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Technology-enhanced Assessment and Feedback Practices: A Systematic Literature Review to Explore Academic Development Models

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Abstract

In the current higher education context, the development of academics' competencies seems to be a crucial issue, with a strong focus on teaching, learning and assessment digital skills (Redecker & Punie, 2017). In connection with the framework of DigCompEdu (2017), it seems important to understand how to better sustain academics' new professionalisation as Digital Scholars (Weller, 2011) in order to structure efficient and effective academic development models aimed at fostering new teaching skills required at university in the post pandemic era.
This systematic literature review, developed following the PRISMA model (Moher et al., 2009), aims to investigate existing academic development actions, programmes and models in the international literature to scaffold university teachers' digital competences, with particular focus on technology-enhanced assessment (TEA) and feedback practices.
The results point out a real attention on the topic of academic development to promote digital competences, but it seems that the area of TEA academic development models and practices is under-researched and therefore requires further investigation. This paper presents approaches and strategies to promote the use of technology in assessment and drafts perspectives for the future.

Keywords: *Technology-enhanced assessment and feedback; academic development; higher education; models.*

Introduction

In this historical period and in our digital world, the importance of the development of teachers' digital competence, intended as "the competence to act in today's digital world" (Van Petegem et al., 2021), is strongly highlighted. In connection to that, the European Framework for the Digital Competence of Educators (DigCompEdu; Redcker & Punie, 2017) describes the educators' digital competencies and divides them into six main areas and in related 22 sub-competencies as follows:

1. Professional Engagement
2. Digital Resources
3. Teaching and Learning
4. Assessment
5. Empowering Learners
6. Facilitating Learners' Digital Competence

The framework structure shows the interconnections between the educators' professionality, their specific pedagogical competencies and the direct correlation with student learning process. In Figure 1, it is possible to have an overview of the framework.

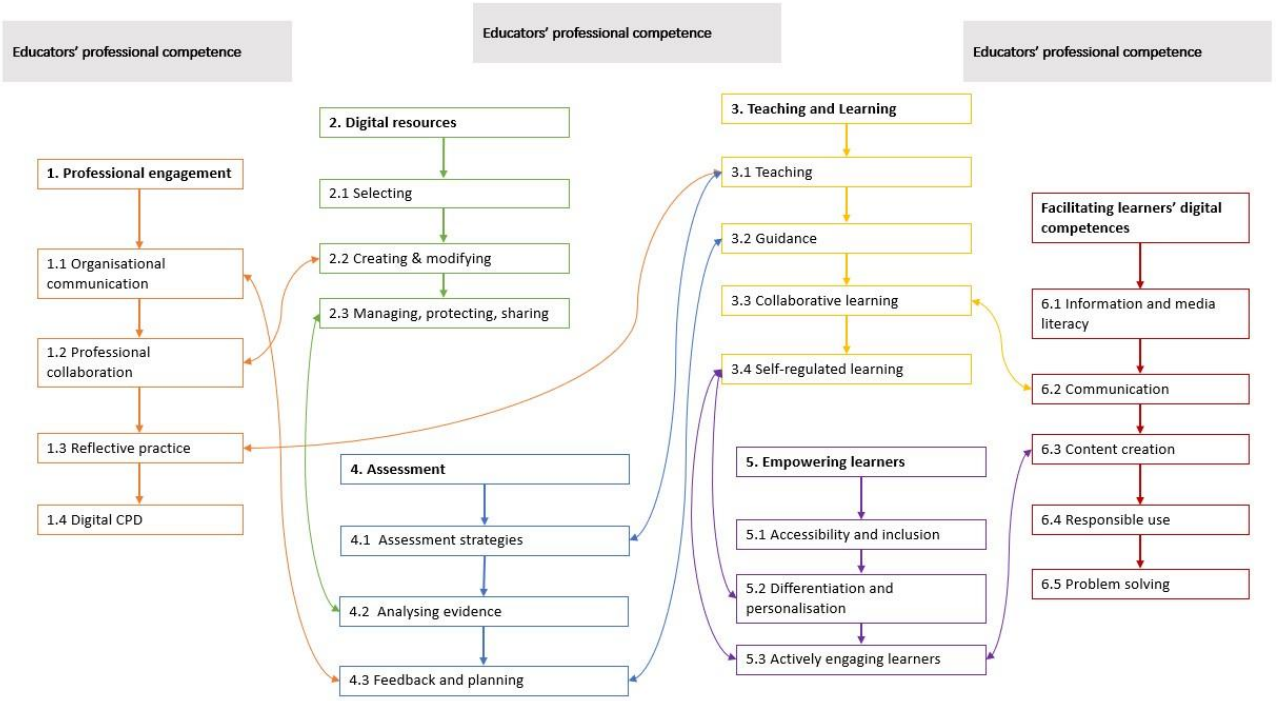

Fig. 1 The DigCompEdu Framework (p.8).

In higher education, digital competencies are linked to a new emerging professional role that university teachers cover, the role of Digital Scholar, which is defined as "someone who employs digital, networked, and open approaches to demonstrate specialism in a field" (Scanlon, 2018; Weller, 2011), i.e., a professional who can incorporate efficiently the use of digital technologies and approaches into teaching, assessment and research practices.

Considering the broader term Digital Scholarship, Pearce and colleagues (2010, p.5) said that

"digital scholarship is more than just using information and communication technologies to research, teach and collaborate, but it is embracing the open values, ideology and potential of technologies born of peer-to-peer networking and wiki ways of working in order to benefit both the academy and society. Digital scholarship can only have meaning if it marks a radical break in scholarship practices brought about through the possibilities enabled in new technologies".

Therefore, in the current educational context, it seems fundamental to understand how to support the growth of these new professionals in the universities in order to create innovation in terms of digital progression in the teaching and learning systems.

1. Assessment and feedback with technology

Due to the complexity of the framework and the connected areas and sub-competencies, in this research, it was decided to focus the attention mainly to Area 4, dedicated to the assessment and feedback topic with the implementation of technology.

Table 1. "European Framework for the Digital Competence of Educators: DigCompEdu" – Area 4: Assessment (adapted from Redecker & Punie, 2017, https://publications.jrc.ec.europa.eu/repository/handle/JRC107466).

Area 4 "Assessment" of "European Framework for the Digital Competence of Educators: DigCompEdu"	
Area	Description
Assessment strategies	● To employ digital technology for formative and summative assessments ● To improve the diversity and appropriateness of assessment styles and methodologies
Analysing evidence	● To develop, choose, critically examine and analyse digital data on student activity, performance and progress in order to inform teaching and learning
Feedback and planning	● To leverage digital technology to deliver focused and timely feedback to students. To change instructional tactics and give targeted support based on evidence provided by the digital technologies being utilised ● To teach students and parents how to interpret and apply the evidence supplied by digital technology to make decisions

The framework suggests that incorporating digital technology into the assessment process can function as a means to monitor students' progress, offer feedback and enable educators to evaluate and adapt their teaching strategies. Accordingly, academic development initiatives should equip educators with the necessary digital skills, enabling them to seamlessly integrate technology and data into their teaching, learning and assessment approaches.

The purpose of this study is to investigate what types of academic development models and programmes encourage the implementation of assessment and feedback practices that are reinforced by the use of technology in teaching and learning processes. In fact, the research is focused on the technology integration in the assessment and feedback process and identifies if and what kind of academic development activities focused on *technology-enhanced assessment* (TEA) are adopted in the higher education field, namely, strategies to inform and to train university teachers to enhance their digital assessment and feedback competences.

How to define technology-enhanced assessment?

It is a broad term that includes various methods by which technology aids in organising and implementing assessments within learning environments, allowing educators to conduct assessments through innovative approaches.

Devedciz & Devedciz (2019) said:

"TEA enables teachers to conduct assessment in a number of innovative, alternative ways. It places students in real-world situations and requires them to apply relevant skills and knowledge, rather than just reproduce facts that they have remembered and apply standardised problem-solving procedures. TEA supports assessment methods that require students to develop their own responses to a given situation, not just to follow one or more prescribed paths. Some of the TEA methods and tools often used in modern assessment include self-assessment, peer assessment, e-portfolios, e-checklists, e-rubrics, concept maps, journal entries, digital storytelling, collaborative development projects using Social Web tools, and presentations and discussions using e-communication tools".

Recent research emphasises the growing interest in TEA practices within higher education. TEA encompasses a range of strategies facilitating peer, self and teacher assessments, thereby addressing assessment challenges associated with distance learning, flexible learning and large student enrolments (Oldfield et al., 2012; Whitelock & Watt, 2008) by developing the possibility of generating "constructive, timely and 'easy to understand' feedback" (Whitelock, Gilbert & Gale, 2011, p. 2; Sweeney et al., 2017).

Furthermore, Oldfield and colleagues (2012) emphasise the importance of the change produced by the incorporation of digital technologies in the processes of assessment and feedback processes; these new strategies could stimulate different aspects such as:

• Incorporating various assessment types to support learner choice
• Formulating new approaches to introduce summative assessments
• Attaining crucial competencies such as peer interaction and collaboration
• Employing data analytics to enhance and inform assessment practices.

The report JISC (2010) highlights that TEA could introduce the following benefits in higher education teaching and learning:

- More diversity and authenticity in assessment design.

- Improved learner engagement, such as interactive formative exams with adaptive feedback.
- Assessments can be scheduled and held at different times and locations.
- Simulations, e-portfolios and interactive games can capture broader talents and qualities that are difficult to measure using traditional methods.
- Effective submission, marking, moderation and data storage processes.
- Consistent, precise results, with the option to mix human and computer marking.
- Get immediate feedback.
- Increased possibilities for learners to act on feedback, such as reflecting in e-portfolios.
- Innovative techniques centred on the use of creative media and online peer and self-assessment.
- Evidence that is accurate, timely and easily available on the success of curriculum design and delivery.

These studies appear to suggest that incorporating digital technologies into the design of teaching, learning and assessment practices, as well as into educational contexts, could provide meaningful opportunities to create environments rich in variety, fluidity, discussion and exchange (Grion et al., 2016; Picasso et al., 2023*).

Recently, Sambell and Brown (2020) offered an open-access repository which focuses on how to redesign university assessments in the context of the pandemic and, with a series of papers and posts, provides practical strategies for introducing online assessment approaches, using the emergency as a golden opportunity to rethink assessment and feedback in a more authentic way.

In addition, exploring the literature, important data were collected in order to foster the theoretical framework at the base of this research. For example, Tonelli and colleagues (2018) in their review put in evidence the correlation between assessment and technology: they introduce an overview connected to computer-based assessment (CBA; Sim et al., 2004) practices that sustain through technology the flexibility, multiplicity and efficiency of implementation of assessment processes, in connection with the promptness of the score and feedback produced, supporting the efficiency of the assessment flow itself, even for class with a large number of students, in a predominantly summative key (Cantillon, Irish, & Sales, 2004; Deutsch et al., 2012; Kalogeropoulos et al., 2013; Tonelli, Grion & Serbati, 2018). Literature evidence about the possibility of introducing the use of Learning Management System (LMS) is present, so systems are intended as environments for online or blended learning activities for the implementation of self and peer assessment and formative evaluation (Burrows & Shortis, 2011) and related dashboard (Yoo et al, 2015). LMS aims to create environments for teachers to directly share information about their progress and thus guide their attention in a focused manner through intelligent tutoring systems (Crow et al., 2018) that clarify any doubts and give targeted feedback.

Another system to introduce TEA practice is identified in the semi-automated feedback and marking tools (Shortis & Burrows, 2009) that are useful to implement peer assessment, self-assessment and timely and detailed feedback to individual students to facilitate more efficient and effective assessment for large classes, both formative and summative.

All this evidence generates crucial evidence to support the research: in connection with the above-mentioned theoretical frameworks, the systematic literature review was developed to deeply explore the international research scenario that can inform the creation of an academic development model focused on TEA for Italian academics and to inform direct action processes to support the development of university teachers' digital competence in assessment and feedback area.

2. Materials and Methods

2.1 Procedure

This paper follows a systematic review methodology and is guided by two specific research questions:

1. What academic development (AD) models promote TEA and feedback competencies and practices within higher education teaching and learning processes?
2. What are the key features of such academic development models?

The review was carried out using two international online databases, ERIC (Education Resources Information Center) and Scopus, widely recognised as valuable sources for educational papers.

After attempting different matches, the following keywords were used to identify the papers in the chosen databases:

"Technolog* assess*" OR "Technolog* feedback" AND "academic development" OR "educational development" OR "faculty development" AND "Higher Education" AND "models". This word combination grew from a complex testing process, taking into account different databases. The decision to match these keywords was developed through a broad process of analysis: in order to maximise and to focus the review on our main topic, it was important to select only

the contributions that focused on the academic development process and training models regarding assessment and feedback digital competences of the academic staff at the university level. All the records found that included the focus on student learning weren't included in the review.

2.2 Inclusion and exclusion criteria for the studies' selection

For the review process, articles published in English from 2018 to 2022 were considered, in peer review journals and with full text available. Only articles focusing on higher education were considered, identifying academic development frameworks, models, key conditions, practices, programmes and principles connected to the aspect of continuous and specialised professional development in Higher Education. In Table 1, the selected criteria are described:

Table 2. Eligibility criteria for the systematic literature review process

Criteria	Inclusion	Exclusion
Time frame	2018–2022	Before 2018
Language	English	All the other languages
Sector	Resources focused on higher education	All the other typology of school level/institution
Paper characteristics	Full text Peer review Journal articles	All the papers that are not available Report Conference proceedings Books
Target/topic	Training	
	1. Framework: records that include training models and focus on development of assessment and feedback digital competences for academics.	
	2. Papers that identify academic development framework, model, key conditions, practices, programmes, principles	
	3. Frameworks/models applied in practice	
	4. Focus on teacher competencies	

3. Results and discussions

The initial search using keywords before the introduction of the eligibility criteria produced a great number of results (SCOPUS n= 129; ERIC n= 34.019). After the introduction of the eligibility criteria, the records were reduced (SCOPUS n= 38; ERIC n= 456).

In order to describe the research design for data synthesis, we use below the flow diagram referring to the PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses; Moher et al., 2009) as shown in Figure 2.

The study employed a thematic synthesis for qualitative evidence synthesis, as outlined by Thomas and Harden (2008). To address the research questions, three themes were identified to delve into the academic development (AD) models supporting TEA and feedback competencies, along with their associated characteristics. In Table 3, all the gathered records are categorised under the identified thematic areas.

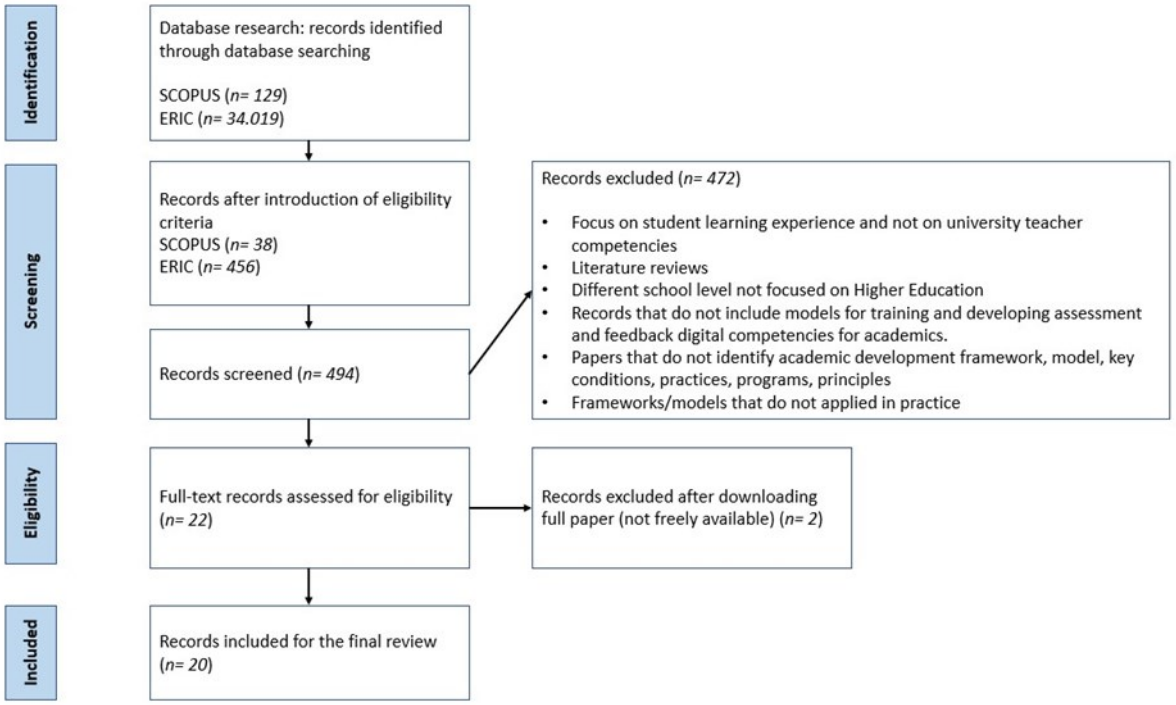

Fig. 2 Diagram of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009) used to summarise the inclusion and exclusion processes.

Table 3 Thematic areas identified for the analysis.

Area	Topics	Records
Approaches to scaffold academics' competencies	-Actions to scaffold the combination between pedagogical competences and digital competences -Community of Practice (CoP) -Video Annotation Activities -Case-Based Learning -Scholarship of Teaching and Learning (SoTL)	Suárez-Rodríguez, J., Almerich, G., Orellana, N., & Díaz-García, I. (2018). A basic model of integration of ICT by teachers: competence and use. *Educational technology research and development,* 66(5), 1165-1187. Podorova, A., Irvine, S., Kilmister, M., Hewison, R., Janssen, A., Speziali, A., Balavijendran, L., Kek, M., & McAlinden, M. (2019). An important but neglected aspect of learning assistance in higher education: Exploring the digital learning capacity of academic language and learning practitioners. *Journal of University Teaching & Learning Practice*, 16(4), 3. Báez, J. C., Marquart, M., Chung, R. Y. E., Ryan, D., & Garay, K. (2019). Developing and supporting faculty training for online social work education: The Columbia University School of Social Work Online Pedagogy Institute. *Journal of Teaching in Social Work*, 39(4-5), 505-518. Soto, M., Gupta, D., Dick, L., & Appelgate, M. (2019). Bridging distances: Professional development for higher education faculty through technology-facilitated lesson study. *Journal of University Teaching & Learning Practice*, 16(3), 7. Moritz, D., Pearce, S., Christensen, L. S., & Stamboulakis, D. (2021). Designing a peer-led approach to teaching review and enhancement in academia. *Journal of University Teaching & Learning Practice*, 18(1), 7. Mirriahi, N., Jovanovic, J., Dawson, S., Gašević, D., & Pardo, A. (2018). Identifying engagement patterns with video annotation activities: A case study in professional development. *Australasian Journal of Educational Technology*, 34(1). Kehoe, T., Schofield, P., Branigan, E., & Wilmore, M. (2018). The double flip: Applying a flipped learning approach to teach the teacher and improve student satisfaction. *Journal of University Teaching & Learning Practice*, 15(1), 7.

		McCune, V. (2018). Experienced academics' pedagogical development in higher education: Time, technologies, and conversations. *Oxford Review of Education*, 44(3), 307-321. Henry, D., Brantmeier, E. J., Tongen, A., Jaffee, A. T., & Pierrakos, O. (2021). Faculty Empowering Faculty: SoTL Leaders Catalyzing Institutional and Cultural Change. *Teaching & Learning Inquiry*, 9(2).
Actors and structures	-Academic developers and change agents - Theoretical foundations -Teaching and Learning Centres (TLC) strategies	Macdonald, R. H., Beane, R. J., Baer, E. M., Eddy, P. L., Emerson, N. R., Hodder, J., Iverson, E. R., McDaris, J. R., O'Connell, K., & Ormand, C. J. (2019). Accelerating change: The power of faculty change agents to promote diversity and inclusive teaching practices. *Journal of Geoscience Education*, 67(4), 330-339. Martinovic, D., Kolikant, Y. B. D., & Milner-Bolotin, M. (2019). The Usefulness of Technology in Teacher Professional Development: Extending the Frameworks. *Journal of the International Society for Teacher Education*, 23(2), 21-36. Geertsema, J. (2021). Faculty development in the context of a research-intensive university. *Hungarian Educational Research Journal*, 11(3), 230-245. Troelsen, R. (2021). How to operationalise holistic academic development.The case of a Danish center for teaching and learning. *Hungarian Educational Research Journal*, 11(3), 254-261.
Research findings on implementation	-Inquiry -Case studies -Experiment in class	Little, D., & Moore, J. L. (2021). A typology for catalyzing pedagogical change: Fostering multiple pathways through SoTL. *Hungarian Educational Research Journal*, 11(3), 262-273. Zamir, S., & Thomas, M. (2019). The effects of university teachers' perception, attitude and motivation on their readiness for the integration of ICT in classroom teaching. *Journal of Education and Educational Development*, 6(2), 308-326. Grier, D., Lindt, S. F., & Miller, S. C. (2021). Formative assessment with game-based technology. *International Journal of Technology in Education and Science* (IJTES), 5(2), 193-202. Packer, C. (2019). Participant-Centered Adjunct Faculty Development: A Case Study Using the Great Teachers Model. *Journal of the International Society for Teacher Education*, 23(2), 6-20. Borup, J., & Evmenova, A. S. (2019). The effectiveness of professional development in overcoming obstacles to effective online instruction in a College of Education. *Online Learning,* 23(2), 1-20. O'Keeffe, M., Gormley, C., & Ferguson, P. (2018). Moving the focus from grades to feedback: a case study of pass/fail marking. *Practitioner Research in Higher Education*, 11(1), 70-79. Pekkarinen, V., Hirsto, L., & Nevgi, A. (2020). Ideal vs. experienced: University teachers' perceptions of a good university teacher and their experienced pedagogical competency. *International Journal of Teaching and Learning in Higher Education*.

First, it can be noticed that assessment and feedback are often discussed in an integrated way within approaches and reflections regarding teaching and learning in general and academic development. There are very few studies which focus on professional development models to scaffold TEA practices; however, strategies integrating ICT in educational activities may also be used for assessment and feedback purposes. For this reason, the thematic areas are broad and aim to gather the most relevant information to provide an overview of existing models of university teachers' professional development. The three areas are the following:

•Approaches to scaffold academics competencies: focus on the approaches, strategies and models to be implemented in order to sustain academic development in higher education to scaffold TEA and feedback practices and academics' pedagogical competences and digital competences.

•Actors and structures: focus on roles and institutional units that are crucial to scaffold the integration of actions described in the previous category.

•Research findings on implementation: focus on the importance of the implementation of research actions in the field such as academics' needs analysis and monitoring of impacts and results of TEA practices.

3.1 Approaches to scaffold academics' competencies

The articles included in this area are focused on the development of academics' digital competencies with a broader overview in terms of strategies, actions and models implemented or tested at an institutional level. The actions described in the contributions introduce attention to the combination between pedagogical competences and digital competences of academics. The papers deal, in fact, with the integration of ICT in design and implementation of technological tools, resources and practices in the educational environments.

The main aim of the work of Suárez-Rodríguez and colleagues was "to build a basic model of the explanatory relationship of competences in ICT with teachers' use of these technological resources useful at all levels of education" (Suárez-Rodríguez et al., 2018). The researchers took in account four areas: 1. technological competences; 2. pedagogical competencies; 3. personal-professional application and 4. classroom use. The authors employed a questionnaire to build the model, which is divided into three sections: knowledge and skills of technology resources, application of technological resources (for teachers and with students) and implementing technological resources into classrooms. Within the sub-area of "Design of enriched environments with ICT", the authors emphasise as a critical competence for academics the ability to design and use ICT as an instrument for assessing students' learning, which is interpreted as a fundamental pedagogical competence at all levels of education.

Another broader focus that emerged from the papers' analysis was the theme of academics' digital literacy as the ability to use "a large variety of complex cognitive, motor, sociological and emotional skills that are needed to perform in digital environments" (Podorova et al., 2019). In this paper, the topic of digital competencies, digital literacy and digital learning was explored in relation to surveys and inquiries investigating the real needs, practices and skills declared directly by faculty members included in the study. This approach has the potential to drop the research work into practice, in order to elaborate models or programmes that can immediately relate to faculty members' practices, needs and their professional development. Podorova and colleagues, for example, implemented a survey to understand the academics' daily digital practices. In the realm of assessment and feedback practices, the researchers discovered that 80% of participants (41 respondents) reported relying on technology for more than half of their day-to-day work and 78% use technology for providing feedback to students. The survey indicates that a significant portion of respondents are self-taught in using digital technologies for specific purposes, with no apparent training received from their current institution. Concerning approaches for developing personal and professional digital capacity, 84% of respondents state that they search online when they need help, 78% seek information from colleagues and 68% turn to the university Learning Management System (LMS) support. Regarding training and ongoing support, at least 50% of the respondents appear to lack sufficient support from their institutions in using digital tools. The inquiry emphasises that attending an online workshop is perceived as the most suitable form of training (76%), with 66% of respondents favouring face-to-face workshops, 58% desiring one-on-one conversations with an expert user and 53% expressing a willingness to independently use online resources.

From the thematic analysis, the following approaches emerged as strategies, actions and programmes to scaffold TEA and feedback:

- Community of Practice (CoP)
- Video Annotation Activities
- Case-Based Learning
- Scholarship of Teaching and Learning (SoTL, Boyer, 1990).

An interesting approach is described in the paper of Kehoe and colleagues (2018) that is focused on flipping the professional development programme distributed in 12 weeks, focused on specific different aspects of emerging education topic such as "1. Learning outcomes and curriculum; 2. Assessment design; 3. Blended learning and online tools and 4. Career advancement".

The "double flip" was a semester-long, flipped-classroom programme of professional development that modelled best practice in curriculum and learning design, assessment and effective use of online tools for teaching: participants undertook the programme on their own, but establishing groups in order to foster the creation of communities of practice that could cement participants' learning and disseminate it more widely across faculty members. In addition, the flipped activities were connected to face-to-face workshops with specific tasks. The introduction of the Communities of Practice approach in this study represented a great opportunity to support innovative learning and teaching practices, so a common space where participants could share their opinions and experiences. This is an example of an academic development programme promoted through an integrated approach (LMS learning environments to integrate a flipped-classroom approach, in connection with face to face workshop, creation of communities of practice between peers) that combines the use of technology to create a safe setting where university teachers can freely set their own learning experience and

where they can also experience as "students" formative assessment and feedback approaches that they are supposed to learn and implement in their classes.

The review highlights a significant contribution in the field, focusing on a professional development programme employing a case-based learning approach. Mirriahi and colleagues' study (2018) investigates how educators interact with video case studies and online activities to stimulate the adoption of personalised learning strategies, thereby influencing the refinement of future programme offerings. The research analyses the learning strategies of university teachers participating in the professional development initiative, utilising traced data collected from a video annotation tool that served as the primary learning tool in the programme. The analysis is structured into three stages, each building upon the previous one, progressively providing a more profound and detailed understanding of learners' engagement patterns and study strategies. This study holds the potential to introduce effective strategies for monitoring the academic learning process within specific formative programmes. It also serves as a foundation for implementing innovative teaching, learning, assessment and feedback strategies.

Finally, in faculty development programmes, the Scholarship of Teaching and Learning (SoTL) emerges as a crucial topic, defined by Boyer (1990) as an innovation that acknowledges and values the significance and practice of effective teaching. Henry and colleagues (2021) highlight various ways in which educational development centres can support faculty SoTL work, including individual consultations, university-wide programmes, grant funding, dissemination of information about conferences and relevant journals, references to campus SoTL experts and fostering faculty communities (Henry et al., 2021; Schwartz & Haynie 2013). Their programme, named the Engaged Teacher Scholars Program (ETS), is designed to facilitate growth and innovation, initiating organisational change through a faculty-developing-faculty model. At the individual level, the programme provides faculty support in creating and sharing evidence-informed teaching and learning scholarship. In their research, they also discuss Faculty Learning Communities (FLCs) as a means to sustain faculty engagement in SoTL work, aiming to assist a small group of faculties in developing skills (Cox 2003). According to the authors, these specific institutional strategies represent successful approaches for enhancing academics' competence in integrating ICT in teaching, learning and, specifically, in assessment and feedback processes.

These studies provide an overview on how to investigate university teachers' practices and needs in order to structure interventions that are relevant and consistent with the actual development of teaching professionalism in terms of digital competences in general and, in our analysis, with specific focus on assessment and feedback.

The contributions analysed in this part of the systematic review put in evidence also that technology can be the medium to improve academic development's programmes and processes. In fact, technology is not only a content of training programmes but also the principal means to design and to deliver an appropriate and flexible learning environment to scaffold fundamental knowledge and specific competences vital for the new role of the university teacher as a digital scholar (Weller, 2011).

3.2 Actors and structures

Teaching and Learning Centres (TLC) serve as a vehicle for enacting substantial changes within institutions, particularly concerning the quality of teaching and innovative practices. Troelsen (2021) introduces the concept of "holistic academic development", which encompasses a comprehensive approach to assisting academics in their diverse roles. The TLC's mission is to collaborate with academics and relevant university units to enhance the quality of teaching, learning and assessment, encompassing e-learning and e-assessment. Notably, the focus on assessment and feedback practices, enriched by technology, is highlighted as a pivotal component of the action plan and strategies adopted by TLCs. The researcher shares the experience of a Danish Center for Teaching and Learning, offering valuable insights. In terms of assessment and feedback, the TLC undertakes extensive initiatives to support the multifaceted professional development of academics, utilising feedback sessions and leveraging e-portfolios. The acknowledgment of assessment as a critical competency is emphasised in the academic development actions. Additionally, strategies such as feedback and e-portfolios are employed to foster the professional growth of university teachers.

On the other hand, Geertsema (2021) emphasises another essential actor in academic growth processes: the academic developer. The author defines it as a highly complex profession that requires a comprehensive grasp of transformation as a cultural process in higher education. Academic developers might indeed fill the role of change agents in their institutions, sustaining innovation processes (Sutherland, 2018). Academic development becomes "an activity with a longer-term perspective aiming to contribute to the transformation of the organisation of teaching and learning activities" (Bolander Laksov, 2008, p. 91), necessitating a strategic approach to academic development as a cultural shift. Geertsema cites the UNITE framework, a tool for organising educational progress (van Dijk et al., 2020), which defined six university professors' tasks: Teaching and Learning; Educational Design; Assessment and Feedback; Educational Leadership and

Management; Educational Scholarship and Research; and Professional Development. The field of "Assessment and feedback" is considered as a critical duty and element of the university professors' professionalism, described as:

"Closely connected to the educational design task and concerns the design, construction, performance, and evaluation of learning and performance of assessments, with three subtasks: providing feedback and performing formative and summative assessments; design, construction, implementation, and evaluation of assessment instruments, for example an exam or portfolio; and design, implementation, and evaluation of assessment plans or strategies that combine multiple assessment instruments, for example for a course or curriculum" (van Dijk et al., 2020, p. 10).

This overview allows us to focus on the power of the context and the various actors who can play a key role in the process of change and in the design and implementation of academic development initiatives aimed at improving academics' competences; TLCs and academic developers strategies can widely embrace technology, especially after the pandemic, so their actions can scaffold TEA and feedback in teaching and learning practices.

3.3 Research findings on implementation

This section of the study focuses on records that demonstrate the value of doing academic development research, such as examining academics' requirements and attitudes, as well as monitoring the effects and outcomes of TEA and feedback procedures. Inquiry and case studies appear to be effective for guiding institutional activities and building strong connections among university lecturers.

For instance, Zamir and Thomas (2019) developed their work to explore the relationship between academics' internal factors that influence the integration of ICT in their practice; their research results suggest that academics' perceptions, attitudes and motivation are significant variables in forecasting ICT integration in the classroom. In fact "the positive perceptions allow probability to devise innovative techniques to enhance learning; therefore, teachers' ICT use involves aspects like basic computer literacy to operate application software for accomplishing professional tasks" (Zamir and Thomas, 2019, p. 320). This kind of reflection could help future studies to develop more concrete and complete research and action strategies to activate specific programmes for faculty in a broader way.

An intriguing case study is presented by Borup and colleagues (2019), wherein the authors utilised faculty surveys, discussion board comments and interviews to assess the efficacy of a 6- or 7-week professional development course aimed at equipping faculty members to teach online courses. This study serves as an illustration of technology not only being incorporated as content within academic development programmes but also functioning as a medium for constructing specialised training programmes. The course modules cover topics such as online instruction course design and development, assessment and feedback, student collaboration, discussions, and presence and support.

Participants were organised into small learning groups (4–5 people): they interacted regularly with their group members in discussion board activities, they worked collaboratively, and they were also engaged in peer-reviews of the learning objects created as part of the workshops.

The researchers observed the programme's impact and evaluated the outcomes using the TPACK (Koehler & Mishra, 2009). The framework focuses on the influences of pedagogical knowledge, technological knowledge, participant confidence and motivation, perceptions and teaching.

In general, the improvements in participants' TPACK competences is visible through the introduction of the pre- and post-course surveys: the participants had large increases in TPACK scores, showing significant enhancements in their overall confidence regarding teaching online (Rienties, Brouwer & Lygo-Baker, 2013).

Thanks to the analysis of the articles related to this third thematic area, the importance to inform the practice and the creation of academic development programmes sustained by research actions seems fundamental, in order to promote the improvement of technological knowledge and competences, also in connection with assessment and feedback practices enhanced using technology.

Conclusions and future research perspectives

This systematic review aims to raise knowledge of available academic development programmes and models that can support the implementation of a TEA strategy by analysing the 20 selected papers.

In order to answer the research question aimed at investigating the existing academic development model focused on TEA and related assessment and feedback digital competences, the first evident finding is that in literature there is very little investigation of programmes concerning this kind of topic. On the other hand, there is a general attention on digital competencies and academic development initiatives for a wide teaching and learning approach integrated with technology.

In fact, assessment and feedback are deeply integrated and connected with the learning process, so many strategies applied to teaching practices in general can be applied more specifically to TEA.

The inquiry process connected to the second research question highlighted important data in terms of characteristics of the AD models themselves: the records analysed put in evidence the presence of different approaches implemented to sustain the development of the academics' digital competencies. It seems that the most common possible models could combine more formal actions like actions promoted at institutional level to scaffold the combination between pedagogical competences and digital competences and SoTL programmes with more informal activities like Community of Practice to create peer learning processes. In both cases, it will be important the institutional support in terms of design and related professional figures like academic developers, as strategic and crucial elements for the implementation of specific actions focused on the continuous development of teaching professionalism. Finally, the literature underlines the importance of supporting targeted research actions validating the use of TEA, the continuous monitoring and the constant improving of the related practices.

These results allow us to draft some educational and research implications and to highlight some lessons learnt.

A first lesson learnt from the analysis is the importance of understanding academics' training needs and internal factors before the beginning of every programme or model, then implementing actions of needs analysis and investigation of their perceptions, attitudes and motivation to tailor specific interventions. Researchers in the field contend that for the continued acceptance of assessment methods fostering the construction, integration and transformation of knowledge among academics, it is crucial to scrutinise academic development needs. This analysis should strive to establish corresponding educational beliefs and values as emphasised by Reinmann and Wilson (2012) and Samuelowicz & Bain (2002).

As a second lesson learnt, it is crucial to highlight the importance of defining well-structured digital competences, starting from the existing theoretical frameworks (DigCompEdu, 2017; TPACK model, 2009), to create formative pathways focused on solid foundations. It also seems crucial the power that institutions like Centres for Teaching and Learning (Troelsen, 2021) could play in terms of designing and implementing development programmes, and these changes could also be sustained through the help of professional experts like academic developers (Macdonald et al., 2019).

In fact, a third lesson learnt could refer to the importance of appropriate infrastructures and experts that might scaffold digital literacy in assessment and feedback practices.

A fourth lesson learnt could refer to the effectiveness of promoting integrated approaches for academic development, so, for example, the importance to introduce models that integrate workshops and training activities with communities of practice to share experiences, problems and best practices among peers.

The fifth lesson learnt is about the importance of developing constant and up-to-date research on existing practices to inform the scientific and academic community and to share new approaches and strategies useful for strengthening the new digital competences of university teachers.

As a final lesson learnt, we highlight the importance of using technologies not only as a content but also as a medium to develop specific skills, especially in assessment practices (Soto et al., 2019; Baéz et al., 2019).

This systematic review has some limitations in terms of generalisability of the results: the selected articles are located in the range between 2018 and 2022. This enabled us to narrow down our analysis; however, the topics identified through the analysis process are wide and some records might have been excluded. Secondly, this paper in fact surfaced a few areas that might be further explored in future, to enrich the research also in terms of specific actions, strategies and programmes useful to be implemented to sustain the development of academics' digital competencies in the field of TEA processes. The focus of the analysed contributions was often wide, and it touched the whole domain of technology-enhanced teaching and learning, with a minor focus on TEA and feedback competencies and practices. This shows that the area of TEA academic development models and practices is relatively under investigated and therefore calls for more specific research in this field.

As the National Forum for the Enhancement of Teaching and Learning in Higher Education (2018) states:

"the potential of TEA to contribute to staff efficiencies was evident through (i) efficiencies of time and workload, (ii) increased transparency and visibility of student activity and (iii) the fostering of student autonomy. TEA in the automated assessment/intelligent tutorial systems domain was shown to have the clearest potential for efficiencies for staff in terms of reduced workload around assessment, particularly if the assessment process is valid and reliable and provides automated feedback".

This points out, also supported by other similar reports (UNESCO, 2012), the importance of the introduction of these kinds of approaches and practices, but also the need to increasingly connect the new professionalism of the university teachers as digital scholars to academic development programmes (Raffaghelli, 2021) to fully leverage the potential of TEA practices.

References

*Báez, J.C., Marquart, M., Chung, R.Y.E., Ryan, D., & Garay, K. (2019). Developing and supporting faculty training for online social work education: The Columbia University School of Social Work Online Pedagogy Institute. *Journal of Teaching in Social Work*, 39(4-5), 505-518.

Bagon, S., Gacnik, M., & Starcic, A.I. (2018). Information communication technology use among students in inclusive classrooms. International Journal of Emerging Technologies in Learning, 13(6), 56-72.

Bawa, P., (2016). Retention in online courses: Exploring issues and solutions—a literature review. *SAGE Open*, January–March 2016, pp. 1–11.

Blignaut, P., Burger, A., McDonald, T., & Tolmie, J. (2009). Computer attitude and anxiety. In Encyclopedia of Information Science and Technology, Second Edition (pp. 647-653). *IGI Global.*

*Borup, J., & Evmenova, A.S. (2019). The effectiveness of professional development in overcoming obstacles to effective online instruction in a College of Education. *Online Learning*, 23(2), 1-20.

Boyer, E.L. (1990). *Scholarship reconsidered: Priorities of the professoriate.* Princeton University Press: 3175 Princeton Pike, Lawrenceville, NJ 08648.

Burrows, S., & Shortis, M. (2011). An evaluation of semi-automated, collaborative marking and feedback systems: Academic staff perspectives. *Australasian Journal of Educational Technology*, 27(7).

Cantillon, P., Irish, B., & Sales, D. (2004). Using computers for assessment in medicine. *British Medical Journal*, 329(7466), pp. 606–609.

Cox, Milton D. (2003). "Proven Faculty Development Tools that Foster the Scholarship of Teaching in Faculty Learning Communities." *To Improve the Academy 21*, no. 1:109–42.

Crow, T., Luxton-Reilly, A., & Wuensche, B. (2018). Intelligent tutoring systems for programming education: a systematic review. In *ACE '18: Proceedings of the 20th Australasian Computing Education Conference*, (2018), pp. 53–62. https://doi.org/10.1145/3160489.3160492.

Delcourt, M.A.B., & M.B. Kinzie (1993). Computer technologies in teacher education: The measurement of attitudes and self-efficacy. *Journal of Research & Development in Education*, 27, 31–37.

Eurydice. (2011). *Key data on learning and innovation through ICT at school in Europe 2011.* Brussels: Eurydice. http://eacea.ec.europa.eu/education/eurydice/documents/key_data_series/129EN.pdf.

Deutsch T., Herrmann, K., Frese, T., & Sandholzer, H. (2012). Implementing computer-based assessment–A web-based mock examination changes attitudes. *Computers & Education*, 58(4), (2012), p. 1068-1075.

Gachago, D., Morkel, J., Hitge, L., van Zyl, I., & Ivala, E. (2017). Developing eLearning champions: A design thinking approach. *International Journal of Educational Technology*, 14(1), 1–14.

*Geertsema, J. (2021). Faculty development in the context of a research-intensive university. *Hungarian Educational Research Journal*, 11(3), 230-245.

*Grier, D., Lindt, S.F., & Miller, S.C. (2021). Formative assessment with game-based technology. *International Journal of Technology in Education and Science* (IJTES), 5(2), 193-202.

Grion, V., Cesareni, D. (2016). Multiplicity, fluidity, dialogue and sharing: keywords to under-stand the complex dynamics between human learning and technology. *QWERTY*, 11(1), 5-10.

*Henry, D., Brantmeier, E.J., Tongen, A., Jaffee, A.T., & Pierrakos, O. (2021). Faculty Empowering Faculty: SoTL Leaders Catalyzing Institutional and Cultural Change. *Teaching & Learning Inquiry*, 9(2).

International Journal for Academic Development (2021). Aims and scope. https://www.tandfonline.com/action/journalInformation?show5aimsScope&journalCode5rija20

JISC (2010). *Effective Assessment in a Digital Age. A guide to technology-enhanced assessment and feedback.* https://www.webarchive.org.uk/wayback/archive/20140613220103/http://www.jisc.ac.uk/media/documents/programmes/elearning/digiassass_eada.pdf

Kalogeropoulos N., Tzigounakis I., Pavlatou E.A., & Boudouvis A.G. (2013). Computer-based assessment of student performance in programming courses. *Computer Applications in Engineering Education*, 21(4), pp. 671-683.

Kabakci Yurdakul, I., & Coklar, A.N. (2014). Modeling preservice teachers' TPACK competencies based on ICT usage. *Journal of Computer Assisted Learning*, 30(4), 363–376.

*Kehoe, T., Schofield, P., Branigan, E., & Wilmore, M. (2018). The double flip: Applying a flipped learning approach to teach the teacher and improve student satisfaction. *Journal of University Teaching & Learning Practice*, 15(1), 7.

Koehler, M.J., & Mishra, P. (2009). What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education*, 9(1), 60-70.

Krumsvik, R. J. (2011). Digital competence in the Norwegian teacher education and schools. *Högre utbildning*, 1(1), 39–51.

Laksov, K.B. (2008). Strategic educational development. *Higher Education Research & Development*,27(2),91–93.

*Little, D., & Moore, J.L. (2021). A typology for catalyzing pedagogical change: Fostering multiple pathways through SoTL. *Hungarian Educational Research Journal*, 11(3), 262-273.

Loyd, B.H., & Gressard, C. (1984). Reliability and factorial validity of Computer Attitude Scales. Educational and Psychological Measurement, 44, 501–505.

*Macdonald, R.H., Beane, R.J., Baer, E.M., Eddy, P.L., Emerson, N.R., Hodder, J., Iverson, E.R., McDaris, J.R., O'Connell, K., & Ormand, C.J. (2019). Accelerating change: The power of faculty change agents to promote diversity and inclusive teaching practices. *Journal of Geoscience Education*, 67(4), 330-339.

*Martinovic, D., Kolikant, Y.B.D., & Milner-Bolotin, M. (2019). The Usefulness of Technology in Teacher Professional Development: Extending the Frameworks. *Journal of the International Society for Teacher Education*, 23(2), 21-36.

*McCune, V. (2018). Experienced academics' pedagogical development in higher education: Time, technologies, and conversations. *Oxford Review of Education*, 44(3), 307-321.

Meyer, K.A., & Murrell, V. S. (2014). A national study of training content and activities for faculty development for online teaching. *Journal of Asynchronous Learning Networks*, 18, 3–18.

*Mirriahi, N., Jovanovic, J., Dawson, S., Gašević, D., & Pardo, A. (2018). Identifying engagement patterns with video annotation activities: A case study in professional development. *Australasian Journal of Educational Technology*, 34(1).

Mishra, P. & Koehler, M.J. (2009). Technological Pedagogical Content Knowledge: A framework for teacher knowledge. *Teachers College Record*, 2016, 108(6), 1017-1054. doi: 10.1111/j.1467-9620.2006.00684.x.

*Moritz, D., Pearce, S., Christensen, L.S., & Stamboulakis, D. (2021). Designing a peer-led approach to teaching review and enhancement in academia. *Journal of University Teaching & Learning Practice*, 18(1), 7.

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & PRISMA Group (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Annals of internal medicine*, 151(4), 264-269.

National Forum for the Enhancement of Teaching and Learning in Higher Education (2018). *Staff Use of Technology-Enhanced Assessment in Higher Education: A Systematic Review.* https://hub.teachingandlearning.ie/wp-content/uploads/2021/06/Technology-Enhanced-Assessment-Insight-NF-2018-with-doi.pdf

Oldfield, A., Broadfoot, P., Sutherland, R., & Timmis, S. (2012*). Assessment in a digital age: A research review*, University of Bristol, Bristol.

*O'Keeffe, M., Gormley, C., & Ferguson, P. (2018). Moving the focus from grades to feedback: a case study of pass/fail marking. *Practitioner Research in Higher Education*, 11(1), 70-79.

Oo, C.Z., Chew, A.W., Wong, A.L., Gladding, J., & Stenstrom, C. (2022). Delineating the successful features of research data management training: A systematic review. *International Journal for Academic Development*, 27(3), 249-264.

*Packer, C. (2019). Participant-Centered Adjunct Faculty Development: A Case Study Using the Great Teachers Model. *Journal of the International Society for Teacher Education*, 23(2), 6-20.

Pearce, N., Weller, M., Scanlon, E., & Kinsley, S. (2010). Digital scholarship considered: How new technologies could transform academic work. *in education,* 16 (1).

*Pekkarinen, V., Hirsto, L., & Nevgi, A. (2020). Ideal vs. experienced: University teachers' perceptions of a good university teacher and their experienced pedagogical competency. *International Journal of Teaching and Learning in Higher Education* 32(1), 13-30.

Phillips, M., (2015). Digital technology integration. In M Henderson & G Romeo (eds.), *Teaching and Digital Technologies*, Cambridge University Press, Melbourne, Australia, pp.318–331.

*Picasso, F., Doria, B., Grion, V., Venuti, P., Serbati, A. (2023). What Technology Enhanced Assessment and Feedback Practices do Italian Academics Declare in Their Syllabi? Analysis and Reflections to Support Academic Development. In: Fulantelli, G., Burgos, D., Casalino, G., Cimitile, M., Lo Bosco, G., Taibi, D. (eds) Higher Education Learning Methodologies and Technologies Online. HELMeTO 2022. Communications in Computer and Information Science, vol 1779. Springer, Cham. https://doi.org/10.1007/978-3-031-29800-4_21

*Podorova, A., Irvine, S., Kilmister, M., Hewison, R., Janssen, A., Speziali, A., Balavijendran, L., Kek, M., & McAlinden, M. (2019). An important, but neglected aspect of learning assistance in higher education: Exploring the digital learning capacity of academic language and learning practitioners. *Journal of University Teaching & Learning Practice*, 16(4).

Popovic, C., & Plank, K.M. (2016). Managing and leading change: Models and practices. In D. Baume, & C. Popovic (Eds.), *Advancing practice in academic development* (pp. 207–224). London: Routledge.

Popovich, P.M., Hyde, K.R., Zakrajsek, T., & Blumer, C. (1987). The development of the Attitudes Toward Computer Usage Scale. *Educational and Psychological Measurement*, 47(1), 261-269.

Raffaghelli, J.E. (2017). Exploring the (missed) connections between digital scholarship and faculty development: a conceptual analysis. *International Journal of Educational Technology in Higher Education*, 14, 1-20.

Redecker, C., Punie, Y. (2017). *Digital Competence of Educators.* Edited by Yves Punie. https://publications.jrc.ec.europa.eu/repository/handle/JRC107466

Reimann, N., & Wilson, A. (2012). Academic development in 'assessment for learning': the value of a concept and communities of assessment practice, *International Journal for Academic Development*, 17:1, 71-83.

Rienties, B., Brouwer, N., Bohle Carbonell, K., Townsend, D., Rozendal, A-P., van der Loo, J., Dekker, P., Lygo-Baker, S. (2013). Online training of TPACK skills of higher education scholars: A cross-institutional impact study. *European Journal of Teacher Education*, 36, 480–495.

Rienties, B., Brouwer, N, & Lygo-Baker, S. (2013). The effects of online professional development on higher education teachers' beliefs and intentions towards learning facilitation and technology. *Teaching and Teacher Education*, 29, 122–131.

Ruiz-Jaramillo, J., & Vargas-Yáñez, A. (2018). La enseñanza de las estructuras en el Grado de Arquitectura. Metodología e innovación docente a través de las TIC. Teaching structures on Architecture degrees. ICT-based methodology and teaching innovation. *Revista Española de Pedagogía*, 76 (270), 353-372.

Sahay, S., & Dawson, K. (2019). A Survey to Investigate Teachers' Perspectives Toward Technology Integration in Teaching in Delhi, India. In *Society for Information Technology & Teacher Education International Conference* (pp. 1785-1790). Association for the Advancement of Computing in Education (AACE).

Sambell, K. & Brown, S. (2020). *Kay Sambell and Sally Brown: Covid-19 Assessment Collection.* https://sally-brown.net/kay-sambell-and-sally-brown-covid-19-assessment-collection/

Sappey, J., & Relf, S. (2010). Digital technology education and its impact on traditional academic roles and practice. *Journal of University Teaching & Learning Practice*, vol. 7, no. 1, pp. 1–19.

Scanlon, E. (2018). Digital scholarship: Identity, interdisciplinarity, and openness. *Frontiers in Digital Humanities*, 5, 3.
Schwartz., Beth M., and Aeron Haynie. 2013. Faculty Development Centers and the Role of SoTL. *New Directions for Teaching and learning*, 136: 101–11.

Serbati, A., Grion, V., Li, L., Doria, B. (2022). Online Assessment: Exemplars as the Best Sources for Comparison Processes?. In *Learning with Technologies and Technologies in Learning* (pp. 419-434). Springer, Cham.

Shortis, M., & Burrows, S. (2009, November). A review of the status of online, semi-automated marking and feedback systems. In *ATN Assessment Conference 2009: Assessment in Different Dimensions* (p. 302).

Sim, G., Holifield, P., & Brown, M. (2004). Implementation of computer assisted assessment: lessons from the literature. ALT-J, 12(3), 215-229.

Soeiro, A., Blaschke, L.M., Brown, M. Farrell, O. (2020). EDEN webinar series: Education in time of a pandemic. How to design and manage assessment for online learning. *European Distance and E-Learning Network*.

*Soto, M., Gupta, D., Dick, L., and Appelgate, M. (2019). Bridging Distances: Professional Development for Higher Education Faculty Through Technology-Facilitated Lesson Study. *Journal of University Teaching & Learning Practice*, 16(3).

*Suárez-Rodríguez, J., Almerich, G., Orellana, N., & Díaz-García, I. (2018). A basic model of integration of ICT by teachers: competence and use. *Educational technology research and development*, 66(5), 1165-1187.

Sutherland, K. A. (2018). Holistic academic development: Is it time to think more broadly about the academic development project? *International Journal for Academic Development*, 23(4), 261–273.

Schwartz., B.M., & Aeron Haynie (2013). Faculty Development Centers and the Role of SoTL. *New Directions for Teaching and learning*, 136: 101–11.

Sweeney, T., West, D., Groessler, A., Haynie, A., Higgs, B. M.,Macaulay, J., Mercer-Mapstone, L. and Yeo, M. (2017) Where's the transformation? Unlocking the potential of technology-enhanced assessment', *Teaching and Learning Inquiry*, 5(1), pp. 1-16.

Thomas, J., & Harden, A. (2008). Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology*, 8(1), 45.

Tonelli D., Grion V., & Serbati A. (2018). L'efficace interazione fra valutazione e tecnologie: evidenze da una rassegna sistematica della letteratura. Italian Journal of Educational Technology, 26(3).

*Troelsen, R. (2021). How to operationalise holistic academic development–The case of a Danish center for teaching and learning. *Hungarian Educational Research Journal*, 11(3), 254-261.

Yoo, Y., Lee, H., Jo, J.H., Park, Y. (2015). Educational Dashboards for Smart Learning: Review of Case Studies. In G. Chen, V. Kumar, Kinshuk, R. Huang, S. Kong, (eds) *Emerging Issues in Smart Learning. Lecture Notes in Educational Technology.* Berlin, Heidelberg, pp. 145-155, https://doi.org/10.1007/978-3-662-44188-6_21.

van Dijk, E., van Tartwijk, J., van der Schaaf, M., & Kluijtmans, M. (2020). What makes an expert university teacher? A systematic review and synthesis of frameworks for teacher expertise in higher education. *Educational Research Review*, 31, 1–16.

van Petegem, W., Bosman, J. P., De Klerk, M., Strydom, S. (2021). *Evolving as a Digital Scholar: Teaching and Researching in a Digital World*. Leuven University Press.

UNESCO, (2012). *Technology-Enhanced Assessment in Education*. UNESCO Institute for Information Technologies in Education. https://unesdoc.unesco.org/ark:/48223/pf0000220235

Weller, M. (2011). *The digital scholar: How technology is transforming academic practice.* A&C Black (2011).

Whitelock, D., & Watt, S. (2008). Reframing e-assessment: Adopting new media and adapting old frameworks. *Learning, Media and Technology*, 33(3) 153-156.

Whitelock, D., Gilbert, L., & Gale, V. (2011). Technology Enhanced Assessment and Feedback: How is evidence-based literature informing practice? In *2011 International Computer Assisted Assessment (CAA) Conference, Research into e-Assessment*, Southampton 05-06 Jul 2011.

*Zamir, S., & Thomas, M. (2019). The effects of university teachers' perception, attitude and motivation on their readiness for the integration of ICT in classroom teaching. *Journal of Education and Educational Development*, 6(2), 308-326.