. 6 Sample of the Webmix and Lesson Plans services from Symboloo

*Plans* is accessible from any device with internet access, allowing students and their parents to work together with this technology from anywhere.

## 6.1 *Starting a Lesson Plan*

Upon entering the Lesson Plans platform, we have the option to start designing the itinerary with *Create a Learning Path*. Although basic, the configuration options of the itinerary editor allow us to provide the educational data necessary for every user to know the pedagogical intention, the contents to be worked on, the characteristics of the activities and the evaluation processes, and the duration. In the category option, the platform offers you a drop-down menu with different levels and academic courses that go from infant education to professional training; at the same time, it offers a space to add the theme, and the tags or key words that allow the route to be found in the *Marketplace Repository* of *Symbaloo* when using these words. These options allow to cover the orientation phase and to invite the student to continue the navigation on the itinerary.

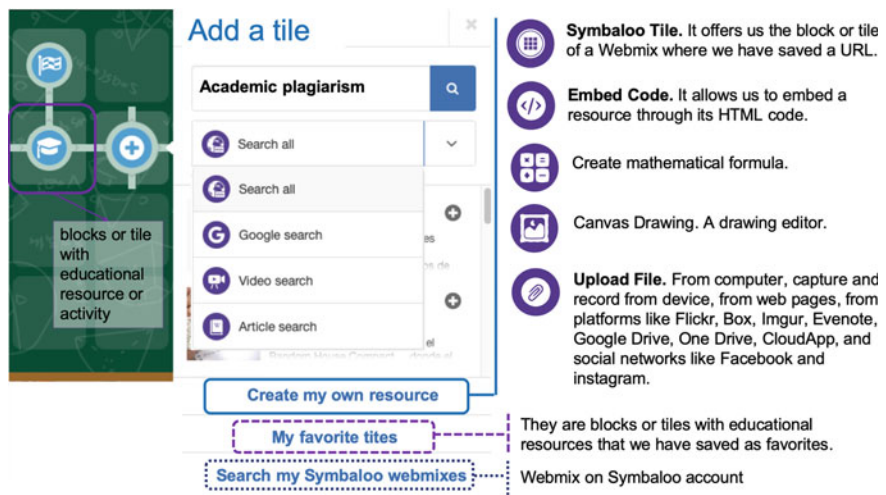
As mentioned above, with Lesson Plans we can incorporate elements for gamification through the *Question Reward* option, which allows you to assign value in the form of badges to each question. On this last point, it is important to work with dedication on the questions that are asked throughout the route considering their level of difficulty. With regard to the graphic component, the editor offers to change the background, which we recommend is simple to avoid distractions during navigation; there is the possibility to enlarge or reduce the blocks or tiles of the route while creating. Considering the design of a personalized route based on learning styles and designed with the ADDIE theory, we provide a detailed description of the initial sections with an example of the academic plagiarism (see Table 3).

## 6.2 *Developing Personalized Routes*

Once the descriptive elements are available, the search for and incorporation of educational resources is carried out. These can be tracked through the *Add a Tile* block of options (see Fig. 7) in the *Learning Path*, connected to various search engines such as Yahoo, Bing, Google and YouTube; it is worth noting that it is activated when the creation of a block of the route is initiated and uses filters to generate results with educational intent. Another way of adding content and resources is by activating the option *Create my own resource*, with several sections, one for the text editor, useful to describe the activity or resource it will offer; and a section with the possibility of inserting HTML code, uploading file, inserting mathematical formula, a drawing and even a previously elaborated *Webmix*. Finally, you have the possibility to search in a block of a route saved as a favorite.

**Table 3** Initial data to design an itinerary with Symbaloo

|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div>Edit settings</div> <div></div>         | <ul style="list-style-type: none"><li>• Title: Academic Plagiarism</li><li>• Description: Open Educational Resource (OER), in Learning Object format<ul style="list-style-type: none"><li>– Contents: concept of plagiarism, why avoid it, types of plagiarism, not plagiarizing others, APA standards, ways to cite so as not to plagiarize</li><li>– Activities: recognition of plagiarism with a Web tool; organization and identification of citations considering APA standard, analysis of cases</li><li>– Evaluation: through multiple choice questions</li><li>– Self-evaluation: through specific exercises on the content worked on throughout the route</li></ul></li><li>• Objectives:<ul style="list-style-type: none"><li>– Know the tools applied to avoid academic plagiarism</li><li>– Reflect on actions related to academic plagiarism</li><li>– Apply actions to prevent academic plagiarism</li></ul></li><li>• Expected duration: 25 min</li></ul> |
| <div>Edit category</div> <div></div>         | <ul style="list-style-type: none"><li>• Grade Level: Education superior</li><li>• Subject: Education</li><li>• Tag: academic plagiarism, higher education, information competence</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <div>Edit question rewards</div> <div></div> | <ul style="list-style-type: none"><li>• Two levels of difficulty have been chosen, a medium level for questions extracted from a resource such as a video or a reading, and a high level for questions resulting from applied exercises</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |



**Fig. 7** Lesson Plans tools to develop a route

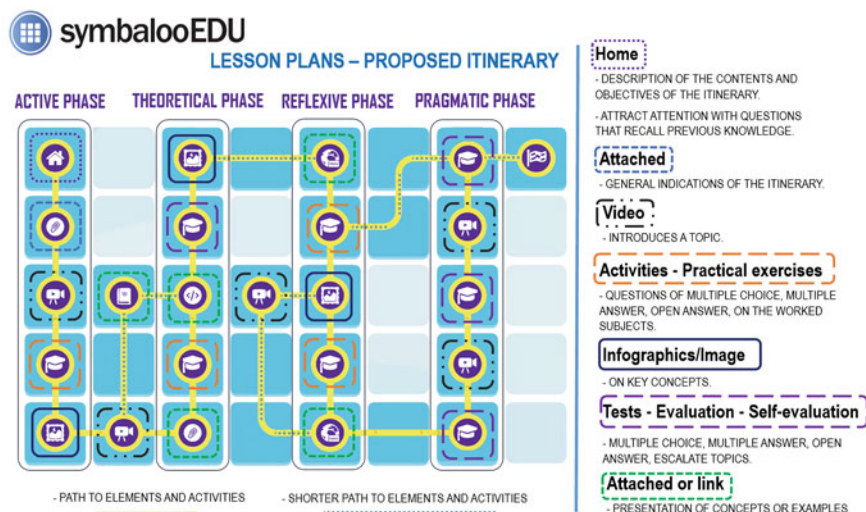


Fig. 8 Lesson Plans tools to develop a route

As you add the elements (attachment, image, link, video, activities, exercises or test, etc.) in a block, the platform generates a circle with a symbol to identify it. At the same time, it offers between three and four branches that allow the generation of learning paths, shortcuts or returns; each link to the next block is represented by a line. The graphical interface offered by the platform when creating the route is intuitive, allowing to recognize the direction of each block, and offering the opportunity to follow the established route, take shortcuts or returns (see Fig. 8).

The figure above represents a personalized learning itinerary developed with the *Symboloo Lesson Plans* platform and based on the information generated in the design phase of the applied ADDIE model. Although the idea is to reflect each of the parts and phases of the instructional proposal in an organized way, we recommend experimenting with the options for the location of blocks, offering a diversity of routes, alternatives of elements for different learning preferences, motivating the students to select the route that is of their interest, and guiding them with the objective of navigating through each block and completing the itinerary; in this way we can guarantee a monitoring and evaluation.

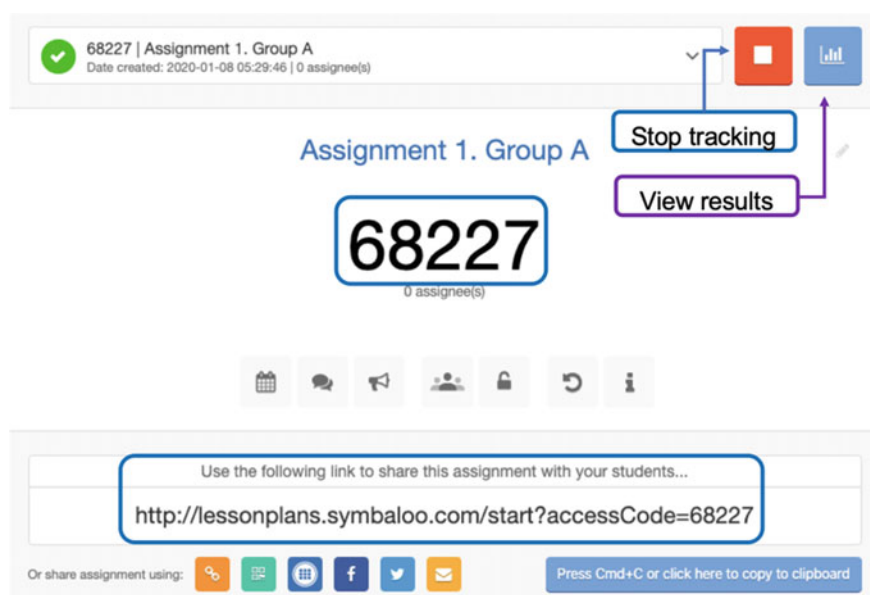
## 7 Implementation and Evaluation Phase of the Itinerary

During the implementation phase, the learning environment is prepared through the selection of an application method, and students are provided with personalized instruction [37]. Four parts are recommended for this phase adapted from Branch

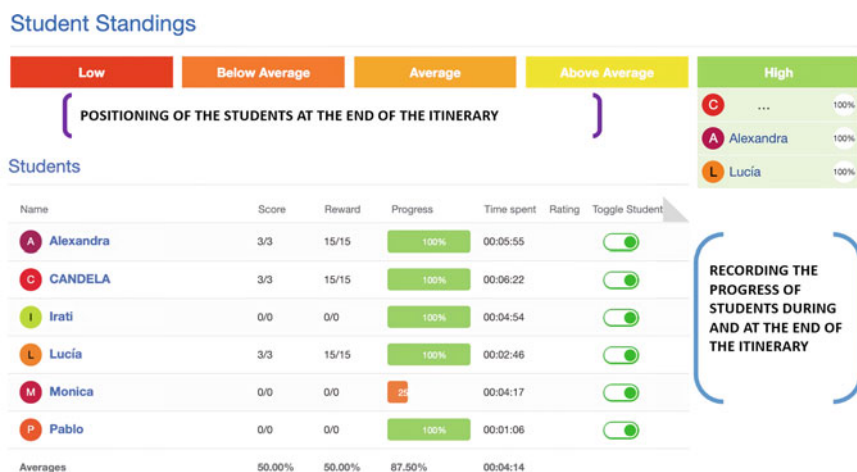
[37]: (a) Identification: the learning preferences of the students, their previous knowledge or prerequisites can be confirmed; (b) Calendar: the deadline for interaction with the itinerary and the number of times the students will work in the classroom are indicated; and (c) Course preview: to introduce the tool, the page where they will have to enter (see Fig. 6) with the session code (<https://lessonplans.symbaloo.com/>), how to interact with the itinerary, and carry out the activities (it is possible to use itineraries of a few blocks, selecting them from the Marketplace <https://lessonplans.symbaloo.com/marketplace>). The platform offers the option (in Assign and Start tracking) to copy the URL of the itinerary and share in various communication platforms (see Fig. 9).

Monitoring and personalized support is the fourth part of the implementation phase. It is based on monitoring the interaction of the student with the itinerary during its application in teaching; for example in the b-learning mode. In this case, we can find out in which block a student is located, how long it has taken to carry out the activities, what the performance has been when responding to the tests or exercises with respect to their peers (see Fig. 10).

Although the monitoring system of Symbaloo Lesson Plans provides basic interaction data (it would be interesting to know how much time the student takes on a specific task or block) we consider that the Learning Analytics they offer allows us to begin a statistical analysis on the performance of each student and to identify possible problems with respect to the understanding of the content or competencies that were expected to be developed with the instruction. Increasingly, there is pressure on university institutions to use learning analysis to evaluate both their students and



**Fig. 9** Options to Assign and Start tracking



**Fig. 10** Options for registration and student standing

the management and success of a resource [65], therefore, Symbaloo offers us the opportunity to start with this type of analysis and apply part of the last phase of the ADDIE model, *Evaluation*. In this last phase we can identify the data provided by the evaluation criteria and instruments applied that will allow us to know, in addition to the student's performance, the resulting increase in knowledge or capacity, the perception of the route, the degree of improvement of a behaviours and the capacity to apply a learning. At the same time, this phase gives the opportunity to perfect the instructional design with a personalized approach in order to offer a training that is better adapted to the needs and interests of the students.

Learning is a process that, in our view, needs to be previously mediated, provided or strategically taught by a teacher, who then relinquishes her control and promotes a self-sufficient and independent learning process. Personalized learning itineraries created with technologies such as Symbaloo are an opportunity to enhance inclusion, personalization, learning analysis and student engagement towards more independent learning, as it can lead to increased motivation. It is also worth noting its easy incorporation into models such as b-learning as it allows the continuation of the classroom in virtual learning spaces adjusted to the preferences and styles of the students.

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# Pedagogical Tools for Teaching in a Blended Learning System



Antonio Víctor Martín-García

**Abstract** In this chapter, we discuss how to pedagogically organise an integrated and simultaneous teaching–learning process around face-to-face and online activities. We present a theoretical and didactic framework in which to situate the design and bring together different pedagogical resources and tools for working in blended learning contexts

**Keywords** Blended learning · Instructional design · Pedagogical tool

## 1 Introduction

The b-learning approach adopts multiple variants, one of the most common of which is the alternating of face-to-face and virtual learning activities at different times. In this type of case, both training approaches are implemented independently and the aim in most cases is to complement and support one of them with some of the advantages of the other, without establishing an integrated system per se. The challenge increases when the design and development of a course that seeks to generate a balanced and simultaneous process of both training approaches is proposed.

In this chapter, we situate ourselves precisely in that setting and propose a b-learning environment in which the teaching–learning process is presented in an integrated sequence of activity of the participants (teacher and students), giving pedagogical meaning to both the face-to-face and virtual classrooms. The most radical approach to blended learning is provided by what is known as flipped learning. According to it, the teacher’s explanations and transmission of content are presented and prepared in order to be assimilated by the students outside the classroom through prior study (different types of material are used for this, mainly through video classes, teacher’s notes and printed reference material), while work that was traditionally done outside the classroom (homework, group work) is now done in the classroom under the supervision and with the help of the teacher.

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Transforming a pure training system, either face-to-face or e-learning, into a mixed one involves needing to consider certain difficulties which are almost always related to the opposition and resistance of some teachers and students to changing their habits and traditional perception of teaching, the result of their experience of schooling. In these cases, passivity, inertia and the search for ‘comfort zones’ and convenience are the result. For this reason, the b-learning system must initially activate interest and improve the predisposition and attitude of the participants as part of a culture of innovation and change. The system also needs to adapt the work environment (rearrangement of furniture and classroom spaces and other learning places) and, above all, learning time (class hours and prior study time outside the classroom). It also requires a good instructional design that seeks the assimilation and construction of knowledge, activating fundamental elements related to deep learning, such as autonomous work and reflection, group interaction (in the physical and virtual classrooms) and connection between the curricular content of subjects and the immediate reality of the discipline to which that content refers.

## 2 Instructional Design of the BL Environment

For the general design of the BL system, we propose the following actions:

### 2.1 *1st Define a Theoretical and Pedagogical Framework for the B-learning System*

In the proposal, we select three frameworks for the theoretical framing of our design. From them, the different methodological strategies that affect aspects ranging from the definition and sequencing of objectives and content to the organisation of the groups inside and outside the classroom are extracted, and dynamic activities that demand the resolution and creation of practical cases and the design of projects based on social and/or professional reality are developed. In Chap. 4, we justified the use of the theoretical approaches that we now summarise.

***Learning based on student activity*** The theoretical reference of this approach is the cultural-historical activity theory, which has been enriched over three generations of research from the initial works of L. Vigotsky, and Alex Leontiev, to the more recent work of Yrgö Engeström. Each of these stages proposes a concept of activity based on interaction and mediation. Current development of this approach also connects with others the theories of situated learning (Lave and Wenger; Wenger), distributed cognition (Hutchins), and Engeström’s expansive learning.

***Learning based on group and social collaboration*** Generating a cooperative, or better still, collaborative, environment is a fundamental part of BL design. The idea

is that students work in small groups according to the fundamentals and strategies of cooperative and collaborative learning, which are summarised in the following principles:

1. Individual responsibility: All group members are responsible for their individual performance within the group.
2. Positive interdependence: Members must depend on each other to achieve a common goal.
3. Collaboration skills: The skills necessary for the group to function effectively, such as teamwork, conflict resolution, leadership, etc.
4. Promotive interaction: Group members interact to develop interpersonal relationships and establish effective learning strategies.
5. Group process: The group reflects periodically and assesses its operation, making the necessary changes to improve its effectiveness.

***Learning based on reflective activity and practical action*** Based on the work of authors of the likes of Jean Piaget, John Dewey and Kurt Lewin, David Kolb, Bernice McCarthy, etc., giving rise to experiential learning, which proposes a student-centred training methodology within a process that is described as a learning cycle and follows a basic approach that can be summarised as having 4 stages:

1. We do something, we have an experience.
2. We reflect on what we have done, on that experience.
3. From this reflection, we draw some conclusions or generalisations, where other elements may also intervene.
4. We apply and test these conclusions in practice.

## ***2.2 2nd Determine the Learning Objectives and/or Outcomes (Learning Based on Cognitive Objectives)***

To set the learning objectives and/or outcomes, one of the approaches indicated in previous chapters can be used. We propose here as guidance the use of the Revised Taxonomy for the digital age, which is based on the initial approach of B. Bloom and Anderson, but adapted to digital environments [1, 2]. The use of domain taxonomy (cognitive, affective, psychomotor) seeks to order the learning process and knowledge creation according to a continuum of different thinking skills, from lower order (LOTS) to higher order thinking skills (HOTS). All incorporating now different activities, tasks and digital resources [2].

Similarly, other taxonomies can serve as guides, one of the best known of which is the one proposed by Marzano and Kendall [3, 4]. As we know, this taxonomy of educational objectives combines four basic systems: a self-awareness system (considering the necessary attitudes and feelings related to motivation towards learning); a cognition system for information processing (composed of four mental processes that must occur consecutively: Memory-understanding-analysis-use, for decision making, problem solving, etc.); a metacognition system (which regulates the systems of thinking and decision-making on the selection of information and the cognitive processes necessary for it) and three knowledge domains: information, mental procedures and psychomotor procedures.

### ***2.3 3rd Establish the Didactic-Methodological Component: Teaching Strategies***

Didactic design refers to the selection and use of various methodological elements that serve to organise and develop different training activities (both face-to-face and online).

In our design, we propose the incorporation of the following aspects into the system, among others.

- Just-in-time teaching (JiTT).
- Peer instruction.
- Team- or project-based learning.
- Gamification.

#### **2.3.1 Just-in-Time Teaching**

Just-in-time teaching (JiTT) is a learning-centred methodology that was first described by Novak and colleagues in the late 1990s [5, 6]. This methodology aims to take advantage of the possibilities of online work in order to get the most out of face-to-face teaching time. With JiTT, through study verification questionnaires, teachers can receive information just in time about problems of understanding content that their students may have [5–10].

On the basis of the students' difficulties or problems of understanding the material proposed, the teacher designs the class, adapting it to these needs just before starting it [9, 11]. By trying to get the students to autonomously study and understand the subject matter beforehand [6, 12], the face-to-face classes can be used to delve deeper into the subject and resolve uncertainties, and help the teacher to adapt to their learning pace [7]. The JiTT methodology not only helps to focus the class on content that is difficult to understood, it also creates a more participatory and

productive environment, replacing the traditional approach of the teacher giving a lecture and the students taking notes.

JiTT has a close relationship with flipped learning in that the students prepare the material before class, and it is also possible for this material to be presented in the form of a video. To date, most studies on this methodology have focused on checking the correlation between the application of this methodology and the improvement of student results [5, 13], and all of them have shown that students using the JiTT methodology improved their results compared to those who did not.

This methodology is recommended for use in classes of around 40–50 students and we can summarise it in the following:

JiTT objectives.

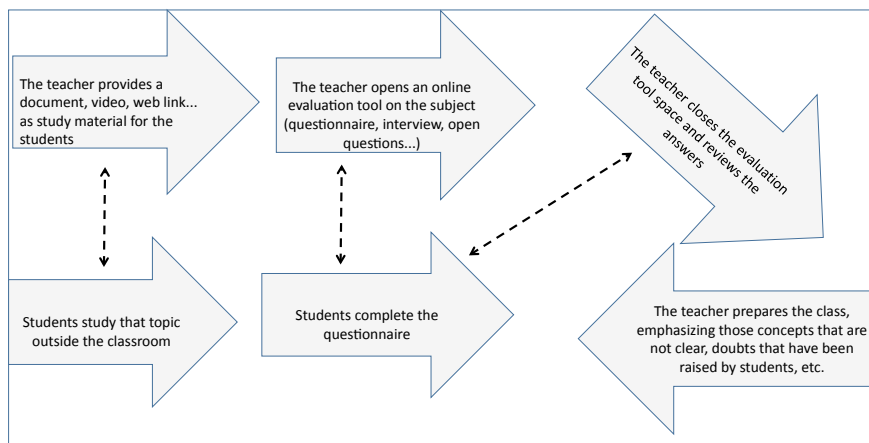
- Ensure students study the topic before class.
- Allow students to study autonomously.
- Encourage students to reflect on the subject.
- Be aware of the concerns (uncertainties, interests, aspirations, etc.) of the students regarding the subject and theoretical content.
- Encourage classroom participation.
- Improve understanding in class.
- Improve learning outcomes.

### Procedure (Steps to Follow)

As Nowak [5] points out, it is necessary to take into account the type of subject taught, the type of content, to identify the parts of the lesson. What content is most relevant? Is it necessary to explain it with practical activities? How should the content be sequenced into different parts? Is it important to make a list of concepts? Once these uncertainties have been resolved, the teacher needs to design a set of questions to test whether or not the students have understood the content. Raising the questions beforehand is a highly important step in the JiTT methodology because this will motivate the students to prepare for the classes. The questions should be broad enough to allow answers that can enrich the class discussion (Fig. 1).

### Teacher's Tasks

At least one week before the beginning of the topic, the teacher should review the materials, modify them if necessary, and create an assessment tool to check whether or not the students have studied and understood the content of the materials provided. Two or three days before the class, the teacher should analyse the answers. One day before the class, the teacher studies the information provided by the students and designs the class on the basis of the uncertainties, concerns and needs expressed by the students. In class, the teacher focuses on the most common uncertainties and misconceptions revealed in the assessment. The teacher can use the answers of the



**Fig. 1** Schematic approach to just-in-time teaching

students to ask questions that encourage reflection. Here are examples of possible questionnaire questions: (1) What do you think are the most interesting ideas about this topic and why? (2) What part needs closer examination in class and why? (3) Write a 100-word summary of the most important parts of the topic; etc. [12].

In this step, it is important for the teacher to select some of the most relevant or interesting answers to discuss in class with the students. The teacher can also respond by written message to any student uncertainties or questions that require attention and send it to all students before class.

The last moment of the process is a final knowledge test or exam. It is important for students not to perceive this as a traditional stressful exam, but as a resource that primarily serves to reinforce their learning. The procedure can be as follows:

- The teacher prepares a questionnaire with the Socrative app. The number of questions is variable, generally around 20 multiple-choice questions. Each student uses their mobile phone (m-learning) in the classroom to individually answer each question (the teacher instantly receives the answers on his screen and can see which questions the students have mostly answered correctly and which ones they have not, and therefore require further explanation).
- Once the questionnaire has been answered individually, several groups are formed (they can be stable groups or randomly created groups for each occasion) to answer the questionnaire again. In this way, the members of the group can debate and compare their opinions. Repeating the questionnaire for a second time as a group is recommended if the number of mistakes is high because the students who did better on the task can help their classmates in this stage of improving understanding and learning.

A variant of this procedure is to use this type of test through m-learning directly, that is to say, without sending queries or questions to the teacher beforehand, using for example applications and technological tools such as Plickers.

#### Resources. Technological Support Tools

- Just-in-time teaching digital library: [https://jittdl.physics.iupui.edu/sign\\_on/](https://jittdl.physics.iupui.edu/sign_on/).
- A digital library with JiTT resources to apply in science classes.
- A page explaining the JiTT methodology and showing some practical examples for biology and physics: <https://jittdl.physics.iupui.edu/jitt/>.
- Practical example: Just-in-time teaching in statistic classroom: <https://www.tandfonline.com/doi/full/10.1080/10691898.2016.1158023?scroll=top&needAccess=true>. This resource is interesting because it highlights the components of the JiTT methodology and also dedicates extensive space to explaining the work week of a teacher carrying out this methodology, including resources used (video, text, etc.), and features a table on what to do and what not to do.
- Plickers.

### 2.3.2 Peer Instruction

Peer Instruction (PI) is an interactive teaching methodology developed by Harvard physics professor Eric Mazur in 1990 [14]. The fundamental element of this methodology is the relationship between students and feedback for the construction of learning in a cooperative way between them, totally modifying the conventional methodology carried out in traditional classrooms [15]. With this methodology, a series of higher cognitive processes is generated through interaction and dialogue between students, and skills, attitudes and values [16] are developed.

The basis of the PI approach is taken from Vygotsky's work and supports the importance of interaction in the learning process because it is understood that this not only entails the reconstruction and active transformation of the subject, but also requires interaction with others. Another aspect of this methodology is that it facilitates cooperative learning, another element that we have highlighted in the theoretical foundations of the b-learning system. The basis of cooperation here is peer learning. This type of learning is defined by Pujolás Maset [17] as the carrying out of tasks or activities that allow discussion and debate among students, encouraging the construction of learning together [18].

In summary, this methodology represents a change in the traditional way of designing a class: the process begins with the explanation of a concept by the teacher, followed by the students answering a set of questions raised regarding the concept. These questions will be multiple choice or dichotomous in order to examine understanding of the essential concepts of the subject; the questions raised are based on hypothetical situations and students must predict what will happen by applying their logical

**Table 1** Advantages and disadvantages of peer instruction

| Advantages                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Disadvantages                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Significant learning improvements<br>Can be used in different disciplines<br>Complements other active methodologies<br>Generates active learning<br>Allows interaction and dynamism in classes<br>Learning is built through interaction and dialogue<br>Student-centred teaching<br>Encourages argument and teamwork skills<br>Immediate and individualised feedback for students<br>Immediate feedback for the teacher on the degree of understanding of the students | Need for a large battery of questions<br>Takes longer to plan<br>Need for students to organise their time<br>Need for self-regulation of learning by students<br>The custom of students to work individually and competitively<br>Resistance by students to new class dynamics<br>Possible risks in class development |

*Source* Franken and Marinovic [15], Olave and Villarreal [19]

and critical reasoning and understanding of the subject [12]. Once these questions have been raised, the students reflect on the answer individually and then establish an interaction and dialogue together to discuss its foundations or explain the choice of their respective answers.

PI objectives.

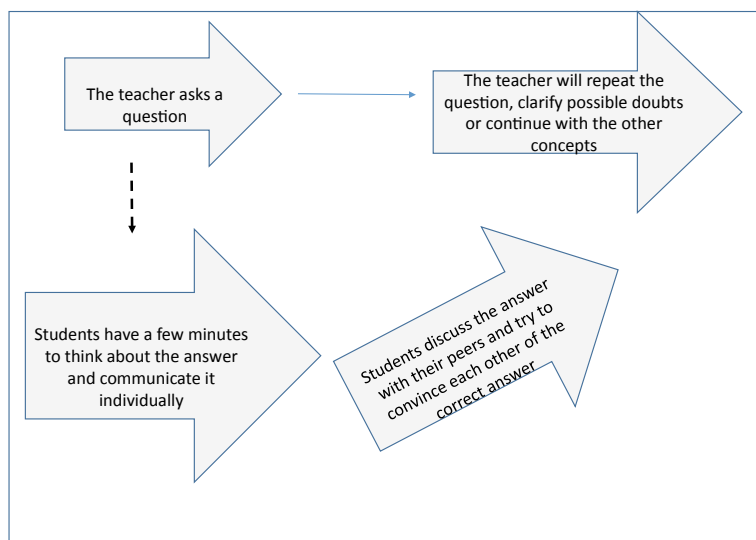
- Generate multiple discussions and debates in class between pairs of students.
- Assess student understanding.
- Encourage participation.
- Promote meaningful learning.
- Motivate students towards learning and towards the subject.
- Encourage students to develop their argument skills and to work in a team (Table 1). Procedure to follow (Fig. 2).

**2.3.3 Teacher’s Tasks**

Before the Class

The teacher should have prepared the content and textual, audio-visual and/or graphic resources before starting to work on the new content, making it available to students [20]. The students should consult all of the material before each class in order to be able to use the face-to-face time more effectively to discuss the relevant and key content of each topic [20] at a higher level of complexity and understanding, checking students’ ability to analyse, as well as their ability to assess situations and predict what the effect will or should be if a certain purpose is sought [12].

The teacher will then have to design at least 10 or 12 questions for each class with dichotomous or multiple-choice answers related to the topic being taught [9].



**Fig. 2** Schematic approach to peer instruction. *Source* Compiled by the author based on Pinargote Vera [20]

### During the Class

Prieto Martín [12] describes the following procedure for developing PI during a class: The teacher provides mini-explanations and intersperses them with multiple-choice comprehension and conceptual application questions. The students have to think and give the answer individually, then discuss the answer with the closest partner who has chosen a different option.

They then have to respond again by conducting a general discussion to explain the answers. Finally, the teacher assesses the answers taking into account the following aspects: if the percentage of correct answers is less than 30%, the teacher offers clues or optional details and again asks a set of questions. The teacher can also ask a student who answered correctly to explain why the answer is correct and the others are incorrect.

If 30–70% are correct, the students discuss the answers again and those who changed their answers may be asked to explain why they did so. If 70% are correct, the students who answered correctly explain their answers out loud, and the teacher may offer a brief explanation and move on to the next concept [12].

### Resources and Technological Support Tools

- KAHOOT: a classroom response platform for creating online questionnaires and polls for students (<https://kahoot.it/>).

- SOCRATIVE: intelligent response system for creating questions, quizzes and games for students (<https://www.socrative.com>).
- QUIZZIZ: quizzes with a multiplayer mode (<https://quizizz.com/>).
- CLICKERS: devices consisting of a transmitter and rCard USB receiver that can be used to get quick information and feedback from the audience and can be used in activities carried out with PI.
- PLICKERS: augmented reality tool for conducting multiple-choice tests and asking questions through mobile phones or tablets in order to get answers in real time and provide information about correct answers and errors (<https://www.plickers.com>), supporting formative assessment tasks.
- Smartphones, tablets, computers, interactive whiteboards, Internet access.
- Practical example, Peer Instruction in the Humanities Project: based on a project in which the PI methodology is implemented in the humanities discipline (<https://artsonline.monash.edu.au/peer-instruction-in-the-humanities/>).

### 2.3.4 Project-Based Learning (PBL)

The third component of the methodological process is project-based learning. For practical purposes, this methodology also helps us to organise work groups and create a learning community based on the principles of collaborative learning outlined above (division of work, distribution of roles within the group, assumption of individual responsibility, etc.).

Project-based learning lies fully within the philosophy of active and participatory methodologies. That is to say, it seeks to develop two clear components or objectives: learning by doing and the fundamental aspect of connecting the theoretical subject matter of the classroom to real situations, related to the application and transfer of knowledge. Along with this, it also undoubtedly involves working in teams, the basis of professional and work performance.

The origin of the idea of learning based on projects lies in the work of J. Dewey and his commitment to learning based on experience in the context of his experimental school, although it was his disciple W.H. Kilpatrick who actually developed and defined this methodology. Imaz [21] describes some of the basic characteristics of this methodology, as well as its immediate antecedents, most notably its use in universities such as the University of Maastrich in the Netherlands, the University of Aalborg in Denmark and the Buck Institute of Education in California [22]. In Spain, it was also gradually introduced as shown by the holding of two State Project-Based Learning Symposiums (San Sebastián in 2011 and Seville in 2012), which were essentially aimed at pre-university education levels.

## Procedure to Follow

The procedure to follow in our proposal is the following:

1. Plan the organisational aspects: this firstly involves the organisation of work groups. Participants should be organised in groups of 6–8 members (the number may vary and depends on the total class size).
2. Select the project topics (depending on the programme of the subject). A class session is dedicated to presenting the possible topics using an inductive type strategy through directed discussion, brainstorming, etc., in which, starting from different realities, the target subjects are located in scenarios in which their daily lives unfold (family, neighbourhood, community, natural spaces such as public parks, streets, squares, institutional spaces such as different kinds of centre, etc.). In many cases, the scenario largely decides the way of identifying the topics, but there can obviously be other possible criteria depending on the subject matter to work on.
3. Set the guidelines and rules of operation of the groups. At this time, the assignment of groups and distribution of tasks is sought, setting the roles that students must play.
4. Set the work plan. With the help of the teacher, each group must set their work plan: information search, trips outside, preparation of the final report, etc. The elements of the project must also be defined: title (acronym); recipients or beneficiaries; purpose, foundation, objectives; description and physical location, spatial coverage; activities and tasks; methodology; calendar; human resources, material resources, etc.; and criteria for project assessment. All projects must fulfil two basic criteria: they must refer to a concrete reality and make proposals for improvement and/or change of that reality.
5. Implement the project. This step is defined in the project approach, but it is rarely implemented in reality given the time constraints imposed by the academic calendar. All of the projects are presented by the work groups to the class as a whole, either in person or by creating a project blog.

In short, the b-learning system facilitates the practical work component of the PBL methodological strategy (both in preparation sessions inside and outside the classroom) and becomes an educational strategy with great possibilities that particularly encourages the participants and motivates them about the topic addressed. Students become active agents of their own learning and begin to value group work and understand the importance of discussing different work approaches; it involves assuming a professional method of work based on debate, reflection and informed and consensual decision-making among all. Finally, from the perspective of values, this dynamic facilitates the acquisition of relational and affective objectives through respect for peer opinions, open dialogue, responsibility and commitment to the group. Similarly, group work socialises, helps to overcome disputes and raises awareness of the needs of members and, depending on the disciplinary field in question, can promote community intervention actions.

### Technological Support Resources

To the basic elements of traditional cooperative learning is added the more recent pedagogical approach of computer-supported collaborative learning (CSCL). Regarding CSCL environments and applications, there are numerous examples of groupware systems and diverse software in the pedagogical literature and on the market that allow shared work spaces to be generated. One of these is computer-supported intentional learning environments (CSILE) created by Scardamalia and Bereiter which has given rise to the Knowledge Forum platform for the joint creation of materials. Similarly, the Synergeia Forum, defined generically as groupware, is an example of a knowledge construction space.

Other resources that can also be used include Google Drive to help coordinate different groups, Blogger to create the project blog, cooperative editors in LATEX environments, such as Overleaf, designed for academic work related to research and writing documents or presentations which facilitate cooperative work and help group participants to improve their work and general academic collaboration.

In this case, as with all BL methodologies, the idea is to use technological resources to contribute to the objective of generating a learning or practice community, also related to the idea of expansive learning, which benefits from constant connectivity thanks to new developments and improvements of digital technologies and devices.

### 2.3.5 Gamification

Games, in any of their formats, are highly popular, widely used, and present in all stages of our lives. Through games, we socialise, have fun, interact with non-real characters, follow rules, seek information, learn to solve problems, make decisions, etc.

The use of games in the classroom presents a wide variety of possibilities depending on their type (correspondence, collecting, resource management, strategy, construction, resolution, exploration, role, memory, etc.), whose benefits affect various areas of cognitive, social, affective, communicative and psychomotor development [23]. There is a group of these games that are considered ‘serious games’ (SG) [24], designed for learning certain content or skills. These types of games are part of ‘game-based learning’ (GBL), which involves the use of games as a tool to support learning, through training, research or knowledge assessment [25, 26].

In addition to this, a type of methodology called gamification has been developed over recent few years, using the elements and rules of games to promote active learning and generate participatory and playful dynamics in educational contexts [27, 28]. Gamification-based teaching seeks to increase the intrinsic motivation of the student by offering an environment of relationship and interaction, competence and autonomy [29]. At the same time, it promotes collaboration, role play, progression in the achievement of objectives, etc. [29–31]. To do so, gamification uses the mechanisms of the game as points, rankings, badges, and rules in situations that alone do not allow it to be played (Table 2).

**Table 2** Differences between gamification and GBL

| Gamification                                                                                                                  | Game-based learning (GBL)                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Geared towards the achievement of objectives that will facilitate the acquisition of content or development of various skills | Geared towards the learning of a specific content or ability                                    |
| It consists of the use of game mechanics in traditionally non-recreational environments                                       | It consists of the use of games and videogames for educational purposes in educational contexts |
| The student is expected to participate in diverse learning situations                                                         | Students are expected to engage in a specific learning experience                               |
| Experience points, achievements, rewards, incentives, badges                                                                  | Experience towards critical thinking and problem solving                                        |

*Source* Compiled by the author: based on Rodríguez and Santiago [31], Zicherman and Cunningham [27]

### Procedure to Follow

It essentially involves establishing a system of points, rewards, etc., which each group obtains as it progresses towards the development and achievement of learning objectives or results. Werbach and Hunter [32] mention the elements that must be present in a teaching setting with the use of gamification:

- **Points:** in addition to providing constant feedback to the player and data for the designer, they indicate progression, determine winning states and encourage competition. In addition, achieving rewards and reaching levels can also be linked to a certain number of points.
- **Badges:** the visual representation of an achievement. Both points and badges are intended to satisfy the innate urge to collect things, with badges also being aesthetically pleasing.
- **Scoreboards:** These show the achievements of players in descending order and are intended to motivate players to move up the classification, although they can also be demotivating.
- **Levels:** defined steps in player progression. They are usually challenges or missions presented in advance to participants.
- **Avatars:** These are graphics that represent and clearly identify the character of a player.
- **Combat:** These are short battles or duels that involve states of clear victory and the mechanics of competition.

### Technological support resources

As a framework for designing gamification systems, 6D Framework [32] consisting of 6 stages can be used.

- (1) *Delineate target behaviours*; establish what knowledge or attitudes students are intended to acquire or practise through play.

- (2) Describe your players. This involves defining the behaviour of the players, the roles of each of the participants.
- (3) Devise activity loops; propose the challenges... What do we have to achieve? These challenges must have different levels of increasing difficulty to adapt to the domain that students have acquired. At the same time, it is necessary to define and describe the rules that must be followed.
- (4) Don't forget the fun; propose a motivating competition.
- (5) *Deploy the appropriate tools*; among these are reward systems (badges). Rewards are a fundamental part of the game and as such must be very well established to maintain motivation among students. The external elements or extras that can be used during the gamification process must also be defined.

## 2.4 *4th Coordination and Sequencing of Classroom Activities (P-activity) and Online or Non-classroom Activities (E-activity)*

A fundamental aspect in the implementation of the BL system is the coordination and organisation of the activities to be carried out by the students. It is in this stage where all planning is put into play, in which the principles of activity, collaboration, action-reflection cycle, etc. must be articulated. As we have pointed out, the basic idea is to start from learning objectives and/or outcomes, which are organised into stages of increasing complexity. Each of these objectives should give rise to different types of activity that are proposed as the course progresses, both in the classroom or virtual environment and in the physical or face-to-face classroom. It is therefore a question of dividing the academic year by establishing a calendar of work sessions based on the time available. To assist in the sequencing of the tasks and activities that students must perform in the BL system, various strategies can be taken into account. An easy one to apply is the model proposed by Dee Fink in 2003 called the castle-top or merloned model [33]. This approach suggests alternating online and face-to-face activities in an ordered time sequence.

### 2.4.1 The P-activities (Face-to-Face Activities)

F2F activities are designed from the idea of the dynamics of active participation and group interaction, based primarily on presentations, debate and discussion and reflective practices. The activities to be carried out in the classroom can be of an individual or group type and are carried out in a complementary way to the presentation by the teacher of the main content of the programme. The possibilities of learning activities or tasks can be varied. Part of the activities to be carried out are derived from

teaching methodologies such as peer-tutoring and PBL. In our system, the activities are grouped into several types: participatory dynamics: workshops, case studies and problems, group work, which allow the exchange of knowledge, skills, attitudes and experiences; presentations, sharing, expert seminars, etc., and assessment activities (tests and questionnaires).

In general, the basic class content for each topic is provided in writing to the students in the content management platform used (LMS, CLMS), along with complementary support literature, audio-visual resources and activities and tasks proposed by the teacher. This allows the presentation classes to be dedicated to presenting thematic outlines, summarising and reviewing the most significant content, offering global perspectives on a topic, making known recent research, clarifying a conceptual structure that is difficult or laborious to understand, clarifying uncertainties, etc. Together with this kind of theory lesson, practical classes are designed, as indicated, from the pedagogical principle of project-based learning, and consist of the carrying out of dynamic activities that involve organising the class into several groups of 6–8 students who propose various socio-educational intervention projects. Most of the content of the subjects is inserted into these projects to ensure that the content to be learned does not appear in a decontextualised manner from the teacher, but is identified with a reality and problem related to the discipline being worked on, for which students seek potential real or innovative solutions. For all of this, it is necessary to use different spaces and media in addition to the classroom (Internet, dynamic or psychomotor room, library, documentation centres, social centres, etc.)

#### **2.4.2 The E-activities (Online)**

In most cases, the BL system is not created from scratch, but is often part of a face-to-face system in which everything (spaces, times, curricular framework, administrative requirements, etc.) is designed from that logic. For this reason, the procedure for integrating the virtual part must be done gradually in order not to overload the student's activity (not forgetting that of the teacher).

Much of the activity that takes place outside the physical classroom involves prior independent study. This kind of study should be guided and controlled in order to be really useful. This guidance involves providing students with different kinds of digital material or resources such as: Knowledge pills, which are an example of so-called virtual learning objects [34], pre-recorded videos with an approximate duration of 5 min that serve to personalise certain content; documentary material: articles, book chapters and teacher notes.

This type of procedure, based on just-in-time teaching [5, 6, 9, 10, 13], has two objectives: firstly, to control the prior study of the participant (for which various technological tools and questionnaires such as Socrative, Kahhot!, Edpuzzle, Google forms, Office 365, etc., can be used), and, secondly, to serve as a basis for preparing classes on students' prior questions and uncertainties. In this way, part of the face-to-face classes are intended to answer questions, uncertainties, requests to expand on content, complementary aspects, etc.

The third moment of the process is the exam, the knowledge test. It is important for students not to perceive this as a traditional stressful exam, but as a resource that primarily serves to reinforce their learning. The specific procedure to follow here may be the following: the teacher prepares a questionnaire with the *Socrative* app. The number of questions is variable, generally around 20 multiple-choice questions. Each student uses their mobile phone (m-learning) in the classroom to individually answer each question (the teacher instantly receives the answers on his screen and can see which questions the students have mostly answered correctly and which ones they have not, and therefore require further explanation). Once the questionnaire has been answered individually, several groups are formed (they can be stable groups or randomly created groups for each occasion) to answer the questionnaire again, in this case, introducing debate and the contrasting opinions of the members of the group. Repeating the questionnaire for a second time as a group is recommended if the number of mistakes is high because the students who did better on the task can help their classmates in this stage of improving understanding and learning.

A variant of this procedure is to use this type of test through m-learning directly, that is to say, without sending queries or questions to the teacher beforehand.

In addition to the prior independent study, for the e-activities, the following can be carried out: e-portfolio, online groupware tools, podcasts, vodcats, wikis, student blog, forums, reading of academic articles, etc.

### 2.4.3 Design of E-activities

For this section, we follow the contributions of Gilly Salomon [35], according to the following 4 stages of the training process [36].

- Stage 1: Access and motivation;
- Stage 2: Online socialisation;
- Stage 3: Information exchange;
- Stage 4: knowledge construction.

For each of these stages, it is necessary to prepare specific activities. Each of the activities must be designed according to the same pattern:

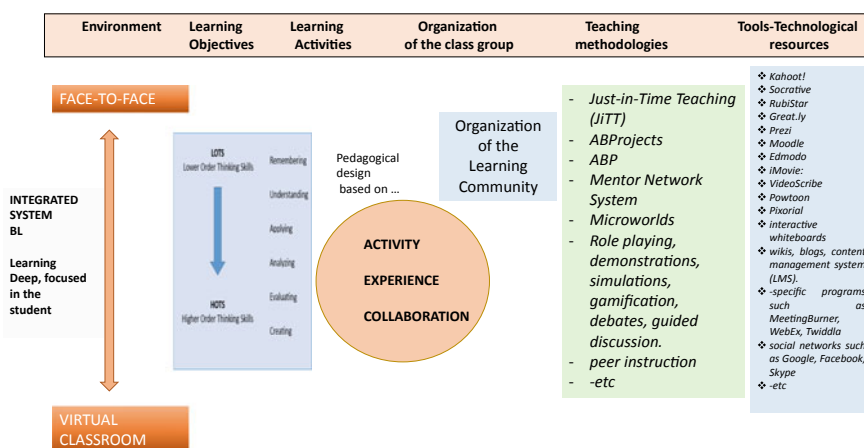
- Stage in which it is located, purpose,
- Motivating stimulus,
- Number of participants,
- Expected actions of the students,
- Expected preparation time (teacher),
- Expected completion time (students),
- Teacher's actions (messages, instructions, deadlines, etc.),
- Assessment systems,
- Technological tools required.

## 2.5 5th Establish a System of Tutoring and Individualised Guidance

One of the duties of university teachers is giving students individual attention in order to guide their study, follow their personal work, provide bibliographic sources, clarify uncertainties of various kinds, offer direction and methodological advice on the preparation of individual or group projects, etc. In addition to the above, tutorials are a good way of providing the student with more vivid feedback on their learning process, providing more personal knowledge of the student and establishing a relatively individualised relationship. Tutorials should, therefore, be considered an essential resource complementary to classroom activity, particularly necessary in the monitoring and guidance of individual or group work, and the preparation of project design and implementation of activities. It is, therefore, necessary to establish an online tutoring system using the usual tools available in CSL systems, coordinated with the attendance of students in F2F tutorials.

### 2.5.1 Final Consideration

Student-centred learning, through a training model in which F2F teaching and e-learning converge, demands not only a greater workload for the teacher and students, but also active involvement of the students. Opting for this dynamic undoubtedly requires a broad consensus of the academic organisation and the involvement of other teachers to ensure the necessary institutional coherence and standardisation (Fig. 3).



**Fig. 3** Main theoretical and pedagogical design elements of the b-learning system. Own elaboration

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# Learning and Development of Practical Skills Through the B-Learning Strategy



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and Sara Serrate González

**Abstract** The aim of this chapter is to present a training proposal to enhance the acquisition of professional competences in practicum courses or external curricular work placements as part of university degree studies based on the blended-learning strategy. We present a proposal based on three stages (S1. Initial training, S2. Assignment and joining the centre and S3. Assessment and monitoring) in which continuous communication between the agents involved (students, academic tutors and professional tutors), student support in the teaching–learning process and continuous assessment are guaranteed. We stress the need for the university institution to articulate mechanisms to provide students with effective and quality training adapted to the needs and requirements of the social, business and employment system of today’s society.

**Keywords** Blended learning · Practical competences · Practicum · External work placements

## 1 Introduction

The new focus on competence-based training in the university sphere presents itself as a challenge in the framework of the knowledge society. The current teaching–learning dynamic focuses attention on the education of students and their leading role in the process of learning, specifically, in developing skills that can be easily applied to the complex and changing social and employment world [1, 2]. It involves incorporating and implementing methodologies that promote meaningful,

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experiential and cooperative learning in which the student is an active part of the process [3].

The creation of the European Higher Education Area (EHEA) constitutes a need, opportunity and requirement to achieve efficiency and competitiveness in line with the new requirements of the employment and social world. A university education that must integrate knowledge, but also basic and cross-disciplinary skills related to the comprehensive education of people and the competences associated with vocational training [4]. A significant change resulting from the process of transformation to adapt to the EHEA is the emergence of the professional competences that students must acquire.

The practical training of students constitutes one of the most relevant areas in the curricula of different degrees [5]. A practicum is conceived as an ideal setting both to acquire and put into practice professional competences and to facilitate the move from academia to the world of work [6].

External work placement activities seek to enable the practical application of the knowledge, skills, abilities and competences that have been acquired by students during their courses. Given the inclusive nature of a practicum, it should be possible to apply both the competences acquired in subjects studied and generic and cross-disciplinary competences.

Institutions, centres and companies expect graduates to have the technical competences of the discipline studied, but also to show a wide range of skills and attributes such as teamwork, communication, leadership, critical thinking and problem solving [7].

In line with the theoretical budgets that inspire the European Higher Education Area, practicums are a subject of great educational potential given the strong link between theory and practice and the possibility of carrying out activities that allow the acquisition and development of competences for the exercise of the profession [8]. A practicum that, according to [9], takes the form of 'a space for interconnection between the university and the productive system, through which it contributes to developing in future professionals the knowledge, abilities and attitudes inherent to good professional performance, through involvement in professional activities in real contexts and conditions to achieve a higher professional grade' (p. 11).

Practicums, supervised practice, curricular practice, teaching practice, business practice, etc., become a crucial subject to complete and enrich teaching-learning processes, bringing students closer to the reality of the professional context. It constitutes an ideal framework to enable students to apply the theoretical and practical knowledge acquired during their studies, providing them with work experience and the opportunity to contribute to the development of their own knowledge [10, 11]. A practicum that, according to [12], is 'intended to enrich education by complementing academic learning (theory and practice) with experience (also educational, that is to say, linked to learning) in workplaces (p. 314).

And to say of [13] with an educational purpose: its aims must be educational, its ways of materialising and experiencing pedagogical, its experiences clearly orientated towards diversified and complex learning (knowing, knowing how to do,

knowing how to be and knowing oneself), 'socialising' in the intervention of theory and praxis, text and context for comprehensive education (not only academic and professional of our students, 'its significant practices' for academic qualification and the aims explained in the profile of each degree. Aware of the important educational role of practicums, it has been incorporated into real work contexts on different university courses, since it allows students to come into direct contact with the professional environment, reality and work in a space of integration and encounter between theory and practice from the perspective of competences [14]. It is therefore a strategic period of the professional socialisation process by becoming:

one of the areas that arouses most interest in this process of convergence, perhaps because of the key role it plays as an element of transit between the university institution and the professional field. [15] (p. 342)

Authors such as [16] highlight the change that has occurred in the world of work, with employers no longer demanding great volumes of knowledge or highly specialised technical skills, preferring instead other types of abilities and competences such as the ability to make decisions, learn for yourself, work in groups, etc.

'In the curricular framework of university studies, practicums become the indispensable environment in which to analyse the educational methods necessary to help each student competently apply the knowledge and skills acquired for the execution of professional work' [17] (p. 456). A practicum as a space for reflection, since it is possible [18] to see, make, see make and make see. Practical activities that bring students closer to the culture of the profession and the contexts where it is practised, where they can put into practice the ability to observe and reflect on the experience and generate cognitive frames of reference to integrate theory and practice [19], while helping to develop competences such as teamwork, responsibility, planning, innovation, communication skills, initiative and conflict management, along with the integration of information.

Today's society demands active participation in its vital processes, which requires a new way of learning, of conceiving the training process as a means of acquiring competences appropriate to the jobs market, improving employability, but without abandoning theoretical knowledge. Education must be transformed into a practical activity related to theoretical activity, becoming an interactive process in which both complement each other.

Participation in professional activities tutored by teachers and professionals in the exercise of what we call practicum facilitates, in addition to making contact with reality and enriching educational settings, the mastery of the subject matter to be learned, carrying out of tasks and, of course, the development of competences, skills and abilities.

The proposal of external work placements must be well integrated into the educational programmes of university degree studies as a complementary discipline and educational experience with respect to other personal and professional activities and facilitate the integration of theory and practice in the application of knowledge to real contexts.

In short, practicums must be conceived as spaces that lead to the gradual immersion of students into the realities of the profession, enabling theory and practice to be integrated and promoting the transfer of competences (knowledge and skills) acquired and the construction of professional identity. Due to its same characteristics, in bringing the professional world closer, it promotes the acquisition and integration of content and develops competences, such as communication skills, teamwork and the assumption of responsibilities or skills in problem solving, development of critical capacity, etc. [20–22].

Practicums are a great opportunity to make students face themselves and their personal strengths and weaknesses when approaching real situations of professional practice that require personal involvement, thus influencing the personal dimension of subjects and the management of their own emotions, values, capacity of judgement and reasoning, etc., by placing them in a framework of action in which they must use all of their personal resources (what they know, what they are), aspects of work placements that require them to have other types of competences different to those used in conventional academic activities.

## **2 Development of Practical and Professional Competences in University Education**

Periods of external curricular work placement are organised, in the majority of university degrees, on a time and space basis different to *class time* by becoming what we call *company time*, in which students are incorporated into the day-to-day life of the host organisation. Different circumstances may occur, but the most common is for students to leave their university classrooms, carry out a work placement and then return to the university to finish their studies. It is a time and space in which the intern is still a university student, but is integrated into the entity or company as a trainee who is required to carry out professional work. This work has a dual aim: the first is that during the time that students are in the organisation, their functions and services will be a benefit to the entity and subjects with whom they intervene, and the second, and more importantly, that this completion of tasks and functions will allow them to continue learning as it constitutes training time.

External work placements provide, therefore, constructive and active learning by offering pre-professional students a real opportunity to develop, acquire and practise competences. The aim of this period is ‘to empower the person, to get them to do activities that they did not previously do or did differently’ [23] (p. 80) and, that way of doing something ‘different’ is what differentiates them from simulated contexts in classrooms or small segregated experiments in the subjects in which they have participated during their years of education. What is sought here is the giving of unity to the body of acquired knowledge that enables them to acquire and develop skills for professional practice.

Responsibility for external work placements lies with the university institution and its teachers, given that it forms part of the curriculum. The peculiarity is that this subject involves the essential collaboration of professionals who welcome and support students during this period. Thus, the responsibility for learning is three-dimensional, as it rests with the student, who has to manage their learning autonomously, with the academic tutor, who, as one of the teachers on the degree course, is responsible for the academic aspect of the subject, and the professional tutor in the organisation who is responsible for supporting and assessing the professional work.

Practicums offer, therefore, real practice opportunities in which the student can develop personal and behavioural skills, but requires academic and professional support in order to ensure a period of significant learning.

From the focus of competence-based training, predominant in the training processes of external work placements, it is important to keep in mind that if competences are a combination of knowledge, capabilities and behaviours [24]:

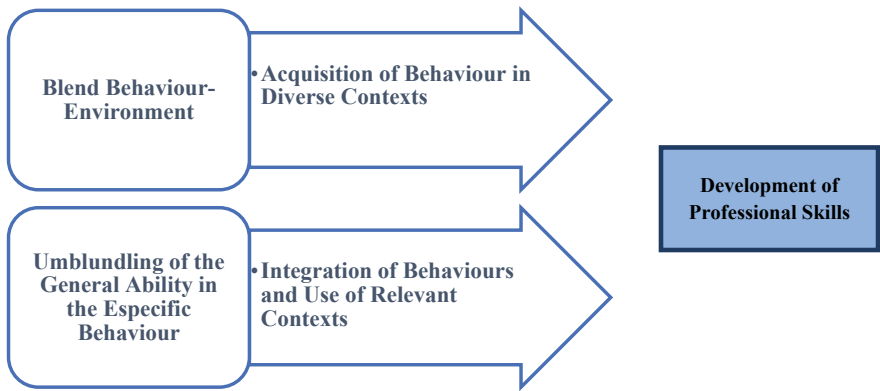
competence is not the simple sum of particular knowledge and skills, competence constantly articulates, composes, doses and weighs these diverse resources and it is the result of their integration. Thus, competences are translated into generic skills or abilities that allow people to efficiently perform their professional functions. [23] (p. 80).

And in this regard, working with students requires a continuous monitoring process where those responsible for learning, in this case teachers and professionals, must assess whether these abilities are learned and internalised knowing that, as pointed out by [23], the behaviour-environment combination takes into account that learning during a practicum represents markedly contextual learning. We refer to learning in a given environment that offers them the possibility of making decisions regarding the suitability of some behaviours compared to others and the disaggregation of general ability, translated into specific representative behaviours, where the development aim is improvement, and all of this translates into clearly observable behaviour units that facilitate the acquisition, anchoring and use of knowledge (Fig. 1).

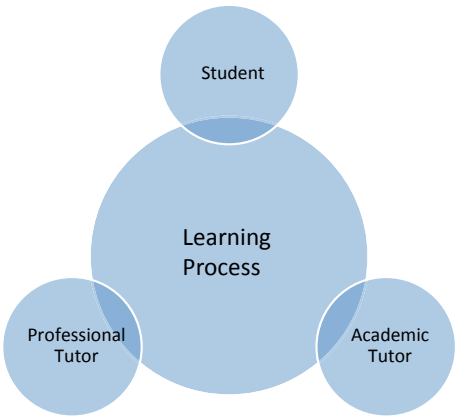
Therefore, it is important that during the external work placement period there is continuous communication between the different agents involved in order to maximise the acquisition of practical competences, taking into account that:

- The **professional tutor** is the one who acts as a guide in the work placement context by having the opportunity to see how the student applies the knowledge and develops the behaviours and competences in the professional context, offering guidance for improvement.
- The **academic tutor** is the one who provides guidance to the student if difficulties arise, knowledge is questioned or it is necessary to reinforce previously acquired learning to adapt to the work placement environment (Fig. 2).

In the approach presented, the teaching–learning process is based on participation and reciprocity from an androgynous model [25], where there must be synergy and direct contact between the tutors to enable students to be involved in the development of their own learning. It is a teaching–learning process where self-learning strategies



**Fig. 1** Development of professional competences [23]



**Fig. 2** Participating components in the learning process

are enhanced through experience, where tutors act as facilitators in the acquisition of abilities and skills, and the promotion of creativity [26] and where the teaching process becomes a dynamic and interactive process, facilitating continuous on-site training and assessment.

The current reality, however, enables students to integrate into various work place-ment processes that sometimes make it difficult to monitor and contact the student, even more so, when the placements are carried out in other parts of the country to where the university is located. This is why new training models are implemented to overcome the difficulties that practicums represent and hence we think of the support of a combined approach as a promoter of a better training process for students.

### 3 Practical Training Through the B-Learning Strategy

Information and communication technology (ICT) offers teachers the opportunity to innovate and improve the quality of teaching–learning processes in the university context [27] and this is where we consider the significance that blended learning strategies can have on learning and the development of practical abilities. What can ICT contribute when seeking to improve the potential of practicums? In principle, the virtual teaching and learning environment improves adaptation to the rhythms, interests and needs of each student, and it provides us with advantages such as allowing us to introduce aspects as significant as the encouragement of a greater role for students in regulating and controlling their own learning process and increasing the quantity and quality of interactions between teacher and students, and between students.

In this context that we present, in which a curricular subject requires the intervention of different educational agents and the participation of students in different contexts and spaces, it is important to ensure that students feel supported at all times, in person and virtually, and to have an activity log with which to observe the learning process and provide students with spaces for feedback. Among new training settings are combined teaching models known as blended learning, b-learning or BL. It is a teaching–learning model that includes face-to-face and e-learning education, enhancing the advantages of both approaches [28–30]. The particularity of this model is that it results in the convergence of two learning environments, one of them face-to-face, which has a long tradition in European university systems, and the other virtual, which is increasingly becoming more popular by being able to expand and offer new possibilities for interaction and communication [31, 32]. It takes the form of a hybrid or mixed and flexible system characterised by interactivity, which facilitates the combination of resources and tools for information and communication and overcomes limitations of space and time in the educational process [33–36]. In addition, this model ‘integrates fundamental elements such as educational innovation, advancement of ICT and updating of teaching practices, promoting student learning as a whole’ [37] (p. 56).

In this regard, the potential of the b-learning model, already revealed in other educational contexts [38, 39], makes it possible to overcome physical and time barriers and articulate a face-to-face and virtual space in which tutors and students share the teaching–learning process offered by the practice space. It must be taken into account that, unlike other subjects, in practicums, there are two face-to-face spaces: the university’s classrooms, where the learning process begins and ends, and the centre or organisation, which the student joins to complete the number of external work placement hours set in the curriculum. And in this regard, b-learning helps us to bring closer, if not unite, the social reality between theories and practice well expressed by [40] ‘education has taught us to separate, compartmentalise, isolate and not unite knowledge, all of which constitutes an unintelligible puzzle. The inability to organise scattered and compartmentalised knowledge leads to an atrophy of the natural mental disposition to contextualise and globalise’ (p. 52).

We must acknowledge that the possibility of varied work placement settings is scarce, so professional contexts can be enriched using networking to compare student experiences. Thus, we must collaborate by analysing the same situation from different cultural or disciplinary perspectives (collaborative learning), based on horizontal communication between our students to share their experiences, situations that undoubtedly enrich one of the basic competences in professional development and ways of doing things: socialisation.

Cyberspace makes it possible to carry out and enrich educational activities in the university teaching environment [41], a virtual framework that provides new, more open learning spaces to assimilate, but above all to manifest how the generic and specific competences that have been acquired in the degree courses are put into action throughout the work placement period. The practicum course is part of this framework, in that connection of theoretical disciplines with reality, in the implementation of functions, in the acquisition of knowledge and in the development of skills and abilities through curricular practices, but the binomial face-to-face/virtual space specifically in external work placements must allow us to monitor and support, as well as to constantly communicate with all involved for the benefit of the student's learning process.

In some studies, it has been highlighted that the widespread use of b-learning was intended to overcome the failure of e-learning [42] by opening the possibility of improving the quality of learning outcomes, correcting the absence of face-to-face contact [43]. Bartolomé [44] and Area and Adell [45] point out that among its objectives is the improvement of learning outcomes through flexibility in times and spaces, access to a wide diversity of resources offered by the teacher and the possibility of new models of interaction between the agents involved, all through the use of technology as a complement to the activities carried out in face-to-face classes. But it also allows the development of education based on digital competence (a key competence for the twenty-first century highlighted in the 2015 OECD DeSeCo report) that allows them to function in a digital and technological society, taking advantage of the benefits of online work and increased autonomy and responsibility of students in their own processes, as elements of educational improvement [32, 37, 43, 46].

Based on the level of implementation of b-learning, authors like [47] and [32] differentiate four typologies: (1) at activity level, (2) at course level, (3) at training programme level and (4) at institutional level. Each of them differs in the combination of face-to-face elements with aspects based on communication mediated by technology, such as the virtual classroom, in which time is organised according to activities, blocks or sections of the same programme, in which space-time is combined. In the last of the typologies, a b-learning institutional model is presupposed, resulting in a reduction in face-to-face hours to offer online itineraries [31]. In our case, the implementation of b-learning is proposed at institutional level in such a way that teaching timetables and times are made more flexible so that students can carry out their work placements by adapting to the needs of the institutions, having time for face-to-face classes in the university and times for training and monitoring through the virtual platform. To implement this educational model, which facilitates

the acquisition of practical competences, it is essential to have the collaboration of teachers, overcoming resistance to this type of educational model [48].

It is worth considering the role of the teacher in the process of designing the b-learning experience to offer the student a quality training process. The teaching staff must determine aspects of planning and methodologies that allow students to learn through the integration of elements such as the control of time, place, rhythm or the route marked through the Internet with supervision in the classroom both in the university and the work placement organisation [49]. There are studies that have determined different patterns of use of the combined methodology by teachers. Based on the combination of resource distribution methods, the combination of teaching methods or the combination of face-to-face instruction with online instruction, authors such as [49], based on previous work, establish two groups of b-learning models in the combination of time and resources used.

- A group of models called Rotation where students change the learning method following a fixed sequence decided by the teacher combining online learning and other group activities or projects, tutorials, etc. The subtypes that would define this rotation model are defined as: (a) class or site rotation model, laboratory rotation model, inverted classroom model or individual rotation model.
- Another group of defined models are called Flexible, based on online learning, with face-to-face support having varying degrees of importance. Among them they define (a) a flexible model in which there is a fluid change between methods and teachers online and in the classroom. It is based on flexibility and adaptation to define the proportion of online and face-to-face support by offering small group activities, projects or tutorials, (b) an à la carte model, where students receive completely virtual courses with a remote teacher and are offered experiences in classroom campus; it is about, as the authors state, course-to-course experiences and (c) an enriched virtual model in which students distribute their time between face-to-face and online learning, through a distribution of content and activities. In this case, these are complete academic experiences, different from the flipped classroom experience, as it does not require a daily presence for students.

In relation to methodology, authors like [31] establish six profiles of teachers; in the first five, the weight of the subject or course is in the face-to-face part although in a different proportion: (1) face-to-face, the face-to-face part is used for activities and presentations, and the virtual part for making the material available to students (2) complementary, in this case, virtuality is used for the distribution of materials and the carrying out of specific activities, maintaining the submission of activities carried out in the face-to-face part (3) overlapping, the virtual part is a complement to the face-to-face part where material is offered and activities are carried out (4) alternate, for 30 and 50% of the subject or course, the virtual space is used, establishing a separation based on aspects of time or type of activities between the virtual and face-to-face parts (5) integrated, this differs from the previous one in that there is no separation between the virtual and face-to-face parts, both are integrated throughout the course or subject. In the last profile described, (6) virtual, teachers undertake their subjects completely in virtual form.

The training activity presented would, to a greater extent, resemble a flexible model where the role of the teacher and the professional tutor would be defined by an integrated profile in which there is no separation between virtuality and face-to-face, with both integrated throughout the practicum as long as they are a continuum in the student's training process. And students are aware that the subject they are taking requires a dual responsibility, the first to maintain a time continuum in face-to-face learning in university classrooms and through the virtual platform, and the second is presence in the work placement centre and the implementation of functions and competences already acquired, as well as their commitment to specialised and situational learning.

## **4 B-Learning Design for Practical Training**

### **4.1 *Instructional Design***

The objective of the design represented is to strengthen the competences of the students and take advantage of the educational opportunities of practicums. This requires the implementation of a rigorous and flexible model, according to the characteristics and requirements of each of the institutions, professional fields and academic profiles to be developed. For the virtual space, Moodle (Modular Object Oriented Dynamic Learning Environment), the free and open-source learning management system (LMS) inspired by the pedagogy of social constructivism, was used, providing a wide variety of tools and functionalities [50].

In this regard, a training model structured into three stages is proposed:

- **Initial training stage**

An initial face-to-face stage prior to the student's incorporation into the external work placement centre.

This initial stage includes a series of training seminars coordinated and taught by both the staff of the external centres and by work placement tutors and managers.

Students are offered information on the characteristics of the work placement centre and its functions, requirements and activities. It is important for the students to know about the different options, not only to help them with their choice, but also to acquaint them with the different professional pathways.

In addition to seminars that provide information on centres and functions, there are also seminars of an educational nature on practical competences. These seminars are structured around 3 blocks of content:

- Practicum organisation and time management
- The portfolio as a tool for reflection on external curricular work placements
- Resilience, assertiveness and professional ethics.

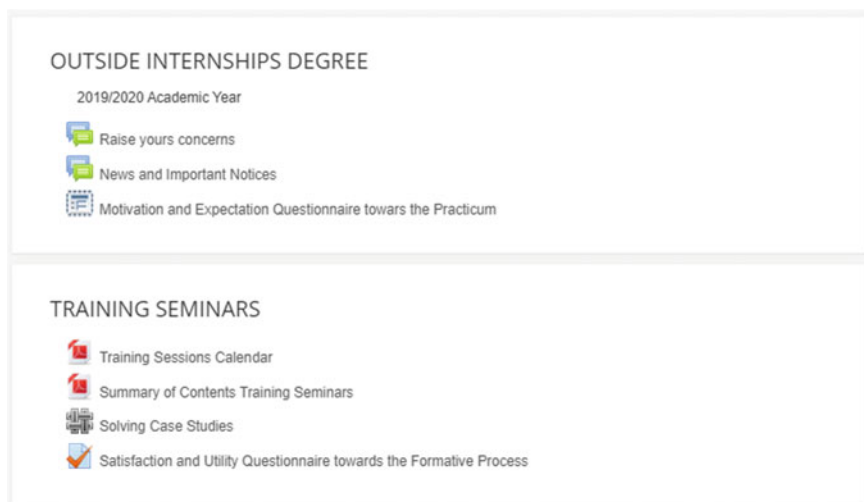
Making students participants and accountable for their professional development requires knowing and identifying their training needs and requirements, offering them the possibility of requesting the kind of content and competences they wish to work on prior to joining the centres. As a tool to find out about students' attitudes towards the practicum and their requirements, an ad hoc questionnaire is produced to identify their degree of interest in the work placement period, initial expectations and training deficiencies, or to find out on which aspects they consider it necessary to receive training prior to joining the centres.

These results are addressed with a questionnaire on training process satisfaction and usefulness and a final questionnaire prior to joining the external centre.

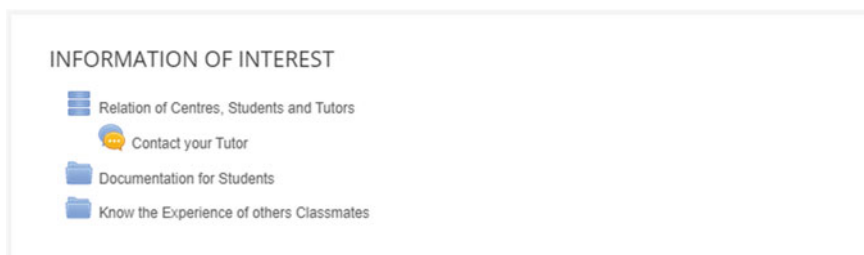
This initial face-to-face stage is supported by the use of Moodle as a virtual training platform (as can be seen in image 1), not only as a tool to communicate to students information about the operation and management of the practicum, but also as a space for sharing opinions and experiences through participation in forums encouraged by the coordination team. In addition to serving as a repository of relevant documents available to students on the professional profile to be developed, the platform also contains a collection of practical cases to be discussed on forums with participation encouraged by academic tutors and professionals (Fig. 3).

- **Assignment and joining the centre stage**

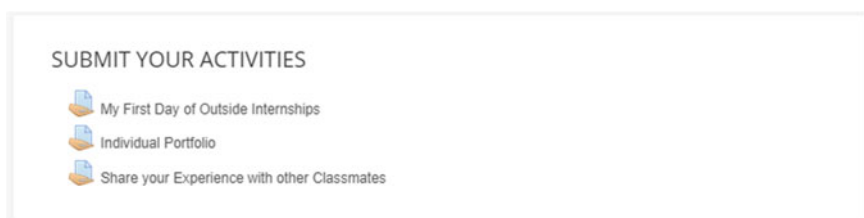
The assignment and joining the centre stage is a period of uncertainty for students, who need to be supported. During this time, the academic tutor needs to be constantly coordinating with the professional tutor.



**Fig. 3** Example of content and seminar presentation (taken from Moodle)



**Fig. 4** Example of content and tools available to the student (taken from Moodle)



**Fig. 5** Tasks requested from the student during the practicum (taken from Moodle)

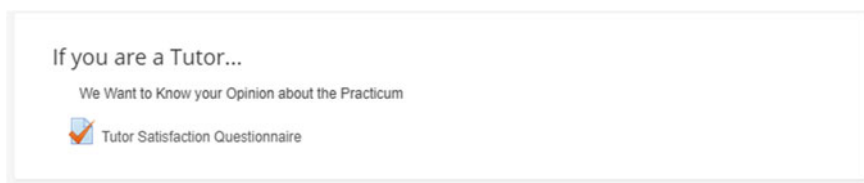
Once the centre and tutors have been assigned, it is a priority to establish the first contacts (see image 2). Knowing that it is not always possible for there to be a face-to-face meeting between the tutors and the students, Moodle is used to communicate information and maintain constant contact with the student through the meeting forum and by email (Fig. 4).

After the first contact with the centre, they are invited to reflect on the first day of the work placement (image 3) and send it to the academic tutor through Moodle within a week of joining. In this activity, the student is asked to reflect on the first professional contact, as well as their expectations and initial feelings (Fig. 5).

Virtual submission of the activity allows the tutor to quickly access the information and offer feedback to the student, offering support and helping to prepare the content for the following virtual and face-to-face meetings according to the characteristics and peculiarities of each tutoring process.

## ***4.2 Monitoring and Assessment of the Practicum Stage***

The academic and professional tutors are jointly responsible for monitoring the student and this requires them to maintain constant contact with each other and the student, given that the student's development and progress is the priority.



**Fig. 6** Assessment questionnaire for tutors (taken from Moodle)

The academic tutor is urged to have at least three one-to-one meetings with each student (at the beginning, during and just after the work placement). These meetings can be face-to-face or virtual, using the messaging tools and applications of different platforms such as Google Hangouts and Skype, which are commonly used by students. The content of these meetings is supported by previous actions and the training needs of the student.

In this regard, it can be affirmed that the assessment of the practicum is not just relegated to the student's appraisal through a final document in which the centre and the activities carried out are described and contextualised, but that it is a continuous and supported process in which the student must acquire sufficient competences to perform a critical assessment of the learning, its usefulness and a number of aspects to improve.

Thus creating a model for educational and process assessment that starts from participation in training seminars, performance of practical cases and reflection carried out in the student's portfolio. In this way, if what is sought is improvement of the professional competences of students and their taking advantage of the potential of the training model, safeguarding the need to grade the student, all agents must be involved in the assessment. In this regard, a satisfaction questionnaire for academic and professional tutors is available on the platform, as well as follow-up meetings by the coordinators of the practicum to propose innovation strategies that result not only in the student's competence development but also in the improvement of the training process (Fig. 6).

The assessment and monitoring stage of the practicum is part of the cyclical and continuous process in which students, based on their experience, collaborate in the initial training of new students with their participation in training seminars and forums, as well as through the recording of a video made available to new students in a section called 'Find out about the experience of other students' (Fig. 7).

## 5 Conclusions

The proposal we present is part of the strategic line of quality in higher education, through which universities must promote training adapted to social, business and employment requirements, which allows students to be trained for optimum professional development. The use of the blended-learning methodological strategy in the

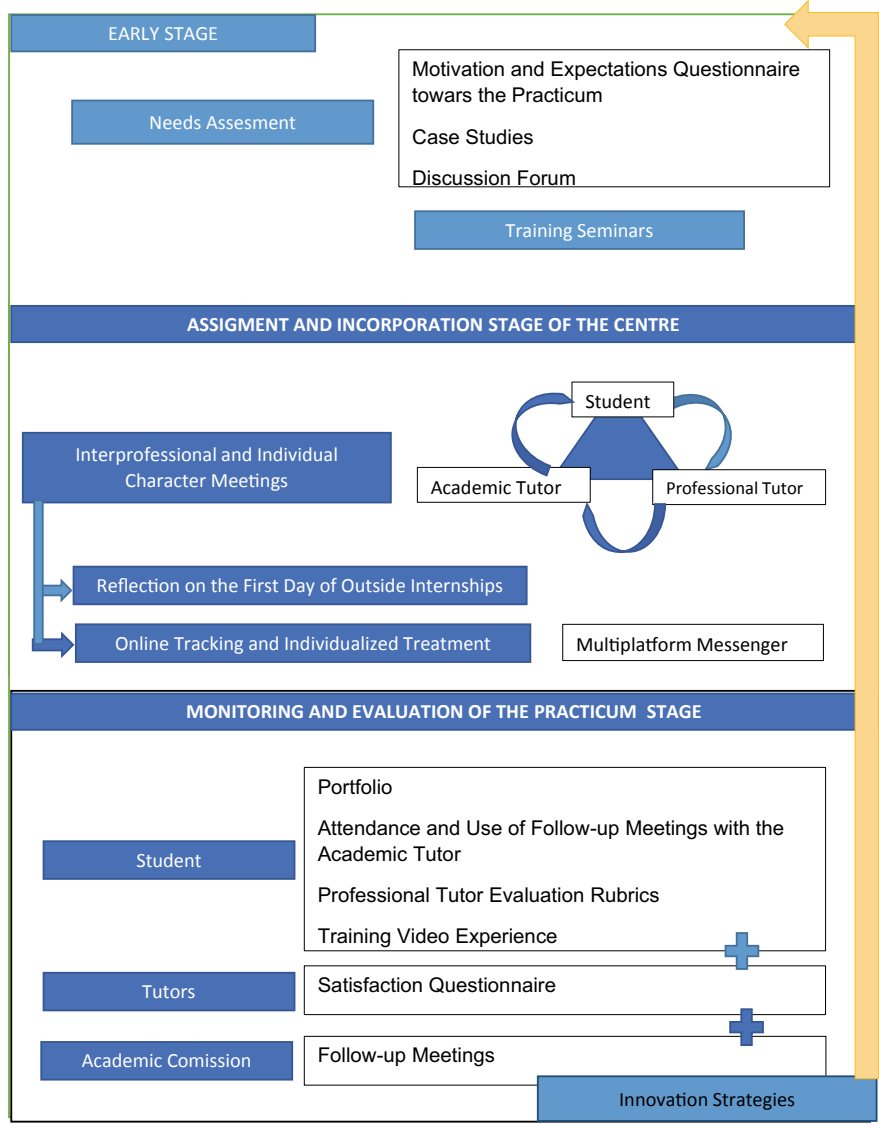


Fig. 7 Training model overview

practicum process allows an interconnection between the agents involved, promotes the performance of the teacher in the tutoring process, and provides support for the student in professional encounters.

Proposing a practicum model through b-learning makes it possible to influence the development of students' professional competences, overcoming some of the space and time limitations of face-to-face models, promoting the overlapping of activities

and, consequently, attending to the peculiarities and requirements of work placement centres [50].

The present three-stage model established is structured under a complementary approach that combines face-to-face and virtual learning, and is part of a cyclical process in which assessment becomes the basis on which to implement innovation and improvement strategies in higher education.

Under this model, therefore, the aim is to ensure effectiveness and efficiency, and improve the quality of teaching–learning processes, responding to the demands and requirements of higher education, also promoting autonomous learning in the student and the possibility to change, amend or adapt the process at any time.

## Annex

Área personal > PRACTICUM GRADO

**Navegación**

**Administración**

- Administración del curso
  - Activar edición
  - Editar ajustes
- Usuarios
- Filtros
- Informes
- Calificaciones
- Gradebook setup
- Copia de seguridad
- Restaurar
- Importar
- Reiniciar
- Banco de preguntas
- Recycle bin
- Cambiar rol a...
- Administración del sitio

**Matrícula UXXI**

Gestionar asignaciones

**Buscar en los foros**

Búsqueda avanzada ?

**Últimas noticias**

Añadir un nuevo tema...  
(Sin novedades aún)

**OUTSIDE INTERNSHIPS DEGREE**  
2019/2020 Academic Year

- Raise your concerns
- News and Important Notices
- Motivation and Expectation Questionnaire towards the Practicum

**INFORMATION OF INTEREST**

- Relation of Centres, Students and Tutors
- Contact your Tutor
- Documentation for Students
- Know the Experience of others Classmates

**TRAINING SEMINARS**

- Training Sessions Calendar
- Summary of Contents Training Seminars
- Solving Case Studies
- Satisfaction and Utility Questionnaire towards the Formative Process

**SUBMIT YOUR ACTIVITIES**

- My First Day of Outside Internships
- Individual Portfolio
- Share your Experience with other Classmates

**If you are a Tutor...**

- We Want to Know your Opinion about the Practicum
- Tutor Satisfaction Questionnaire

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# Students' Perception of Distributed Teaching Presence in Discussion Forums. A Case Study



Rosa María Guilleumas-García, M. Cruz Sánchez-Gómez, Juanjo Mena, and Ana María Pinto-Llorente

**Abstract** The Information and Communication Technologies (ICT) have been implemented regularly in faculty classes in the last two decades. ICT—mediated learning environments have the potential to transform educational practices as well as students' learning experiences. Online discussion forums are useful to share graduate students' opinions and the social construction of knowledge. The objective of this chapter is to analyse the distributed teaching presence as reflected in university teachers' contributions through their inputs in the forums of a faculty teaching course. A qualitative research study was conducted to analyse two online virtual courses at the Technological University of Pereira (Colombia). Main results indicate that participants' tended to solely present their own visions, ideas and understandings, but did not compare them with other participants, which had the effect of missing the communicative and interactive potential of e- and b-learning. Transcending the traditional teaching approaches based on transmission of content and entering into a more constructive and interpersonal communication is key for a proper use of this type of teaching.

**Keywords** Blended learning · LMS · Online discussion forum · Teacher education

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## 1 Introduction

Society in the twenty-first century is witnessing dizzying changes in most human activities largely due to the development and growth of Information and Communication Technologies (ICT), particularly the Internet, the Web, computers and mobile technology. The educational world is no exception to this phenomenon and has incorporated a variety of technological tools and resources into classrooms and educational practices that seek to facilitate and improve teaching and learning processes [1, 2], since, as Coll et al. [3] note, digital ICT makes it possible to create environments that integrate known semiotic systems and extend, to unimagined limits, the human capacity to (re)present, process, transmit and share large amounts of information almost instantaneously with increasingly fewer space and time limitations and lower economic cost.

Traditional educational contexts are not, however, the only ones that have experienced the impact of ICT. Based on these technological advances and taking advantage of the growing educational demand that traditional education fails to meet, particularly in the Latin American context [4], e-learning has experienced exponential growth in the last decade. According to known data, at least one in two university students in the world is currently enrolled on an online course. For 2019, these same studies venture to predict that around 50% of classes in higher education centres will be taught using the e-learning mode [5]. This growth has been significantly helped by the development of e-learning and b-learning platforms, also known as Virtual Learning Environments (VLE) or learning management systems (LMS). The best known and most popular are Moodle, Schoology, WebCT, Blackboard and Edmodo.

The tools that these platforms incorporate facilitate sharing all kinds of resources (text, audio, image, video, etc.), and enable synchronous and asynchronous communication, collaboration and the creation of students and teachers' communities of practice and learning [6, 7]. These advantages have made them a widely used resource in 100% virtual or distance education mode, mixed and face-to-face modes, where they are used as support in the classroom.

Among the most popular resources in socio-constructivist-inspired virtual training approaches are asynchronous online discussion forums, which are used for opinion sharing and the social construction of knowledge [8, 9]. Although there are already online forums where users record their voice messages through computer microphones, the vast majority of forums are textual [10].

Garrison and Anderson [11] highlight the value of textual asynchronous communication carried out in forums to promote reflection, analysis and systematic discussion, and argue that the requirements of participation in text-based media, such as the promotion of reflection, explicitness and accuracy, can represent inherent advantages when trying to raise the cognitive level of the exchange. That is to say, this type of communication can be more effective in facilitating critical thinking and discourse.

Likewise, online forums allow greater participation in discussions, given that those who need a longer response time can do so at their own pace and have less

pressure than when the discussion takes place face to face. In this way, they can promote social and collaborative learning [12].

Along with allowing access to an almost unlimited amount of sources of information provided by the Internet and Web, forums also help diminish the role of the teacher as the sole repository of knowledge [13].

Nowadays, it is impossible to know or read everything about a subject and students can often contribute to the construction of knowledge in a learning community by supplying relevant resources and information, as well as through their reflection and partial or complete understanding of a topic, since they enable other classmates and, even the teacher, to compare their particular interpretations of the subject under discussion or the proposed learning tasks, and confirm or review that interpretation in the light of the shared information and points of view, thus increasing their knowledge.

Garrison and Anderson [11] and Gómez-Puerta et al. [13] also concur with this idea and maintain that although the teacher's role is essential to identifying the most relevant knowledge, sequencing it, selecting the most appropriate sources of information and implementing the activities and assessment relevant to the objectives set, in the new virtual training settings fostered by the Internet and new digital technologies, and within the framework of a learning community, 'all the participants have the opportunity to contribute to teaching presence' [11] adding that 'as participants develop from a cognitive and social point of view, teaching presence becomes more distributed' [11].

The fact that something has the possibility of happening does not, however, necessarily mean that it will happen. As Coll and Bustos [14] note, in ICT-mediated learning environments, the potential of ICT to transform educational practices is evident, but the fulfilment of this potential depends on how it is used by the participants in the educational experience.

In line with this approach, we consider that in the context of e-learning courses, teaching presence can also materialise or not depending on the interaction of the learners among themselves and with the teacher through their contributions in the forums. Sometimes, though, teachers, with the purpose of encouraging students to take a more active role and exert an educational influence on their classmates, reduce their own participation and teaching presence within online learning settings, with the risk that students, failing to get the help they need, drift through the learning process and do not achieve the objectives of the course.

Therefore, we consider it of great importance to study the way in which teachers and students help each other in the processes of joint construction of knowledge through their interaction in discussion forums, since it constitutes the basis for the study of teaching presence in these settings and may contribute knowledge that allows progress in the development of proposals to improve teaching and learning processes in these spaces.

In this regard, the implementation of LMS as support for both b-learning courses [15] and e-learning courses offers the advantage of recording a wide variety of data on user's actions, which some researchers relate positively to the effort made by students, their performance on the course and their results [16].

Analysis of this data, known as Learning Analytics, is an emerging field in educational research defined as the use of smart data produced by the user and analysis models to discover information and social connections and predict or advise in relation to learning [17, 18]. This type of analysis is a valuable complement to addressing and understanding the processes of interaction and knowledge construction that take place on e-learning courses.

Consequently, research is needed to explore the way in which teaching presence materialises in the interactions between teachers and students in asynchronous online discussion forums and to identify the participation and access patterns associated with that potential exercise of teaching presence in order to identify the most suitable profiles and intervene in online courses in a timely manner to support students' knowledge building processes in order to increase their chances of success in them.

Although there is research in this area in the European context of formal education such as that carried out by Bustos [19], no research of this kind has taken place in the Colombian context, neither in formal nor in non-formal education, where the number of virtual courses has increased considerably in the recent past and is expected to continue growing in the coming years. It is therefore of great relevance to review the processes that take place on e-learning courses in order to identify actions to improve their educational quality.

## 2 Design

### 2.1 Method

Interest in understanding the way in which this complex phenomenon takes place in the particular context of online courses places this research within the qualitative interpretive paradigm [20], given that it seeks to interpret and understand the phenomena studied in their natural context, without the intervention of the researcher in the variables studied [21], and 'the aim is to find out *what happens* (...) or what has happened and what it means or has meant for subjects or groups in a certain dynamic reality' [22]. In addition, the role of researchers includes interacting with the research findings based on their theoretical orientation while informing readers of the way in which this orientation was used to draw conclusions [23].

Although the quantitative approach in educational research predominated for years, qualitative research, and especially the interpretative perspective, has been gaining importance since the last decades of the twentieth century [22].

Among its most outstanding features are the following: 'It has a holistic consideration of educational reality, seeks to understand the complexity and meanings of the processes; seeks a critical understanding of educational reality by interpreting the meanings; and cannot be researched without context analysis' [22].

All of the above are relevant aspects for the research presented in this work, which does not seek to verify a hypothesis previously proposed but to gain understanding

on how teachers and students jointly build knowledge through their interactions in two virtual courses implemented through the Moodle platform and using the forums as a strategy and tool for learning.

Interest in understanding and interpreting what happens in the classroom (face-to-face or virtual) has as its ultimate goal the improvement of educational processes in the e-learning mode, since we agree with Imbernón's position that educational practice is modified by changing those who act in it, the contexts where they intervene and how to understand it. [Interpretive] research does not direct the action through prescriptions from the theory but rather seeks to clarify it so that it is the actors involved in the practice who self-regulate their educational experiences [22].

The research was designed as a multiple case study, which is a widely accepted and applied methodology in research about teaching and learning in networks that use asynchronous communication [24].

The selected cases, called Case 1 and Case 2, were two virtual courses from the Comprehensive Teacher Development Plan of the Technological University of Pereira (UTP) in Colombia and were aimed at teachers of that institution.

Yin [25] defines the case study as an in-depth empirical examination of a contemporary phenomenon in its real context, and notes that it is used to contribute to our knowledge of individual, group, organisational, social, political and other related phenomena.

The case study is a commonly used research design in the educational field and, in particular, in studies about learning in virtual environments since it seeks to help understand complex social phenomena [25], such as the one that concerns us in this research: how teaching presence is exercised by teachers and students working together in the collaborative construction of knowledge throughout a course of study.

Yin [25] highlights the need to clearly define the case and states three fundamental characteristics of the case as a unit of analysis:

- It must clearly differentiate people who are included in the case from those who are not.
- It must have clear time limits for the beginning and end.
- It must be a real-life phenomenon, not an abstraction.

The courses selected for this study met these characteristics: they were indeed real-life phenomena and each course had a different time frame, tutor and theme of its own, its own development space and its own objectives, content and learning tasks. This gave them individual character and clearly differentiated one from the other.

Course 1, Pedagogy of Virtuality, was considered Case 1 and Course 2, Teaching Strategies for ICT Mediated Education, was considered Case 2. This research, therefore, studied the teaching presence exercised by the participants through their contributions in the interaction spaces proposed in each of the cases presented.

In addition, Yin [25] highlights the need for the study unit used to be similar to those previously studied by other researchers, in a way that allows comparison of the findings obtained with those of existing research.

The cases studied in this research were indeed similar study units to those used by other researchers in the area, such as Silva [26] and Bustos [19], but nevertheless they represented an innovation with respect to other research carried out in this area, as they were natural cases, and not specifically designed for the study carried out, but rather real examples of the virtual courses offered and implemented by the UTP.

The courses were selected as case studies for this research after completion, meaning that neither the research nor the researcher had any influence on the variables studied.

This characteristic of the cases gives the study particular significance and relevance since it contributes knowledge about an educational proposal in use at a large higher education institution and may help understand and improve their on line teaching practices.

## **2.2 Data Collection**

This study examined the following sources of data:

1. The logs provided by the Moodle platform about access, activity and grades of the participants from each course. These logs, obtained as Excel files, were used to analyse tutors' and students' access and participation in the course. The results of this analysis allowed identify the participants with profiles potentially suitable to the exercise of teaching presence in each case.
2. The messages of the participants in the different forums offered in each of the courses studied. These messages were obtained and downloaded from Moodle by using the NCapture Tool of the Nvivo v.10 software. Data corresponding to the different courses was labelled and stored for later analysis.
3. The semi-structured interviews done to the participants, (the tutors of both courses and 13 students) who accepted the researcher's requests to share their experience and perceptions in relation to the learning process in the virtual course. Eight students were actually enrolled in both courses and thus, were participants in both cases; the remaining five only participated in Case 2. The interviews were audio-recorded with the participants' authorization and were labelled and stored to be analysed later on with the Nvivo software.

## **2.3 Data Analysis**

Data analysis involved quantitative processes (on the access and activity logs) and qualitative ones (on the content of the forum messages and the interviews done) and was based on the proposal by Coll et al. [27, 28] and Bustos [19] for the analysis of distributed teaching presence in asynchronous communication learning environments.

Regarding this methodological decision, it is important to explain that researchers such as Garrison and Anderson [11] identify lack of validated data analysis tools as one of the main problems in the area of analysis of learning processes in virtual environments and state that, the fact that each researcher invest their efforts in developing new data analysis instruments, in particular for content analysis, and that no further use is made of those tools previously developed by other researchers, entails that instruments are not tested in different contexts and thus, lack validation that extends further than the original study.

For this reason, Rourke et al. [29] recommend that there should be other research done and affirm that.

“the definitive proof of a coding scheme is replicability (...) the lack of replication (that is, lack of applications of coding schemes created by successful researchers) should be considered as a serious problem. (...) The reliable application of a coding scheme by researchers who are not involved in its creation could be [considered] a consistent test of its effectiveness.”

Thus, the present study applied the proposal developed by Coll et al. [27] and Bustos [19] in order to analyse the structure of the participation as well as the teaching presence demonstrated by the participants.

The content of participants' messages in the forums was analysed according to the categories proposed by Bustos [19].

## ***2.4 Objectives and Research Question***

Within the framework of the aforementioned issue, the following research question was posed:

What are the participation patterns and forms of distributed teaching presence manifested by participants in two non-formal virtual education courses carried out through the Moodle platform and supported by asynchronous discussion forums in text format?

In order to answer this question, the following objectives were proposed:

The general objective was to interpret the participation patterns and distributed teaching presence manifested by participants in two non-formal virtual education courses carried out through the Moodle platform and supported by asynchronous discussion forums in text format.

The specific objective was to analyse the distributed teaching presence as reflected in the participants' input in the forums of two non formal virtual education courses for university professors.

## 2.5 Population and Participants

The population under study were the teachers of the Technological University of Pereira (Colombia) who participated in the virtual teacher training courses offered by the Academic Vice-Chancellery of the Technological University of Pereira through the university virtual department, called Univirtual.

In the research, a sample consisting of the participants in the cases studied was used; that is to say, the two tutors of the courses that constituted the chosen cases and the 35 students (17 women and 18 men) who carried them out. All of them were practising teachers at the Technological University of Pereira, belonging to various faculties and programmes and voluntarily enrolled on each of the two courses.

The two tutors were experienced in running training courses in virtual environments and belonged to Univirtual's regular staff of teacher trainers. The first teacher, whom we will refer to during the research as Teacher 1 (P1), had a Bachelor's Degree in Mathematics and Computing and was completing a master's degree in Education. The second teacher, (whom we will refer to as P2), had a degree in Systems Engineering and a master's degree in education.

The participants received a code that identified them (E1, E2, etc.) based on the position they occupied on the preliminary list of enrolled students interested in taking the courses, which contained around 100 participants.

It should be noted that the participants of the two cases varied partially because not all participants in Course 1 continued to Course 2, nor had all participants in Course 2 completed Course 1. In total, there were 35 unique students over the two courses. Although all of them were contacted to request their cooperation in the research and attendance to an interview about their learning experience on the course, only 13 agreed to it, 7 women and 6 men. Their ages ranged from 31 to 56.

Of these 13 students, 84.6% had previous experience in virtual courses and took the course exclusively for personal interest in the proposed topics. The tutors also agreed to be interviewed for this research.

## 3 Results

In Case 1, 41 documents containing the contributions of the participants in each of the three discussion forums offered in the course were analysed.

Of the 242 excerpts coded for this case and associated with the three main dimensions of teaching presence, 92.9% (225 excerpts) related to *shared meanings management*, followed by 5.42% related to *task management* (13 excerpts) and finally 1.67% was associated with *participation management* (4 excerpts).

The teaching presence of the participants in Case 1 particularly focused on shared meanings management, with little contribution to the task management and participation management dimensions.

Within this dimension, three categories accounted for 58.3% of contributions: *Contribution on own initiative of own meanings or presented as own* (S\_SP, 62 excerpts, equivalent to 27.6% of those coded in the category), *favourable assessment of meanings previously contributed by other participants* (S\_VF, 38 excerpts, equivalent to 16.9%) and *identification of topics or themes of attention, examination and discussion* (S\_IT, 31 excerpts, 13.8%).

As examples of the contributions associated with the subcategory with greatest presence, *Contribution on own initiative of own meanings or presented as own*, the following excerpts belonging to the first forum of Case 1 are presented:

Example of contributions on own initiative of own meanings or presented as own:

**Case\_1\\Forum\_1\_C1\\Activity 1. What we know about Virtual Education> Reference 9**

(E65): *'There is a topic (well, actually many) in virtual education that I am passionate about and it is the new role that the facilitator assumes. It is a total paradigm shift. A rebirth of teaching seen as a complement to the individual construction of the knowledge of each of the students.*

*In a face-to-face environment, for example, the teacher does not clearly experience the role of 'motivator' in a class session. I remember maths classes in which the teacher (yes, from the UTP) had coloured chalk and taught not only maths but also drawing, design, blackboard use... truth is that... the only thing that really motivated me was the blue eyed girl from the administration management college.*

*In distance education and specifically virtual education, the role of the facilitator as a motivator of the learning process becomes evident and is, in my view, very important in academic exercise. If I feel motivated, I enter the RFD course, otherwise I flag.'*

As can be seen in the excerpt presented, participant E65 presents his vision of the role of the facilitator in virtual environments. He does not rely on external sources, or on the contributions of other classmates, nor does he invite them to participate with meanings on this topic or to compare their opinions, but exclusively uses his personal experience to describe the teacher's role as a motivator in virtual education and highlight its importance.

A second example of contribution associated with this category is the following excerpt also belonging to the first forum of Case 1:

**Case\_1\\Forum\_1\_C1\\Activity 1. What we know about Virtual Education> Reference 13**

(E58) *'In virtual education, if the course does not motivate and interest me, if the teacher disregards motivation, support and student's performance, the student simply does return into the course and is lost. Hence the high dropout rate that virtual education courses usually have.*

*All of this makes virtual education a constant challenge for the teacher, who needs to constantly update themselves and their pedagogical work, learning about*

*new tools and thinking and rethinking ways of overcoming the obstacles of non-face-to-face learning in order to be present, to effectively support students, to generate a learning community that supports the individual and solitary processes of students.'*

As we see in this excerpt, which also belongs to the first forum of Case 1 and which, as indicated by its reference number (13), is subsequent to the first example presented (reference 9), participant E58 also talks about the role of the teacher as a motivator from his own understanding of this role, as a *contribution on one's own initiative of one's own meanings or presented as one's own*, without referring to external sources nor to the contributions made by E65, who had already talked about this role before.

The two examples presented above clearly illustrate the result of the distribution of contributions by categories, since, despite their extent, the predominance of the contributions of each participant is evident and none of the contributions incorporates other possible subcategories that could involve the consultation of sources of meanings such as books, articles, web pages, etc., related to the subjects of the course or greater interaction with other participants.

In relation to what has been just discussed, it is worth highlighting the contrast, in Case 1, between the high number of excerpts recorded by the first category, *One's own contributions or presented as one's own (S\_SP)*, versus the low results of categories that involve interaction with other participants such as *Request to other participants to provide meanings on a topic or on the meanings provided by whoever made the request (S\_RQ)*, *Response to a request from another participant to provide meanings on a topic or state an opinion on the meanings provided by whoever formulated the request (S\_RRQ)*, or *Identification and/or correction of errors (S\_IE)*.

Finally, there were three categories in which no excerpts were coded. They were *Request for clarification or explanation to other participants about previously presented meanings (S\_PP)*, *Response to a request for clarification or explanation from another participant about previously presented meanings by the person responding (S\_RPP)* and *Literal or almost literal reminder of meanings previously presented by other participants (S\_RE)*.

These results would seem to indicate that the learning process of the participants in Case 1 was based more on consultation of course content than on construction with others. In general, participants tended to present their visions, ideas and understandings, but did not compare them with other participants', which had the effect of missing 'the essential feature of e-learning (...) its communicative and interactive potential (...) that transcends the unilateral transmission of content and broadens our approaches regarding interpersonal communication within the educational process' [11].

Table 1, which summarises and illustrates, respectively, the coding of each of the categories of the *shared meanings management* dimension (both its absolute value and percentage of total coded excerpts in the category) is presented below.

Regarding the *task management* and *social participation management* dimensions, their appearance in the contributions of the participants was very low, (13 and 4 excerpts respectively coded in Case 1).

**Table 1** Coding of shared meanings management. Case 1

| Code | Categories                                                                                                                              | Ref | %    |
|------|-----------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| SP   | Contribution of one's own meanings                                                                                                      | 62  | 27.6 |
| VF   | Favourable assessment of meanings presented by other participants                                                                       | 38  | 16.9 |
| IT   | Identification of topics for attention, examination and discussion                                                                      | 31  | 13.8 |
| SI   | Formulation of summaries or recapitulations integrating the meanings provided by others or oneself                                      | 16  | 7.1  |
| DOC  | Incorporation of meanings through one's own or others' document attachments                                                             | 16  | 7.17 |
| RF   | Reference to sources of meanings (books, articles)                                                                                      | 15  | 6.7  |
| RQ   | Request for other participants to provide meanings on a topic or on the contribution done by the one making the request                 | 14  | 6.2  |
| ED   | Expression or manifestation of uncertainties or incomprehension about one or more of the topics under discussion                        | 11  | 4.93 |
| SF   | Contribution of meanings attributed to external sources                                                                                 | 10  | 4.48 |
| RRQ  | Response to a request from another participant to provide meanings on a topic or on the contribution done by the one making the request | 8   | 3.58 |
| IE   | Identification and correction of errors                                                                                                 | 2   | 0.9  |

*Note* Code Short code to identify the category; *Ref.* Number of coded references in a category

*Task management* appeared mainly in relation to the categories of *Formulation and reminder of task characteristics* (T\_FR, 6 excerpts, 46.15%), *Assessment of task characteristics or requirements* (T\_VC, 5 excerpts, 38.4%) and *Proposal for the revision or reformulation of task characteristics, its approach and its product or result* (T\_PR, 2 excerpts, 15.38%).

An example of the coded excerpts in this dimension, in the category of *Formulation and reminder of task characteristics*, is the following excerpt corresponding to the first forum of Case 1:

#### **Case\_1\\Forum\_1\_C1\\Activity 1. What we know about Virtual Education> Reference 1**

P1: *'Respond to the forum taking into account the proposed seed, making use of the tiger rubric and clearly expressing your points of view in a well-argued way.'*

As can be seen in the example presented, the teacher gives specific and brief task instructions and reminds the students to use the TIGER rubric. Since this rubric included a very detailed description of the characteristics that forum contributions should meet and allowed the participants to self-assess, this circumstance could have influenced the low appearance of the categories *Request for clarification on task characteristics* and *Formulation of clarification on task characteristics*.

The remaining categories in this dimension, *Request or demand for clarification in relation to the task* (T\_PP); *Formulation of clarification on task characteristics* (T\_FP); and *Assessment of the degree of respect or compliance with task requirements* (T\_VC), did not record any excerpt in the coding. The absence of requests for

clarification of task characteristics or requirements obviously reduces the possibilities of the associated category of *Formulation of clarification on task characteristics (T\_FP)*, so it is not surprising that this category did not registered coding.

The lack of coded excerpts in these categories could mean that task description and instructions were clear to the participants and therefore they did not have any queries about it. It is also possible that the participants did not express their queries about the task through the course forums but chose, instead, to use alternative communication channels such as the teacher's email or the internal messaging service provided by the Moodle platform.

With regard to *participation management* (the teaching presence dimension exercised the least by the participants), the only categories that were identified in the contributions were *Formulation/Reminder of participant participation or performance rules* (P\_FR, 1 excerpt, 25% of all the elements coded in this teaching presence dimension), *Assessment of participation or performance rules* (P\_VR, 1 excerpt, 25%) and *Assessment of the degree of compliance with participant contribution in the forum or performance rules* (P\_VC, 2 excerpts, 50%).

To illustrate the coding carried out in this last dimension and particularly in the category of *Assessment of the degree of compliance with the rules of participation*, the following excerpt, belonging to the third forum of Case 1, is presented:

#### **Case\_1\\Forum\_3\_C1\\novato-Ped2012-1 ~ Classmates, Where Are They > Reference 1**

*E1: 'Hello Classmates. I'm wondering, where are you? It's strange not to see your contributions in the forum...'*

The excerpt, part of one of the contributions made by participant E1, shows us the way in which this participant points out the lack of participation in the forum (negative assessment of the rules for non-compliance with them) and draws attention to the fact that in the face of this problem, it is one of the students who makes the complaint, and not the course tutor.

We present below the results of the coding for Case 2.

In Case 2, 46 documents containing the contributions of the participants in each of the three discussion forums of the course were analysed. Out of the 167 excerpts identified in Case 2 and associated with the three main dimensions of teaching presence, 96.4% (161 excerpts) were coded in the Shared Meanings Management dimension, 2.4% (4 excerpts) in task Management and 1.2% (2 excerpts) in Participation Management.

Similar to what was observed in Case 1, in Case 2, the teaching presence of the participants was concentrated in the *shared meanings management* dimension, which registered 96.4% (161) of all the excerpts coded in the case.

Within this dimension, the category that received the largest amount of contributions was *Contribution on own initiative of own meanings or presented as own* (S\_SP), with 84 references (52.2% of everything coded in this dimension), followed at some distance by *Favourable assessment of meanings previously contributed by other participants* (S\_VF) (with 19 excerpts and 11.8%) and *Reference to one or more sources of meanings* (S\_RF) (with 12 references and 7.5% of the coding).

These three categories accounted for 71.5% of all of the excerpts coded in this dimension while the remaining 12 categories received the remaining 28.5% in percentages that ranged between 4.3% of categories such as *Contribution of meanings attributed to external sources* (SF), and 0.6% recorded by *Critical assessment of meanings* (VC). The *Response to a request for clarification from another participant about previously presented meanings by the person responding* (S\_RPP) category registered no coded excerpt.

We present Table 2 for a clearer visualisation of the information presented.

The data in Table 2 shows that the participants in Case 2 focused their contributions to the forums on the presentation of their own ideas (52% of all coding associated with the *shared meanings management* dimension versus 27.6% in Case 1), with very few references, either literal or through summary, to the contributions of other participants, although favourable assessments were made in relation to what was contributed by other classmates. This would seem to indicate that although these

**Table 2** Coding of shared meanings management. Case 2

| Code | Categories                                                                                                                                   | Ref | %    |
|------|----------------------------------------------------------------------------------------------------------------------------------------------|-----|------|
| SP   | Contribution of one's own meanings                                                                                                           | 84  | 52.2 |
| VF   | Favourable assessment of meanings presented by other participants                                                                            | 19  | 11.8 |
| RF   | Reference to sources of meanings                                                                                                             | 12  | 7.5  |
| SF   | Contribution of meanings attributed to external sources                                                                                      | 7   | 4.3  |
| RQ   | Request for other participants to provide meanings on a topic or on the contribution done by the one making the request                      | 7   | 4.3  |
| IE   | Identification and correction of errors                                                                                                      | 6   | 3.7  |
| DOC  | Incorporation of meanings through one's own or others' document attachments                                                                  | 4   | 2.5  |
| RE   | Literal or almost literal reminder of meanings presented by other participants                                                               | 5   | 3.1  |
| SI   | Formulation of summaries or recapitulations integrating the meanings provided by others or oneself                                           | 5   | 3.1  |
| IT   | Identification of topics for attention, examination and discussion                                                                           | 3   | 1.9  |
| PP   | Request for clarification or explanation to other participants about previously presented meanings                                           | 3   | 1.9  |
| RRQ  | Response to a request from another participant to provide meanings on a topic or contribution by the one making the request                  | 3   | 1.9  |
| ED   | Expression or manifestation of uncertainties or incomprehension about one or more of the topics under discussion                             | 2   | 1.2  |
| VC   | Critical assessment of meanings previously contributed by other participants                                                                 | 1   | 0.6  |
| RPP  | Response to a request for clarification or explanation from another participant about meanings previously presented by the person responding | 0   | 0    |

*Note:* *Code* Short code to identify the category; *Ref.* Number of coded references in a category

contributions were read, the discourse of others was not incorporated, or at least such incorporation was not evidenced in the messages published.

It is also noteworthy that, in Case 2, references to document sources, either through inclusion in citation messages (meanings attributed to external sources) or reference to documentary sources such as books, articles, web pages, etc., were relatively low for a population of university teachers who would be expected to be more accustomed to documenting their contributions in academic discussions.

Another aspect that stands out is that although the *Request for other participants to provide meanings on a topic or on the contribution done by the one making the request* category had a low incidence in the coding of Case 2 (7 excerpts, 4.3%), the appearance of its counterpart the *Response to a request from another participant to provide meanings on a topic or contribution by the one making the request*, was even rarer (3 excerpts, 1.9%), that is to say that, although there were few requests to interact, those participants whose request was actually answered were even fewer. The same was observed in relation to the *Request for clarification of previously presented meanings* category, which only recorded 3 coded excerpts (1.9%). Its counterpart, *Response to a request for clarification*, was not evident in the messages analysed and, therefore, no excerpt associated with this category was registered.

The above is consistent with the high appearance of the *Contribution on own initiative of own meanings or presented as own* category and shows that the participants contributed to teaching presence essentially sharing their knowledge and personal experiences rather than with academic contributions from document sources, listening to others and comparing points of view, identifying errors and topics of attention or discussion, or negotiating meaning through requesting and providing clarification.

As examples of the contributions of Case 2 participants in this category, we present the following excerpts from the messages published in Case 2 forums:

### **Case\_2\Forum\_2\_C2\novato-est2012-1 ~ Problem-based learning > Reference 1**

E34: 'Problem-based learning'.

*Real problematic situations related to course content that is expected to be resolved by students as a group. The fundamental thing about the form of work generated is that the students can identify what they require in order to deal with the problematic situation and the skills that are developed in order to resolve it.*

*It is the strategy that I normally use in the subjects that I guide: Statistics, and Inferential Statistics. I think it is better to learn by doing. I initially explain the topic with one or two examples, and later there are group workshops to finish in class with my guidance if necessary.'*

This excerpt, which covers the complete message published by participant E34, is a clear example of a contribution focused entirely on the contribution of own meanings. Despite being involved in an academic conversation with other academics (remember that all participants were practising university teachers) and referring to two recognised teaching and learning methodologies (problem-based learning or PBL, developed by Howard Barrows, and learning-by-doing, expounded by John Dewey), E34 does not cite sources or references and only presents the strategy he

uses as if it were his own elaboration. He also states '*I think it is better to learn by doing*', which could be interpreted as a pedagogical conclusion that he has reached on his own.

It is also significant that although the participant describes a methodology that has little to do with the PBL or learning by doing, when reviewing the subsequent forum messages, it is evident that he does not receive any feedback in relation to his error (Identification of errors) by either the tutor or other course classmates, who make mostly favourable assessments regarding what he stated.

Another example where the coding in the *Contribution of own meanings* (SP) category can be observed is the following message published by participant E50:

**Case\_2\Forum\_3\_C2\novato-est2012-1 ~ And about strategies, what do we now know > Reference 1**

E50: '*In the construction of pedagogical strategies, pedagogical design is fundamental. Technological aspects are a resource to support the process.*'

*It is important to begin by defining the word 'design'. According to the Royal Spanish Academy Dictionary, it means plan or project, and for Smith and Ragan, 1993, 'pedagogical design involves a systematic planning process characterised by precision and scientific rigour.'*

*If pedagogical design is considered to be a planning process, this entails prior determining of teaching strategies, a series of aspects such as the pedagogical model that will guide the academic activity and from there define objectives, competences, themes, time required, teaching strategies and assessment.*

*In the case of education through ICT, this process is valid and must prioritise pedagogical aspects over technological ones, as stated in the document Lesson 1: Important aspects in the design of activities that integrate ICT.*

*The technological aspects that support pedagogical strategies must have correspondence, that is to say, if the objectives guide the activity towards the transmission of knowledge, it would not be possible to use a technology that leads the student to assuming a reflective and interactive role. In conclusion, there should be consistency throughout this process.'*

This message was mostly coded in the *Contribution of one's own meanings* category, however, it also contained excerpts associated with the *Contribution of meanings attributed to external sources* (SF) category, such as '*for Smith and Ragan, 1993, "pedagogical design involves a systematic planning process characterised by precision and scientific rigour"*'.

The example shows that, in contrast to the previous excerpt, participant E50 includes in his message not only his own meanings but also meanings he attributes to other sources, in order to explain how his knowledge has changed in relation to ICT-mediated teaching strategies. The participant also mentions the documents provided on the course ('*as stated in the document Lesson 1: Important aspects in the design of activities that integrate ICT*').

However, the coding results revealed that messages like this were infrequent in the Case 2 forums, since the *Contribution of meanings attributed to external sources* category recorded only 4.3% of the coding in the *Management of shared meanings* dimension (7 excerpts) compared to 52.2% (84 excerpts) recorded by the *Contribution of one's own meanings* category.

In relation to the *Task Management* dimension, the five excerpts identified in Case 2 belonged to the *Formulation/Reminder of task characteristics or requirements* category and coincided with the instructions provided by the tutor (P2) at the beginning of each forum. He was the only participant who contributed to task management and did so only in that category.

An example of the excerpts coded in this category is the following text:

**Case\_2\\forum\_1\_c2\\novato-est2012-1 ~ and about the strategies what? ~ > Reference 1**

P2: 'Reflect on your ideas and conceptions about teaching strategies.' How do you understand the teaching strategies? How can technology support the implementation of teaching strategies? Think about your experience, what you have used, learnt, read and, based on this, make your contribution.'

In the example presented, it is possible to observe an intervention of the tutor explaining the characteristics of the task (participation based on experience, knowledge and reading to answer the questions raised) and how it should be addressed ('reflect on your ideas and conceptions, etc.').

There were no contributions from any of the participants that could be associated with any of the remaining categories of this dimension.

Even more scarce is the appearance of the *Social Participation Management* dimension, in which only 2 excerpts were coded in Case 2. Both correspond to the *Formulation/Reminder of the rules of participation* category, and again, they are contributions from the tutor (P2) at the beginning of the conversation forums, where he makes concise reference to the expected participation of participants as follows:

**Case\_2\\Forum\_3\_C2\\And now what do we know about teaching strategies? ~ > Reference 1**

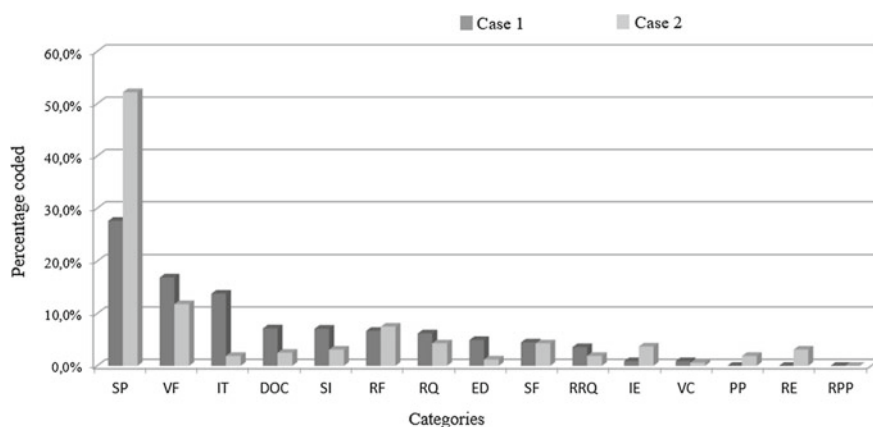
P2: 'Activity Dynamics. Answer the proposed question by making use of the Tiger rubric and clearly expressing your points of view in a well-argued way.'

The example presented is one of the two excerpts found in the contributions of Case 2 and associated with the *Social Participation Management* dimension.

It is notable the lack of excerpts in relation to other categories in this dimension, which aims to contribute to regulating participation in aspects of course management such as the frequency and number of expected contributions from participants and respect for the rules of participation.

It is also noteworthy that the course tutor (P2) was the only participant in Case 2 who made contributions to the *participation management* and *task management* dimensions.

Comparison of both Cases in relation to the three teaching presence dimensions analysed showed considerable similarity in the results obtained. Although in Case



**Fig. 1** Comparison of meanings management results

2 there is a small increase in contributions related to shared meanings management and an equivalent decrease in contributions associated with task management (5.42% in Case 1 versus 3% in Case 2), it can be said that in both cases the teaching presence exercised by the participants in the conversation forums was almost completely associated with *Shared Meanings Management* and, within this dimension, with the *Contributions of one's own meanings* (SP) category.

Figure 1 presents a comparison of the results of the coding for Cases 1 and 2 in the *Meanings Management* dimension category, which was the one that registered the highest coding in both Cases.

These results coincide greatly with those obtained by Bustos [19], whose research showed that, in general, the participants in the cases studied (students on a doctoral course) contributed to the exercise of teaching presence mainly in the *Meanings Management* dimension and more specifically in the *Contribution of one's own meanings* and *Formulation of favourable assessments* categories, which also occurred in the two cases studied in this research, where these two categories had the highest concentration of coded excerpts.

The results of our research also align with those of Bustos [19] in terms of the categories from the *Meanings Management* dimension with lower presence in the contributions of participants. This author notes that 'there are few contributions in which categorised excerpts are identified as formulation of summaries or recapitulations (...), expression of uncertainties, questions or incomprehension (...) excerpts), identification and/or correction of errors (...) and identification of topics'.

These categories also have a low coding in the two Cases studied in our research, particularly in Case 2, in which results were obtained ranging from the 1.2% (2 excerpts), recorded by the *Expression of uncertainties* and *Critical assessment of meanings contributed by other participants* categories, to the 3.7% (6 excerpts) coded in the *Identification and correction of errors* category.

In Case 1, however, the coding in these categories is higher (from 13.8% (31) of excerpts coded in the *Identification of topics of interest* category to 7.1% attained by *Formulation of summaries or recapitulations*). The categories *Request for clarification*, *Response to a request for clarification* and *Literal reminder of meanings* had a null presence in the coding.

As a summary of the results presented in relation to the forms of teaching presence manifested in the contributions of the participants through the forums of the cases studied, there is a notable coincidence of both cases being manifested almost exclusively in relation to the *Shared Meanings Management* dimension, that is to say, in aspects whose objective is the communicative exchange between participants in order to present and discuss the course's proposed content and learning tasks.

The results presented showed that within this dimension the categories with the highest frequency of appearance, again in both cases, in the messages of the participants were *Contribution of own meanings (SP)* and *Favourable assessment of meanings presented by other participants (VF)*, and among those of lesser occurrence *Critical assessment of meanings previously contributed by other participants*, *Request for clarification or explanation to other participants about previously presented meanings*, and *Response to a request for clarification or explanation from another participant about previously presented meanings by the person responding* were found in both cases.

Regarding the low use of the forums by participants to ask questions about content, express uncertainties or share the difficulties they encountered, Silva [26] points out that it is generally difficult for teachers to make this kind of enquiry in public spaces, since it entails recognising their own shortcomings.

The results presented allow infer that in both Case 1 and 2 there was a low level of negotiation of shared meanings between the participants, since in general terms the contributions seemed to be centred on their own experience and personal knowledge, with little reference to other sources of meanings and scarce critical appraisal or identification of errors, incomprehension or gaps in what was presented by other classmates as well as low interaction with both the classmates and the tutor, which is evidenced in the poor coding of categories that involve exchange with others, such as *Request to contribute meanings* or *Request for clarification on what was presented* and the corresponding categories of response.

It is also worth highlighting the coincidence in both cases of the scarce exercise of teaching presence in the *Participation Management* and *Task Management* dimensions, which are limited to few participations by the tutors of the cases studied in which they describe briefly the rules of participation and the task to be performed (*Formulation of the rules of participation (P\_FR)* and *Formulation of task characteristics (T\_FR)*).

The null coding in other categories of these two dimensions, which are associated with the regulation of participation and task characteristics, would seem to point to poor tutor monitoring throughout the course in relation to respect for or breach of these rules or characteristics by the participants of the cases studied.

As we noted earlier, in relation to this aspect, the interviews carried out with the participants revealed that task management could have been carried out by the tutors

through spaces different to the conversation forums, such as email or the internal messaging service of the Moodle platform.

This seems to be indicated by the statements of some of the course participants in the interviews, where they assessed the role of the tutor in relation to the response to uncertainties raised about the task to be performed.

*Interviews\\E33>*

*'The role of the teacher when ..., of the facilitator, when I had several doubts was very precise when collaborating on the explanation of what had to be done.'*

*Interviews\\E57>*

*'Well, they also, when there was an enquiry, responded quickly'*

*'They also, when they were concerned that I had not, for example, sent a contribution, wrote to me personally: 'XXXX, why haven't you made your contribution?'*

*Interviews\\E56>*

*'I said [to the tutor] I need to know if I am doing well or if I need something. Then he gave me an answer: no, you're fine. You are meeting the parameters that are required in the activity.'*

As inferred from these words of the participants in the interviews, E57 refers to having been required to participate by the tutor privately (*'he wrote to me personally: XXXX, why haven't you made your contribution?'*), which can be seen as a *Reminder of the Rules of participation* and E33, E56 and E57 seem to have requested clarification regarding the task characteristics and received a satisfactory explanation by the course tutor. However, the fact that they do not specify that they made their enquiry through the forums and the non-coding in the *Request for clarification* and *Formulation of clarification* categories supports the possibility of both the teachers' and the students' use of an alternative communication channel to exercise teaching presence in the dimensions of *Task Management* and *Participation Management* by the tutors of the cases studied.

## 4 Conclusions

Virtual education is an option that is increasingly gaining importance both globally and in the Colombian context. The learning platforms that serve as support to online courses make available to teachers and students a wide variety of learning tools, among which discussion forums stand out for their opinion sharing and social construction of knowledge possibilities, thanks to the contributions of participants [30].

Although the role of the teacher in these spaces remains fundamental, easy access to document sources and varied profiles of students on virtual courses allow them to provide help and collaboration to other classmates and consequently enable the teaching presence to be exercised in a distributed way by all of the participants on a course [31].

Studying the way in which teaching presence materialises in the processes of joint construction of knowledge through the interaction of teachers and students in online discussion forums can allow progress in the development of proposals for improving the teaching and learning processes in these spaces [32].

In this research, we set out to study the participation patterns and forms of distributed teaching presence manifested by participants in two non-formal virtual education courses carried out through the Moodle platform and supported by asynchronous discussion forums in text format.

Teaching presence was mainly exercised by the students and it manifested in the Shared Meanings Management dimension, through contributions of one's own meanings, favourable assessments of other participants' contributions and identification of topics of attention and discussion. There was very low critical assessment and identification/correction of errors and no contribution in aspects such as request for clarification, response to a request for clarification and literal or almost literal reminders of meanings previously presented by other participants.

From this analysis, it can be inferred that the participants focused on their own knowledge, opinions and experiences when participating in the forums and that there was generally little argument and interaction with others or incorporation into the discourse of ideas from other classmates or from reference sources. This could be considered as scarce use of the communicative and interactive potential of e-learning to achieve teaching and learning processes that 'transcends the unilateral transmission of content and expands our approaches' [11].

These results coincide with those of other research works carried out in this field, such as those by Bustos [19] and Silva [26], in which it was found that forum messages tended to focus on each participants' own contributions and were therefore more personal than collaborative.

It was also revealed that there was little teaching presence in relation to Participation Management and task management and that it was mainly the tutors who were involved in exercising it, which leads to the conclusion that either the tasks did not require clarification or negotiation for them to be carried out, or that they were carried out through alternative communication channels that are not evident in the course forums.

In relation to this aspect, we consider it very important to analyse the type of learning tasks and questions raised for discussion in this type of course with a view to ensuring that collaboration and negotiation with other participants is a real requirement of the task to be carried out, since, as Silva [33] notes, collaborative work must go beyond a simple exchange of opinions and interaction around a topic.

This research contributes to validating the methodological design used for the analysis of distributed teaching presence in online courses supported by asynchronous text-based conversation forums, since, according to Garrison and Anderson [11], 'the definitive proof of a coding scheme is replicability. (...) the reliable application of a coding scheme by researchers who are not involved in its creation could be convincing evidence of its effectiveness'.

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# Didactic Interaction in Blended Learning: Analysis Models



Osbaldo Turpo Gebera and Francisco José García Peñalvo

**Abstract** The objective of this chapter is to make explicit the models of analysis of the interactions that arise in Blended Learning, for which it is required to define the categories that configure the discourses built in the scenarios that configure them; basically studies in this field have privileged what happens in forums and online chats. The corpus of analysis, that is, the discourses retrieved from the didactic exchanges constitute the input on which the possibilities of knowledge construction are explored; a process that demands to consider the sequences that contribute to its unveiling. The models presented here are intended to show the multiplicity of possibilities involved in determining the interactions that make possible the collaborative construction of knowledge.

**Keywords** Blended learning · Interaction analysis · Virtual forums · Didactic interaction · Collaborative construction of knowledge

## 1 Introduction

The digital transformation that we are experiencing affirms an unprecedented fact in the social dynamics, fundamentally in the ways we relate to knowledge and information. The Information and Communication Technologies (ICT) are making possible new training scenarios to meet the demands of society, in order to ensure the acquisition of the skills that allow us to face the changing conditions of current and future work. In this regard, Blended Learning (BL) is presented as a “standardized” modality [1], which facilitates access to learning opportunities by fostering collaborative

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interactivity and intensive use of technology, among other potentialities [2]. Likewise, BL, from the various evaluations of its course, shows positive impacts and adaptability to the environment, being favorably valued by students [3, 4].

In the scenarios promoted by BL, the agents and training subjects are involved in a dynamic of continuous exchanges that lead to the construction of knowledge, from a greater tutorial intervention, a continuous feedback, successive critical debates, among others that amplify and strengthen the interactions that favor it [5]. BL goes beyond the combination, integration or convergence of pedagogical spaces, it seeks the concurrence or continuity of the training strategies that overcome the face-to-face-virtual dichotomy [6–9]. Hence the importance of analyzing the processes of didactic interaction or teaching and learning or communication that emphasize active participation, considering the attention to the concurrent dynamics.

## **2 Framework for Understanding the Didactic Interaction in BL**

The analysis of the interactions that are built through the training processes implemented under BL arouses a growing educational interest [10]; since they make didactic interventions possible, through different synchronous and asynchronous platforms (chat, forums, e-mails, etc.), that lead to an extended participation of the actors and resources of the educational process. Interaction differs from interactivity. Interaction is situated within a set of jointly constructed didactic sequences, where intensity (periodicity, involvement, ...) and relevance (planning, emphasis, ...) are assigned to the exchanges that take place at the different levels of concurrence (face-to-face and virtual) [11]. Therefore, analyzing the didactic interactions implies considering the relevant variables that make the knowledge construction processes explicit.

The analysis of didactic interaction investigates the events that occur in an educational environment, and which are expressed through learning (behaviors, thoughts or activities) [12]. In BL the subjects interact from different levels, through the use of technological resources or in a physical or direct way, in any sense, the discussions or communicative exchanges contribute to the collaborative construction of knowledge, mediated, besides the technology, by the socio-affective relations that occur among the participants. In essence, in the didactic interaction the constructed discourses prevail, constituting the inputs of the analysis that the diverse models of the didactic interaction emphasize. All discourse is constituted from the prominence of those involved, and built from their knowledge of the environment. In BL, the models of analysis emphasize the spaces that contribute to their understanding.

The constitution of BL as a training modality responds to an eclectic and practical thought [13], which extends as it integrates not only a diversity of technological devices, but also a wide variety of learning methodologies, which have contributed to the flexibility, autonomy and responsibility of the training process [14]. On this plane of techno-pedagogical intersections, a diversity of BL models emerges, ranging

**Table 1** Face-to-face and virtual interactions in BL

| Dimensions                                  | Face-to-face interaction                                                                      | Virtual interaction                                  |
|---------------------------------------------|-----------------------------------------------------------------------------------------------|------------------------------------------------------|
| Co-presence                                 | Indispensable                                                                                 | Not indispensable                                    |
| Technology                                  | Background                                                                                    | Manifest presence                                    |
| Individuals involved                        | Limited                                                                                       | Unlimited                                            |
| Audience                                    | Under certain control                                                                         | Vast                                                 |
| Interlocutors                               | Clear identification                                                                          | Ephemeral identification                             |
| Context                                     | Physical-material                                                                             | Simulated                                            |
| Prevalent interaction                       | Verbal                                                                                        | Textual, images, sounds, etc.                        |
| Non-verbal communication                    | Does not belong to the same level as the verbal communication, based on gestures, looks, etc. | On the same level as verbal communication            |
| Organizational structure of the interaction | Stable                                                                                        | Flexible (dissipative)                               |
| Interaction with communicative modalities   | Limited and excluding                                                                         | Multimodal                                           |
| Staging                                     | Quickly verified                                                                              | Accepts a high level of invention and reconstruction |

Source Adapted from [17]

from the combination of virtual and face-to-face learning activities to the convergence of means and resources that channel the training purposes [15]. In these models, discursive processes are constructed as a result of the interactions of the complex network built from the participation of the students who learn, the contents that are learned, and the teacher who helps to construct and assign meaning to the contents that are learned [16].

In BL scenarios, the use of technological and pedagogical tools is influenced more by the way teachers structure, support and develop activities, and by their skills and previous experience in the use of ICT, than by the characteristics of the media and technological resources. In this sense, it is important to distinguish the relationships that are built in the spaces that make up BL (Table 1).

### 3 Models for the Study of Didactic Interaction in BL

The study models of didactic interaction consider both communication among participants and the cognitive, social and affective relationships they build [18, 19]. In this dynamic, situations of reciprocity occur, as well as other specific behaviors, regulated by the context and the environment, which in the case of BL, are mediated from a double implication: face-to-face and virtual. The ways in which learning is acquired, the means and resources that make it possible, and the instances where it is

produced and received (virtual or face-to-face communities); as well as the continuous updating of teachers and the processes involved contribute to the configuration of study models, [20]. Additionally, the concepts that subjects (teachers and students) have about learning and teaching [21], as well as their implementation [22], that is, the differences between what is said and what is done.

The process of studying the didactic interactions that take place in the must also consider the instructional design [23], as it recovers the advances of modern pedagogy, learning theories, models on how learning takes place and how learning is assessed. Basically, approaching the study of the didactic interactions that take place in LB presupposes answering questions such as: who is it directed at? who interacts? for what purpose? what resources and means do they have? what criteria do they follow? what contents are considered? among other questions that constitute the planes of didactic exchange. A process that is related to the role of educational actors, and whose actions are directed toward the collaborative construction of knowledge. Basically, the study of interactions that are emphasized in BL focuses on what is produced in virtual scenarios, it is there, where the study models of didactic interactions are located.

### ***3.1 Electronic Didactic Discourse (EDD)***

The discourse developed in online (or virtual) educational contexts presents a dynamic analogous to that of classroom discourse in face-to-face educational contexts, but with differential characteristics, marked by interaction in the network of networks, the Internet [24]. In this sense, the EDD contemplates the strategies and resources necessary to perform effectively in the collaborative construction of knowledge in virtual learning communities.

EDD is structured from a matrix articulated from the linguistic analysis, from the ethnography of communication or sociolinguistics; it basically adopts a qualitative approach, from a functional and discursive analytical perspective. It focuses on the study of discursive communities, where interactions are manifested through texts produced by the participants who operate the language in an open or directed way, and in a particular instance of production and reception, such as chat rooms and virtual forums.

The analysis of discursive texts in virtual communities involves accounting for the discursive contributions generated in virtual learning environments. Consequently, the discourse produced has an action/intentional, relational and intertextual character, so its approach must be multiple (of conceptual and methodological character), in order to adequately understand the actions propitiated, as well as to appreciate the intentionality of the discursive activity. In EDD, it is required to count on the discursive texts of constructed in on-line interaction, as well as their location within the historical context of the developing speech. This presupposes identified intersections between teachers and students, which reveal the referential connection. This type of

discourse seeks to reveal the common features and specificities that occur in virtual learning scenarios.

### **3.1.1 The Corpus of Analysis**

For the EDD, the corpus is made up of the discursive texts retrieved from the training forums and chat rooms. Discussion forums or asynchronous conferences are tools widely considered in discursive analysis, insofar as they reveal a close link between the participants in a communicative situation of the virtual classroom; so similar or only surpassed by the chats. The relationships built respond to the thematic deployment that leads to the construction of a macrodiscourse, hence the importance of forums as a teaching tool. In the formative chats, the interaction is similar to the classroom dialogues, although more spontaneous when generating multiple topic chains. The difficulty of chats as a didactic tool lies in the complexity of maintaining the focus of the thematic conversation, having to resort successively to relocation, in order to avoid digressions.

### **3.1.2 Asynchronous EDD: Study of the Interactions in Forums**

The analysis of the didactic interactions of the participants in the virtual forums, whose nature is asynchronous, requires a previous distinction, that is, to recognize the types of participation in the forums. Among the dimensions that intervene in differentiation, we have: the degree or level of interactive activity developed (high or low activity), the number of participants and individual attitudes (high exposure or hiding one's presence) [25] (Table 2).

### **3.1.3 Variations in the Use of Forums**

Although it is a question of promoting a conceptually constructive exchange between the participants, a simple formative and reflexive asymmetry, which guarantees an effective script and orientation, is not always achieved. It also requires the possibility of deep and creative investigation of new visions about reality and knowledge, based on the use of the forum in the methodology of the critical case.

When the teacher/tutor proposes activities and exercises, and the students respond to them, answering individually, the forum is opened. In those cases, a mainly additive participation takes place, in particular when a team work is not intended, but an individual fulfillment. Another aspect, to be taken into account, has to do with the attitudes of the participants and the experiences that determine their typical dynamics. For example, a creative, curious, communicative and industrious community will hardly remain in the narrow margins of additive contributions; on the contrary, it will create dialogical sequences with a high degree of interaction. This does not mean that a friendly or cordial tone is accepted as dialogical.

**Table 2** Types of participation in forums

| Type of participation                                               | Conceptualization                                                                                                                                                                                                                 |
|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Additional or related to the forum topic                         | Related to the forum topic, expressed through an opinion, comment, information about the proposed topic. It does not imply a “dialogue” with the other contributions                                                              |
| 2. Interactive or relative to discourse flow                        | Related to the discourse flow, the contribution has the character of an answer to a previous contribution or it relies explicitly on another to develop its own                                                                   |
| 3. Aiming at tending to maintaining the topic in the discourse flow | Oriented to fix or redirect the topic or establish another topic or activity. It is done from a position of authority or power relative to the forum, the topic or the participants. It also involves animation, evaluation, etc. |
| 4. Disruptive or relative to diverse topics                         | It is related to issues different from those developed in the forum and implies a supposed change of focus with or without a recognized intention and with a generally disruptive effect if participation is taken into account   |
| 5. Anomalous or unexpected                                          | Contribution that may be appropriate to the topic, but out of for other reasons. It may result in an insidious, annoying or aggressive contribution                                                                               |

*Source* Adapted from [25]

Some forums, whose purpose is didactic in itself, are really learning workspaces, derived from the interaction of the participants, which produces deepening or amplification of topics—product of the confrontation and/or conceptual collaboration among the participants—, or resulting didactic products (summaries, charts, diagrams, tables, etc.).

### 3.1.4 Synchronous EDD: Study of Chat Interactions

In the case of chats in educational contexts, the interaction is similar to classroom dialogues, since participation is in principle spontaneous and multiple threads or topic chains co-occur or co-exist. In didactic chats, the problem is the permanent difficulty of keeping the focus of the conversation on the educational objective or on the proposed task. Thus, for example, when comparing chats with or without a tutor; in the former, the tutor’s guiding and moderating role usually produces successive refocusing; while in the latter, digressions are frequent and the commitment to the task is weakened (similar to what happens in face-to-face classes with or without a teacher’s guide).

The experience and the analyses carried out on the difficulties, do not allow to establish orderly dialogues, where authentic and deep interchanges prevail; to achieve it it is required a lot of practice, shared rules of effective participation and an attentive task of the tutor/teacher with didactic movements (tactical-discursive actions), of fast, fair and effective nature. Unlike face-to-face class dialogues, chats require careful planning in which the tutor must be able to anticipate the texts that participants write [25].

3.1.5 Fundamental Didactic Uses of Didactic Interactions

- 1. In initial or alternative generation instances, such as brainstorming
- 2. Periodically to monitor the progress of an activity
- 3. In final instances, such as synthesis or evaluation (Table 3).

Forums and chats in virtual contexts constitute spaces of didactic interaction, and their particularities must be valued with respect to physical spaces. On the other hand, although participation is democratized and everyone has a voice in the virtual world, it is necessary to recognize and value them, that is, without explicit censorship. To this end, it is necessary that the profile of the online teacher/tutor increase their strategies and resources in order to perform effectively in the collaborative construction of knowledge.

Table 3 Tactics to control understanding of ambiguous or subtle issues

| Tactic                                                                                                           | Teacher intervention                                                                                             |
|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| 1. Summarize and record suggested ideas                                                                          | Teacher/Tutor retrieves the student’s comment, to correct and complete it                                        |
| 2. Break in and start again discussions that break down or become unsteady, taking up things that have been said | Teacher/Tutor gives an order and carries out activities to recover the topic that was proposed initially         |
| 3. Ask participants if they have anything to add before finishing a topic                                        | Teacher/Tutor verifies students understanding of the topic before going on to another topic                      |
| 4. Interrupt discussions that do not progress                                                                    | Teacher/Tutor changes the topic and proposes to correct the exercises of the previous class                      |
| 5. Remind participants of basic meeting rules if they do not follow them                                         | Teacher/Tutor reminds students of and sets the participation order when established turn-taking is not respected |

Source Adapted from [25]

## 3.2 *Analysis of Discussion Forums*

For data analysis, it is necessary to have a record of the interactions built in the online discussion forums corresponding to a training path. In BL the forum constitutes a useful resource, which is the space where the generated exchanges are expressed. In a concrete way, the dynamic value of the teaching–learning process is recognized, as a result of the didactic interaction of the participants when approaching the programmed contents. From the proposal we reviewed [26], two moments of analysis are foreseen:

1. Organization of the information retrieved, consists of identifying which forums are available, in which times they were generated, to which training space they belong to (modules, workshops, etc.), how many forums they are made up of, how the participants were distributed (groups, individuals), what type of action (simultaneous, deferred), how many messages were sent to the forums, ... On these bases, the forums are recorded, considering:
  - (a) Number of forums per workshop, module, etc.
  - (b) Number of forums per workshop, module, etc.
  - (c) Membership of a training course (module, workshop, ...)
  - (d) Number of groups that make up the training path
  - (e) Total number of messages sent during the forum
  - (f) Time of the training path (date, sequence, teaching unit, etc.).
2. Internal analysis of the forums, describes the behavior of the participants, the frequency of participation, the moments of involvement, both with colleagues, teachers, etc., which are the moments of greatest participation. Such questions are defined from:
  - (a) Frequency of participation (students, tutor, ...)
  - (b) Average number of submissions (students, tutor, ...)
  - (c) Times in the forum when they mostly make submissions.

It is at this point in the analysis that decisions are made about which forums to cut and select, considering the exchanges and intentions. In the selection of the forums, the importance of the total number of data is assumed, and the capacity of resources to deal with them is assessed. Likewise, recurrent behavior is taken into account, i.e. behavior that will not differ too much from that of the other participants.

### 3.2.1 *Procedures for the Analysis of Didactic Interactions*

Once the forums to be analysed have been selected, the data are observed and recorded. This involves defining the unit of analysis (intervention, frequency, average number of submissions, the time of greatest intervention, etc.). Observation includes identifying the purposes of the participants' intervention, trying to discriminate the

intentions (types of contributions), based on segmenting the messages sent, taking as units of observation the different purposes of intervention (greetings, thanks, response to questions asked, formulation of new questions, suggestions for material to expand on information, establishment of a relationship between theoretical concepts and reality itself, opinion and reference to the contributions of other peers, etc.

### 3.2.2 Elements or Criteria for Identifying the Purposes of Interventions

- Sentences or paragraphs of the messages sent, recognizing the indicators or marks that facilitate the discrimination of the purposes of intervention (presentation of a new idea, different from the previous one), separated in a different sentence or paragraph.
- Identification of the indexes or key words, which would allow to associate the idea expressed by the participant with a specific purpose, either as a slogan in the forum or as an answer to a question.
- It is often the case that the indicators are not so explicit, given that two or more different ideas are usually included in the same paragraph; it is appropriate to separate them.
- Once the observation units (discursive segments) have been defined, they are analysed within the forums. Likewise, the number of interventions is assessed in relation to the purposes, the differences in the purposes of intervention (between those who contribute on one occasion and those who do so more than once). In this way, it is possible to identify the total number of participants who intervene in each forum, and calculate the average number of submissions.
- Once the purpose of the intervention has been determined (characteristics and number of interventions per participant), a data registration form is drawn up for each forum (Table 4 attached).

The template allows for the recognition of the purposes of intervention, of teachers and students, as well as particular points considered significant from each intervention, as well as a summary of what was observed in the forum.

- In order to elaborate the categories related to the purposes of intervention, in the first instance [27], the categories formulated were redefined on the basis of what is observed as recurrent in the data analysis (Table 5).
- The most recurrent categories are taken into account, which, although they deviate from the regularities, are significant in illustrating specific situations.
- Description of what was observed, putting in relation the variables studied, trying to characterize the interactive processes that took place in the forums, in order to understand how these behaviors could enable or condition learning in these contexts.

The analysis of the discussion forums showed that data analysis implies a successive reduction of data, which must be significantly perceived; that is, avoiding the

**Table 4** Comparison of instructions presented in the forum (as an example)

|            | Instructions as posted in the forum                                                                                                                                                                                                                                                                                                                                                                                        | Discrimination of sub-instructions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Workshop 1 | <p>Forum 1</p> <p>Please participate actively and comment on the following</p> <p>Based on the pedagogical currents presented in class and on the readings</p> <p>1. What application would they have in my field of action?</p> <p>2. Is it better to follow one of these currents, or a mixture of them?</p> <p>3. Comment on any experience of success or failure, where the presentation had played a leading role</p> | <p>Forum 1</p> <p>Please participate actively and comment on the following</p> <p>Based on the pedagogical currents presented in class and on the readings</p> <p>1. What application would they have in my field of action?</p> <p>2. Is it better to follow one of these currents, a mixture of them?</p> <p>3. Comment on a successful experience (...), where the presentation had played a leading role</p> <p>4. Comment on any experience of (...) failure, where the presentation had played a leading role</p> |

Source Adapted from [26]

**Table 5** Purposes of intervention of teachers and students

| Purpose of the teacher/tutor's interventions                                                                                                                                                                                                                                                                                                               | Purpose of the students' interventions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1. Organization</li> <li>2. Offering help               <ol style="list-style-type: none"> <li>(a) Unspecified</li> <li>(b) Specific</li> </ol> </li> <li>3. Collection of contributions</li> <li>4. Formulation of new questions</li> <li>5. Opinion on the forum</li> <li>6. Stimulating participation</li> </ol> | <ol style="list-style-type: none"> <li>1. Response to instructions               <ol style="list-style-type: none"> <li>(a) Initially raised</li> <li>(b) Raised during the forum</li> <li>(c) Other questions</li> </ol> </li> <li>2. Assistance requests</li> <li>3. Help offers               <ol style="list-style-type: none"> <li>(a) Unspecified</li> <li>(b) Response to request</li> <li>(c) Offering resources/materials</li> </ol> </li> <li>4. Presentation of suggestions</li> <li>5. Collection of contributions</li> <li>6. Presentation of an opposing opinion</li> <li>7. Opinion on the development of the forum</li> <li>8. Manifestation of metacognitive processes</li> <li>9. Expression of feelings/expectations</li> <li>10. Expressions to encourage others</li> <li>11. Greetings/thanks</li> <li>12. Outside interventions</li> </ol> |

Source Adapted from [27]

selection of weak exchanges, few meetings, absence of discussions with minor disagreements, individual interests. In that sense, it is a matter of choosing evidence that contributes to the transcendence of the messages, and that contributes to the purpose of revealing the strategies that contribute to the clarification of the discourses.

3.3 Construction of Knowledge Through Argumentation

The model developed by Badia et al. [28] considers the patterns of interaction and sequences of argument and the quality of the contents of the arguments generated in online environments. The model’s approach considers: (1) examination of collaborative knowledge construction activities, based on the involvement of students in argumentative formative interactions, and their interrelationship with the didactic interaction among participants and the personal acquisition of knowledge; and (2) analysis on how technology-based scripts (discursive texts) can facilitate knowledge construction through argumentation. The structure of analysis comprises four dimensions of the educational interaction process (Table 6).

3.3.1 Levels of Analysis of the Argumentative Process

It comprises two levels of analysis, the first classifies the sequences of arguments; and the second classifies the statements with argumentative content (Table 7).

Table 6 Dimensions of the process of educational interaction

| Dimension                          | Conceptualization                                                                                                                                                                                                                                                          |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Participative                   | Quantifies the amount of participation (in terms of number of messages sent and number of words in the messages) and the heterogeneity of participation as members of a group or collective                                                                                |
| 2. Epistemic                       | It obtains information on how arguments and the application of theoretical concepts contribute to the solution of a learning task. That is, how the information is obtained and how it is related to previous knowledge, the space of the problem and the conceptual space |
| 3. Social modes of co-construction | Examine the extent to which there is interaction and influence on the participants’ reasoning, and how this is linked to the construction of personal knowledge                                                                                                            |
| 4. Argumentative                   | It highlights the processes of how statements are formally constructed, taking as a reference the formal criteria of argument composition and the specific components of the arguments (statements, data and justifications)                                               |

Source Adapted from [28]

**Table 7** Levels of analysis and categories that constitute the argumentative process

| Levels of analysis                                  | Categories                               | Description                                                                                                             |
|-----------------------------------------------------|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| First level of analysis:<br>sequences of arguments  | Argument                                 | A statement preceded or followed by a justification                                                                     |
|                                                     | Counter-argument                         | A statement that goes against an argument                                                                               |
|                                                     | Integrative<br>Response/replication      | A response to the counter-argument, which can take the integrative form of rejection, partial acceptance or replication |
|                                                     | Non-argumentative contributions          | Non-argumentative contributions                                                                                         |
| Second level of analysis:<br>sequences of arguments | Simple contributions                     | Contributions without justification or rationale                                                                        |
|                                                     | Substantiated or justified contributions | Contributions that limit the validity of the statement by introducing alternative explanations and viewpoints           |
|                                                     | Contributions with caution               | Contributions that combine the two previous characteristics                                                             |
|                                                     | Justified and cautious contributions     | Contributions that combine both previous characteristics                                                                |
|                                                     | Non-argumentative contributions          | Other kinds of non-argumentative contributions                                                                          |

Source Taken from [28]

The use of the analytical framework revealed: (a) scripts that promote the quality of argumentation, (b) depth of cognitive processing of content and its direct relation to the quality of its argumentation, and (c) quality of collaborative argumentation which is directly related to high-level cognitive processing and knowledge acquisition. It is also evident that, in online discussions, the use of several specific script types contributed to the increase in the quality of simple argument construction; as well as to the quality of argument sequences, and the degree of knowledge acquisition.

### 3.3.2 Quality of Argumentative Contents

The quality of argumentation in learning involves discussing multiple competing perspectives in order to agree on a common point of view. It starts with presenting a personal position, questioning others and responding to criticism. The analysis of the quality of argumentation involves interrelating the quality of arguments with the two levels of analysis (Table 8).

**Table 8** Dimensions of analysis of the quality of the contents of the arguments

| Dimensions                     | Categories/subcategories                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Content of the argumentation   | <i>Discursive movement</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                | Initial statement or thesis, response to the statement, change of statement, reply against the justifications, reply against the thesis, clarification against a reply, support for a comment, consultation or doubt about a meaning, clarification of a meaning, organization of interaction, interactions outside the task                                                                                                                                                                                                                                                                                                                                                              |
|                                | <i>Rationale or justification</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                | Level 0. No rationale or justification<br>Level 1. Rationale or justification based only on explanations without evidence<br>Level 2. Evidence-based rationale or justification<br>Level 3. Rationale or justification including evidence and explanations, or multiple evidence presented in a coordinated manner                                                                                                                                                                                                                                                                                                                                                                        |
|                                | <i>Conceptual quality</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                | Level 0. Non-regulatory<br>Level 1. Transitional<br>Level 2. Normative<br>Level 3. Coordinated                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Structure of the argumentation | Level 0. No opposition<br>Level 1. Simple statements in response to unjustified and unreplied claims<br>Level 2. Statements for or against with justifications but without counter-arguments<br>Level 3. Statements for or against with justifications but with only one counter-argument that changes the thesis of the initial statement<br>Level 4. Multiple counter-arguments that change the thesis of the initial statement, with no counter-arguments that change the justifications used to support the initial statement<br>Level 5. Multiple counter-arguments, and at least one counter-argument that changes the justifications used for the support of the initial statement |

Source Taken from [28]

### 3.3.3 Reciprocity and Shared Knowledge

In this line, complementary lines related to virtual collaborative learning are studied; they are related to the degrees or levels reached of shared collaborative knowledge and the processes of formative interaction related to the creation of common knowledge.

### 3.3.4 Levels of Shared Knowledge

The conceptualization of the levels of shared knowledge is related to other terms such as reciprocal understanding, mutual understanding, shared perspectives, or perspective taking. Underlying all of them is the idea of reciprocity, that is, the shared mutual knowledge that people possess. Addressing the reciprocal understanding of knowledge generated in virtual settings involves analyzing the types of messages, the level of communication and the quality of communication in a virtual discussion. Table 9 describes the dimensions and categories involved.

### 3.3.5 Processes of Construction of Common Shared Knowledge

Possessing common shared knowledge involves a process of interaction aimed at building consensus on understandings, knowledge, beliefs, assumptions and pre-suppositions. The process develops from two interdependent sub-processes: (a) co-intentionality (or degree of educational intentionality aimed at achieving a common learning objective, shared explicitly or implicitly), and (b) co-referencing (or establishing common shared meanings about content). The latter takes place at the level of understanding the content information, for which it must be oriented according to the characteristics of a given task and specific learning objectives.

In this regard, the construction of reciprocal understanding responds to: (a) questions about their practical activities or requests for clarification of the content of previous messages; (b) answers to the questions; (c) explanations of their experience; (d) agreements or disagreements; (e) conclusions or summaries of other opinions or points of view; (f) elaborations or conceptualizations of other points of view or theoretical reasoning; and (g) personal comments. On these bases, the mechanisms for the construction and maintenance of reciprocal knowledge are established (Table 10).

The analytical instruments referred to by Badia et al. [28] are applicable to large samples of virtual discussions, allowing the characterization and obtaining of data of the dimensions and categories through frequencies of occurrence. However, they have limitations in terms of the lack of precision in the key concepts of their theoretical framework, the obtention of restricted information on the evolution and dynamics of their construction, as well as the absence of a sufficient description of the type of learning tasks.

**Table 9** Analysis of the levels of shared knowledge

| Dimensions               | Categories                           | Description                                                                                                                                                                                                                      |
|--------------------------|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Kind of messages         | Theory                               | Message with theoretical content                                                                                                                                                                                                 |
|                          | New topic/question                   | Message that raises a new issue                                                                                                                                                                                                  |
|                          | Experience                           | Message explaining a personal experience                                                                                                                                                                                         |
|                          | Suggestion                           | Message with indications or suggestions                                                                                                                                                                                          |
|                          | Comment                              | Message with personal comments                                                                                                                                                                                                   |
| Level of communication   | High-level discussions               | Predominance of messages with a theoretical content, with proposals for new topics, and mutual negotiation processes among students                                                                                              |
|                          | Progressive discussions              | Predominance of messages with an experiential content, with proposals for new themes and reflections, but without becoming theoretical discussions.<br>Cross-references abound and there is a great variety of types of messages |
|                          | Low-level discussions                | Predominance of messages with personal comments and opinions, with individual positions that do not take into account the previous messages                                                                                      |
| Quality of Communication | Stage 0: Self-centered               | Students express subjective opinions and points of view, without paying attention to other students' points of view                                                                                                              |
|                          | Stage 1: Subjective perspective      | Subjective perspectives and the views of other students are clearly differentiated                                                                                                                                               |
|                          | Stage 2: Reciprocal perspective      | Students recognize and value the opinions of other participants                                                                                                                                                                  |
|                          | Stage 3: Mutual perspective          | Students agree on their own point of view with the perspective of the rest of the participants and, therefore, a common point of view emerges                                                                                    |
|                          | Stage 4: Social-symbolic perspective | Students reach higher levels of communication among themselves by connecting mutual perspectives with social, legal or moral perspectives of a society                                                                           |

Source Taken from [28]

**Table 10** Mechanisms for the establishment and maintenance of common shared knowledge

| Dimensions                                      | Categories             | Description                                                                                                               |
|-------------------------------------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Mechanisms to establish common shared knowledge | Presence of the others | Awareness of the social presence of others                                                                                |
|                                                 | Diagnostic process     | Think carefully about how to communicate information in order to avoid misunderstandings and hurt other people's feelings |
|                                                 | Feedback               | React and respond to the messages of others in an appropriate manner through various forms of feedback                    |
| Mechanisms to maintain common shared knowledge  | Contact                | Maintain virtual interaction through access to communication                                                              |
|                                                 | Perception             | Receive and read the messages                                                                                             |
|                                                 | Understanding          | Understand the messages                                                                                                   |
|                                                 | Attitudinal reaction   | Responding to messages in an appropriate manner                                                                           |

Source Taken from Badia et al. [28]

### ***3.4 Analysis of the Interactions in the Virtual Spaces: Diversity of Identified Categories***

The analysis of interactions in online spaces aims to understand how learning takes place, based on discourse analysis, combining quantitative and qualitative methodologies. In BL, discourses are raised in a double scenario, virtual and face-to-face, although virtual discourses are privileged in the analysis, as the ones we will see next.

#### **3.4.1 Analysis of the Interaction that Occur in Computer-Mediated Conferences (CMC)**

The model of analysis of the didactic interactions that take place in Computer-Mediated Conferences (CMC) distinguishes both virtual interactions and participating interventions [29]. The tables below establish such differentiations, which are intended to provide data on the interventions.

Tables 11 and 12 contain previously valid categories, based on the use of units of analysis, such as messages and thematic units. Even so, the categories could not be clearly identified, since they overlapped, hence it was established that the categories are not exclusive, with some interventions responding to more than one of the categories.

**Table 11** Categories for tutorial interventions

| Category                                | Description                                                                                                                                                                      |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Beginning of the debate                 | The topic of discussion and the guiding questions that will bring the debate to life are presented, and the participants are asked to intervene in the development of the debate |
| Partial synthesis                       | What was discussed is summarized, highlighting the main contributions and refocusing the discussion with new questions                                                           |
| Final summary                           | What was discussed is summarized, highlighting the main contributions, and the debate is finalized                                                                               |
| Rationale                               | The participants are invited to express themselves in more detail on the issues they raise                                                                                       |
| Applicability                           | There is a focus on reflection concerning how the course work can contribute to their professional development                                                                   |
| Exchange of experiences and information | Interventions aimed at facilitating participants to share experiences and information, which could be useful for other participants                                              |
| Feedback                                | Interventions that guide the participant in the course work and the use of resources                                                                                             |

*Source* Taken from [29]

**Table 12** Categories for interventions by participating teachers

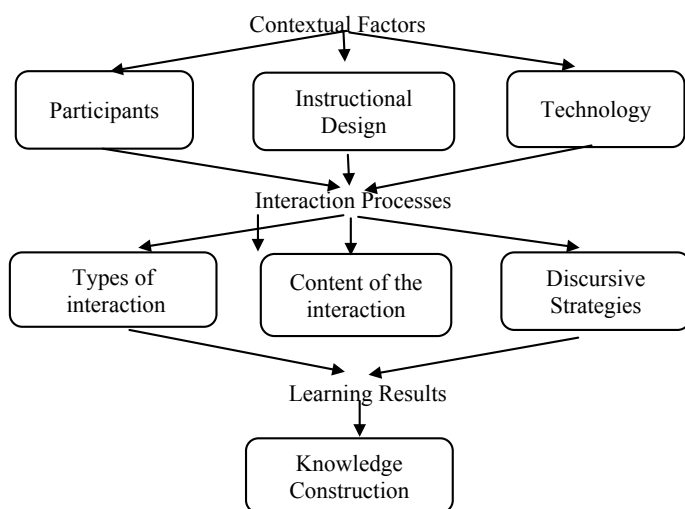
| Category                  | Description                                                                                                                                                                                                                            |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Theoretic elements        | They present theoretical elements related to learning theories and cognitive foundations related to the course contents                                                                                                                |
| Previous experience       | They intervene from their experiences related to their own teaching practice or from those narrated by other participants                                                                                                              |
| Course appreciation       | Course appreciation and the influence of the course on their professional development are given                                                                                                                                        |
| Transfer to the Classroom | They refer to the transfer to the classroom of the various aspects of the course such as: activities, materials, methodological strategies among others                                                                                |
| New training needs        | They express the need for further teacher training related to course content, didactic strategies for teaching course content, and mastery and integration of ICT resources                                                            |
| Structural problems       | They refer to structural problems that hinder teaching practice and innovations, which do not depend on the teacher, such as lack of technological infrastructure, time, material and support from pedagogical and/or managerial teams |

*Source* Taken from [29]

### 3.4.2 Analysis of Interactions in CMC Environments

The proposal describes and analyses the factors and processes involved in the effectiveness of online learning communities. The proposal poses some differences related to the emphasis placed on factors associated with instructional design and the types, content and interaction strategies linked to knowledge construction [30] (Fig. 1).

The proposed methodology comprises both a quantitative and a qualitative methodology. The former allows you to determine the times and types of interaction (Table 13), and percentage of categories of the three types of presence of the forum participants (Table 14); while the latter helps to recognize the types of presence of the participants (Tables 15, 16 and 17).



**Fig. 1** Methodological strategy for the analysis of interaction in CMC environments

**Table 13** Times and types of interaction per session in the electronic forum modality

|         |                             | Type and number of interactions |                  |                                               |
|---------|-----------------------------|---------------------------------|------------------|-----------------------------------------------|
| Session | Time of use of the platform | General Exploration             | Task orientation | Contribution to the task (number of messages) |

Source Taken from [30]

**Table 14** Percentage of categories of the types of presence of participants in the forum

| Presence                            | Categories                            | Frequency | Percentage |
|-------------------------------------|---------------------------------------|-----------|------------|
| Teacher presence (coded segments)   | Instructional design and organization |           |            |
|                                     | Facilitating discourse                |           |            |
|                                     | Direct teaching                       |           |            |
| Cognitive presence (coded segments) | Trigger event                         |           |            |
|                                     | Exploration                           |           |            |
|                                     | Integration                           |           |            |
|                                     | Resolution                            |           |            |
| Social presence (coded segments)    | Affective                             |           |            |
|                                     | Interactive                           |           |            |
|                                     | Cohesive                              |           |            |

Source Taken from [30]

**Table 15** Knowledge construction (KC) in the forum, phase 1 and phase 2, without teacher presence

| Phase 1 extract                                                | KC Phase (Gunawardena Model, 1997)                                           |
|----------------------------------------------------------------|------------------------------------------------------------------------------|
| A1: Student with little prior knowledge of the subject         | 1. Share/compare information                                                 |
| Phase 2 extract                                                | KC Phase (Gunawardena Model, 1997)                                           |
| A2: Student with an advanced level of knowledge on the subject | 2. Exploration of dissonances and inconsistencies between ideas and concepts |

Source Taken from [30]

**Table 16** Strategies used by the tutor to support knowledge construction in the forum

| Phase 4 extract: Evaluation or modification of ideas (co-construction)       | Discursive Strategies  |
|------------------------------------------------------------------------------|------------------------|
| T: Teacher<br>S2: Student with an advanced level of knowledge on the subject | Joint construction     |
| T: Teacher<br>S2: Student with an advanced level of knowledge on the subject | Repetition/Elaboration |

Source Taken from [30]

**Table 17** Type of Strategies used by the tutor to support knowledge construction (Phase 5) in Forum 2

| Phase 5 extract: New agreements/application of new meanings                                                                                        | Discursive Strategies                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| T: Teacher<br>S2: Student with an advanced level of knowledge on the subject<br>A3: Student with an intermediate level of knowledge on the subject | Joint construction<br>Anaphoric connection |
| T: Teacher<br>S2: Student with an advanced level of knowledge on the subject                                                                       | Repetition/elaboration                     |

Source Taken from [30]

**Table 18** Categories of analysis

| Dimension     | Operationalization                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Participatory | Participation in general, whose indicator is the number of contributions to the discussion and the active participation or direct involvement in the learning process                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Social        | All those participations that are not related to the learning process                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Interactive   | Interactive participations<br>Implicit answers<br>Explicit answers<br>Implicit comments<br>Explicit comments<br>Independent participations<br>Unrelated participations                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Cognitive     | 1. Initial clarification: where a basic understanding of the problem is given, identifying its components<br>2. Deep clarification: where values, beliefs and assumptions underlying the problem definition are identified<br>3. Inferences (deductive and inductive), admitting or proposing an idea based on its connection with propositions previously assumed to be true<br>4. Judgment, which includes decision making, propositions, appreciations and criticisms, and<br>5. Strategies, which include the proposal of coordinated actions for the implementation of a solution or a decision |
| Metacognitive | It includes evidence of metacognitive knowledge (declarative) and metacognitive skills (procedural knowledge about assessment, planning, self-regulation and self-reception)                                                                                                                                                                                                                                                                                                                                                                                                                         |

Source Taken from [31]

### 3.4.3 Content Analysis in Virtual Interactions

Content analysis is a method for studying interactions based on a constructivist and collaborative approach to learning, defined on the basis of three stages: (i) communication of information; (ii) first response to this information; and (iii) second response to the initial information, related to the first one [31] (Table 18).

The approach of the analysis requires recognizing the roles of participation. Table 19 describes the forms of participation.

## 4 By Way of Conclusion

The process of analyzing interactions demands several stages, some concurrent and other preliminary, the important thing is to identify the categories of analysis, which as we have seen, vary from model to model. In any case, the study of the interactions leads to the identification of the aspects that contribute to the construction of knowledge. To that extent, it is important to consider the variety of dimensions and

**Table 19** Roles assumed by students

| Role                 | Description                                                                                                                                                        | Forms of participation                                                                                                                                                                                                         |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Initiator            | The student who always initiates the interactions. He/she is usually identified during the first few days after the face-to-face session                           | He/she starts his/her participation with phrases such as “I think ...” or “In my opinion ...”                                                                                                                                  |
| Helpers              | These students do not let conflicts appear; they always agree with their peers’ previous comments                                                                  | They initiate their participation with phrases like “I agree with what you mention, [name of the addressee of the comment]...”, “I couldn’t agree more with you, [addressee], “What you say, [addressee], is very interesting” |
| Troublesome          | Students who, at least once a week, demonstrate against some of their classmates’ contributions. They do not offer very deep arguments about why they do not agree | Their contributions are brief and clearly against the ideas of some of their peers in the group. They do not offer many arguments to support their point of view                                                               |
| Occasionally against | Students who are generally in favor of the comments of others, but who at some point express an opinion against                                                    | This type of student offers ample justification for not supporting the comments of a given partner. They strive in their arguments to make it clear that this is not a personal matter                                         |
| Mediators            | They are students who, when faced with a situation of disagreement, seek to mediate so that the discussion ends                                                    | In this case, the comments issued by the mediators go towards the resolution of a conflict; they use phrases such as “... let’s see, let’s continue with the initial discussion ...”                                           |

Source Taken from [31]

categories involved. This overview of the models of analysis of interactions not only shows the diversity of categories involved, but also the need to integrate them, in order to have a better understanding of the collaborative construction of knowledge.

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