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Obstacles in the development of learning ecologies: a challenge for expanded learning in pandemic scenarios

Obstáculos en el desarrollo de las ecologías de aprendizaje: un desafío a la formación expandida en los escenarios de pandemia

学习生态发展的障碍：在疫情背景下加强培训的挑战

Препятствия в развитии экологии обучения: проблема расширенного обучения в условиях пандемии

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Abstract

The present study, which is based on a Delphi research, aims to highlight the different types of obstacles that have to be taken into account for the proper planning and development of learning ecologies, which are primarily concerned with the integration of multiple contexts (face-to-face, virtual and hybrid), environments (formal, non-formal and informal) and resources for learning, especially ICT.

In this way, it could be useful to know the obstacles that prevent taking advantage of the formative opportunities provided by the different ICT-mediated learning ecosystems, whether, for example, to maintain the continuity of formal educational processes through different contexts, such as virtual or hybrid contexts, which in effective practice have been used as an alternative to carry out the training activities that the pandemic prevents from being developed in face-to-face environments.

Keywords: learning ecologies, online learning, ICT, learning obstacles.

Resumen

El estudio presente, que parte de una investigación realizada a través del método Delphi, quiere poner de relieve los diferentes tipos de barreras que han de tenerse en cuenta para la planificación y el desarrollo adecuado de las llamadas ecologías de aprendizaje, que atienden primordialmente a la integración de múltiples contextos (presenciales, virtuales e híbridos), ambientes (formales, no formales e informales) y recursos para el aprendizaje, especialmente las TIC.

De este modo, podría resultar de utilidad conocer los obstáculos que impiden aprovechar las oportunidades formativas que proporcionen los diferentes ecosistemas de aprendizaje mediados por las TIC, sea, por ejemplo, para mantener la continuidad de procesos educativos formales a través de contextos diversos, como los virtuales o híbridos, que en la práctica efectiva se han empleado como alternativa para llevar a cabo las actividades formativas que la pandemia impide desarrollar en ambientes presenciales.

Palabras clave: ecologías de aprendizaje, aprendizaje en línea, TIC, barreras al aprendizaje.

概要

本研究从通过 Delphi 方法进行的一项研究着手，强调在学习生态的规划和发展中应该考虑的不同类型的障碍，主要解决对多种环境（面对面、虚拟和混合）、场合（正式、不正式和非正式）和学习资源，尤其是 ICT的整合。

通过这种方式，我们可以了解阻碍利用学习生态系统通过 ICT 介导提供的培训机会的因素，例如，通过虚拟或混合等不同环境保持正规教育过程的连续性，在实践中，这些方法是疫情期间无法面授的有效替代方法。

关键词: 学习生态, 在线学习, 信息通信技术, 学习障碍。

Аннотация

Настоящее исследование, основанное на методе Дельфи, направлено на выявление различных типов барьеров, которые необходимо учитывать при планировании и надлежащем развитии так называемых экологий обучения, которые в первую очередь связаны с интеграцией различных контекстов (очных, виртуальных и гибрид-

ных), сред (формальных, неформальных и неофициальных) и ресурсов для обучения, особенно ИКТ.

Таким образом, было бы полезно узнать о препятствиях, которые мешают воспользоваться возможностями обучения, предоставляемыми различными учебными экосистемами, опосредованными ИКТ, например, для поддержания непрерывности формальных образовательных процессов в различных контекстах, таких как виртуальные или гибридные, которые в эффективной практике используются в качестве альтернативы для проведения учебных мероприятий, которые пандемия не позволяет проводить в очной среде.

Ключевые слова: экология обучения; онлайн-обучение; ИКТ, барьеры в обучении.

Introduction

Schools in Spain were forced to close during the second part of the 2019-20 academic year in the face of the global threat of the pandemic. In this same timeframe and for the same reason, students and teachers from all over the planet embarked on the adventure of exploring the territories of virtuality (García-Peñalvo & Corell, 2020).

Practically overnight, with a certain amount of bewilderment due to the speed and unpredictability of events, students and teachers found themselves in the new normality of online learning: a working ecosystem that the situation forced them to take on, although not always willingly (Díez-Gutiérrez & Gajardo-Espinoza, 2020).

However, the prevalence of the efforts of institutions and individuals to overcome the difficulties of the new situation became gradually apparent: it was necessary to resort to agile forms of communication, such as videoconferencing applications or group chats; to share resources and effort in a virtual environment, and to interact through a wide variety of ICT tools (Cabero-Almenara & Llorente-Cejudo, 2020). In this way, the vast majority of the learning processes that began in that year were saved. From the first levels of primary education to university higher education, ICT-mediated virtual contexts acted as a lifeboat for the maintenance of education in Spain (Trujillo-Sáez et al., 2020).

A considerable leap into the new learning ecosystems took place, which needed an unexpected exploration of their key components, the rules governing their functioning and the difficulties or obstacles that were emerging in this task. It is at this point that the so-called ecological learning theory makes sense and comes in handy: ecological learning theory aims to offer a holistic and functional explanation of human learning by embracing and normalizing learning in a variety of contexts, resources, activities and interactions of all kinds. In a sense, it is a perspective that guides individuals through the best manner to navigate and interpret their learning journey through life. This work is even more important and momentous from now on, especially since, as Zacharia (2020) says, the move towards new digital ecosystems will probably not be reversed:

> By 2018, you could finally say that the majority of the world was connected. Covid-19 came on stage and obliterated the one remaining obstacle to a digital future—human attitudes. Many people were stuck in their old ways. Some were still reluctant to send credit card information over the Internet. Others would never think of taking a class online. [...] But all these taboos have been broken, the obstacles crossed, and now a new

> normality exists. It is unlikely that we will ever fully go back to the past. The pandemic served as a forced mass product testing for digital life—and for the most part, our technological tools passed (pp. 117-118).

As a contribution to this effort, the following pages aim precisely to bring out the obstacles or limitations that condition the expansive learning advocated by ecological learning theory. This is supported by the knowledge gained from a Delphi research study designed to describe and understand the learning ecologies of prospective primary school teachers, the findings of which may shed light on ecological functioning in general.

The now classic definition of learning ecologies by Barron (2006a, 2006b) refers to the persistent interest over time, on the part of the learner, in providing him/herself with an organization of various contexts, virtual or physical, each of them made up of activities, resources and personal relationships, as well as the interactions that arise in them. The transcendental feature of this definition is that it allows the learning researcher to group in a unit of study such heterogeneous facts as learning in a plurality of environments: formal, non-formal and informal (Billet, 2001; Bull et al., 2008; Christen, Sangrà, & González-Sanmamed, 2016; González-Sanmamed, Souto-Seijo, González, & Estévez, 2019b), as well as in face-to-face, virtual and hybrid settings (Coomey & Stephenson, 2001; Williams, Karousou, & Mackness,2011), where new ICT tools are often highly integrated (Çetinkaya & Keser, 2018) and even the determining influence of more subjective aspects is recognised, such as motivation towards learning, either synchronously (life wide learning) or diachronically (lifelong learning) (Becket & Hager, 2002; Boyer, Edmonson, Artis, & Fleming, 2014).

Therefore, the correct perception of a learning ecology requires linking the whole range of its constituent components into a functioning unit and at the same time accounting for their reciprocal influences and conditioning factors. In the following paragraphs, those components and relationships which are most decisive for ecological functioning will be presented.

The very existence of a diversity of spaces reveals the need of a guide for the learning journey through these multiform environments (Comey & Stephenson, 2001; Eraut, 2000; Foresto, 2020; González-Sanmamed, Estévez, Souto-Seijo, & Muñoz-Carril, 2020). The possession of this map by the learners indicates the existence of a conscious ecology, i.e. they no longer randomly traverse the different ecosystems they encounter, but recognise the possibilities and obstacles that may be presented to them, depending on the nature of the environment in which they find themselves. The simple awareness of the existence of this diversity of spaces constitutes a major step towards a learning ecology (Jackson, 2013).

The specific activities, events and experiences that mediate learning, which can take place in any of the settings or spaces referred to above, also represent another indispensable element in the game of ecological interrelationships and, as such, are influenced by the setting or space in which they take place, and determine different responses in the learners themselves (Nardi, 1996).

Usually, material objects of all kinds used for the purpose of learning come to mind when talking about learning resources, with ICTs standing out above all. In this sense, the ecological perspective also includes under this term other types of resources that maintain a closer relationship with the internal sphere of the subject. It is once again the result of the dense web of relationships between the elements that make up each

learning context. Thus, a differentiation is made between material resources -a notepad, a video, a library, for example-; social resources, derived from dealing with other people; ideational resources, which respond to the previous experience of the learners; and identity resources, formed by their individual traits, such as their sense of self-efficacy, which will influence their preference for or rejection of the use of other resources (Barron, 2006a; González-Sanmamed, Muñoz-Carril, & Santos-Caamaño, 2019a; Jackson, 2013; Nasir & Cooks, 2009; Sharar, 2016).

Although they also play a role within the set of learning resources in the form of relational resources, relationships between the learner and family, friends or peers, etc. generate a configuration of settings, spaces, activities and resources with distinctive features of their own. Engaging in learning networks offers a good example of the diverse manifestations that personal relationships can present when embedded in a multiplicity of connections that broaden and enhance interactions for learning (Mason & Rennie, 2008; Prestridge, 2018). The current importance of this ecological component cannot be overemphasised, as it is seen as a principle for expansive learning, and in turn calls for an interested, active, autonomous, socially and technologically skilled learner (Attwell, 2007; Bakker & Akkerman, 2014; Downes, 2012; Oddone, Hughes, & Lupton, 2019).

In addition to lending unity to the set of components and contexts of their learning, the subject maintains a sustained interest over time, which is an indispensable condition not only for the very genesis of the learning ecology (Barron, 2006a), but also for its long-term continuity. The presence of this internal driver of interest or motivation over time (diachronic axis) through the different scenarios in which it is nurtured (synchronic axis) leads to another important ecological dimension, the so-called lifelong learning. That is, the recognition that human beings, especially those of today, for whom technological tools facilitate their engagement in multiple settings, are continuously learning beyond the stages of formal education and, to this end, they are in a position to use the required competences in self-direction and self-regulation of their own learning (Gouthro, 2017; Jarvis, 2007, 2014; Knowles, 1975; Maina & González, 2016, Rogoff, Callanan, Gutiérrez, & Erickson, 2016).

The general principles of ecological theory, as outlined so far, seem to offer a guideline for the implementation of current educational policies that take into account all this diversity of layers involved in learning (Banks et al., 2007; Barab & Roth, 2006; Luckin, 2008, 2010). However, it also provides the learner with a roadmap for taking advantage, in terms of learning, of the potential that the plurality of formal, non-formal and informal ecosystems and self-directed learning offer, to name but a few of its components (González-Sanmamed et al., 2019a; Manuti, Pastore, Scardigno, Giancaspro & Morciano, 2015; Zimmerman & Schunk, 2020). Nevertheless, on the path towards this transition to effective practice, whether institutional or personal, it is extremely important to anticipate the obstacles that may hinder, limit or prevent ecological learning.

For this work we have taken as our starting point a study, carried out using the Delphi method, to determine the learning ecologies of future primary school teachers in Galicia, from which we have extracted the aspects derived from one of the questions posed in the first stage of the study, namely, the obstacles that could prevent or limit the ecological development of learning. The panel of experts, around which the Delphi methodology is based, is perfectly suited to this enquiry into realities that are still little studied and whose limits appear blurred (Cilliers, 2005; Cyphert & Gant, 1971; Rowe & Wright, 1999).

Methodology

The Delphi method is a research technique that requires collaboration with a panel of experts who, over several rounds of questionnaires and in controlled iterations that include feedback for the processing of the answers produced, generate consensual knowledge (Keeney, Hasson, & McKenna, 2011).

The use of this technique is well suited to obtain knowledge about a complex object with characteristics that are not yet perfectly defined, as is the case of learning ecologies, where it is advisable to be introduced to the topic through an initial exploratory study (Linstone & Turoff, 1975; López-Gómez, 2018).

The following are characteristic features of the Delphi procedure: anonymity in the responses, which allows the expression of individual opinion, freely and without coercion; iteration, that is, the creation of a continuous circuit of expression; and the review of opinions, facilitated by the researcher's feedback. Reaching a previously established degree of consensus in the opinions expressed would mark the end of the process (Donohoe, Stellefson, & Tennant, 2012; Okoli & Pawlowski, 2004).

In the field of education, the Delphi method has been used in a number of studies, including McIntyre-Hite (2016), Mohr and Shelton (2017), Pozzi et al. (2019), Charro (2020) and Mirata, Hirt, Bergamin, and Van der Westhuizen (2020).

Selection of experts

In the absence of a universally valid criterion for selection, we have relied on the recommendations made by Adler and Ziglio (1996) (cf. Skumolski, Hartman, & Krahn, 2007), on the suitability of experts, which require the conditions of (a) possession of knowledge about the research topics and real involvement in them; (b) ability and willingness to contribute to the exploration of the problem; (c) confirmation of their involvement in time and effort; and (d) possession of communication skills and the ability to express priorities through procedures that facilitate the reaching of conclusions.

The application of these criteria resulted in the creation of a panel of 12 international specialists in the field of education, of which 10 remained in the second round and 9 in the final round (Figure 1).

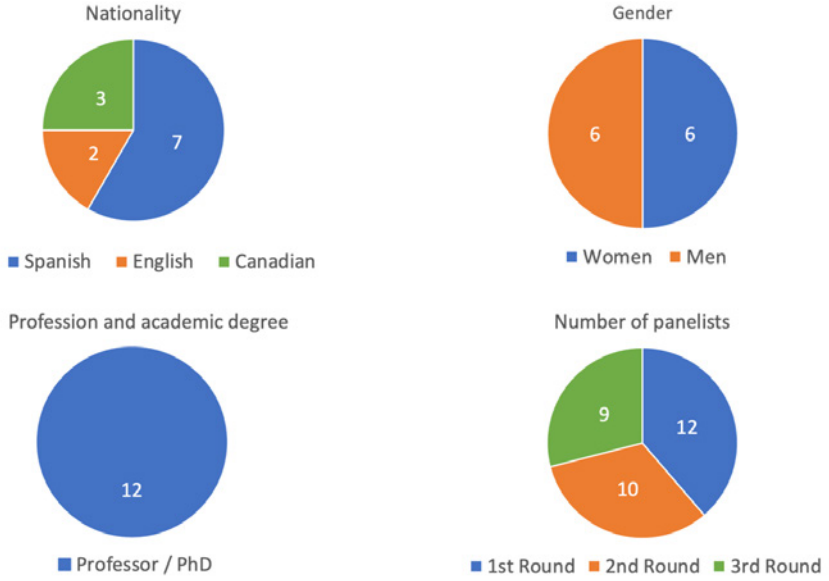
Delphi process

The Delphi process was conducted over three rounds and started with a questionnaire of four open questions to the panellists, based on the general theoretical framework on learning ecologies, of which the question of what obstacles might prevent or limit the ecological development of learning is of interest for this paper.

A questionnaire of this nature was chosen as a trade-off to avoid the methodical risk warned by the Delphi literature of biasing the expert discussion by selecting a closed set of questions; or, at the other end, in the case of using a single open-ended question, the danger of obtaining a too large number of scattered responses, which would make the task of obtaining consensus in a necessarily limited time very difficult (Keeney et al., 2011). As mentioned above, while the questionnaire included other questions on the ecological issue, this article focuses exclusively on the question that asked about factors that may negatively impact on learning ecologies.

Figure 1

Panelists' demographic and participation data



The qualitative analysis of responses in Delphi processes usually includes a systematic procedure of coding, eliminating redundancies and grouping responses into thematic clusters (Brady, 2015; Miles, Huberman, & Saldaña, 2014; Saldaña, 2009). For this purpose, the computer-assisted qualitative data analysis software (CAQDAS) ATLAS.ti was used. The results of the analysis of the expert responses were sent back as feedback to the expert panel, which corrected and purged the items considered not relevant for the study. This same data analysis procedure was carried out throughout the second and third rounds, until a consensus was reached among the panellists that brought the process to an end.

Analysis and results

Following the procedure described in the previous section, the results obtained in each of the three rounds are presented below.

First round

Based on the question posed to the panellists on obstacles that may prevent or limit the ecological development of learning (Q1), 61 responses were obtained, which were reduced to a total of 45 statements after discarding those responses that were thematically redundant. This complete list was sent back to the panel to give each panellist the opportunity to make any modifications or nuances to their responses.

Second round

The second round aimed at the reduction, categorization and dimensioning of obstacles to ecological learning, on the basis of the catalogue obtained from the first questionnaire. To this end, the panellists were asked to group the answers from the first questionnaire into more comprehensive categories (Q2), from which 6 types of obstacles initially emerged: pedagogical, contextual, personal, technological, interactional and economic. Finally, this last category was discarded because it contained a very small number of first-round responses (n=3) and these three responses were distributed among the groups of contextual and technological obstacles. The 5 typologies of obstacles that were identified will be described below (Figure 2):

(a) Pedagogical obstacles (n=19). These include factors related to traditional pedagogies, with the characteristics of the centrality of the teacher in the teaching-learning processes, the reaction against the innovation and transformation of classical educational procedures, the strict subjection to the curriculum, the disconnection with the real contexts of the students and with emerging and non-formal learning.

(b) Contextual obstacles (n=8). These are aspects that converge in the excessive institutional nature of learning or its opposite, excessive informality, either because of the lack of recognition of learning results in informal settings, or because of economic pressures to maintain traditional models, or because of the promotion of competitiveness and the achievement of immediate results in formal settings. A family environment reluctant to change or the lack of strategies for interacting in networks also reflect these contextual limitations.

c) Personal obstacles (n=8). This group includes individual factors such as, for example, a lack of motivation to move to other contexts, lack of time and deficiencies in the self-regulation of learning.

(d) Technological obstacles (n=6). These refer both to subjective elements, such as a deficit in technological training or an attitude of apprehension or hostility towards ICT; and to objective elements, such as the lack of availability of resources.

(e) Obstacles in interactions (n=4). This refers to any type of interaction, personal or non-personal. Personal obstacles in interactions are, for example, the lack of active referents or the keys to distinguish them, and excessive interactivity. With regard to non-personal interactions, the most significant is the lack of processes that guarantee the intrinsic quality of these interactions.

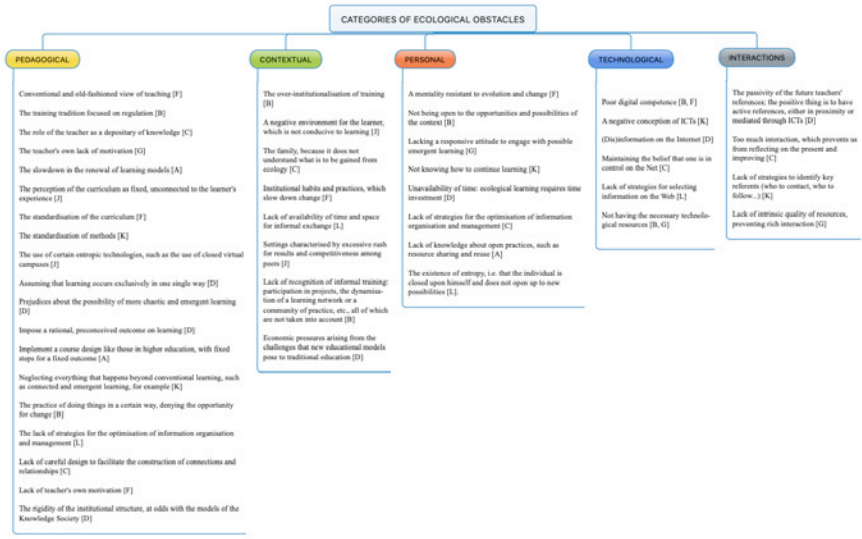
Third round

The content analysis of each of the five clusters revealed commonalities that seemed to suggest the possibility of further refinement of the groupings. Coding in ATLAS.ti showed the emergence of three irreducible factors transversal to the above categories, and thus the possibility of subsuming the different categories into three global groups or dimensions. Thus, the category of obstacles in interactions appeared to intersect, in practically all its data, with the technological factor, while personal obstacles showed intersections with technological and pedagogical factors. Thus, the panel was asked to indicate their agreement or disagreement with the relevance of integrating the five categories resulting from the previous round into three global dimensions: pedagogical obstacles, technological obstacles and contextual obstacles (Q3). Finally,

and as a culmination of the Delphi procedure, the panel unanimously confirmed the relevance of this further dimensioning. The three obstacles are described below.

Figure 2

Distribution of obstacles by category (in brackets the key of the reporting panelist)



Pedagogical obstacles

They respond to the constraints posed by the fixation of traditional pedagogical schemes in the face of the new spaces, settings and technologies demanded by teaching in today's society. These include the lack of skills for self-direction of learning, a restricted curricular design or one that is divorced from the contextual reality of the learner, limitations of a didactic nature, the existence of rigid organizational systems and the absence of appropriate methodological proposals for learning, enhanced by the multiplicity of resources offered by the digital society.

Technological obstacles

These obstacles are concomitant with the previous dimension and stem from causes such as the intrinsic difficulty of use, which may also entail a cost in terms of learning time, as they affect not only the technical aspects, but above all, the planning of a strategic use for learning. They also include economic factors, such as the unavailability of technical resources, the cost of equipment maintenance and the need to update equipment due to the high rate of obsolescence of technological resources. No less important are the decisions related to the selection and purchase of materials and their optimal integration into the teaching-learning processes. On the other hand, it is also worth highlighting the obstacles derived from the training requirements of the agents involved (teachers, students, coordinators, counsellors and other stakeholders) and the actions aimed at facilitating positive attitudes and the acceptance of technology in the educational sphere.

Contextual obstacles

They emerge from the systemic nature of learning ecologies as a network of multiple settings, spaces and scenarios, in which a variety of factors intervene. These include those operating at the classroom level, which are related to classroom management processes; those that affect the institutional level and involve school organizational and management processes; and those located in the social sphere, in which it is worth highlighting aspects such as policies at the state and supranational level, the prevailing technological culture and its various consequences, and the multiple digital divides, which influence and condition educational decisions in one way or another.

Discussion and conclusions

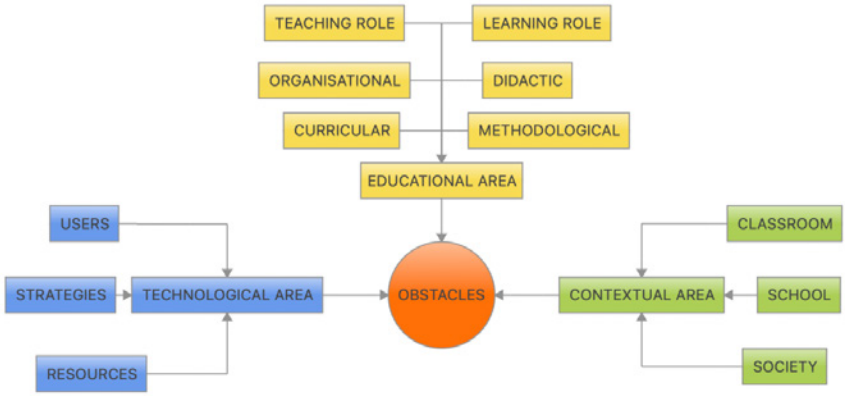
It seems that the immediate logical step after the recognition of potential risks for ecological learning would have to be the enunciation of corresponding countermeasures for prevention. Yet, these cannot be expressed in simple rules. Complexity emerges again as the first characteristic that is revealed when trying to break down the barriers to ecological learning. Obviously, the fact that complex solutions are needed does not mean giving up on this task, but simply the recognition of the need to involve numerous actors, to activate diverse scenarios and to have ample resources at one's disposal.

Discussion

According to our study, this recognition points to the necessity of addressing three fundamental areas: pedagogical, technological and contextual (Figure 3), which should be taken into account for reflection and appropriate decision-making in order to promote the optimal construction and adequate development of learning ecologies, thus avoiding a faulty implementation that leads to the appearance of the barriers and obstacles that have been made explicit throughout this study.

Figure 3

Obstacles in a learning ecology



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One example, which comes from the contextual dimension but also involves the pedagogical dimension and, to a certain extent, is influenced today by the widespread use of technology, is the need to acknowledge informal learning, expressed in various ways in the course of the Delphi by criticising "the excessive formalization of training" [B], or by mentioning "the institutional habits and customs that slow down the changes" [F] brought about by learning ecologies. And also, in more detail, by pointing out "the lack of recognition of informal learning: participation in projects, the involvement in a learning network or a community of practice, etc., all of this is not taken into account" [B].

Another complex set of obstacles can also be seen when we look at the technological domain as a potential leverage factor for learning, as was explicitly stated in the Delphi development ("low digital competence" [B, F], "lack of strategies for selecting information on the Web" [L], "a negative conception of ICT" [K]). Although there are many steps in the right direction, the digital divides and the limitations resulting from a lack of resources are still active to a greater or lesser extent. This precarious situation is exacerbated by the challenge of a low-quality ICT use, especially in the absence of the essential organizational and strategic skills that are required (Becker et al., 2018; De la Selva, 2015). All of these, demand the involvement of social and economic institutions, but are in turn connected to aspects of the individual. One example is the negative perception of ICT by teachers who see their use as a threat to their pedagogical practice (González-Sanmamed, Sangrà & Muñoz-Carril, 2017) or even the realisation that a change towards less central and expository roles is required (Howard, 2013; Sanabria & Hernández, 2011).

What has been said in the previous paragraphs also applies to the pedagogical dimension. It is desirable and possible to understand pedagogy as a spearhead towards ecological learning, but again obstacles of diverse nature limit progress in this direction: "the institutional structure, at odds with the models of the knowledge society" [D], revealing, therefore, the need to overcome "a conception of the curriculum as something closed, unconnected with the experience of the learners" [J], without "ignoring everything that happens beyond linear learning, such as connected and emergent learning, for example" [K]. And yet it continues "The discouragement of the renewal of learning models" [A], as it "[assumes] that learning happens only in one way" [D], for example in "the adoption of certain entropic technologies, such as the use of closed virtual campuses" [J]. The very concept of ecologies that has been developed in recent years implies having a global tool for learning and, therefore, suitable for interpreting the fact of learning in its multiple facets and guiding the person in their search for knowledge (González-Sanmamed, Sangrà, Souto-Seijo, & Estévez, 2020).

Conclusions

The categorization presented in Figure 3 underlines the need to maintain an integral vision from which to identify obstacles that involve more than one area and whose tackling requires a global vision and joint action. However, while being aware of their complexity, or perhaps precisely because of it, it seems possible to maintain a hopeful vision in the task of avoiding, minimising, if not demolishing, the obstacles that impede the development of learning ecologies.

As far as contextual aspects are concerned, already at the end of the last century, Hager (1998) considered that it was time to take steps towards the recognition of informal learning and the challenge involved in transforming the prevailing social mindset that

conceptualises informal learning as third order learning, the fruit of serendipity, unpredictable, ineffable, too context-dependent and therefore not generalisable.

In this search for transcending formal boundaries, technology also plays an important role in various ways: for example, through participation in different types of networks that form authentic learning communities, or communities of practice that facilitate the creation of one's own content, potentially free from formal boundaries. More internal aspects to the individual are also added to this interweaving of active factors in the formal-informal tension of contemporary learning, such as those referring to lifelong learning, which takes place in different spaces and at different times, totally irreducible to formal learning.

As a final remark, it should be noted here that this commitment to overcoming obstacles in the use of multiple educational contexts, to a strategic application of ICT and to the corresponding adaptation and renewal of pedagogical praxis does not lose sight of the pandemic situation that is currently affecting all areas of educational life, and which forces, as indicated earlier, such urgent changes as the extension of educational frontiers outside the physical classroom, towards virtual and hybrid spaces (González-Sanmamed, Sangrà, Souto-Seijo, & Estévez, 2020). From this point of view, the very concept of ecologies that has been developed in recent years implies having a pedagogical tool suitable for interpreting the fact of learning in its multiple facets and guiding the person in their search for knowledge, as it takes into account the opportunities offered by the different contexts, which we can access through a reflective use of the new technological tools.

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