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Special issue: Co-Design of Technology-enhanced Learning Experiences

Editorial of the special issue:

Co-Design of Technology-enhanced Learning Experiences

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Learning design is a line of work and research in the field of educational technology with a long history, which has grown in scope and influence over time, and can now be defined as "*formal process for planning technology-enhanced learning activities, usually supported within a community where designs and ideas can be shared and re-used*" (Lewin et al., 2018, p. 1132). This process promotes the role of teachers as designers (Laurillard, 2012; McKenney et al., 2015; Shamir-Inbal & Kali, 2009), as they need to systematise, make explicit and share decisions about learning designs that integrate ICT - the artefact produced by this methodology is also called "learning design" - and, furthermore, teachers need to reflect on their educational interventions to improve the quality of their teaching. Despite the long history and breadth of the field of learning design (Beetham & Sharpe, 2020), this special issue focuses on only some of these lines of work.

Specifically, in this special issue we focus on educational co-design which, in addition, is often linked to the professional development of teachers for the integration of ICT (Hernández-Leo et al., 2014; Michos & Hernández-Leo, 2016; Mor & Mogilevsky, 2013; Voogt et al., 2015) and the importance of collaborative curriculum design (Ronen-Fuhrmann & Kali, 2015), as well as the creation of teacher communities of practice that include co-design (Laurillard, 2012; Marín et al., 2018; Michos et al., 2016). Work is also currently underway to investigate such collaborative practices through learning analyses to facilitate decision-making during the design or implementation of activities (Rodriguez-Triana et al., 2015; Rienties & Toetenel, 2016), as well as to understand how a co-design community works. Understanding the adoption of learning analytics by teachers in technology-supported educational contexts is a field in which ethical and data privacy issues are of increasing interest (Prieto et al., 2018).

In this special issue we therefore aim to provide a broad overview of learning design and, in particular, co-design of technology-enhanced learning experiences, and to answer from theory and practice the question, what are the most effective practices and theories in the field of co-design?

We try to provide answers with the 10 contributions that make up this special issue divided into 4 thematic areas.

In the first thematic area, which deals with **methodological approaches to the co-design of technology-enhanced learning experiences**, we have two contributions that delve into the methodological concepts of participatory design and its general application in the field of research and innovation in educational technology, and a third paper that focuses on describing how co-design processes can contribute to the improvement of teaching-learning processes linked to the training of teachers and other education professionals in research methods.

As an opening to the topic, Begoña Gros and Eva Durall propose an interesting journey in their article *Challenges and opportunities of participatory design in educational technology* (only in Spanish) through the origins of this approach and its applications in the educational field. In this overview, it can be clearly seen how this trend has evolved from concepts closer to the production of products or devices (American trend) to another that is closer to a more constructivist vision (European trend) centred on understanding the co-design process itself. Likewise, the authors include numerous references that highlight the importance that co-design has acquired in the educational field, where it has been used as a resource for an infinite number of purposes, including the development of educational policies, the design of activities, educational innovations, academic curricula, learning tools, educational games, etc. A prominent place is occupied by the design of technology-enhanced learning environments, in which this type of approach has served, in turn, to involve groups traditionally excluded from the design process. Likewise, the authors present different classifications and methods of participatory design in which, regardless of the approach chosen, there are aspects that the work teams must guarantee. In this case, ensuring the level of participation, the identification of ethical and power aspects that guarantee the transparency and transfer of the reflections into action are crucial elements in any participatory design process.

Next, Jennifer Saray Santana Martel and Adolfina Pérez-i-Garcias in their work entitled *Learning co-design and the use of ICT in higher education: a systematic literature review* (only in Spanish), pose as research question: How do students and teachers co-design making use of technology in higher education according to the scientific literature of the last six years (2014-2019)? To answer this question, the authors conduct a systematic literature review that identifies characteristics of the studies, of the co-design experiences, as well as benefits and challenges for such experiences. They highlight 6 technology-enhanced learning experiences (virtual learning environment, communication tools, collaborative work, as well as subject-specific tools) in which students and teachers co-design course content and materials, tasks and evaluation, in one of them even with professionals from the area. Additionally, the predominance of social sciences in educational co-design is indicated. After the description of the articles in the special issue we take up some of the most relevant results of this review to reflect on the topic.

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To close this thematic block, Iván M Jorrín-Abellán, Anete Vasquez and Rachel E. Gaines present in the manuscript entitled *Co-designing Research Methods Lesson Plans in the Interactive Research Methods Lab*, an Interactive Research Methods Lab (IRML) located in the Faculty of Education at Kennesaw University (USA). This Lab provides students with the opportunity to live a personalised and practical experience in the creation of research designs, conceptual frameworks and literature reviews using interactive augmented reality content. Following Roschelle et al.'s (2006) and Barberá et al.'s (2017) conceptual approach to co-design, IRML researchers and university faculty co-designed five teaching units for undergraduate and graduate students in various courses.

For readers who are more distant from the field of co-design, this article is particularly interesting to reflect on crucial aspects that ensure the existence of balance in decision-making, the distribution of tasks and responsibilities among the participants in these processes that guarantee the quality of the resulting co-designed artefacts. Furthermore, the work carried out delves into the impact that the use of the resources offered by the IRML and the co-design approach has had on providing faculty members with innovative and significant alternatives for the teaching of research methods. The results obtained also indicate that this type of approach in the teaching of research methods is necessary as it has the potential to help students understand the complexity intrinsic to any research process.

In a second thematic axis with great presence, we have 4 contributions that present **strategies oriented to share co-designs of technology-enhanced learning activities**. Bárbara de Benito, Juan Moreno García and Sofía Villatoro Moral present in their article *Technological environments in co-designing personalized learning paths in higher education* (only in Spanish), an analysis of the tools and functions associated with co-design processes for the construction of personalised learning paths in virtual environments. This co-design has involved the teaching team (14 faculty members) of educational technology courses at the Faculty of Education of the University of the Balearic Islands (Spain), as well as the students of these courses. Based on the results obtained, a proposal is presented for a technological configuration of co-design of personalised learning itineraries that can be applied in other university contexts with the aim of fostering self-regulation and student agency.

In their work *ICT-based co-design of geometric problems: study of an experience with student-teachers on a blended learning module* (only in Spanish), José Carlos Piñero Charlo and María Teresa Costado Dios present a strategy for co-designing problems in a blended learning environment within the framework of Didactics of Mathematics with a group of 87 students of the Primary Education degree of the University of Cadiz (Spain). The results point to the importance of these experiences and the use of pedagogical tools that promote reflection through them in the initial training of teachers, taking into account that teamwork skills are fundamental in the professional practice of teaching.

Evelyn Diez Martínez and Rosa Alejandra Morales Velasco present in their work entitled *Codesigning Learning Objects as a strategy of training for Higher Education teachers* (only in

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Spanish), a strategy of support as co-design in a professional development offer for faculty members in the design of learning objects, in which 12 instructors from different disciplines from the Autonomous University of Querétaro (Mexico) participated. The results point to difficulties involved in the design of learning objects, as well as aspects that are easy for faculty members in this process, at the beginning and after the course in which the training facilitators co-designed the learning objectives with the instructors. This experience was useful in identifying areas where faculty members required further support, tools or training in the design of learning objects.

Mayré Molina Zambrano and Yovanni Alexander Ruiz Morales present in their work *Learning Object Design based on WebQuest for areas programming that define architectonic space* (only in Spanish), the co-participatory development between faculty members, 10 students and 4 experts of a learning object in the form of a WebQuest for the Architecture Degree at the National Experimental University of Táchira (Venezuela) following the PRADDIE model: pre-analysis, analysis (main involvement of students for their characterisation), design, development and production (main involvement of experts for the assessment of the learning object). The material was positively evaluated and aspects to be considered for its improvement in the future were proposed.

In a third thematic axis, two contributions are included which focus on the **application and validation of strategies for the co-design of technology-enhanced learning activities**. Esther García-Zabaleta, Adriana Díez-Gómez, Raúl Santiago and María Ángeles Valdemoros present in their manuscript *Pedagogical potential of Case Study Method using Digital Portfolio and Digital Rubric: An Interdisciplinary Approach* (only in Spanish), the evaluation by 150 students of an interdisciplinary co-design strategy among faculty members in the framework of the Primary Education Degree at the University of La Rioja (Spain). The teaching team of the courses involved in contents related to the role and functions of the Primary Education teacher (5 members of the teaching staff) co-designed the teaching methodology related to these contents (case study), as well as its evaluation system (e-portfolio and e-rubric). The results show that the students benefit from the process of teacher co-design as they were able to integrate the contents of the three courses involved by establishing synergies. In addition, the proposal implemented allowed work to be done on specific degree competences and general competences.

Brenda Luz Colorado Aguilar presents in her work *Co-design of the ITAS course in the initial training of preschool education teachers in the face of the COVID-19 contingency* (only in Spanish), the evaluation by 27 students of the Bachelor's Degree in Preschool Education from a normal school in Veracruz (Mexico) of the co-design strategy together with their instructors of the course "Information Technology Applied to Schools" (ITAS). This co-design consisted of making agreements in a consensual manner between the course instructor and the students regarding aspects such as communication during the course, the adjustment of content, or the organisation of time and groups. The results were positive with regard to the co-design strategy applied, especially in relation to the organisation and dynamics of the course, and the communication, guidance and empathy of the instructor were also highlighted. On the other hand, the importance

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of taking into account the students' moods was noted, giving them more weight in the design of educational programmes.

The fourth and last thematic block has a contribution that refers to the **application of learning analyses for the (understanding and) improvement of the (co)design of technology-enhanced learning activities**. The article developed by María Jesús Rodríguez-Triana, Luis P. Prieto, Tobias Ley, Dennis Gillet and Ton de Jong entitled *Combining the Knowledge Appropriation Model and epistemic networks to understand co-creation and adoption of learning designs using log data*, delves into the lack of evidence to understand how teachers adopt innovative practices in the classroom. The work developed by the authors provides an insight into how statistical models and epistemic network analysis of data from authoring tools' learning analytics allow us to explore large-scale patterns in the co-creation and adoption of educational innovations in schools, using the Knowledge Appropriation Model (KAM, Ley et al., 2020) as the underlying theoretical framework. To this end, the co-creation processes of 40,235 designs and their eventual implementation from Graasp have been analysed. Graasp is an authoring tool to promote inquiry-based learning in schools within the framework of the community created by the European project Go-Lab. Although Graasp currently has a not insignificant user base who use this tool to co-design learning activities to promote enquiry (over 35,000 teachers and 100,000 students worldwide), the prevalence of designs that are eventually implemented in classrooms is low. In this context, the analysis developed by Rodríguez-Triana et al. (2020) makes it possible to identify large-scale patterns that can help researchers focus on certain designs or teachers in co-design communities in order to improve understanding of how these communities work and to evaluate the impact that this type of initiative has. In this particular case, the authors conclude that there is a need to invest in strategies to encourage teachers to be more autonomous in the creation of learning designs to promote enquiry in a way that overcomes the constraints arising from the context itself (lack of institutional support, small or non-existent user communities, etc.).

We believe that the contributions presented in the special issue provide diverse views on the topic and give multiple answers to the question initially posed. On one hand, we analyse the contributions linked to the implementation of co-design strategies. Based on Gros and Durall (2020), four issues should be considered in participatory or co-design: the levels of participation of the participants, their role, their agency capacity and the scalability of the projects.

Taking into account the ladder of participation proposed by Bovill and Bulley (2011), we can observe that there are contributions in the special issue that are located in low-middle steps, where there is a co-design of parts of the course, and others in high steps, in which participants (in some cases students, in others teachers) co-design courses together with other stakeholders (researchers, teachers/teaching staff, experts). Most of the articles show applications at intermediate levels, such as the co-design of activities/contents (e.g. of problems, in Piñero & Costado, 2020), of materials (e.g. learning objects, in Díez Martínez & Morales Velasco, 2020; Molina Zambrano & Ruiz Morales, 2020) or of methodology and evaluation (García-Zabaleta et al., 2020). Examples of high levels can be found in the manuscript of Benito et al. (2020) through the

co-design of personalised learning itineraries affecting all the courses involved, in Colorado Aguilar (2020) through the adoption of consensus agreements between instructor and students on aspects of communication, organisation and content of a course, and in Jorrín-Abellán et al. (2020), where the co-design involved five teaching units related to research methodology between researchers and teaching staff from different degrees.

As for the role and agency capacity of the participants, the papers presented in this special issue differ in the level of participation and in the type of participant involved. Thus, by way of example, the role of students in the co-design proposed by Molina Zambrano and Ruiz Morales (2020) was centred on its characterisation, while external experts were involved in the evaluation of the learning object developed, and the teaching team was the maximum responsible with agency in this co-design. Similarly, the students in the study by García-Zabaleta et al. (2020) benefited from a co-design process that was mainly of a teaching nature, and their involvement was more in the joint application of the products of the process and their assessment. In contrast, the study of Colorado Aguilar (2020) shows a greater role and agency of the students insofar as they agreed with the course's instructor on relevant aspects of the course design. Similarly, the study of Jorrín-Abellán et al. (2020) also reveals a high-level role and agency on the part of the teaching staff in co-designing their courses with the researchers.

Regarding the scalability of the studies, we also identified important differences between the contributions. Most are groups of less than 100 participants, usually much less, who are involved in co-design. For example, the study of Molina Zambrano and Ruiz Morales (2020) includes faculty members, 10 students and 4 experts; that of Piñero Charlo and Costado Dios (2020) has 87 students and the course's instructor. The study by Rodríguez-Triana et al. (2020) is an example of a large-scale study in which more than 40,000 designs from a community of more than 35,000 co-designers of activities to promote research in the classroom have been analysed.

On the other hand, we would like to emphasise some characteristic aspects of the contributions of this special issue that reveal possible limitations in the topic of study of co-design. We find it remarkable that four of the eight empirical works are framed in the context of initial teacher training, two in teacher professional development and one combines the first one and the broadest context of Educational Sciences. This confirms one of the results of the systematic review carried out by Santana Martel and Pérez-i-Garcías (2020) which indicates that the field of social sciences, and we should even say specifically education, is the most prolific for co-design. Only the study of Molina Zambrano and Ruiz Morales (2020) is in a different field to that of Educational Sciences (Architecture). On the other hand, we do not have experiences related to other educational contexts beyond higher education, although the study of Rodríguez-Triana et al. (2020) points to possibilities in the teacher professional development at non-university levels. We know little about other disciplines and educational contexts, where possibly the characteristics and conditions may be different (Gros & Durall, 2020). Nor do we know much about the involvement of other stakeholders, beyond students and teachers. Only two studies involve other stakeholders in co-

design (IMRL researchers, in the case of the manuscript presented by Jorrín-Abellán et al. (2020), and experts in the contribution of Molina & Ruiz (2020)).

The review by Santana Martel and Pérez-i-Garcias shows the benefits and challenges of co-design, and some of these are reflected in the results of the contributions included in this special issue. For example, Piñero Charlo and Costado Dios (2020) and García-Zabaleta et al. (2020) refer, in their specific contexts, to the improvement of students' academic performance and the quality of their work. The feeling of the learning community and the important role of the teacher as a support providing constant guidance, direction and feedback, are directly referred to in Colorado Aguilar's (2020) contribution. In contrast, the challenges of co-design are less visible in the manuscripts presented; this may be linked to the fact that many of the studies do not directly evaluate the co-design process as such. For example, little is said about the possible feeling of mistrust and uncertainty on the part of some participants regarding the co-design process, the need for continuous feedback from the teacher, little capacity to design, the lack of motivation and commitment of some participants, anxiety and stress on the part of participants and teachers, or the need for an epistemological change (Santana Martel & Pérez-i-Garcias, 2020).

We therefore stress the importance of carrying out studies that specifically research co-design processes and their impact on different educational aspects to guarantee their value, according to the parameters of the levels of participation of the participants, their role, their capacity for agency and the scalability of the projects (Gros & Durall, 2020). There are still questions to be answered that we hope future research and practice will take into account. Some of these questions have been revealed in our previous written lines; for example, how to plan co-design processes in contexts where the agency of the participants is relatively limited (e.g. school, non-university training centres, work environment)? How to structure co-design processes in such a way that they do not generate situations of stress and anxiety for any of the participants, due to the high level of agency? What methodological approaches are most appropriate for understanding the behaviour of large-scale co-design communities? To what extent and how are active co-design processes with high numbers of participants possible? What can be the role of other stakeholders beyond teachers and students, and how does it influence the co-design of certain aspects of the curriculum? What does co-design look like and what benefits and challenges does it bring in the context of disciplines outside the social sciences? does it have distinctive characteristics different from those seen in the social sciences and, especially, in the educational sciences?

Finally, we would like to conclude that, despite the need for greater diversity in the views of co-design (disciplines, educational context, type of actors), as well as critical reflection on such implementations and considerations of a cultural, ethical, social, etc. nature; we consider that the manuscripts of the special issue make quality contributions to the advancement of the study of co-design and point to valuable ideas for the implementation of co-design processes.

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As editors of this special issue, we would like to thank all collaborators for their involvement in this publication. We hope that the contributions will be of interest to the readers of the EDUTEC journal and that they will serve as references for further work on this topic.

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