



Supporting decision-making processes on blended learning in higher education: literature and good practices review

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Abstract

This article seeks to support decision-making processes in higher education institutions interested in using blended learning (from now on *bLearning*) as a complement to other learning ecologies. It explores factors that could influence an institution's decision to implement *bLearning* and addresses questions that should be answered in this regard. It aims to serve as a framework to strategic and tactical decisions around *bLearning* as a complement to other learning modalities. Questions aimed at supporting the construction of multidimensional *bLearning* environments that transform educational practices are raised around themes requiring critical analysis to materialize the *bLearning* implementation strategy: educational, operational and business models. This work concludes with an analysis of how to achieve the institutional transformation process, including how to articulate the *bLearning* modality with existing pedagogical approaches such that *bLearning* innovations become institutionalized and sustainable.

Keywords: Blended learning, Hybrid learning, Higher education, Strategic thinking, *bLearning*, *bLearning* educational model, *bLearning* operational model, *bLearning* business model

Teaching and learning modalities in higher education institutions

One of the most common tensions in higher education institutions (HEIs) is related to deciding which teaching methods and learning environments should be used to ensure quality and expand coverage (Green, 1994; Brookes & Becket, 2007; Lee & Im, 2014). Each of the existing modalities (face-to-face, virtual, and blended) have their advocates, though often arguments for or against a given methodology are often based on the what is in fashion at the moment.

Face-to-face learning and technology-enhanced learning

Traditionally, HEIs used the face-to-face modality, or traditional classroom instruction where teachers and students interact in person. This approach includes: close relationships between teacher and students, well-organized spaces in which necessary resources for teaching and learning are available, a campus with qualified staff. Technology enhanced learning environments can improve the educational offer and guarantee quality in higher education, yet in a context of increasing local and international competition (Kirkwood & Price, 2014; Mykhnenko, 2016; Liu & Chen, 2017).

Technology becomes important when institutions face expansion. This situation presents challenges including tensions between coverage (reaching dispersed populations) and quality (offering excellent education services) (Green, 1994). Active pedagogies supported by digital technologies are often involved in innovations in the face-to-face modality because these can enrich face-to-face interaction; this is known as technology-enhanced education (Kirkwood & Price, 2014). Despite this type of enhancement, technology-enhanced education still cannot achieve large-scale coverage due to infrastructure and staffing cost factors. It is impossible to distribute human talent beyond campus, this being the most valuable resource for meeting quality requirements. In many countries, certifications of institutions and programs teaching face-to-face have a well-defined framework of principles and procedures, thus making it possible to establish which HEI meets accepted quality standards (Brookes & Becket, 2007).

Distance education and virtual learning environments

Distance higher education is another important modality used to increase coverage since it ensures that quality requirements are not inferior to those of the equivalent face-to-face education. Early distance education models were focused on content. Printed or audiovisual materials were made available to students who had sporadic interactions with tutors and counselors in centralized learning centers distributed in the regions targeted. In this modality, pedagogical and technological factors designed for this purpose are at the center of innovations (Galvis, 1982). The digital technologies allow for the creation and operation of a virtual (online) campus which promotes synchronous and asynchronous interaction with the available resources between all sides of the educational process (Galvis & Pedraza, 2013). This provides the opportunity for learners to receive support, which is predominately virtual, in learning centers. It is worth noting that quality in this modality is also regulated by standards and procedures provided by accreditation entities, allowing for characterization and differentiation of what is offered in this modality and between the organizations (Tanweer & Qadri, 2016). Meta-evaluations on the use of this modality (Means, Toyama, Murphy, Bakia, & Jones, 2010) have helped to overcome resistance or skepticism about its use in HEIs. These evaluations state that HEIs do not only seek to expand coverage, but to improve educational quality; online education can make learning more flexible, and thus more effective.

***b*Learning modality and multidimensional hybrid learning environments**

Rahman, Hussein, and Aluwi (2015, p. 769) mention that the literature reveals several definitions of *bLearning*, and the general consensus on *bLearning* characterization often unites the traditional face-to-face learning system and the electronic learning (eLearning) system, as proposed by (Graham, 2006). A report for the Online Learning Consortium—OLC (before, Sloan Consortium) defines “*blended courses and programs*, as having between 30 percent and 79 percent of the course content delivered online. *Face-to-face* instruction includes those courses in which zero to 29 percent of the content is delivered online; this category includes both traditional and web facilitated courses. The remaining alternative, *online courses*, are defined as having at least 80 percent of the course content delivered online” (Allen, Seaman, & Garret, 2007, p. 5). A more

recent report published by the same Consortium mentions that “as eLearning has evolved into a global change agent in higher education, it has become more diverse in its form and applications. This increased diversity has complicated our ability to share research findings and best practices, because we lack a shared set of definitions to distinguish among the many variations on eLearning that have arisen” (Mayadas, Miller, & Sener, 2015). As a consequence, a revised version of categories and definitions of courses and programs was proposed and shared by OLC, as summarized in [Appendix 1](#). It is interesting to notice that this proposal refines Graham (2006) and helps differentiating seven types of courses and four types of programs, depending on how the course activity, or the program, mixes face-to-face and online activities (space for learning) as well as synchronous and asynchronous activities (time for learning) when digital technologies are in use. Another interesting consideration is that “blended” and “hybrid” are considered synonyms, which is true, as long as there are mixes of spaces and times for learning in both cases. But it is conceptually short, as long as learning should be the focus of the different learning ecologies, and not only the blends of space and time for the student-teacher-interaction in doing learning activities.

In this regard, Singh (2003), cited by Rahman et al. (2015, p. 769) says that “in order for a learning approach to occur as blended learning the two characteristic must be combined so that it complements each other and promotes learning and application-learned behavior”. Osorio Gómez and Duarte (2012, p. 260–261) define “learning environment as a set of conditions in place for understanding learning activities”, and explain that “when referring to blended learning, the term ‘blended’ expresses the aspect of combining face-to-face instruction with ICT-mediated instruction. However, different combinations of instructional approaches or instructional methods are possible, one of which is hybrid learning.”

Above considerations lead to highlight the pedagogical dimension of blending and gives this flavor to the hybrid approach to learning, in which the intention to promote learning, while getting the best from the combination of opposite but complementary modalities [face-to-face, online], matters. “The hybrid concept constitutes a potential continuum in the teaching–learning process as it can be seen as the expansion and continuity of space–time (face-to-face and distance, synchronous and asynchronous) in the learning environment. The challenge of the hybrid approach therefore is to achieve integration between face-to-face and eLearning actions in the delivery of learning activities, in such a way that each adds value to the other in a continuous process that leads to learning objective attainment.” (Osorio Gómez & Duarte, 2012, p. 261).

The continuum notion as related with learning environments is very important to understand. As explained by Osorio Gómez (2011, p. 73–76) hybrid learning activities are not limited to what happens in the classroom (face-to-face and virtual classrooms) but also include activities in autonomous learning spaces; this expands space and time for learning and breaks the discrete approach to the design of instruction. “The metaphor of the continuum refers to the notion of connecting and integrating, as opposed to the fragmentation, division and discretization of the learning environment. When hybrid environments are constructivist learning environments, the interaction Student-Student and Student-Instructor should enhance the individual and collaborative construction of knowledge in a continuous process at both the theoretical and methodological levels. (Osorio Gómez, 2009, p. 245)”.

It is evident from the above conceptual revision that there are several dimensions to be considered to design blended learning environments. Table 1 gathers two schemas to create multi-dimensional blends in learning ecologies. Besides the first dimension considered by (Singh, 2003) and (Galvis, 2017a), which deal with interrelated concepts, the rest four dimensions are mutually complementary. Each of these lenses help to understand multiple possibilities of blending pedagogical and technological resources.

The multi-dimensionality of the blend is a framework that agrees with Rossett and Frasee's perspective on *bLearning* (Rossett & Frasee, 2006, p. 2). They argue that blended learning environments "integrate seemingly opposite approaches, such as formal and informal learning, face-to-face and online experiences, self-directed and directed instruction, as well as digital references and personal connections, to achieve individual and institutional [learning] goals." The relevant characteristics to understanding this multi-dimensional framework are that *bLearning*:

- Recognizes that education occurs in formal (e.g., classroom), non-formal (e.g., work, communities of practice) and informal learning environments (e.g., media, websites), building on the strengths of each learning environment.
- Highlights the fact that both human facilitators and digital technologies can play a key role in education; a selective combination of these means can be the basis for rich, sustainable and expandable learning experiences.
- Recognizes alternative and complementary paths for learning, promoted by individuals but also by collective efforts. A well-conceived combination of learning paths can lead to curriculum plans that allow for education, personal growth, and productive life to align.
- Accepts that interaction with content stored in repositories can complement interaction with facilitators and co-workers or peers, by physical or digital means; a combination of exchanges that considers the nature of what is learned and the desired level of expertise, which can lead to the creation of rich, flexible, effective and sustainable learning experiences.

In addition to finding appropriate multidimensional blends for a given educational context, another great challenge of the *bLearning modality* is to make the most of face-to-face and virtual modalities when they are used to provide blended learning ecologies

Table 1 Two lenses to look at dimensions of the blend

Dimensions of the blend (Singh, 2003)	Dimensions of the blend (Galvis, 2017a)
<i>Offline</i> (face-to-face) and <i>online</i> (virtual) learning environments	<i>Spaces</i> (face-to-face, online, autonomous) and <i>time</i> (synchronous, asynchronous) for student-teacher-content <i>interaction</i>
<i>Self-paced</i> (learned controlled) and <i>live, collaborative learning</i> (among many learners)	<i>Pedagogy</i> (conventional, inverted) and <i>locus of control</i> (teacher, students, group)
<i>Structured</i> (formal) and <i>unstructured</i> (informal) learning	<i>Media</i> to attain knowledge (expository, active, interactive media)
<i>Custom content</i> (adaptive, flexible) and <i>off-the-shelf content</i> (generic)	<i>Learning experiences</i> (formal, non-formal, informal)
<i>Learning</i> (before a new job-task), <i>practice</i> (using job-tasks or simulation models), and <i>performance support</i> (Just-in-time coaching)	<i>Learning environments</i> (personal / networked, at work / at home, virtual classroom / physical classroom)

(Pavla, Hana, & Jan, 2015). After more than a decade of experimenting with and reflecting on the use of this modality at the University of los Andes Center for Innovation in Technology and Education (Conecta-TE), our experience has shown that *transformative bLearning programs*—those where *bLearning* is used to foster educational change aligned with the plan for institutional development—require attention to a combination of organizational, educational and operational factors of success (Galvis & Osorio, 2017).

Studies have shown that perceived value of *bLearning* has the most significant contribution on students' satisfaction on *bLearning*: “when students perceive their learning as relevant, interesting, and enjoyable, the value of learning satisfaction increases” (Rahman et al., 2015, p. 773). These authors also established that this is followed by easy of use, a technology-based design-factor; the third unique contribution is learning climate, since a positive learning climate encourages the exchange of ideas, new information and knowledge. This depends on trust and cooperation between students. Last, but not least, is student-instructor interaction, which includes instructor delivering information, support the students as well as provide feedback on students' works.

Focus and conceptual framework

This article aims to outline factors that support institutional decision-making processes around challenges in these three complementary dimensions mentioned. The paper seeks to answer the question:

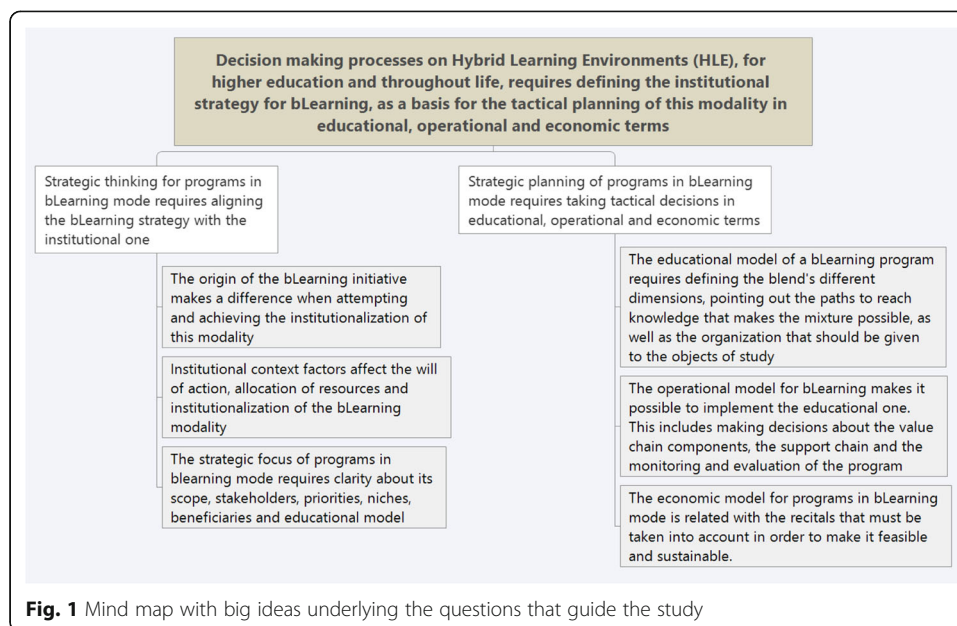
How can sound pedagogical, operational, and organizational conditions for *bLearning* to thrive in HEIs be created?

Key subordinate questions will also be addressed, and include:

- How can strategic institutional thinking about *bLearning* programs and courses in HEIs be developed?
- How can tactical decision-making processes behind the implementation of *bLearning* strategies proposed by a given educational organization be supported?

To tackle these questions, expert focus group sessions were conducted. Participants included expert *bLearning* stakeholders at the University of los Andes, most of whom have created and taught *bLearning* programs and courses for more than a decade. The goal was to determine *big ideas*, i.e., fundamental concepts, (Mitchell, Keast, Panizzon, & Mitchell, 2017) needed to be addressed to conduct this study. Based on reflection and a collective discussion, we created a mind map that expresses big ideas to be developed in order to solve questions of interest. This map was later refined upon interaction with other *bLearning* experts from HEIs that are leaders in the use of technology-based education, as is shown in Fig. 1.

With this mind map as a reference, we carried out a systematic literature review around strategic and tactic issues to support decision making processes concerning *bLearning* in higher education. Selected studies were included because of their relevance, endurance of results, conceptual clarity as well as because of pertinence of cases in consideration. This led to update a benchmark study on good practices and lessons learned in the use of *bLearning/eLearning* at HEI in Europe, North and South America, that the author had



conducted (Galvis & Pedraza, 2013). Six case studies were revised in collaboration with key informants from Universitat Oberta de Catalunya [Spain], Instituto Tecnológico de Monterrey [México], Babson College [Massachusetts], Pontificia Universidad Católica del Perú [Perú], FLACSO-PERT [Argentina], and Universidad de los Andes [Colombia] (Galvis, 2017b). Appendix 2 shares interview guides prepared with this purpose. This was done with the aim of understanding the evolution of each case in the 3 years after the original benchmark. Based on the findings, we collaboratively authored with the informants six case studies about *bLearning/eLearning* in higher education and are included in a book in print (Galvis, 2018, in press).

We also reviewed studies tracking innovation in education (Rogers, 1983) and analyzing change processes around technology-enhanced pedagogy in HEIs (Graham, Woodfield, & Harrison, 2013; Porter, Graham, Spring, & Welch, 2014; Porter & Graham, 2016). It was clear that the institutionalization of innovations such as *bLearning* goes well beyond the application of best practices. Articulating the *bLearning* modality with the *modus operandi* of an organization requires negotiation and agreement between those who believe in current approach and those who believe that strengthening and/or expanding is worth considering.

Furthermore, this study builds on previous research related to the meaning of teaching in the digital age (Ginns & Ellis, 2007; Bates, 2015; Brown, 2016), which is a broad domain which discusses enhanced learning, blended learning, and virtual learning.

Strategic thinking about *bLearning* programs

Strategy is not the consequence of planning; on the contrary, it is a starting point: “strategic planning, as it has usually been practiced, is in fact strategic programming, entailing the articulation and elaboration of strategies or visions that already exist ... In contrast, strategic thinking is related with synthesis, the generation of innovative ideas, new perspectives; it entails intuition and creativity” (Mintzberg, 1994, p. 107–108). Building on these concepts, we proposed the following set of guiding questions as a

frame of reference to strategically plan a program or a course using the *bLearning* modality:

Set of Questions #1. Strategic thinking about the *bLearning* initiative

- *Mission*. What is the fundamental purpose of the *bLearning* program? What should its products or services be like? Which stakeholders should the program serve and under what conditions?
 - *Success indicators*. What variables should be revised to determine success in fulfilling the mission?
 - *Identity*. What would make this program unique? What would distinguish it from similar programs? What should be the unmistakable trademark of this program?
 - *Desirable blend*. How can the differences among similar programs be increased in terms of their functionality, taking advantage of the multi-dimensional opportunities of blending? Which dimensions are subject to innovation given the available strengths and opportunities?
 - *Integration*. Is it convenient to make alliances or subcontracts to handle some of the elements of the value chain or the support chain? What elements cannot be delegated and must be addressed directly by the program?
 - *Vision*. What is the desirable state of the medium-term program? What is the medium-term expected perception from beneficiaries?
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The following paragraphs present findings regarding guiding questions #1, from literature review and above-mentioned case studies.

Leadership and rationale for adoption and institutionalization of *bLearning*

Initiatives in *bLearning* do not grow spontaneously. There are people, reasons or circumstances that lead actors to consider the desirability of offering a *bLearning* program in an educational organization. Examining the following perspectives can help to uncover this.

The rationale behind offering a *bLearning* program/course

The study by Galvis and Pedraza (2013) shows that it is worth understanding the origin of the intention to offer educational opportunities that were flexible in terms of space, time and modality. That said, there are different implications for these reasons depending on from whom and where they arise. The consequences vary if the forces leading the change are in the top management of an organization, in potential stakeholders, or in potential beneficiaries, as opposed to emerging collectively from learning communities interested in gaining access to flexible or alternative learning opportunities.

Reasons leading to the use of blended learning environments

In order to meet the needs that foster a *bLearning* initiative and reveal what cannot be accomplished with educational solutions in the existing modalities, it is important to establish why the *intertwining of learning environments* is considered. Case studies reviewed by Galvis (2017b) showed that, usually, the goal is to reach people who do not have access to a formal face-to-face education. These are often people who have no experience as learners in virtual environments but want to overcome space-time barriers to gain effective access to education opportunities throughout life. Likewise, the desire to maximize the use of the physical infrastructure, such as increasing classroom availability, could be a reason for using virtual spaces. Additionally, the quality of *bLearning* can match other modalities if the appropriate mixture of the following is provided: interactions types (face-to-face and distance); means (expository, active or interactive);

control schemes over the learning process (teachers, students, groups of learners); and learning environments (work, home, educational institution, virtual classroom, face-to-face classroom). Given this range of possibilities (Galvis, 2017a), it is important to understand why a diversity of combinations in the *bLearning* initiative occur.

Institutionalizing the use of blended learning environments

Within any educational institution, it is likely to find teachers and managers who are eager to explore innovative options, such as offering courses or programs in blended learning environments. Still, it is not common for those individual initiatives to become institutional ones. However, if the initiative has been institutionalized, it is important to understand how this has happened. Was the initiative the result of an internal drive to innovate (e.g., through benchmarking) that was piloted prior to its institutionalization (Burkei, 2014), or is the institution willing to make such transformations as part of its mission (this is known as the reengineering of educational processes)? (Penrod & Dolence, 1992).

Factors that influence the *bLearning* initiative

The context of a system includes everything that can affect it without being directly influenced by it; when a factor is influenced by the system, it ceases to be context and becomes an organic part of the system (Churchman, 1968). This definition is very useful to streamline what a *bLearning* initiative program or course and its context can be. In some cases, it can be an institution, a department, another program, or it can be all the above. For this paper, we consider the following possible contextual elements, even though in some cases they may no longer be of contextual nature, because they are all key to this endeavor: institutional strategy, board level commitment, social adjustment versus *bLearning* modality, level of maturity for *bLearning* adoption.

Aligning the blended modality with the institutional strategy

Each organization has its own strategy to succeed in achieving its mission and accomplishing its projected goals. In this regard, it is vital to be clear about the role that blended modality can play as a differentiating educational factor, as an element that adds value to the learning process, or as an element that ensures a sustainable, competitive advantage for the organization. These qualities seem to be at the core of what Ohmae (1990) calls wise competition. It is also essential to achieving an alignment between the business strategy of the educational organization and the blending strategy of the chosen program. Educational and computer technologies can become an organizational transformation factor (Henderson & Venkatraman, 1994) insofar as they consider not only the instrumental components (what is included in that process' chain of support), but also the essential one (what is included in the value chain of the educational process).

Board level commitment with the *bLearning* modality

As obvious as it may seem, without an effective managerial commitment in a *bLearning* program context, it is impossible for this type of initiative to thrive. Studies

on best practices in *eLearning* and *bLearning* programs (Galvis & Pedraza, 2013) show that this type of commitment is a key factor in making the following possible:

- Using the teacher's time as authors, course directors, facilitators, or evaluators as part of their academic load, or compensating them when their contribution to the program is not part of their teaching responsibilities;
- Relying on sufficient and appropriate financial resources to design and implement the program, and then to implement, replicate or expand what has been designed. (A medium-term investment recovery can be expected);
- Rethinking fundamental processes present in the chain of educational value and aligning technological, administrative, and financial support processes with these fundamentals according to the desired dimensions for the blend.

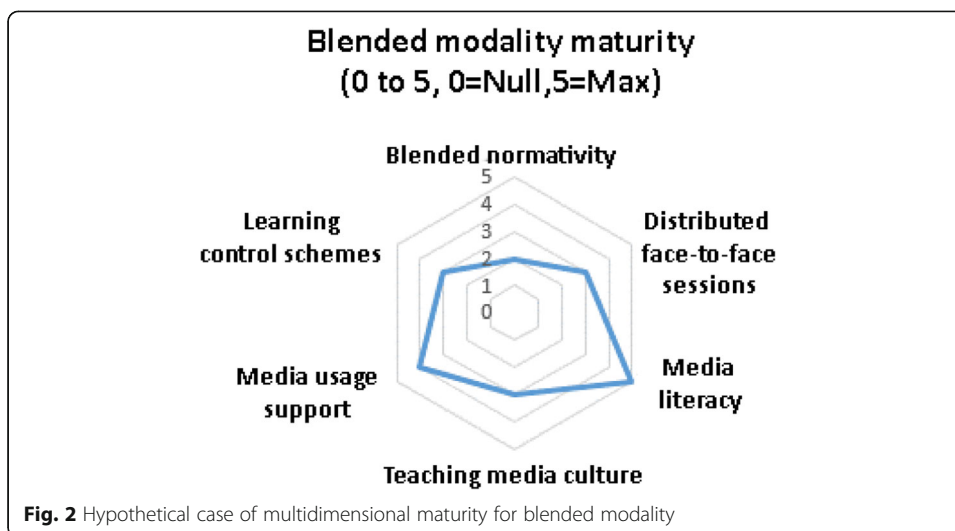
Socio-technical adjustment towards bLearning

Socio-technical studies analyzing Organization, Individual and Technology (OIT) relationships have shown that the period of time between the commitment to technology and its strategic use in an organization (from barely wanting to explore it until it is institutionalized) is affected by the individuals' differences in expectations, opinions, perceptions and attitudes (e.g. those of managers versus technicians) (Sáez Vacas, 1997). In this regard, it is very important to pay special attention to this transition through social adjustment processes that promote innovation awareness and appropriation. These move from a minor problem in the context to the mitigation of differences that significantly affect processes and products. As stated by Sáez Vacas (*op. cit.*, p.47) "when we talk about social adjustment to technology, in fact, we are alluding to the subtle network of *adoption curves* of each involved individual or group, immersed in a very competitive territory of struggle for power and survival."

Maturity stages of a blended modality program or course

The maturity to do something relies on the capability to carry that thing out in a given context. In order to discover the characteristics of a mature *bLearning* program or course, it is relevant to build on the multiple dimensions of this concept (Galvis, 2017a) and to consider the possible related contextual factors (Solar, Sabattin, & Parada, 2013). Figure 2 displays areas for improvement which are those with the lowest scores.

- *bLearning Normativity*. According to Allen et al. (2007) the *bLearning* modality must offer between 30% and 79% of contents online, thus reducing face-to-face time. From this perspective, it is possible to consolidate the *bLearning* program according to worldwide standards for a blended modality program accreditation. This will depend on whether it is a national or international accreditation body and how these establish the guidelines and percentages for online content. Institutional level regulations could also exist, insofar reducing face-to-face interaction for the sake of virtual interaction is accepted.
- *Face-to-face distribution and media literacy*. The distribution of educational opportunities (Mason & Rennie, 2006), that is, the amount of opportunities on site and synchronous for the face-to-face component, and the amount of opportunities that can be accessed from anywhere and asynchronously for the virtual component, can also be evidence of maturity for *bLearning*. This considers the possibility of conducting



face-to-face sessions for groups that are geographically dispersed (known as face-to-face distribution), as well the teaching staff and the participants making use of different sorts of media to access content. Depending on the program's geographical scope, it may be necessary to have one or more locations for the face-to-face component, either directly operated by the institution offering the course or program, or operated in association with local institutions. Media literacy for the virtual component cannot be taken for granted. Depending on the program participants, those who have already taught or learned with ICT support have probably acquired necessary skills, but otherwise, it is necessary to promote and teach media literacy in the face-to-face session in which the program begins.

➤ *Media culture in teachers.* Depending on the intended goal and the medium's specificity, it is possible to combine active, interactive, and expository media (Forté & Wentland, 1998) to support diverse learning styles (visual, auditory and kinesthetic) (Bersin, 2004), and to promote the achievement of different types of learning outcomes (information transmission, cognitive abilities, motor skills, attitudes). The maturity of this dimension has two complementary edges: the instructional and the institutional one. When the educational culture in media usage is very conventional, using predominantly expository means for teaching, the support for the hybrid modality is elementary. Nevertheless, when the educational culture in media usage is different and also aims at a diversity of objectives and ways to reach knowledge, the level of maturity is higher.

➤ *Media usage support.* Institutionally speaking, the level of maturity is related with the support given to teachers and students for the use of different types of media (Solar et al., 2013). If maturity is limited to addressing access and functionality problems of each media, there is little maturity from this perspective. If it includes strategies to support an adequate use of media through which knowledge is attained, there is a high level of maturity.

➤ *Learning control schemes:* Pedagogically speaking, maturity to support learning in mixed environments is determined by the control scheme's mindset. It may be centered on the teacher, who transmits knowledge, on the learners, who build knowledge, or on groups, who share and reconstruct knowledge (Forté & Wentland, 1998). When the program design seeks a balance of emphasis according to the type of results and

processes it leads, higher pedagogical maturity is required in the environment designers and in teachers; when the educational paradigm allows everyone to make use of their own teaching style without a pedagogical model guiding the process, less maturity is required.

Focusing learning programs on blended learning environments

bLearning entails a series of basic definitions that create synergy between the components of the program offered. The teleological¹ definition of a *bLearning* program demands a clear educational model, its scope, needs and market niches as well as its stakeholders and beneficiaries (Galvis, 2017a).

Desired scope for a bLearning program

Within the context of an educational institution, the *bLearning* modality can be used at different levels or complementarily: learning units, courses, study programs, or group of these. Deciding on a particular scope leads to important structural and procedural implications. Once the scope is established, the institution must decide what characterizes its blending choice (its 'touch' or its 'trademark') and how to ensure its quality (Galvis, 2017a). If only a few learning units will implement *bLearning*, the accompaniment for their design and development can be tailored following the principles of the educational model and without making major adjustments to the value chain and support processes for face-to-face or online courses. However, if *bLearning* is implemented within whole programs, alignment of processes in the value chain is mandatory (Galvis, 2017b).

bLearning program interest groups / stakeholders

By identifying internal and external groups of interest, stakeholders, as well as categorizing them according to the interest in and power to influence the conceptualization, materialization, offer, follow-up and evaluation of a *bLearning* program, it is possible to determine the dissemination strategy among the stakeholders. This stakeholder analysis which uses problem analysis and a logic of creating opportunities for all participants can be useful to outline partnerships, seek sponsorship or recognition from influential groups in the domain of interest, as well as to create formal or informal functional relationships (Svendsen & Laberge, 2007).

Needs that should be met with offers in bLearning environments

Educational needs are often seen as discrepancies between the desired state and the present state in terms of providing an educational service (Jannetti, 2012). To identify needs, a variety of sources are often used, depending on the type of needs to be considered (Suffolk County Community College, 2004). In the case of formal higher education programs, priority is usually given by *normative needs*, meaning those derived from the desire to comply with a rule, to meet requirements or standards. In contrast with current practices, this is the origin of many structural reforms in higher education programs. However, to provide a better service to the target population, initiatives that tend to be more flexible, usually responding to *perceived needs* of the potential beneficiaries or service providers, should be implemented. These could add much value to the current ones. *Comparative needs* are also often considered. These imply contrasting services or peer programs to indicate which discrepancies should be addressed or should be intensified if widening the gap is a differentiating factor.

Desired market niche(s) for a bLearning initiative

After reviewing these perspectives to shape the program's focus, it is worth exploring two possible ways of approaching potential market niches: (1) If the program has a *distributed geographical scope*, it is very important to ensure that the allocated face-to-face component can be offered with the same properties and quality as those of the home environment, that is, those of the institution where the program was created. For this purpose, it is possible to consider strategic alliances with peer educational institutions in the regions of interest as they can be useful to conduct a shared marketing and logistical management, as well as academic management that builds on the partners' strengths (Galvis, McIntyre, & Hsi, 2006). (2) If the program targets include an economic sector, or serve a world-class international organization, it is quite possible that the most important blend of learning environments is composed of organizations from this sector, or of segments of such organizations. In this case, it is possible to combine learning in a working environment with learning in an educational environment, taking advantage of the opportunities offered by the partner's knowledge management, communities of practice in their organizations, as well as the possibilities of syndication and subscription to specialized digital resources in this sector (Rosenberg, 2006).

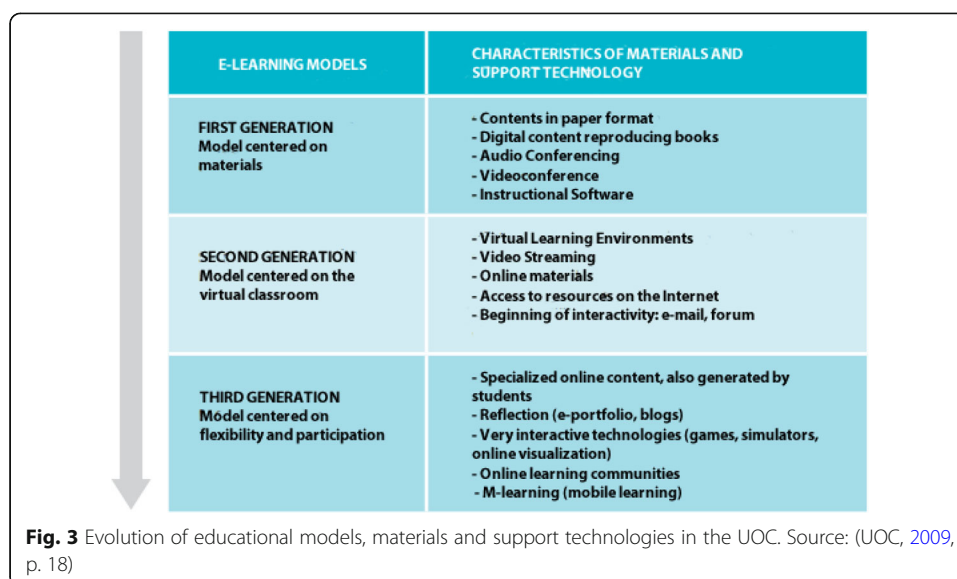
Characteristics of the program's potential beneficiaries

Programs in *bLearning* are open in some dimensions, such as the time and space to study the online component. This does not mean that they are suitable for anyone interested in the subject, even if the learner meets the conditions for admission and has the financial, technological and logistical resources to study. Learners' possible intrinsic and extrinsic motivators, potential family and organizational facilitators and inhibitors for adults learning in blended environments can help or hinder their success. Therefore, when designing these types of programs, it is important to gather sufficient knowledge about the target population. Also, it is key to publicize what it means to take part in the program, perhaps through video clips or face-to-face sessions which explain what taking part in these types of sessions entails and what it means to join a blended learning community. This information helps stakeholders to make informed decisions (Galvis, 2017b).

Outlining the educational model in a bLearning program

The educational model is one of the dimensions of blending that should be considered when designing a program (Galvis & Pedraza, 2013). The educational model can be left open, which means that the creators of virtual learning environments impose their own teaching model within the program's curriculum framework, under the premise that everyone comfortably shares a teaching style and that it is possible to align this with media support. It is also possible to have an institutional educational model, such as the one proposed by the UOC (2009) to its learning community (see Fig. 3) where the common denominator for any course and program is its tendency towards a third-generation educational model. This would not imply a schism for the coexistence of environments of other generations.

The importance of having a clear institutional educational model (or the lack of one) lies in that everyone involved —students, teachers and directors— knows what to expect and what they are responsible for. Likewise, it is convenient to set indicators of achievement and ways of evaluating these indicators.



An interesting educational model to review within the *eLearning* context is the one developed for VHS (Virtual High School) in the Concord Consortium, or CC (Tinker, Haavind, Galvis, Rose, McIntyre, et al., 2002). CC's *eLearning* models became a paradigm that illuminated the transition from distance education by correspondence to the digital format, to *eLearning*, while materializing conjectural, collaborative and experiential learning with ICT support.

Tactical decision-making for *bLearning* initiatives

Tactic, in one of its meanings, is understood as a plan, procedure for promoting a desired end or result.² In this case, it is a matter of implementing strategic thinking. To achieve this, this section shares guiding questions and related principles for building or revising educational, operational and business models that can help to materialize *bLearning* designs.

Educational model for *bLearning* environments

An educational model is related with each set of elements that make it possible for beneficiaries of a *bLearning* program to participate in it, to learn and become certified, if applicable (Galvis & Pedraza, 2013). Its components are the program's backbone and include the: (1) characterization of the blended learning environments, modes of interaction, and applicable resources; (2) examination of options to reach knowledge; (3) decisions about knowledge organization. These elements do not follow a pre-established order and there is much interaction between them, so adjustments in one component can modify another. The following guiding questions/instructions result from the literature review (Lai, Lam, & Lim, 2016) and/or the analysis of good practices in *eLearning* / *bLearning* (Galvis, 2017b). They are outlined here to help decision-makers in shaping or adjusting the educational model for *bLearning* initiatives:

Set of Questions #2. Blending environments, modes of interaction, resources and learning times

- *Learning environments*: In this course, or program, which learning environments are the best to take advantage of? Are the physical and virtual classrooms usually included in the *bLearning* offer sufficient? Is there interest in fostering experiential learning from what is done at work, and/or from what happens in the physical environment close to the learner, and/or in field trips?
 - *Interaction modes and resources*: In each of the chosen learning environments, different modes of interaction can be used to attain knowledge. Interactions can take place through the use of various types of media: interactive in which users engage with each other; active, which are organically engaging; expository, which transmit messages. Considering what one wants to achieve and the chosen learning environments, which learning resources are relevant to the environments and modes of interaction applicable to your case?
 - *Learning times and environments*: Build a timeline with the maximum duration of a course, defining each of the planned face-to-face / virtual cycles. Define the schedule for the combination of virtual / face-to-face environments. Keep in mind that you want to take full advantage of each environment's potential. Be sure that the times and activities for each learning cycle are enough to achieve the proposed objectives.
-

Set of Questions #3. Pathways to reach knowledge

- *Desired/convenient pedagogy to be implemented*: If the course or program is aimed at having characteristic trademark, define whether conventional or active pedagogy is to be promoted in the learning units; otherwise, give the author freedom to define how students should be encouraged to learn.³
 - *Type of classroom setting to be operationalized*: The blended modality can be used with conventional or active pedagogy, but also with conventional classroom practices (students go to the classroom to learn and then consolidate and generalize) or with flipped classroom approach (students learn before attending face-to-face sessions and then consolidate and generalize). Define if the educational model will impose some type of classroom type, or if it is the educators' choice to decide how to conduct their course.
-

Set of Questions #4. Content structuring and development

- *Define how to organize the course's content*. Use fine approximations such as: weekly distribution; using the book's core chapters; modular approach around linked to fundamental concepts, also called big ideas. In any case, it is expected that the learning cycle (motivation, acquisition, reinforcement, and generalization) will be achieved in a sequence that best fits the chosen pedagogy.
-

The subsequent sections present what the literature review and follow up from the aforementioned cases (Galvis, 2017b) show regarding the guiding questions and/or instructions above.

Mixing learning environments, modes of interaction, and resources

The definition of *bLearning* proposed by Rossett and Frasee (2006), and the multi-dimensional aspects of it highlighted both by Singh (2003) and Galvis (2017a), can be better illustrated when different blends are considered, as shown in Table 2 (updated from Galvis et al., 2006, p. 14). This example does not aim to be inclusive or current in terms of technologies, it is just an exemplification of the potential of considering multi-dimensional blends for this modality.

Time distribution and academic workload in blended learning environments

An emerging issue with the mixing of modalities to promote learning in *bLearning* environments concerns time. The academic workload is a consideration that must be taken into account. Activities must be organized considering time distribution so that synchronous tasks (same day and time, not necessarily at the same place when using communication technologies) and asynchronous ones play the best possible role in the educational model and that it is appropriate for the class-interaction time. Factors related to workload and time management are commonly related to the number of credits.

A reasonable mixture of face-to-face / virtual interaction, when participants are geographically dispersed is to meet in the physical classroom every 4 weeks, usually on weekends. This combination has been successfully used in many University of los Andes

Table 2 Resources to promote learning using blended learning environments in formal and non-formal settings *Source:* (Galvis et al., 2006, p. 14)

Type of media	Formal Learning Setting (Classroom)		Informal Learning Setting (Workplace)	
	Physical classroom	Virtual classroom	Virtual Office	Physical office
	Human-based, offline	ICT-based, online	ICT-based, online	Human-based, offline
Interactive media (allow learning through interaction and collaboration between people)	Discussion groups Case discussion Problem-based learning Expert consultation Role playing	Online forums / discussion groups Interactive case discussion Interactive problem-based learning Online expert consultation Collaborative games / simulations	Distributed learning communities (LC) •Task-based LC •Practice-based LC •Knowledge-based LC Online consultation •With colleagues •With experts Collaborative tools •Productivity •Knowledge management	Local learning communities •Task-based LC •Practice-based LC •Knowledge-based LC Consultation •With colleagues •With experts Mentoring Peer coaching Retreats
Active media (allow learning by inquisitive exploration of learning objects or tools)	Exercises Field trips Games Simulations Functional models Sensors Working tools Physical search	Drills + feedback/ reinforcement Web quests Stand-alone e-games Stand-alone e-simulations Digital models + data capturing Digital sensors + data capturing Productivity tools Digital search / Internet / Portals/	Knowledge Management •Individual syndication / blogs •Group / syndication / blogs •Organizational / data bases Just-in-time active learning tools Personal support tools •Help system, wizards Productivity tools, Working tools Search / Internet / Portals/	Knowledge Management Individual Handbooks and manuals Physical search
Expositive media (allow learning by transmission of knowledge)	Demonstration Lecture Video conference Audio conference Digital video Digital audio Books, magazines	Digital-demo e-Tutorial Video conference Audio conference Digital video / video casting Digital audio / pod casting Portals, eLibraries, Group websites Shared personal portfolios	RSS Syndication from •Search agents •Watch lists •Productivity tools •Social networks •Peer produced content •Blogs •Pod casts •Video casts •Personal portfolios	Subscription to •Magazines •Reference services Non formal learning events •Invited lecturers •Brown bag lunches •Seminars •Conferences •Video conferences •Audio conferences

ICT = Information and Communication Technologies, LC = Learning Communities

bLearning graduate study programs since it allows participants from different regions of the country to work and study at where they live and to Uniandes' campus to participate in one or more blended course sessions, depending on how many course credits per semester they are taking (Galvis & Osorio, 2017). Table 3 illustrates this algorithm:

When students are not geographically dispersed, it is possible to consider variations in time distribution of hours per week through the semester, quarter or bimester, depending on credits, or ECTS,⁴ per blended course and on the number of weeks per academic term. For instance, Table 4 shows how a 2-credit course per semester could be offered in blended learning modality in three different ways, depending on the class

Table 3 Time mix of learning modalities in a bLearning graduate program (Source: Uniandes)

Week 0: *Face-to-face* meeting to create community, develop a sense of belonging, appropriate the use of ICT, and program introduction.

Four academic cycles, each:

Weeks 1, 2, 3 per academic cycle I ($I = 1..4$): *Self-paced online* individual or small group academic work, to appropriate / explore / produce knowledge. Academic charge of 4 h per week per credit.

Week 4 per academic cycle I ($I = 1..4$): *Face-to-face session*, small / large group work, to deepen / debate / exchange knowledge with professor and classmates. One hour per credit

session length, as well as on physical classroom availability. This is a typical undergraduate course case, where students are on campus and it is convenient to reduce to physical class sessions by 50%.

Table 5 shows how a 3-credit course per semester could be offered in *bLearning* modality in six different ways, depending on the class session length and on physical classroom availability. This is a typical undergraduate course case, where students are on campus and it is convenient to reduce to 50% or to 66% of physical class sessions.

Ways to achieve knowledge favoring the program's defined blend

The chosen blend must not be detached from the pedagogy used to implement the program (Galvis & Pedraza, 2013). Considering the contributions of learning psychology, it is possible to consider two main approaches to acquire knowledge depending on who is at the core of the process. If the teacher is delivering the knowledge, behaviorist ideas can be very instrumental. These help to organize the activities created by the teacher to encourage learners to appropriate the relevant mental models. If the student, or learning groups, must actively acquire knowledge, it may be very instrumental to use ideas from cognitive psychology in which the subject, acting on objects of study, leads them to the construction their own mental models about what was studied. Case-based learning, problem-based learning, and project-based learning methodologies use the principles of the latter and very good applications of these practices exist, particularly in fields such as medicine, business administration and law.

These ideas might lead to empowering two opposites, but complementary, *bLearning* models: conventional classroom and flipped classroom (Galvis, 2017b). In both cases the learning cycle is the same: motivation, appropriation, refinement and generalization of the concepts learned. In the first model, the appropriation of knowledge occurs through the teacher's act of sharing knowledge in the classroom where students appropriate it, then refine and generalize in the virtual environment. In the second model, the students are exposed to content in the virtual environment before face-to-face interaction. Then they use their findings to dialogue with the teacher and with other colearners about challenges, cases and problems that can be subject to collaborative work.

Table 4 Time mix of learning modalities in a 2-credit bLearning course (Source: Author)

2-credit course	Face-to-face	Week 1		Week 16	
1 H / session	50%	1PC	1VC	1PC	1VC
1 H / session	50%	1PC	1PC	1VC	1VC
2 H / session	50%	2PC		2VC	

H hours of classroom interaction, *PC* physical classroom interaction, *VC* virtual classroom interaction
1 credit = 3 to 4 h of study / week along 16 weeks

Table 5 Time mix of learning modalities in a 3-credit bLearning course (Source: Author)

3-credit course	Face-to-face	Week 1			Week 16		
1 H / session	66%	1PC	1PC	1VC	1PC	1PC	1VC
1 H / session	66%	1PC	1VC	1PC	1PC	1VC	1PC
1 H / session	66%	1VC	1PC	1PC	1VC	1PC	1PC
1.5 H / session	50%	1.5PC		1.5VC	1.5PC		1.5VC
1.5 H / session	50%	1.5VC		1.5PC	1.5VC		1.5PC
3 H / session	50%		3PC			3VC	

H hours of classroom interaction, *PC* physical classroom interaction, *VC* virtual classroom interaction
1 credit = 3 to 4 h of study / week along 16 weeks

Self-management of the learning process that precedes the face-to-face session in the flipped classroom model does not necessarily imply active pedagogy (i.e., student-centered or group-centered), since it makes sense to convey fundamental concepts through technology (e.g., using video clips per each concept). It is possible to take advantage of face-to-face interaction to build knowledge on solid foundations and around problematic situations that require input from other participants and facilitators.⁵

Content structure and development

At first glance, content structuring does not seem too related with the educational model applied to a *bLearning* program. If a *bLearning* course seeks to promote certain types of skills, abilities, and proficiencies within a disciplinary domain and is offered with a blend of classroom and online activities, then the time frame of this blend should set the tone to organize content. For example, in the time sequence of 4 weeks per cycle illustrated in Table 3 it is “natural” for contents to cycle through a four-week period and for each cycle to develop a learning unit in *bLearning* mode. This could eventually also include flipped pedagogy. However, the courses are not always structured in large thematic units. Topics can be divided in the manner proposed by the curriculum or textbook, for example, one learning unit per week; within this, one face-to-face session could be held and the rest conducted virtually.

Another way to approach content structuring in *bLearning* environments is around the discipline’s *big ideas*, also called *fundamental concepts* (Erickson, 2007, p. 7). In this case the course creation team makes use of a three-dimensional instructional design consisting of: what to understand (each fundamental concept), what to know (facts), and what to do with it (skills). From this perspective, it is possible to overcome issues of two-dimensional instructional design (involving facts and skills) ensuring, from its very conception, the sustainable understanding of each big idea. This approach to teaching usually includes performance evaluations. Challenges situated in real contexts are used as learning strategies, and essential higher-level thinking questions are used to guide the inquiry, and solution to these questions are always authentic (Wiggins & McTighe, 2001).

The idea just mentioned presents an interesting disjunction between the conceptual and operational elements because in the first approach (thematic), the organization and development of contents does not necessarily imply a methodology, although it must make use of the defined multidimensional blend. Meanwhile, the second approach (*big ideas*) is bound to an active pedagogy that revolves around inquiry and solution of

authentic problems. Galvis and Pedraza (2012) present a methodology to redesign courses from the *big ideas* perspective.

Operational model for teaching in a *bLearning* modality

An operational teaching model refers to the set of elements that make it possible to implement the educational model. It includes decision-making processes related to the program and its courses, organizational structure to articulate processes, strategies to produce materials, student management throughout the course creation value chain, ICT management for the program, marketing and communication, management of tutorials and accompaniment, evaluation of effects and impact and follow-up with graduates.

The following guiding questions/instructions resulted from the literature review and/or the analysis of good practices in *eLearning* / *bLearning* (Galvis, 2017b) and are provided to help decision-makers shape or adjusting the operational model for *bLearning* initiatives:

Set of Questions #5. Define the normative framework for the chosen program or course.

- *Official program registration.* If it is a program, does the official registration or qualification already exist? What is the standard on the *bLearning* modality to be used? If not, what do you have and what does it take to achieve it?
 - *Course curricular plan.* When referring to courses, what defines the curricular plan in which students are immersed? What guidelines for course virtualization are being considered?
 - *Program management.* Is there a curricular management committee for the program to be offered in mixed mode? Who are the committee members? What requires their approval?
-

Set of Questions #6. Organize and articulate procedures of the value chain and support processes

- *Program adscription.* To which organizational unit does the program in blended modality belong?
 - *Management of the value chain components.* What elements of the value chain will be assumed by the organizational unit "owner" of the program or course? Which ones will be made in alliance with other organizational units? Which ones are going to be outsourced and to whom?
 - *Working teams.* Which working teams will be involved in the development of processes along the value chain? How will these teams be coordinated? What experience do you have with multidisciplinary team management and what lessons have you learned?
 - *Knowledge management.* How do you plan to do the knowledge management which is associated with the value chain? Will there be a shared repository to store information about the design, development, monitoring and evaluation of the complete program and each of its components? What are the guidelines for systematizing information in the repository?
 - *Resource management.* What is planned for the resource management (financial, human, physical, technological, documental, authorship) of the components for the program or courses to be offered in blended learning modality? Is there an integrated management system with other programs or courses of this modality? Who is responsible for each task and how do you monitor the flow of management processes?
 - *Dissemination.* What is planned for marketing, communications and social media for the components of the program or courses to be offered in *bLearning* modality? Is there an integrated management system with other programs, or courses, of this modality? Who is responsible for each task and how do you monitor the flow of dissemination processes?
-

Set of Questions #7. Formulate or refine strategies to produce materials for the program or course

- *Production of materials.* What is decided about the production of materials for the program or course to be offered in *bLearning* modality? Will materials be created within the organization? Will this production use resources created by others?
- *Production times and costs.* What are the budget ceilings and deadlines for the production, acquisition or adequacy of materials?
- *Strategy for original production.* If production is going to be handled in-house, will this be in a handcrafted way, according to each author's criteria? or will it be done on a professional level and be handled by specialized groups?
- *Adjoining production strategy.* If this process is going to use open access materials created by others, what repositories of Virtual Learning Objects (VLOs) and Virtual Learning Environments (VLEs) have been consulted, or do you plan to consult? Who will select and curates resources? If it is necessary to adapt or locate them, who will do it and when?
- *Materials purchase strategy.* If commercially-owned materials will be bought or adapted, who are the suppliers of these resources? What are the terms of use?

(Continued)

-
- *Quality assurance guidelines.* Which guidelines will be used to ensure the quality of materials and learning environments for education? They may be internal to the organization, may be international standards. What is planned in this regard?
 - *Copyright guidelines.* What are the organization's copyright guidelines? How will ownership of online or physical works that arise from the program or course be certified?
-

Set of Questions #8. Define how to monitor and manage students along the value chain

- *Knowledge of the beneficiaries.* Have you characterized potential students? What findings condition, or influence, the preparation and implementation of the program or course? If this information is not available, when, how and who will get it?
 - *Introduction to the modality and to the program or course.* How do you plan to introduce the *bLearning* modality and to the program or course? Who is involved, when and for what reason? What means should be used to ensure the friendliness and quality of this process?
 - *Counseling / coaching services.* Will there be these kinds of services for students in *bLearning* modality? What organizational unit will provide them? What will be the virtual / face-to-face nature of these services? What will the counselors' functions be? How integrated are the counseling information systems expected to be with the student management system of the program or course?
 - *Academic tutoring.* Will these services be available in the courses of the modality? What kind of background, training or certification must be demonstrated by those who provide this service? Are these tutors organized by course, by group of courses, or by program? What follow-up is done, or should be done, to the performance of the tutors and who is responsible or should be responsible for this?
 - *Achievement evaluation and certification.* What should be considered for the evaluation of learning and certification of achievements at course level? Do any institutional guidelines exist? or can each course creator(s) define this according to their own criteria? What policies need to be met in relation to academic achievement information at certain times in the academic calendar?
 - *Feedback information.* How is the student's opinion recognized throughout the program? Who gives feedback to those responsible for the various elements of the value or support chain based on findings about student opinion?
-

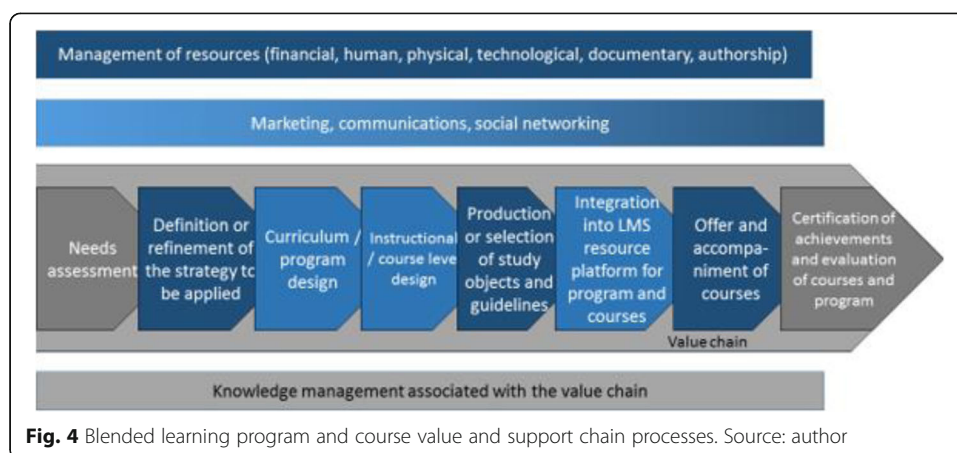
The following sections present the literature review and lessons learned from good practices (Galvis, 2017b) regarding the above set of guiding questions/instructions.

Policy framework for programs and courses in blended learning environments

It is to be expected that every program and course have their leaders, managers, owners, but this does not mean everyone can do as they please. For instance, formal programs offered by HEI in Colombia must be framed within the qualification standards outlined by the National Ministry of Education (MINEDUCACION, 2003). Some other types of programs are framed by the authorizations granted by the academic authorities of the respective HEI. Courses, in turn, are part of the approved curriculum and the guidelines prepared by the National Ministry of Education (MINEDUCACION, 2012) for the design, production and implementation of virtual courses. Since this does not generate a normative context for the courses and programs in the *bLearning* modality, it is considered a good practice to have a curricular administration *bLearning* committee where the respective innovation is to be implemented. This committee focuses on the updating and adjustment of these types of programs and courses and operates as a mechanism for consultation and authorization if need be.

Articulation of processes in chains of support and value

Processes required to carry out a program that uses blended learning environments and that is supported using information and communication technologies are shown in Fig. 4. The central arrow includes, in a sequential order, the processes of the value chain; that is, those that add value which the identification of the stakeholder's needs to the fulfilling of these (Porter, 1982).



The substantive processes of a *bLearning* program, which are its fundamental components, belong to its “value chain”, generate products and make possible educational services, such as:

- *Study of training needs*: A document stating what policy guidelines and what normative, perceived or comparative needs are the basis of the desired program or course.
- *Educational strategy to apply*: A document that makes explicit what makes this program or course unique, what differentiates it from similar initiatives and what is expected to make it attractive to the target population.
- *Program or course curricular design (macro level design)*: A document that establishes the characteristics of the program or course to be offered in *bLearning* modality. These traits should be in accordance with the applicable rules, whether they are international, national or institutional.
- *Instructional design (micro level design)*: Documents that specify each of the course units in the program to be offered. This design seeks to provide clarity about the purpose (needs), contents (topics and objectives), proficiency (evaluation system) and methods and resources for each course’s learning units.
- *Learning objects and study guides*: These are the resources that will make it possible to acquire the knowledge, including those that the student must interpret (learning objects) as well as those that give the student guidelines about how to carry this out this interpretation (study guides).
- *LMS Learning Management System*: This is a digital system where it is possible to create virtual classrooms and repositories that allow the course participants to learn using the resources that have been organized by subject and articulated. Through this platform it is possible to use each of the tools chosen to support the process and leave evidence of learning.
- *Accompaniment*: There is usually a course director in charge who focuses on and monitors course activities. Tutors, one per 20 to 25 students, provide support to academic processes. Counselors per cohort of students help to solve non-academic problems affecting the learner.
- *Certification of achievements and course and program evaluation*. Each course has a learning evaluation system that allows instructors to collect evidence of achievements.

Using these, the institution can certify the results of any given course or program. The evaluation of these academic services are embedded in the course and serve as a basis for making appropriate decisions to adjust the course or program.

In parallel with the substantive processes three groups of *support procedures* are presented:

- *Resource management*: This ensures the availability of resources that intervene in the development of a *bLearning* program. Without neglecting the traditional administrative efforts of every organization (financial, human resources, physical infrastructure), it is crucial to ensure that the others (digital systems and technologies, libraries and collections, copyrights) are effective.
- *Marketing, communications and social media*: These act as the face of the programs and manage the interaction with the outside world through audiovisual, social and interactive media.
- *Knowledge management (KM) associated with the value chain*: This element is an internal process that provides the guidelines and supports for the organization of knowledge around the educational innovation. It is very important to articulate KM with the processes in the value chain because it plays a role in institutional learning in that it systematizes and disseminates knowledge generated by the various processes of the value chain.

From the organizational point of view, there are many decisions to make, to build an efficient and viable operating structure. Below are some considerations derived from best practices (Galvis, 2017b):

- *Functional specialization*: Academic units related to the nature of each *bLearning* program ensure the pertinence of the content, timeliness and organization, management of the teaching-learning processes and evaluation of lessons, as well as monitoring the program and its components. Besides, the educational innovation requires that the value chain processes be completed and thus there is a need for an entity or organization that offers pedagogical, technological and evaluative accompaniment and direction to the development of these processes.
- *Finding a place for the educational innovation unit in the organizational structure*: Depending on the desired level of outreach in the *bLearning* initiative, and of the desire of those seeking external connections around education innovation and related research, it is convenient for the education innovation unit to be part of the institutional staff. This can be as a unit of service (as is the case of computing services, libraries) or as part of the academic vice-rectory staff in which case the unit is seen as a business partner for each of the faculties or departments.
- *Execution of value chain processes*: A golden rule for this is to self-execute the processes that give competitive advantage or are linked to one of the key success factors. Subcontracting specialized groups can be done under appropriate supervision. Those processes that other parties can competently complete at reasonable prices and times, without destabilizing the key factors of success can be contracted (e.g., creating dependency on a supplier). The manner in which the processes of the value chain are executed can determine personnel in the educational innovation unit.

- *Work teams*: Formal and informal higher education programs have a disciplinary or multi-disciplinary nature. Most of the processes in the value chain are methodological (pedagogical or evaluative) or technological (computer-based or audiovisual). Therefore, it is important to create work teams to carry out each process. Leadership of the *bLearning* program can be carried out by a coordination team, while each course requires its own production unit.
- *Internal coordination of processes and resources*: For a *bLearning* program or course to be offered on time and with the expected quality, it is important to do detailed planning, programming and monitoring of each of the processes in the value chain. This requires articulating times, resources and deliverables within each working team.

Production strategies of bLearning program materials

Organizationally and strategically, it is important to consider whether the production of online learning materials will be done internally or externally, artisanally or industrially, and with or without resources for free access. Whatever the case, production requires copyright acknowledgement in addition to license payments when resources are not open access. In some cases, the institution will want materials and learning environments to be a differentiating factor. Usually, this implies that the organization produce and release its own virtual learning objects (VLOs) with copyright protection. Servers that require users to have authorization for accessing resources and downloading copies are instrumental; such is the case with institutional Learning Management Systems (LMS) and Content Management Systems (CMS). In other cases, the institution may decide to give Open Access (OA) to the materials and virtual learning environments created for its courses, like those available in digital repositories such as MERLOT,⁶ OCW,⁷ TEMOA,⁸ or XPLORA.⁹

The decision of whether to use OA materials makes a difference for designing, developing and maintaining a *bLearning* program. OA resources must be used as they are and with no obligation to update them or make them permanently availability. If the resource is also Open Source (OS), limitation of updating can be overcome because of the availability of the source code and the commitment to sharing improvements within the community of users. On the *Creative Commons*¹⁰ website, it is possible to find the existing types of licenses as well as the specific conditions for each of them.

If the unit decides to produce materials internally, authors can be guided on techniques for creating and editing digital audio or video, as well as on using resources that the institution has included in its support toolbox. It is also possible to use a media production group (internal or external to the institution) to help create and refine audio, videos, simulators, games, web pages or other required materials. In any case, the important thing is having well-founded, clear guidelines that help to design, develop, test and adjust the materials, as well as matching production to budgets and timelines.

The challenge with materials is also related with copyright, which must be respected. The unit must recognize the authorship of the sources and register the works that arise from educational innovation projects. There is a convenient guide about online and physical registration of materials in Colombia and the registration of photos and videos from mobile devices (MININTERIOR, 2016).

Student management throughout the value chain

The value chain begins and ends with the customers (Porter, 1982), in this case, the stakeholders who choose to participate in a proposed *bLearning* program, as displayed

in Fig. 4. Analysis of good practices in *eLearning* / *bLearning* show that there is a tacit process within the value chain: student management (Galvis, 2017b). This process refers to the necessary tuning of the program characteristic towards participation opportunities for participation of the program beneficiaries. It also deals with the accompaniment that enables the student to move forward in their learning process in blended environments. The following are key considerations about student management:

- It begins with the characterization of the target population including the recognition of their current learning environments, their stage of life. This provides a context in which to design programs and courses, produce materials and organize the virtual learning environments.
- When materializing the program offer, student management is related both with orientating students to the modality and also to accompanying them through advising and feedback from the program's counselors and course tutors.
- It is key that students develop a sense of community (Rovai, 2002) for their interaction in both virtual and face-to-face spaces.
- It is also important to maintain continued supervision of their participation in individual and group activities, which can be done with learning analytics offered by the LMS, as well as with the use of alerts.
- These follow-up systems are valuable for the facilitation of participatory processes, where accompaniment with indirect light by facilitators makes a difference in the processes of inquiry and participant interaction (Collison, Elbaum, Haavind, & Tinker, 2002).
- Likewise, proper and well-defined feedback on learning processes and products, either by peers or by facilitators, can truly enhance participation.
- At the end of each course, and at the close of the program itself, student management includes the certification of student achievements.
- Student management also implies considering what has been gathered in the grading system, as well as the learners' feedback about their experience through surveys and/or focus groups. This can improve future processes based on the customer's response.

Business model for *bLearning* programs

The business model for a program in *bLearning* modality includes aspects that must be considered to make it a viable and sustainable offer. Literature on costs and funding of educational programs in this modality is practically non-existent; the studies by Bart (2008) and Rumble (1999 and 2001) on *eLearning* modality are the most related resources available. Building on Rumble's (2001) proposals on pricing of online programs, we propose that the business models for *bLearning* programs should take two elements into account: 1) variables that can be controlled and that have an influence on costs; 2) cost factors associated with the development of materials, the courses offerings and program management.

The following guiding questions/instructions arise from literature review and/or the analysis of good practices in *eLearning/bLearning* (Galvis, 2017b), and are outlined to help decision-makers in shaping or adjusting the business model for *bLearning* initiatives:

Set of Questions #9. Calculate costs for the participant in a bLearning program or course

- *Tuition fees.* What is the program's tuition fee and what is included in this payment? Consider the cost of academic guidance and counseling, teaching and certification services; also learning digital resources, such as e-books, digital videos, exercise simulators and games. Consider digital services such as virtual libraries, laboratories equipped with computers, research kits, laptops, tablets or portable digital equipment and Internet connection.
 - *Costs to be paid by the student.* What costs should the participant assume? Consider the digital technology required for each of the learning environments, the costs of attending face-to-face meetings (direct costs, such as travel and lodging expenses; opportunity costs, such as unpaid leave), and expenses derived from objects of study that are not included in the program's tuition fee.
 - *Financial challenges for enrollment.* Consider the beneficiary's characteristics and the funding systems or scholarships available. Do they make it possible to expect effective demand, considering the costs of enrollment and personal costs for participating in the program? What challenges are expected in the program's offer to make it financially attractive to the target population?
-

Set of Questions #10. Determine internal costs associated with program development

- *Cost-changing factors.* Considering the blend of media defined for the program, what are the major cost factors? What production or acquisition strategies are suitable to rationalize costs without risking differentiation?
 - *Models to produce different types of materials.* Which production model should be used for the different types of materials and what are the associated times for each resource type? Consider the course syllabus, study guides, texts, exercises, simulators, games, video clips, audio clips, and websites. What type of materials should an author-editor model use and what are the associated costs? Which media should be produced by a multidisciplinary team and what costs does it entail? In case you have established metrics for each type of material, what do these metrics say about the time required to prepare each type of material?
 - *Production: internal or outsourced?* Considering the offering plan for the blended modality program or course, is the installed capacity sufficient to produce materials, or is it necessary to subcontract? If the latter is necessary, for which parts of the program or course? How efficient is the organization when handling outsourcing processes?
 - *Program's lifespan.* To ensure the program's viability, what lifespan should it have? How many cohorts are needed to ensure the investment recovery? In case of open access throughout the year, how many students are needed to reach the break-even point?
-

Set of Questions #11. Internal costs associated with the program offer

- *Management costs.* What is the institutional overhead on income for the program or course to be offered in blended modality? Is it possible to request that it not be applied as until the program reaches the break-even point? What has not been included in this surcharge that could be a potential expense for the program or course?
 - *Costs of technological services.* What is the added cost of the program or course to be offered in blended modality from the perspective of platform and technological services, access to databases and digital library services? Are these costs included in the institutional overhead?
 - *Marketing costs.* Using the marketing structure that is the most cost-effective for your organization, what are the marketing costs associated with each of the areas of the program or course that you want to offer in bLearning modality? To what extent can these costs be shared with other programs using the same modality?
 - *Flow of human and technological resources.* Given the course offering plan and strategies for student management, what human and technological resources will be required to address student management throughout the program?
 - *Staff hiring policies.* What is the policy for hiring course directors, tutors, counselors and what are its strengths and weaknesses? How can the teaching load of the academics (course directors, tutors) who take part in the course offer in bLearning mode be balanced? Is the background knowledge of graduates or retired teachers being exploited in any way? What estimates should be made regarding graduate assistants and professionals with less experience? What budget forecasts does this entail?
 - *Resources for management, monitoring and evaluation.* What human and technological resources are needed for the management, monitoring and evaluation of the program or course to be offered? Is it desirable for the program or course to have its own management, monitoring and evaluation systems, or are these better done in conjunction with other programs in the same modality?
-

The following paragraphs present the literature review and lessons learned from best practices (Galvis, 2017b) regarding the above set of guiding questions/instructions.

External costs of a program in bLearning modality

External costs, which are passed on to the user or to the sponsor, can be a crucial factor to determine the program's viability because they can determine if stakeholders take an active part in the offer. A program's design encourages stakeholders to perceive

the added benefit, but their decision to participate considers associated costs as well. Thus, the following considerations should be kept in mind:

- It is key to pay attention to the costs of enrollment and of learning objects (materials and digital collections) when these are not included in tuition. Likewise, it is key to explore and share the possible options to cope with costs (scholarships, loans, personal funds), as these charges, and how to deal with them can be a decisive factor in attracting and retaining potential participants.
- It is appropriate to estimate the participant's operating costs. These might include travel expenses and possible work permits to attend face-to-face sessions, availability of computer equipment, and communication systems to participate in virtual sessions or marginal costs for their use.

Internal program costs in the creation phase

When the convenience of offering a program has been established, it is very important to predict its financial viability. It could be that a niche has been identified where the blended modality offers competitive advantages and can make a difference. The following points summarize critical factors in internal costs from experience and the literature review:

- *Production of materials according to their type.* Depending on what is most convenient type of media to use in a *bLearning* program, more or less specialization and effort are required for production. A study by *Arizona Learning Systems* (ALS, 1998, p. 13–14) quoted by Rumble (2001, p. 7) showed that the most cost-effective way to produce materials is to only produce the program including its study guides and assessments. If the program wishes to produce text, audiovisual, or interactive materials such as exercises, games, simulators or virtual reality applications, production costs can be significantly increased in a proportion from 1 up to 150 between the lowest and highest cost option. Audiovisual and interactive materials that make good use of the potential each media has require participation of multidisciplinary teams, which demand important investments. One way to reduce these costs, and eventually production times, is by doing adjoining production. This consists of selecting and adapting resources that match the requirements. These can be either open access (available in digital repositories of open resources), or copyrighted (available through an organization owner of the copyright).
- *Production costs and strategies to reduce them.* As for the effort involved in the materials development, in addition to the ALS findings already mentioned (ALS, 1998), Rumble (2001, p.79) reviews a study by Sparkes (1984, p. 219) who states that an academic needs between 2 to 10 h to prepare a conference, 1 to 10 h to prepare a small group session, 3 to 10 h to prepare a video recording, 50 to 100 h to prepare a text, around 100 h to prepare a live TV session, 200 h to prepare a tutorial and about 300 h to prepare an interactive software, not counting the time of the technical staff supporting the process. Many faculty would agree that these figures are not far from current ones, being the expertise of the academic and the possibility of repurposing available resources what makes the difference. Rumble points out that one way of keeping production costs within an acceptable range is by using an author-editor

model with advisors supporting the author, rather than having permanent staff in charge of producing materials. He also states (p. 80) that because the quality of materials is critical, to achieve cost-efficiency, it is better to seek savings in recurrent costs such as course promotion.

➤ *Technologies that will be used to support learning and management of a bLearning program.* Having this kind of technology makes a difference and it is worth studying the best way to use it from the beginning of the program or course production. It is possible to pay the license fee for the use of LMS or CMS systems and have support for the operation, or to subcontract related services. The chosen option must ensure the best cost-benefit scenario. Security, completeness and interoperability of the information should be insured. Since these systems are often institutional and non-exclusive to *bLearning* programs, it is necessary to determine the *bLearning* marginal costs, unless the intention is to include them within the overhead costs, as can be the case with library costs and digital collections.

➤ *Program expected lifespan.* Investment costs of materials are amortized over the program's lifespan, which must be established to estimate the feasibility and return of investment.

Program internal costs in its execution phase

To start a program, or course, in *bLearning* modality, clarity about the purpose of the offer and the educational resources available might not be the only requirements. It is also necessary to ensure viability at least in the medium term.

➤ *Program revenue overhead.* The central management of educational institutions usually covers their expenses by adding an extra cost to tuition fees or services paid by clients and sponsors. Infrastructure is often included in these costs, which makes it possible to offer programs, such as classrooms, auditoriums, technologies, digital document collections, information and communication services, maintenance and security. If any of the central services required by the program or course in *bLearning* modality is not included in the overhead, it is necessary to include it in the budget. Creating programs in *bLearning* modality can be included within politics of institutional development, so it should be considered if the overhead can be applied only after reaching the financial break-even point.

➤ *Marketing of the program or course.* The materialization of a blended learning modality offer depends on obtaining a sufficient demand so that the income is not inferior to the expenses. For this reason, it is very important to establish how many cohorts are needed to ensure the return of investment, as well as the way to reach the target population and potential sponsors. Marketing has a cost and takes time, so it is important to decide whether it should be done by an internal or external specialized department or if it is the program's responsibility. In any case, it is necessary to establish what the cost and time associated with this task for each program or course offer is.

➤ *Number of simultaneous beneficiaries in courses per program.* Usually programs are organized by cohorts, and the size of these indicates the magnitude of learning support services (mentoring, course leadership) and management (counseling, face-to-face meeting logistics). These are important parameters for the respective costing.

➤ *Number of courses to be produced simultaneously.* A program's offer can be structured by cohorts and likewise the production of the materials. If what must be produced exceeds the installed production capacity, and if time is a pressing matter, it is possible to subcontract. To decide if this course of action is possible, it is important to compare the internal production costs and times with those that are external, considering market prices, hiring pace and the ability to follow up and test what is produced or subcontracted.

➤ *Quality vs Costs.* As for the course offering, costing is challenging, due to the pressures to ensure quality and reduce costs. Rumble (ibid., p. 82) states that usually, pressure is put on developers to achieve low teaching costs in the virtual component. Since digital technologies lead to increased interactions rather than reducing them, institutions are tempted to replace teachers (expert level) with assistants (lower expertise level), thus taking care of the cost but not necessarily ensuring the quality of the service. Universities with courses including large numbers of students at a time (thousands of students per course), such as the Open University of England, have employed the division of labor among those who develop the course, those who teach it and those who evaluate it to ensure quality. Unsurprisingly, tutoring and evaluation are done by personnel with service contracts. This model does not apply to institutions with a restricted number of students per course. Another solution to the quality vs. cost problem is to hire retired professionals with huge disciplinary experience, provided they are fluent in the use of technology and online accompaniment. If they are not, giving them proper training and advice for the fulfillment of their functions is an option.

➤ *Working charge per tutor.* Another critical issue to consider in the course offering with virtual component is the working charge per tutor. According to Rumble (ibid., p. 81) in the US it is accepted that a group of 25 to 30 students demands 10 to 12 h per week from the tutor, meaning that in a full-time period, he could accompany 100 to 120 students. This means that the tutor knows about content and facilitation. Thus, it is convenient to train those who assume this role (Collison et al., 2002). Proposals for online facilitation have been very successful in this regard.

➤ *Replacement of academic staff functions to reduce costs.* Within this perspective, it is possible to increase the teaching load of academics at the expense of other functions, such as research and extension, or to increase the graduate assistant staff and assign professionals with less experience to support experts.

➤ *Staff hiring policies.* While the production of materials and course management should be done with faculty members as a factor of differentiation, other tasks can be done by people with service contracts (e.g. scripts, designs, tutoring, job qualification, etc.)

➤ *Management costs of technology-supported programs* are the least studied, but as proposed by Rumble (ibid., p.83) these are the ones with a greatest cost-effective potential and least cost documentation. The use of digital materials, the possibility of an automatic work flow of online academic and administrative processes, and the implementation of e-commerce practices with virtual or blended programs are opportunities that can be exploited. However, the costs of edu-commerce are not low and should be included within the development of virtual or blended learning universities rather than within the costs of their programs. Furthermore, Rumble states that none of the studies reviewed adequately analyzes overhead costs. Here, two factors

can be critical: equipment costs and management costs. Computer equipment and associated licenses are often considered, yet the costs of maintenance or replacement of networks and equipment are not. The same happens with project planning and evaluation costs, particularly when the virtual or blended programs are new to the institution.

Strategy of change towards *bLearning*

It is possible to take advantage of the opportunities offered by the *bLearning* modality when the appropriate conditions exist for innovation in an institution. In addition, if the organization accepts learning through a combination of face-to-face and virtual environments as a regular practice for, this is favorable. In this context, the careful conception and development of educational, operational and business models can help to reduce the uncertainty related to the understanding and development of this kind of innovations. However, for *bLearning* to go from being practice exclusive of innovative teachers to being adopted at an institutional level, it is essential to implement strategies for change.

Current state of implementation and adoption of *bLearning*

When institutions have not clearly defined and strategically adopted the *bLearning* modality, it is quite possible that this innovation arises only at course level (Graham et al., 2013). In all six cases of adoption of this modality in universities studied here, including public and private HEIs with a variety of missions and in different stages of *bLearning* adoption, the initiative began with innovative teachers who put it into practice. Although in some cases a good number of teachers came to adopt it by themselves, it was not until institutional policies, structures and support systems were defined that it was possible to advance institutionally (Graham et al., 2013).

Following the ideas on innovation dissemination stages proposed by Rogers (1983), Graham et al. (2013, pp. 27–29) found that institutions going through *Stage 1* of a transition to *bLearning* (awareness / exploration) know the organizational challenges this modality represents but have not yet adopted it. These institutions have found organizational challenges that could be solved with *bLearning* (e.g., providing access for more students, meeting the growing demand and/or optimizing the use of the physical infrastructure, greater learning flexibility, improving learning outcomes), but do not have a *bLearning* modality as an institutional strategy. Organizations in *Stage 2* (early adoption / implementation) are often trying to create the appropriate conditions for the innovation to be successful such as: creating governance structures for the modality; adjusting the registration systems and the institutional catalog to clarify what the *bLearning* courses entail; initiating course development processes; starting pedagogical training; offering incentives to teachers to encourage them to rethink their courses. At this stage, it is common to find different efforts to standardize the desired results and corresponding learning assessments both in face-to-face and *bLearning* modalities. Institutions in *Stage 3* (growth/mature implementation), have made this modality a part of their operation and are working

on continuous improvement, taking special care of course and program evaluation and making decisions based on data.

Transition between *bLearning* institutionalization stages

A second study conducted by some of the authors mentioned above (Porter et al., 2014) followed eleven cases of *bLearning* adoption in public US universities. These institutions had different sizes and different levels of adoption depending on modality, mainly at the master's level, which allowed for the identification of patterns related to strategy, structure and support decisions during the transition. Table 6 shows the dimensions studied.

One of the study's initial findings (ibid., p. 28) is that, for the *bLearning* modality to be institutionalized, promoters must exist at different levels of the organization since this creates a shared vision and generates the necessary resources for the development of learning environments and materials, which leads to the adoption of *bLearning* by potential programs and their teachers. A second finding is that the existence of institutional guidelines on the modality is crucial to grant those who adopt it enough freedom to make educational decisions. This study also identified the need to develop the infrastructure to assist the migration from face-to-face courses to blended learning courses, ensuring that *bLearning* courses integrate the best pedagogical elements of both environments. The study indicates that it is key to provide technical and pedagogical support to both teachers and students in this modality. Furthermore, creating incentives for teachers, whether these involve financial compensation, workload reduction or promotion is recommended.

Factors influencing adoption of *bLearning* by faculty members

Above findings show that adoption of *bLearning* modality by institutions is intrinsically related to adoption of *bLearning* by faculty, the first one does not prosper without the second. Thus, it is important to understand what factors influence adoption of *bLearning* by faculty members.

A follow-up study by Porter and Graham (2016) trying to determine the degree to which institutional strategy, structure and support decisions facilitate or impede *bLearning* adoption among higher education faculty, "found that the

Table 6 Dimensions to consider for a *bLearning* implementation. *Source:* (Porter et al., 2014, p. 36)

Theme	Description
Strategy	Addresses issues relating to the overall design of BL, such as definition of BL, and policies surrounding it
Structure	Address issues relating to the technological, pedagogical, and administrative framework facilitating the BL environment, including governance, models, scheduling structures, and evaluation
Support	Address issues relating to the manner in which an institution facilitates the implementation and maintenance of its BL design, incorporating technical support, pedagogical support, and faculty incentives

availability of sufficient infrastructure, technological support, pedagogical support, evaluation data and an institution's purpose for adopting *bLearning* would most significantly influence faculty adoption" (Porter & Graham, 2016, p. 748). These findings are very useful when HEI are setting up organizational infrastructures and resources (e.g., innovation centers to coach faculty members in the integration of digital technologies to their teaching) to foster adoption of *bLearning* in courses and programs.

By the same time Brown tried to establish what factors shape faculty member's adoption and use of *bLearning* in teaching, via review of empirical literature, and identified that six factors cut across studies (Brown, 2016, p. 1): faculty member's interactions with technology, academic workload, institutional environment, interactions with students, the instructor's attitudes and beliefs about teaching, and opportunities for professional development. Institutional assessment of these variables in HEI will allow to define strategies that help creating appropriate conditions for faculty adoption of *bLearning* in their teaching.

Conclusions

The purpose of this study was to support decision-making processes in HEIs that wish to use *bLearning* as a complement to other learning ecologies. Strategic thinking was used to frame institutional decision making about *bLearning* programs, and eleven sets of questions were proposed to guide tactical decision-making from the pedagogical, operational, and business perspectives. Literature review findings and lessons learned from good practices in *eLearning* and/or *bLearning* in six HEI offer some responses to those eleven sets of questions; to take full advantage of the opportunities that *bLearning* offers HEI decision-makers should answer guiding questions in the appropriate institutional context. Some conclusions from the study are:

- Making well-informed, strategic decisions provide focus for the best course of action concerning the integration of *bLearning* modality as a complement to other learning ecologies. These decisions should build on the institution's identity and strengths, its potential allies, and the curricular, pedagogical and technological opportunities. A shared vision between institutional academic decision-makers should lead the blended-learning innovation effort.
- Sustainable and expandable *bLearning* initiatives in HEI, require institutional commitment with this way of teaching. It is vital to be clear about the role that blended modality can play as a differentiating educational factor, as an element that adds value to the learning process, or as an element that ensures an enduring, competitive advantage for the organization; these definitions gain commitment by the part of the HEI authorities.
- Pilot testing this way of teaching and learning at the course level helps gain institutional knowledge and commitment; if this is not possible, critical success factors established from benchmarking studies such as (Galvis & Pedraza, 2013) become very important to consult. Proof of concept for *bLearning* is particularly needed when *bLearning* programs are to be offered

using multidimensional blends that seek to transform educational practices and/or expand academic services to new or larger and/or disperse audiences.

- *bLearning* requires creating appropriate ecologies for faculty to (re)design and offer courses that get the best from face-to-face and virtual learning environments, initiatives that transform educational practices with support of technology. Teacher's time as course authors, course directors, learning facilitators or course evaluators should be considered, with the corresponding costs. Pedagogical and technological support for course and/or program creation, for curricular materials development with quality control, should be available. Financial resources to design and implement good quality initiatives should be ensured as a medium-term investment. Alignment of the educational value-chain and the corresponding administrative and technological support-chain processes for *bLearning* is a must.
- Student-centered teaching using flexible learning environments usually implies deep changes both in faculty and in learners, as well as in academic administration practices. This cultural change requires taking into consideration the learning curve in shifting to a hybrid educational model. Depending on its level of maturity for *bLearning*, HEIs may require a transformation of their educational, operational, and/or business models.
- An educational model is related to each set of elements that make it possible for beneficiaries of a *bLearning* program to participate in it, and to learn and become certified if applicable. Its components are the program's backbone and include the: (1) characterization of the blended learning environments, modes of interaction, and applicable resources; (2) examination of options to reach knowledge; (3) decisions about knowledge organization. These elements do not follow a pre-established order and there is much interaction between them, so adjustments in one component can modify another.
- An operational teaching model refers to the set of elements that make it possible to implement the educational model. It includes decision-making processes related to the program and its courses, organizational structure to articulate processes, strategies to produce materials, student management throughout the course creation value chain, ICT management for the program, marketing and communication, management of tutorials and accompaniment, evaluation of effects, and impact and follow-up with graduates.
- The business model for a program in *bLearning* modality includes aspects that must be considered to make it a viable and sustainable offer. Building on Rumble's (2001) proposals on pricing of online programs, this study suggests that the business models for *bLearning* programs should take two elements into account: 1) variables that can be controlled and that have an influence on costs; 2) cost factors associated with the development of materials, the courses offerings and program management.
- The careful conception and development of educational, operational and business models can help to reduce the uncertainty related to the understanding and development of *bLearning* initiatives. However, for this modality to go from being practice exclusive of innovative teachers to being adopted at an institutional level, it is essential to implement strategies for

change towards *bLearning*. This includes finding out the level of maturity towards the institutional use of the modality, as a framework to build bridges for the transition between institutionalization stages, as well as for the adoption of blended learning by faculty. The first one does not prosper without the second.

- Decisions concerning the educational, operational, and business models are interrelated and frame the design of programs and courses in *bLearning* modality. They serve to align technologies, organizational structures, and change strategy with the desired *bLearning* vision.

Endnotes

¹According to Wikipedia, *Teleology* is the branch of metaphysics that refers to the study of the ends or purposes of a certain object or being.

²Definition taken from <http://www.dictionary.com/browse/tactic>

³*Conventional pedagogies* are centered on the teacher and the transmission of knowledge, while *active pedagogies*, centered on the students and their groups, seek to reach knowledge from the action over objects of study and interaction amongst learners.

⁴ECTS—European Credit Transfer and Accumulation System—credits express the volume of learning based on the defined learning outcomes and their associates workload. One credit per academic term corresponds to 25 to 30 h of work (European Commission, 2015, p. 10), to be distributed along the number of weeks per academic term.

⁵For more information about *inverted learning*, see ITESM (2014).

⁶MERLOT is a curated collection, contains open access resources for online teaching and learning, available at <https://www.merlot.org/merlot/index.htm>

⁷OCW is a collection of complete courses, produced at MIT and released for open access, available at <http://ocw.mit.edu/index.htm>

⁸TEMOA is a curated and open access educational resource portal managed by ITESM and available at <http://www.temoa.info/es>

⁹XPLORA is the European portal for science education, open access and available at <http://www.xplora.org/ww/en/pub/xplora/index.htm>

¹⁰CC is the website of Creative Commons <https://creativecommons.org/>, an organization that conceptualizes, proposes procedures and shares tools to manage digital goods of common interest (*commons*).

Appendix 1

Definitions of ELearning Courses and Programs, Version 2.0 April 4, 2015

“In developing the definitions below, we have tried to incorporate existing definitions developed by others and have incorporated comments from colleagues who have reviewed earlier drafts. We do not present these as the ultimate definitions, but as a step toward more commonly held standards as our field continues to evolve. Additions and revisions will be published periodically, as needed.” (Mayadas et al., 2015) (Table 7)

Table 7 Updated definitions of eLearning Courses and Programs, Version 2.0

Level	Category	Characterization
Course-level	1. Classroom Course	Course activity is organized around scheduled class meetings
	2. Synchronous Distributed Course	Web-based technologies are used to extend classroom lectures and other activities to students at remote sites in real time
	3. Web-Enhanced Course	Online course activity complements class sessions without reducing the number of required class meetings.
	4. Blended (also called Hybrid) Classroom Course	Online activity is mixed with classroom meetings, replacing a significant percentage, but not all required face-to-face instructional activities.
	5. Blended (also called Hybrid) Online Course	Most course activity is done online, but there are some required face-to-face instructional activities, such as lectures, discussions, labs, or other in-person learning activities.
	6. Online Course	All course activity is done online; there are no required face-to-face sessions within the course and no requirements for on-campus activity
	7. Flexible Mode Course	Offers multiple delivery modes so that students can choose which delivery mode(s) to use for instructional and other learning purposes.
Program-level	1. Classroom Program	The program may include a mix of traditional, web-enhanced, or hybrid courses, but all courses require some face-to-face lecture sessions
	2. Multi-Format Program	A program mixes classroom courses with other formats that may use a variety of different delivery modes, web-enhanced, blended, fully online courses, synchronous distributed courses, etc., without a specific access goal.
	3. Blended Program	A significant percentage, but not all of the credits required for program completion are offered fully online
	4. Online Program	All credits required to complete the program are offered as fully online courses.

Source: (Mayadas et al., 2015)

Appendix 2

Interview guide for benchmarking on *eLearning* and *bLearning* in higher education

This document gathers the interview guidelines which were followed to update a benchmarking study conducted by the author in 2012 and reported later on (Galvis & Pedraza, 2013). It was used to approach key informers from six HEI whose trajectory in *eLearning* and/or *bLearning* (from now on *e-bLearning*) is notorious. Informants were contacted by the interviewer and, upon acceptance, the interview-guidelines were sent along with a summary which tackled crucial aspects about their particular *e-bLearning* case. Over the course of the 3 years following this benchmarking process, it was truly significant to validate the available data and to understand the evolution of each of the cases.

Instructions

Feel free to focus your responses on those aspects that you consider to be the most relevant to describe your institutional experience in *e-bLearning* and/or to clarify

information that we have collected about your *e-bLearning* case. If there are URLs or documents that will help us to understand your opinions about the issues addressed in the interview, please let us know by writing to a.galvis73@uniandes.edu.co

Interview guidelines

1. *Beneficiaries*. What are the target populations in the *e- bLearning* programs in your institution? What educational needs are privileged using this modality? To what extent is the educational *e- bLearning* offer considered inclusive?
2. *Educational model (s) in e-bLearning*. What are the characteristics of the *e- bLearning* educational model in the institution? Which conceptual constructs (philosophical, pedagogical, technological) and operative constructs (educational technology, administrative-financial, educational research, instructional design, teaching) does it take into account?
3. *Transformations of the educational model*. Have there been transformations of this educational model over time? Which aspects have been predominant in each version of the model? What kind of difficulties or challenges have been faced in the implementation of this model? To what extent is the original or transformed educational model innovative in its conceptions, practices or tools?
4. *Organizationally speaking*. Where do initiatives to offer *e-bLearning* programs come from in your institution? What is the interaction between the virtual component and the face-to-face educational component of the University like (if both modalities exist)? If there is a support center for innovation with technologies, where does it report to? How is it organized? What is its reason for being? What products and services are offered?
5. *Financially speaking*. Which aspects are considered to determine the costs of an *e- bLearning* program? What is the estimated time frame (or cohorts) to recover the investment on the design, development and offering of programs in this modality? If the financial parameters have not been determined yet, what has been the regular procedure followed in your institution to offer this type of program?
6. *Management of e-bLearning (operating model)*. What (higher) instances of decision making regulate or support the offer of programs in the *e-bLearning* modalities? What institutional and external actors intervene in the processes of the value and support chains? What strategies are used to make the operation of programs in these modalities cost effective?
7. *Human capital management for e-bLearning*. What are the procedures for hiring teachers who participate in *e-bLearning* courses or programs? What is the regular teaching load of teacher-authors and tutors?
8. *Human capital development for e-bLearning*. What competencies are sought after or promoted by the course directors and their facilitators? How are teachers trained and monitored on the desired competencies? Which strategies are implemented for the professional development of teachers participating in *e-bLearning*?
9. *Student support services*. From the perspective of the operating model, how are services such as: introduction to the educational modality, tutoring, counseling, digital library, student welfare, support for content management and

- self-management of work groups carried out? Who is responsible for what? How are these groups organized if it's the case?
10. *Communication with and between students.* Considering synchronous and asynchronous communication, is there a pattern, or guideline, to communicate with students, or does each tutor and counselor proceed in his/her way? If social networks are used institutionally to support interaction with and among students, what technologies are used and for what purposes? If there has been an assessment of the effectiveness of communication with students, what lessons have been learned?
 11. *Technology to support learning in virtual environments.* What synchronous and asynchronous technologies (e.g., virtual classroom, web 2.0 applications, collaborative and immersive environments, self-publishing and publication of content, labeling of information, use of RSS for syndication in courses, integrated agendas to mail, 2D and 3D virtual worlds) are available for use with institutional support? How do those in charge of the conceptual and the operating models make decisions on how the technology and virtual environments used in each course should interact? Culturally, what fears, or expectations, have been detected in relation to technologies to support student services?
 12. *Internal and external multimedia content* (in multiple formats, open access or proprietary, Mobile learning) What content is produced? What repositories are used? What are the trends in virtual programs?
 13. *Copyright issues.* How are copyrights handled? How and who watches over copyright?
 14. *Academic and operational knowledge management:* To what extent does knowledge management in virtual programs draw on what teachers and/or students generate? To what extent is knowledge management only an individual activity? What strategies are used to make organizational learning in virtual programs and courses possible?
 15. *Motivation / participation (engagement) of teachers and students.* What strategies are used to develop a sense of belonging and commitment of students and teachers in the modality? What are the rates of graduation and retention and what is done to overcome them? What is the pattern of action to prevent dropping out and to overcome situational problems (spatio-temporal and others) of students?
 16. *Evaluation of learning.* What is the focus of the assessment effort in courses in *e-bLearning* modalities: concepts, skills, competences? What type of assessment instruments are predominant: exams, quizzes, projects, problems, cases? How widespread is the use of forum, blogs, wikis, e-portfolios, and rubrics for assessment?
 17. *Quality assessment, evaluation of effects and impact of e-bLearning courses.* Which research subjects privilege the assessment that seeks improvement throughout the process? How is the assessment carried out at the end of the process, if that's the case? Which actors are taken into account and for what purpose? If course evaluation has not been done, what are your forecasts?
 18. *Key Success Factors (KSF) in e-bLearning.* What needs to be done well to be successful in this initiative? What should not be done to avoid failing in *e-bLearning* courses and programs? Which KSF are considered strategic (out of those included in the two lists of KSF) and which are operational (out of those included in one of the two lists of KSF)?

Abbreviations

ALS: Arizona learning systems; bLearning: Blended learning; CC: Concord consortium; CMS: Content management system; Colciencias: Colombian national science foundation; Conecta-TE: Center for innovation in technology and education; eLearning: Electronic learning; HEI: Higher education institution; ICT: Information and communication technologies; KM: Knowledge management; LMS: Learning management system; MINEDUCACION: Colombian National Ministry of Education; MININTERIOR: Colombian National Ministry of the Interior; OA: Open access; OIT: Organization, individual, and technology; OLC: Online learning consortium; OS: Open source; UNIANDES: University of Los Andes, Bogota, Colombia; UOC: Universitat Oberta from Catalunya, Barcelona, Spain; VLO: Virtual learning objects

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Availability of data and materials

Case studies data and material are available in supporting text files from the author, manuscripts in Spanish.

Authors' contributions

ÁHG is the main and only author of this document. The author read and approved the final manuscript.

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