EDITORIAL:

Technology to Improve the Assessment of Learning

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Abstract

The methodologies of assessment are one of the indicators of quality in teaching, to the point that the idea "tell me how you evaluate and I'll tell you how you teach" is very accepted. To that we can add, and with what technology? When it is proposed that learning experiences have served to think and reflect on what we learn, learn about ourselves, self-regulate our learning ... Technologies have many functions and possibilities to improve these processes of diagnostic assessment, summative and formative, customize teaching, communicating and reflecting on what has been learned, making feedback more interactive and instantaneous, more motivating activities, easier and faster to manage evaluation data, essential in e-learning, b-learning and m-learning models. At the same time, these digital resources may have problems that we must also attend to. In summary, technologies are essential resources for the evaluation of learning. These are questions from this work: What technologies can we develop a formative assessment with? What emerging technologies are there to assessment?

Keywords

Assessment, Formative assessment, Information and Communication Technology (ICT)

Tecnología para mejorar la Evaluación del Aprendizaje

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Resumen

Las metodologías de evaluación son uno de los indicadores de calidad en la enseñanza, hasta el punto de que la idea "dime cómo evalúas y yo te diré cómo enseñas" es muy aceptada. A eso podemos añadir, ¿y con qué tecnología? Cuando se propone que las experiencias de aprendizaje han servido para pensar y reflexionar sobre lo que aprendemos, aprender sobre nosotros mismos, autorregular nuestro aprendizaje... Las tecnologías tienen muchas funciones y posibilidades para mejorar estos procesos de evaluación diagnóstica, sumativa y formativa, así como personalizar la enseñanza, comunicar y reflexionar sobre lo aprendido, haciendo que la retroalimentación sea más interactiva e instantánea, más motivadora, más fácil y más rápido de gestionar los datos de evaluación, esenciales en los modelos de e-learning, b-learning y m-learning. Al mismo tiempo, estos recursos digitales pueden tener problemas que también debemos atender. En resumen, las tecnologías son recursos esenciales para la evaluación del aprendizaje, por ello en este trabajo se plantean las siguientes cuestiones: ¿Con qué tecnologías podemos desarrollar una evaluación formativa? ¿Qué tecnologías emergentes hay para evaluar? ¿qué producción científica se está generando en torno a este tópico?

Palabras clave

Evaluación, Evaluación formativa, Tecnología de la información y comunicación (TIC)

I. Introduction

Improving the assessment of learning implies, among many other things, making assessment processes more efficient, automating them by reducing time and effort for students and teachers alike, fostering communication and understanding of what needs to be assessed, identifying quicker ways of assessment and responding faster to the interpretation and analysis of learning evidence and establishing improvements in the organisation and strategies for when and how to assess. Unquestionably, this improvement involves many more factors, but we cannot address them all here due to space constraints. For example, knowing what is worth assessing and how it should be assessed, entails giving an immediate answer to the question of what to teach and how to assess this in the education system. The European Union and its Member States within the Directorate-General for Education and Culture[1] focused on this with great effort. However, this paper is about the improvements that information and communication technologies (ICTs) can bring on in the assessment for learning, notwithstanding other vital issues and elements that are basic to formative assessment, such as educational policies on an informed conception of assessment, design and methodologies in education.

The use of technologies in assessment opens up the possibility of a set of methodological approaches that were not considered before because of their complexity, such as managing a large amount of data (learning analytics), generating interactivity and systematic feedback, and having automatic response processes, among other possibilities now felt necessary. Technologies have traditionally had these functions but and today, they have acquired particular prominence in the so-called emerging technologies understood by Veletsianos (2010) as the tools, innovations and advances used in educational contexts at the service of various purposes related to education.

These new possibilities are not exclusive to the educational field but are associated with the efficiency of technology in many other current assessment processes. For instance, VAR technology (video assistant referee) has also recently been applied to measurement and verification processes in which the human factor is still critical, such as refereeing in football matches. This method and technology provide football referees with greater infallibility since they can rely on several cameras that freeze the plays. In other professional areas where digitization processes are on the rise, these technologies socialise values and assessment responses that then guide decision making. Anyone who has purchased a product or service via the web will read consumer opinions, numerical values and standardised thumbs up or down icons in the assessment of these products and services.

Obviously, teaching is neither a football match nor a product in the industrial sense of the term, although some people insist on considering it that way when talking about assessment. It appears, however, that this perspective is being left behind (Brown & Glaser, 2003), and not because we are optimistic, but because the production means and employee's roles in a new productive society imply new learning and competencies that integrate technologies. Therefore, the time has come to consider the new ways, methodologies and technologies with which we will assess these competencies.

Teachers assess values, attitudes and knowledge in individual or group contexts and practices, which implies the use of a variety of assessment strategies (Martin, 2008; López-Pastor, 2009; Amante, Oliveira, & Gomes, 2019). This assessment also takes place in different, increasingly digitalised educational environments—formal and informal education—, where, in many cases and as the study in the European context of Dinis da Costa & Araújo (2016) indicates, students access technologies that they do not have at home and yield better results in digital reading than in printed text. Students' browsing is, therefore, related to "the performance of online reading beyond printed reading skills" (Dinis da Costa, & Araújo, 2016, p.56). This study reminds us that technologies are not an end in themselves, but a means to learn, and it is embedded in our

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[1] https://ec.europa.eu/jrc/en/research-topic/education-and-lifelong-learning

modern, everyday ways of communicating and sharing our experiences. Nowadays, it is, therefore, unthinkable not to find ICTs integrated into the teaching processes, both as a teaching/learning resource and as facilitators of assessment. For teachers, direct observation in a classroom is not enough, since it is difficult to maintain a high level of observation and analysis capacity throughout a school year, both for groups and individuals. Teachers cannot be asked to stop relying on technology to benefit education in general, and more specifically, in assessment for learning.

II. Integration of technologies in assessment strategies and methodologies

If we briefly go over what technology has represented in assessment for learning strategies, we could safely say that we have moved from teaching based on technology to education where technology is integrated into educational processes in general, and particularly in assessment, facilitating and creating new scenarios and opportunities associated with each technology. In a more detailed analysis of these changes, Redecker (2013, p.3) draws four moments or generations in this hustle, summarising a transition from a conception of assessment that sought "efficient tests" that attempted to introduce facts and processes that were as real as possible to learning with e-learning 2.0 where the various technologies offer a range of possibilities that facilitate personalisation of learning and competencies.

According to Baydas et al. (2015), over the past decade, research in educational technology has shown a shifting interest ranging from studies of learning approaches and theories to learning environments, leaving assessment with an almost anecdotal presence. These authors analysed 1,255 articles and found that most research used intentional sampling, undergraduate students and sample sizes from 30 to 100 subjects. Assessment for learning, feedback and eportfolios accounting for only 10% of the topics compared others such as learning environments (43.3%), educational technology (14.1%) and alternative assessment tools (9.1%).

However, innovation in educational technology has favored experimenting with emerging technologies and then researching specific cases and pilot samples; which, although testing before implementation may seem a sensible approach, this has not always been the case. This newly found wisdom is leading to a cast of contextualised research and a "cluster" of disconnected analyses between the different studies on emerging technologies for assessment for learning. The same also happens with other research topics, which limit, to a large extent, a generalised consideration of the real impact of emerging technologies in assessment for learning. We cannot blame the groups and researchers for such limitations since the rigour of the scientific method requires controlling the context (in our opinion, a more-than-significant element in education, not to mention complicated!). Instead, limitations stem from the sheer speed and quantity of the technologies that emerge, so much so that there is no time for calmness and research with broader samples, before deciding whether to purchase and implement them.

There appear to be several mismatches; for instance, sometimes families have more advanced practices than those used in educational centers, which is the logical result of advertising and the pressure exerted by the financial and business world behind such technologies. This sometimes promotes the exaltation of a seasoned cutting-edge technology success in "controlled" educational contexts, in the face of the scepticism or yearning—according to each case—of the majority of teachers who do not have access to these contexts or the requirements necessary for this emerging technology to have an impact.

Another heated aspect in research on the subject is the tendency to approach technologies as transversal studies and not from perspectives of real classroom methodologies and practices, such as the research we find in peer review and self-assessment with digital rubrics. Both methods

represent a healthy trend, so it means integrating ICTs into educational practices, along with their subsidiary function, although these samples would also need to be broader and the research methods mixed.

The same assessment methodologies and strategies should not be reproduced with the new technologies, as it would be a nonsense and pedagogical absurdity. Simply changing tools would not be enough to achieve a better assessment of learning. Modern technologies can overcome some organisational and management of information and interaction problems between the teacher and students to enable further customising teaching and establishing a strategy of formative assessment; as well as planning programmes where students take a more prominent role in the assessment process, where they feel more motivated and committed to learning through the use of technologies and more active participation in the whole process. This could be developed further with methodologies such as systematic self-assessment, peer review applying rubrics with quality criteria, systematised and automated testing, more playful and gamified activities that turn errors and successes into a reasoned game, more authentic and safe virtual reality environments, visualisation and clearer identification of learning evidences on audiovisual materials, collaboration in the learning of teams and groups sharing indicators and the value of what is assessed, and so on.

III. Technologies to facilitate formative assessment

With a differentiated use of technologies, we can foster learning at all levels of education. In Infant and Primary Education, increasingly more teachers use blogs to communicate with students' families, to exchange experiences between teachers and as a content and resource manager to store information year after year. However, there is still a long way to go before it becomes an instrument for assessment for learning (Bartolomé, Martínez-Figueira & Tellado-González, 2014), even in Secondary Education (Gallego-Arrufat & Dandis, 2014). A blog used for assessment purposes, according to Fernández, Bartolomé & Cano (2013), intensifies feedback in the accompaniment processes, stimulates students' self-assessment and self-regulation, strengthens peer review and shows the importance of writing as necessary evidence of the cognitive process and competency performance.

In university education, the different subjects determine, to a large extent, the selection of tools. The most frequent tools are the very assessment tools of institutional platforms, although teachers are gradually opening up their range of possibilities towards configuring other innovative assessment models in the different subjects of the degree, especially the Practicum and external internships (Martínez-Figueira & Raposo-Rivas, 2019), as they depend on the academic tutor to redefine the virtual environment (Cebrián-de-la-Serna, 2018; Gallego-Arrufat & Cebrián-de-la-Serna, 2018). Some examples of these tools are the use of electronic rubrics (Corubric), concept maps (CMapsTool), specific electronic portfolios (Mahara) and video annotations (Coannotation), among others. Thus, the methodologies applied to these subjects will be determined, on the one hand, by the different strategies of formative assessment, where studies on peer review and self-assessment with technologies predominate; and on the other, by the specific functionalities of technologies, as you can see next:

a. Self-assessment with ICTs

The digital world and its tools allow reviewing student records and assessments collected during learning processes, with self-assessment techniques (Martínez-Figueira, Tellado-González & Raposo-Rivas, 2013; Gámiz-Sánchez, Torres-Hernández & Gallego-Arrufat, 2015) that make

reviewing errors and successes during the process much easier. ICTs provide statistical and graphical aids that provide an overview at a glance, with the advantage of being able to share results immediately, regardless of where you may be physically. The new possibilities and functions offered by technologies facilitate both users' self-assessment and teacher review and follow-up processes for large groups of students. These opportunities seem to be advancing in the immediate future, with big data analysis and learning analytics technologies for more personalised and predictive teaching of student learning. With this, rapid group models can be built to predict and overcome learning problems (Mah, 2016; Zou, & Xie, 2018; Calvet Liñán, & Juan Pérez, 2015).

b. Peer review with ICTs

As indicated by Lapham & Webster (2003) in their study on the interpretation of criteria, their application and weight in the assessment are quite different depending on whether it is considered by teachers or students. The paper aims to bridge the gap between the two by studying peer review and self-assessment in comparison with that of teachers. In this methodology, students end up interpreting and appropriating the teacher's criteria as they progress through the task and the more experience they gain in applying the criteria (Serrano-Angulo & Cebrián-de-la-Serna, 2011). Having quality criteria, knowing how to interpret them and also how to use them in a job or professional product before leaving for the world of work, where they will encounter many situations in which they will need these criteria to apply them correctly is understood as the cornerstones of professional learning. Another analysis in learning areas other than education is that of Hafner & Hafner (2003), with university students of Biology. After three years and 1,577 grades, the authors found validity and reliability in the rubric for peer review among students and for self-assessment. In a nutshell, collaboration brings benefits and promotes valid learning (Hargreaves, 2007).

IV. Emerging technologies and methodologies for assessment

As predicted by Lefrere (2007), in an increasingly globalised and interdependent world, the competencies of students, as well as their institutions, will follow suit. Nowadays, technologies are a part and a consequence of this globalisation, which is why a command of these technologies also happens to be a means for the assessment for learning. In this sense, the training of teaching professionals needs to focus on technologies, as well as on the skills to be attained and the tools required to assess these skills, regardless of what educational level or area of knowledge we are considering. Every educational professional is nowadays required to have a command of emerging technologies and an insight into their possibilities for teaching in general and the assessment for learning, in particular. Using ICTs and assessing the teaching-learning processes are two of the fundamental competencies associated with this type of professional (Zabalza, 2003; Tejada, 2009; Más, 2011).

There are many technologies and methodologies, as well as varying levels of experimentation and dissemination. Teachers are yet to learn about these technologies and the requirements they demand to achieve their greatest impact, focusing their teaching as research: first, a documentary of the possibilities offered by these reports; second, analysis of their context, and third, extrapolation and adaptation to their context. The application of the latest technology has not been positive (Colas-Bravo, De Pablos-Pons & Ballesta-Pagan, 2018; González Pérez & De Pablos, 2015) when massively implemented.

The following summary serves as a sample of some emerging methodologies and technologies used in the assessment for learning and skills; an opportunity for teachers and researchers to approach

this topic:

a. Digital Portfolios or ePortfolios

The portfolio is the most valued pedagogical method par excellence for formative assessment in specialised literature (Albuquerque & Laranjeiro, 2008; Cebrián-de-la-Serna, Bartolomé-Pina, Cebrián-Robles, & Ruiz-Torres, 2015; Barberà, Gwerec & Rodríguez Illera, 2016), which "has exponentially increased scientific production" since 2011 (Scully, O'Leary & Brown, 2018, p.4). In parallel to the technology boom, digital portfolios or eportfolios became both their products and processes, with three fundamental dimensions: digital storage of learning products; distance communication—synchronous and asynchronous—, conversation, dialogue and analysis of experiences (teacher-student, student-student and student-group), together with assessment of evidence collected and experienced during the teaching and learning process (Cebrián-de-la-Serna & Cebrián-Robles, 2018). The technological means for eportfolios have changed over time, starting with LMS (Learning Management System), through specific environments (Mahara, OSP, etc.) and ending in more personalised open environments, like the tools offered by Google with its federation system, Elgg, WIX, etc.

In particular, the Institutional Personal Learning Environments (iPLE) are an eportfolio concept that groups together a set of tools and web services, such as the Wix tool, at the service of a given institution. Pérez-Cascante, Salinas & Marín (2016) used this tool and analysed how iPLEs supported postgraduate students when preparing their final master's degree projects, which shows examples of the acceptance and satisfaction students have of this model of eportfolio in their research work.

Among the studies and proposals of this monograph on "Technology to improve assessment for learning" in the Digital Educational Review, eportfolios are also raised as useful for initial and in-service training of teachers, considering their ability to research and analyse their actions and assess reflective skills and professional development. The study by Martínez de la Muela, Arteaga Martínez & García, entitled "El eportfolio una herramienta para la evaluación del desarrollo profesional docente" (The eportfolio, a tool for the assessment of teachers' professional development), is along these lines. This paper analyses 306 portfolios of compulsory education teachers from 15 Autonomous Communities within the "Teachers in Action" programme, examining the effectiveness of the training programme in terms of a change in self-perception of reflexive competencies, autonomy, critical reasoning and teamwork, as practices related to professional development. It determines that this tool and methodology is feasible for teachers' professional development, given its possibilities to favour critical reflection. However, its results are not as satisfactory to achieve competencies in the form of greater autonomy and teamwork. It concludes by encouraging efforts towards more teacher training in this methodology.

It is, therefore, safe to say that eportfolios should be considered as an adequate method for the initial and permanent training of teachers. However, we do believe that eportfolios should be linked to the improvement in work situations that recognise and allow time for self-training, research on teaching and the exchange of eportfolios among teachers (variable identified as a limiting factor in the study). In any case, ePortfolios have proved useful when (1) they follow good usage practices, as indicated by Beckers, Dolmans & Van Merriënboer (2016), and are used to supervise the development of skills in a more self-regulated learning model, and (2) they are employed in academic life as a positive and regular routine, setting clear goals and tasks with review and self-assessment processes.

b. Electronic rubrics or erubrics

Specialised literature contains numerous review studies on the impact of rubrics in assessment for learning and their implications for formative assessment (Jonsson & Svingby, 2007; Reddy & Andrade, 2010; Cebrián-de-la-Serna, & Bergman, 2014), peer review (Pérez-Galán, Cebrián-Robles & Rueda-Galiano, 2015) and self-assessment (Martínez-Figueira, Tellado-González & Raposo-Rivas, 2013). After reviewing 75 studies, Jonsson & Svingby (2007) conclude with two remarkable results:

- Rubrics can improve performance assessment, especially when they are analytical rubrics.
- Rubrics can promote learning and/or improve instruction.

Digital rubrics have added benefits as opposed to rubrics, with the obvious advantages of digital tools, further facilitating feedback and reflection on learning, as has long been recognised by Campbell (2005). He claims that they gain the advantages of word processing, registering in databases and automatic calculation. Ontology of data, greater interactivity, personalisation versus collaboration and the processing of big data have appeared more recently with the emerging technologies.

Despite the advantages of digital rubrics, some of the aspects indicated by Reddy & Andrade (2010, p.446) have yet to be overcome:

- More rigorous research methods and analysis.
- Studies extended to other samples and geographical and cultural perspectives.
- More studies on the validity and reliability of the rubrics used.
- Studies showing different ways of using rubrics in teaching.

The use of rubrics is frequently linked to eportfolios, which multiplies the potential of both tools and methodologies for communication, recording and assessment of eportfolios. In these cases, they serve as a guide and orientation, debate and context of analysis on learning evidence. Along these lines, this monograph speaks of two papers that use digital rubrics: one is by Tur, Urbina & Forteza, entitled "Rubric-based formative assessment in process eportfolio: towards self-regulated learning", which explains that there were no significant differences between different groups when they used the erubric methodology in their constant improvement after different measures of assessment for learning results over time. Similarly, reflective competencies improve with time but with another circumstantial cadence that defines the intrinsic difficulty of this competency. The other one is "How to assess a meaningful technology-integrated tool for the reflective teacher", by Annacontini and Paiano, which presents a rubric for self-assessment, support and improvement of educators' reflective thinking in the use of digital storytelling. It is set within a critical theoretical framework on the reflective educator and describes the design of a storyboard with an invitation to participants (peer review and self-assessment) and teachers (teacher assessment) with a brainstorming session.

c. Image, video and multimedia annotations technologies

The world of images has always been an essential teaching resource. When these resources were digitised, they opened up new possibilities and technological functions, with apparent advantages; although, they have not been used as much in assessment for learning compared to teaching in general. The three articles included in this monograph are, therefore, innovative in terms of their technology (based on images), as well as their potential methodologies. The first one, "Participative Digital Photography to evaluate the transition to University", Sierra-Martínez, Martínez-Figueira, Raposo-Rivas & Parrilla use "photovoice" as a methodology to evaluate users' transition process to the university. The denotative and connotative analyses of students' images and texts show their

perception of participation, management and the spaces of university life.

Second, newly developed video annotations make it possible to select fragments of short videos and share them with large groups of users. They allow fragmenting and thoroughly and calmly analysing a linear and fast narrative discourse such as videos. All these options motivate recent studies and applications in the field of assessment. Thus, the article by Cebrián-Robles, Pérez-Galán & Quero-Torres, entitled "Estudio comparativo de la evaluación a través de ejercicios sobre texto y vídeo para la identificación de elementos de una investigación científica" (Comparative study of assessment through exercises on text and video for the identification of elements of scientific research), analyses the differences between an assessment of scientific competencies carried out on paper, as opposed to another that uses digital video and collective annotations. The methodology associated with the use of digital video annotation technology (coannotation.com), coupled with digital rubrics (corubric.com), shows significant differences in the quality of the answers given by university students.

Finally, in this block, the article by Dias-Trindade & Moreira entitled "Pedagogical scenarios enriched with audiovisual technologies and their impact on the promotion of learning skills of inmate students in Portugal", focuses on the distance tertiary education of a group of twenty detainees from a Portuguese prison. It analyses the impact of learning skills on the proposed tasks of "deconstruction" of moving images. This methodology and technology have very positive effects on the way most students perceive their learning skills.

d. Digital Security and Blockchain

The Internet boom has brought benefits in all social and productive fields, but also new dangers associated with users' malpractice. These Internet problems in education are recently being addressed mostly because of the repercussions seen in the news and media. The study by Torres-Hernández, Pessoa & Gallego-Arrufat entitled "Intervención y evaluación con tecnologías de la competencia en seguridad digital" (Intervention and assessment of digital security with competencies technologies) aims to ascertain the level of competence of university students in digital security and their assessment in technology-enriched environments. The experience involved 154 students from two universities in Spain and Portugal. Exercises about analysing 148 digital narratives and 141 reflections on netiquette and social networks were proposed. Out of a total of 1,012 activities, the results show that 93.5% of the participants have an intermediate level of competence. Certainly, there is a need to invest in training on Internet security competence and have tools to assess it, as revealed in this study. The digital rubric platform called Corubric.com was used to assess these competencies during the workshop.

Blockchain, on the other hand, is identified in the Horizon Report (Educase, 2019) as a technology whose implementation is expected in four or five years. There is no doubt that this technology will develop experiences and results in the field of education. The article by Rivera Vargas & Lindín Soriano entitled "Blockchain en la universidad: una tecnología digital para diseñar, implementar y gestionar itinerarios de aprendizaje global" (Blockchain in the university: a digital technology to design, implement and manage global learning itineraries) presents the "Edublocs" project and its formative assessment model of individualised learning itineraries in mass university subjects. The project aims to experiment and assess a system of records of results of activities using Blockchain, which makes it easier for students to follow their itinerary. The results are meaningful, given the pioneering and innovative application of Blockchain technology in education, which has allowed knowing the feasibility and relevance of this technology in university teaching.

e. Serious games

Serious games have been incorporated in all levels of education due to students finding them interesting and a source of motivation, but primarily because they can simulate real situations that put into play the skills and abilities necessary for the acquisition of professional competencies. These serious games are usually supported by specific technological platforms, which have been improving in their interactivity and feedback of the behaviours produced by the players. These technological platforms have emigrated to other more personalised environments, such as phones and mobile devices. Almeida & Buzady's work entitled "Assessment of Entrepreneurship Competencies Through the Use of FLIGBY" suggests that engineering and social science students better orient their thinking towards business and better time management skills, as well as decisions about stress and successful management tasks, when using serious games on the FLIGBY platform.

V. To conclude: assessment using emerging technologies in scientific production and research

The dynamism and proliferation of new technologies in society has generated an innovation curve studied and called after the author of his study: the "Gartner curve". To begin with, the Gartner graph represents an ascending curve—"launch phase"—. At the beginning of the ascent to the curve are the technologies that have just emerged. Up to the maximum of the curve or "peak" are technologies that show high expectations for a greater number of users (many followers or users), followed by the fall or "abyss disappointment" (few followers or users), and then the "consolidation ramp" and the "productivity plateau". In the field of education, there are more precise studies such as the Horizon Report (Educase, 2019) that produce an annual map or "still photograph" of the most commonly used technologies, as well as those that will have an impact on the future of education.

In this sense, the preconceptions, subjective perceptions and theories available to teachers and students are essential elements that can represent a stimulus or an obstacle, depending on the case and the technologies, for their introduction in the assessment processes. Technologies can lead to excessive optimism at the outset, as was the expectation of MOOCs, which decline over time. They can also generate criticisms and rejections at first without hardly any time for a serious assessment, like the current criticisms to the learning analytics or Blockchain technologies (Adell & Bellver, 2018) and with time, they may even moderate and change or be accepted as indicated in the "Gartner curve". The monograph presents four articles within this set of approaches.

First, the work of Romero Alonso, Riquelme Plaza & Halal Orfali entitled "Barriers in teacher perception about the use of technology for evaluation in Higher Education" analyses whether the relationship between imaginations, personal beliefs, pedagogical and technological conceptions influence the shift towards the use of technologies for evaluation. It shows how these beliefs can be barriers to change. It also identifies the value of autonomy in student work and feedback as critical beliefs for the use of technology. Secondly, the work of Agreda Montoro, Ortiz Colón, Rodríguez Moreno & Steffens, entitled "Emerging technologies. Analysis and current perspectives", reviews literature through a meta-analysis of 62 research studies, indexed in the WOS and Scopus databases during 2013 and 2018 in the area of Social Sciences. They analyse adaptive learning technologies based on in-depth learning perspectives and the achievement of objectives that are reflected through produced learning analysis. Thirdly, García-Martín & Cantón-Mayo in the work called "Teachers 3.0: Patterns of use of five digital tools", study how 118 Spanish teachers used five digital tools (Google, Wikis, Blogs, YouTube and WhatsApp) in their educational centre, and the impact of their socio-labour variables on the greater or lesser use of these tools for teaching and

assessment. After descriptive and multivariate analyses, they offer different results according to age, sex, professional experience, type of school and performance of academic positions, as well as the tools used. And in fourth and last place, the article by Sarceda, Caldeiro & Guevara with the title "Perception of technology as an assessment tool. A comparative analysis from the learner's perspective", studies the perception Latin American higher education students have of technology as an assessment for learning tool. A sample of 122 students from the School of Education of the Universidad Técnica del Norte (Ecuador) and the School of Teaching of the University of Santiago de Compostela (Spain) was assessed at some point through technology during their educational career. The results of the data analysis show different perceptions, both in terms of contexts and experience, while identifying factors that influence the added value of technology as a tool for assessment.

To conclude, we invite you to read the articles presented in this monograph further, with the hope that it will contribute towards an approach to the expert and technical field of assessment for learning with technologies since such expertise represents a competence for all teachers, not only for specialists.

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