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Open and Interdisciplinary  
Journal of Technology,  
Culture and Education

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Registrazione del Tribunale di Bari

n. 29 del 18/7/2005

© 2020 by Progedit

ISSN 2240-2950

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# Rethinking assessment in the digital era: Designing a pilot study on hybridization in higher education

Loredana Perla\*, Viviana Vinci\*\*

DOI: 10.30557/QW000079

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## Abstract

The proposal seeks to contribute to the ongoing discussion regarding the advancement of authentic and continuous assessment within the realm of higher education. It delves into opportunities presented by digital transformation, online learning, and artificial intelligence, focusing on key areas such as the utilization of e-assessment tools and the complexities associated with online assessment practices. The proposal also describes a pilot study design that explores the hybridization of assessment in higher education through the utilization of a multimodal computer vision system based on AI. The primary goal is to enhance the authenticity, personalization, and flexibility of assessment methods.

**Keywords:** Hybridization, Authentic Assessment, Higher Education, Artificial Intelligence, Multimodal System

## Author Contributions

Loredana Perla (LP) wrote the *Introduction* and the *Conclusion*. Viviana Vinci (VV) wrote the *Sentiment Analysis in the domain of higher*

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*education: Challenges and gaps and A Pilot Study Design*. Both authors made contributions to the article and have reviewed and approved the submitted version.

## **Introduction**

The Covid-19 pandemic has prompted a profound reevaluation of pedagogical approaches among teachers, involving significant adjustments to infrastructure and tools, along with profound cultural shifts (Agrati & Vinci, 2022; Bereiter & Sansone, 2022; Perla et al., 2021b; Zucchermaglio et al., 2021). While digitalization serves an indispensable role, it has also brought to light various challenges and resistance within the academic community, underscoring the pressing need for pedagogical support (Fernández Río et al., 2022; Perla et al., 2020; Tømte et al., 2019). This paradigm shift has gradually reshaped the educational landscape, resulting in a more flexible and hybrid mode of instruction (Perla et al., 2021a), extending its influence into the realm of assessment methodologies by incorporating participatory approaches that foster students' engagement and agency, creativity and responsibility (Grion et al., 2020; Ritella & Sansone, 2020). Notably, the advent of the Covid-19 pandemic has compelled academic institutions to adopt online assessment solutions (Williamson et al., 2020). Unesco (2023) has thoughtfully outlined the key components of effective professional development for remote and hybrid teaching. This holistic approach addresses fundamental knowledge and specific skills that are pivotal in the teaching profession, encompassing the domain of assessment and self-assessment (Table 1).

This paradigm shift has introduced greater flexibility in pedagogical tool selection, emphasizing formative assessment, oral presentations, peer evaluation, and project-based assignments facilitated by platforms/tools such as Teams, Canvas, Turnitin, and PowerPoint and others. This period has also witnessed the widespread adoption of open-book exams administered remotely and the implementation of continuous assessment methodologies. Simultaneously, the demands of the pandemic have necessitated a reevaluation of assessment design,

**Table 1.**

Teacher professionalism and assessment: Specific knowledge and skills (adapted from Unesco, 2023, p. 51)

Student Assessment	Self-assessment
Teachers should assess student learning, adapt assessments to various teaching modes, and teach students self-assessment and seeking support when needed. Use different assessment formats and technologies	Teachers should practice self-assessment, gather data from students and colleagues to enhance teaching, and seek support for self-improvement
Hybrid and remote teaching	
Apply diverse tech-driven assessment techniques, explain various learning methods to students, and utilize varied assessment forms to avoid limitations	Access new resources for teachers to enhance their practice, such as recording and reviewing their teaching sessions alone or with others.

focusing on authenticity, accessibility, judicious automation, pedagogical continuity, and robust security considerations (Grion et al., 2020).

The European Association of Distance Teaching Universities (EA-DTU) Report led by Rossade and colleagues (2022) illustrates the close connection between technology and the development of online assessment strategies in educational institutions. This includes the utilization of tools like quizzes, video-based assessments, and the integration of AI and assessment analytics. These technological advancements are poised to drive innovation in assessment, especially in areas such as academic writing and grammar, potentially enhancing existing practices and reshaping teaching and learning dynamics in educational institutions.

One specific AI-supported strategy, as outlined by Mollick and Mollick (2023), involves creating low-stakes tests that can be integrated into various educational contexts. These tests have proven effective in aiding long-term information retention and identifying areas where students may struggle with study material. Instructors find valuable insights into students' knowledge and comprehension, allowing for effective adjustments to teaching methods. AI emerges as a valuable tool for generating practice tests, quizzes, and short-answer questions to assess students' knowledge during lectures.

Casalino and colleagues (2021) clarify the application of deep learning techniques in Learning Analytics, with a focus on the Knowledge Tracing (KT) methodology. KT employs predictive modeling to gauge a student's likelihood of successfully completing exercises based on their historical performance. This approach allows for modeling student behavior over time, providing actionable feedback for both students and educators. KT is effective in both in-person and online learning contexts, especially in blended instructional models.

In a critical perspective, a thematic series edited by Raffaghelli and colleagues (2020) delves into various aspects of data literacy in Higher Education, exploring the concept of "data culture" in the institutional context. This highlights the growing tension between a neo-humanistic perspective and technocratic imperatives, especially as artificial intelligence and the Internet of Things continue to advance.

Furthermore, the use of AI in education introduces notable risks, including concerns about confabulation, biases, privacy issues, legal complexities, and potential disruption of traditional learning methods. These critical viewpoints emphasize the multifaceted nature of AI integration in education, necessitating a cautious and vigilant approach to implementation. In the academic context in Italy, we observe a restricted adoption of technological tools for assessment, particularly in relation to AI systems (Picasso et al., 2023).

The aim of this contribution is to reflect on how technological advancement and artificial intelligence, such as learning analytics techniques like the described Sentiment Analysis, can redefine assessment and enhance teaching practices. Building upon the considerations presented regarding the potential for hybridizing assessment in digital environments and utilizing adaptive and personalized AI systems that enable intelligent tutoring, profiling, and prediction, the design of an ongoing pilot study will be described.



## Sentiment Analysis in the domain of higher education: Challenges and gaps

The integration of technologically hybridized assessment tools, recently implemented primarily in educational institutions due to the pandemic, struggles to establish itself in the academic realm, especially in the Italian context. Here, assessment is predominantly individual, conceived as a final and summative moment, conducted through a few (and uniform) instruments, with a wide margin of subjectivity and discretion on the part of the teacher, who appears to play a central role. This form of evaluation is often negatively perceived by students. Conversely, automation could provide support in terms of simplifying the processing of a large volume of data, often coming from diverse sources, as well as offering a deeper understanding of students' efforts and support for informed decision-making regarding universities' strategic choices (e.g., orientation interventions, tutoring, periodic analysis of teachers' and students' beliefs, etc.).

A methodology effectively employed in hybrid learning environments within Learning Analytics is Knowledge Tracing, involving predictive modeling that enables: 1) The assessment of the probability that a student successfully completes exercises based on their previous performances; 2) the modeling of students' behavior over time, providing constructive and timely feedback beneficial for both students and teachers (Casalino et al., 2021).

Sentiment Analysis (SA) is a component of Learning Analytics (LA) that entails detecting emotions and polarity (positive, negative, or neutral) towards an entity, whether it is an individual, topic, or event. SA employs natural language processing (NLP) and machine learning (ML) techniques to extract information and opinions from extensive textual data. It operates at different levels, including document-level, sentence-level, and aspect-level analysis, each focusing on different layers of content. The process involves converting input documents into text, pre-processing them using linguistic tools, and annotating them with sentiment labels, often leveraging lexicons and linguistic resources. It involves the contextual mining of unstructured text from documents, enabling the extraction of structured and valua-

ble knowledge (Mite-Baidal et al., 2018). This process allows for various objectives to be served, particularly in the analysis of how students express themselves in asynchronous settings like texts, forums, wikis, or debates. Through SA, insights into students' satisfaction and reactions during learning activities are gained, benefiting both teachers and students. Teachers can use this information to make timely and appropriate adjustments to their teaching methods, thus enhancing the overall quality of the learning process. Simultaneously, students can engage in self-reflection (Grimalt-Álvaro & Usart, 2023).

SA finds numerous applications in business, social networks, politics, and various other fields. In the realm of education (Yadegaridehkordi et al., 2019), it has gained prominence for its potential to enhance teaching, management, and evaluation by examining students' attitudes and behavior toward courses, platforms, institutions, and instructors. SA is utilized to probe into learners' attitudes and performance, as well as attributes related to teachers, courses, and institutions. SA techniques are also employed to improve the understanding of educational processes, assess participant satisfaction, and make predictions regarding performance and dropout rates (Iglesias i Estradé, 2019). It represents a growing area of research that involves multiple stakeholders in the evaluation process, particularly in the context of feedback and appraisal procedures. These evaluations are conducted by drawing on diverse data sources and indicators.

The systematic review conducted by Kastrati and colleagues (2021) analyzed 92 relevant papers, providing insights into various dimensions of sentiment analysis in education. The study revealed a growing trend in publications, especially in 2020, with a focus on deep learning techniques. The findings covered various aspects, including the approaches and techniques used for sentiment analysis, evaluation metrics, datasets, as well as several challenges and gaps.

Among the outcomes of particular interest, one of the major challenges related to Sentiment Analysis (SA) in the domain of education is the handling of figurative language and the limited identification of ambiguous linguistic elements in the pragmatics of communication, such as sarcasm and irony, in students' feedback. This challenge underscores the need for a comprehensive and multimodal analysis

that takes into account the context of registers and linguistic purposes. More specifically, the analysis revealed three major shortcomings of SA concerning: Generalization (many specific approaches are not effectively transferable to other domains or educational contexts); complex linguistic constructs (inability to handle complex linguistic constructs, double negations, unknown proper nouns, abbreviations, and words with dual or multiple meanings); representation techniques (limited research on the use of general-purpose word embedding approaches and contextualized embedding approaches); scarcity of reference datasets and limited data – and a reduced number of samples – to test deep learning models; limited linguistic resources (scarcity of lexicons, corpora, and dictionaries); datasets with unstructured formats (many datasets are unstructured, making it challenging to identify the key entities targeted by opinions); non-standardized solutions/approaches (a wide variety of packages, tools, frameworks, and libraries are applied for SA). The study recommends several steps to address the challenges uncovered. Firstly, it suggests developing structured formats for feedback datasets to standardize and simplify data acquisition. Universally applicable deep learning models for sentiment analysis are needed, along with standardized solutions in the educational field. The study also highlights the importance of recognizing emotions, including the use of publicly available emotion datasets, and considering emoticons as indicators of emotional states in student opinions. Additionally, there is a call for better communication of metrics used to evaluate sentiment analysis systems to enhance transparency. In conclusion, the study emphasizes the need for more exploration of advanced word embedding and semantic representation methods to better capture user opinions and attitudes in educational contexts, aiming to advance sentiment analysis applications and deepen understanding of student feedback in educational settings.

The systematic literature review carried out by Grimalt-Álvaro and Usart (2023) is centered on the examination of how Sentiment Analysis (SA) has been utilized as an assessment tool in the context of online higher education research. The objective of this review is to identify useful tools and techniques related to SA and to evaluate whether these tools and techniques have been applied with a focus on

gender perspectives. This review seeks to provide insights into how SA is being used in higher education assessment and to determine if it takes into account gender-related factors. The analysis yielded several emergent themes. From the study's findings, it is evident that the primary Sentiment Analysis (SA) techniques employed for formative assessment in higher education revolve around automatic data collection, information extraction, and sentiment measurement. The most commonly used tools are visual and diversified based on user roles: Visual tools for researchers primarily utilize iconic representations based on group information (histograms, pie charts); visual tools for end-users (teachers or students) provide timely information and complementary analyses; RAMS (Rapid Monitoring of Learners' Satisfaction), a visual analysis software (pie charts with polarity trends); integrated systems that combine iconic, diagnostic, and learning support mediators. The overall contribution that Sentiment Analysis offers to the student assessment in higher education involves the ability to assess the "emotional climate" of students regarding an educational intervention, enhance the prediction of students' learning performance, and consequently improve feedback and teaching methods. One noteworthy reflection pertains to the inclusion of gender perspectives in the development of SA techniques to contribute to the promotion of fairer assessment practices. The analysis of the referenced literature unveils a perspective that considers technological hybridization as an opportunity to rethink assessment through multimodal and multifactorial approaches that encompass different systems, sources, and data. For instance, the integration of the previously described Sentiment Analysis with other knowledge tracking systems, profiling systems, and personalized assessment methods represents a step towards authentic, personalized, adaptable, and flexible evaluation. In light of these considerations, the design of an ongoing pilot study is presented.

## **A Pilot Study Design**

A comprehensive overview of a pilot study involving faculty and students from two universities in Southern Italy, specifically Bari and

Foggia, conducted in collaboration with an international network of university partners is provided. The primary aim of this project is to explore the application of a multimodal computer vision-based system to enhance assessment methods in higher education and promote a supportive learning environment. This transformation seeks to shift the role of assessment from a mere assessment of learning outcomes to actively fostering learning development.

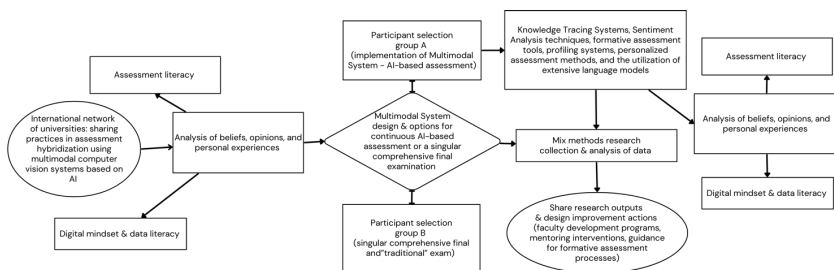
In light of the existing literature, the research design aims to address the following questions guiding the study:

- What representations, beliefs, opinions, experiences, and preferences do university students and faculty have regarding ‘traditional’ assessment methods (summative, predominantly individual and/or uniform, etc.) and the technological hybridization of continuous and learning assessment?
- What instructional design practices and adjustments at the educational level, based on the use of digital data by teachers, are necessitated by the hybridization of assessment through the utilization of multimodal computer vision systems based on AI?
- Does the use of hybrid assessment systems and the development of data literacy skills impact the assessment literacy of students and the professional development of teachers?
- What kind of training needs do university students and faculty express in the hybridization of assessment? And what institutional intervention strategies can universities implement?

The main hypothesis of this study is that the hybridization of assessment using an artificial intelligence-based multimodal vision system will significantly improve the authenticity, personalization, and flexibility of assessment practices in higher education. It is also hypothesized that this approach will foster a more supportive learning environment and promote learning development. Two groups of participants will be selected, one from the University of Bari and the other from the University of Foggia, both consisting of faculty and students using the AI-based multimodal vision learning environment. The sample size will include a minimum of 100 participants from each university. An international network of universities with expertise in AI application in educational systems, including the College of Com-

puting at Georgia Tech, the Leibniz Institute for Research and Information in Education, the University of the West of England, and the Department of Education at the University of Salamanca, will be involved in the research and system design phase. The computer-based multimodal vision system will be implemented in collaboration with the Department of Education, Psychology, Communication, and the Department of Computer Science at the University of Bari Aldo Moro. This system will include components such as Knowledge Tracking Systems, Sentiment Analysis techniques, formative assessment tools, profiling systems, personalized assessment methods, and the use of extensive language models (Figure 1).

**Figure 1.**  
Research project flowchart



Data will be collected through questionnaires, interviews, analysis of learning data generated by the system, and assessment data. The data will include student feedback, assessment results, knowledge tracking data, and sentiment analysis data. The collected data will be analyzed to evaluate the effectiveness of the multimodal system in improving the authenticity, personalization, and flexibility of assessment practices. Advanced statistical techniques will be used to compare results among different universities and identify challenges and successes in implementation. Qualitative interviews with faculty and students will be conducted to gain a better understanding of the challenges and successes in using the system, with particular attention to cultural and organizational differences among the involved universities. These interviews will provide

additional insights into the factors influencing the effectiveness of AI-based online education.

Various forms of continuous and learning-based assessment will be experimented within the pilot study, using platforms like Moodle or Learning Management Systems (LMS). This component will focus on how these forms of assessment can be integrated into the AI-based online learning environment. Continuous assessment forms may include student self-assessment, periodic quizzes and activities, real-time feedback tools, and personalized e-portfolios. Data collected from various forms of continuous assessment within the Moodle or LMS platforms will be analyzed to understand how these practices influence student learning, motivation, and engagement. The effectiveness of continuous assessment forms in promoting active learning and student engagement will be assessed.

A key outcome of this pilot project is to experiment and evaluate the effectiveness of automated support tools for university educators. These tools aim to simplify the processing and efficient and timely understanding of data from various sources, thus providing a comprehensive understanding of student learning and engagement.

While the pilot study is still in its early and conceptual phase, it is possible to consider some potential limitations and strategies to address specific challenges. The first limitation concerns the 'size' of the study (involving only two cases) and the disciplinary specificity that may impact the results and their limited generalizability. This is indeed exploratory research primarily aimed at testing a multimodal assessment system, requiring subsequent experimentation across a greater number of universities, scientific-disciplinary sectors, and countries. Nevertheless, from the very first pilot experimentation, the plan is to involve an international network of partners for ongoing discussion and monitoring of emerging data, hoping to mitigate the risk of self-reference and limited generalization of outcomes.

A second potential limitation involves the difficulty of studying the adoption of techno-organizational innovations without the involvement of governance, thus lacking institutional-level reflection on the impact of digitization on university teaching and assessment practices and the possible necessary actions in terms of faculty support or

development. To overcome this limitation, the study also intends to involve representatives from the governance level (Coordinators and members of the university's top technical structure).

Indeed, the research outcomes can be shared with academic governance bodies to design improvement actions, such as faculty development programs focused on enhancing the evaluative competence of university faculty, including the integration of Artificial Intelligence. This will enable informed decision-making regarding university strategic choices, including mentoring interventions, guidance for formative assessment processes, peer and self-assessment, and periodic analysis of faculty and student beliefs about technology-mediated assessment.

## Conclusion

The transformation under consideration – assessment hybridization in higher education – encompasses a multifaceted enhancement of various fundamental elements. This augmentation primarily targets the facets of authenticity, personalization, choice, flexibility, and a concurrent reduction in high-stake assessments. These adaptations are fundamentally designed to fortify the tenets of academic integrity and advance the holistic well-being of students. The establishment of trust in the domain of online assessment procedures constitutes a multifaceted challenge. This challenge encompasses not only placing trust in the technology itself but also extends to the realm of its seamless implementation. It involves organizational frameworks, intricate considerations pertaining to data privacy, and the imperative of ensuring equitable treatment of all involved parties within the intricate assessment process. For instance, the Universidade Aberta in Portugal has unveiled an innovative pedagogical model that pivots on a student-centric approach, providing a gamut of flexible assessment methodologies. These encompass options for continuous assessment or a singular comprehensive final examination. Sansone and Grion (2022) advocate for the adoption of an integrated teaching, learning, and assessment model known as the *Triological Learning & Assessment*



*approach* (TL&AA). This model emphasizes sustainable and formative assessment processes. It represents an evolution of the Triological Learning Approach (TLA), as proposed by Paavola and Hakkarainen in 2005, 2014 incorporating insights from recent Assessment for Learning (AfL) principles, as articulated by Sambell et al. in 2013, and Sustainable Assessment (SA) concepts as introduced by Boud in 2000. The TL&AA approach is rooted in the practical application of triological practices at the university level, with a specific focus on incorporating elements of AfL and SA. Furthermore, within the scope of the EADTU Envisioning 2023 report, Mas-Garcia and associates have expounded upon a set of ten methods and activities tailored for learning and assessment processes in conjunction with generative artificial intelligence (AI). This particularly includes AI text generators and substantial language models like ChatGPT.

Central to these pioneering methodologies is the seamless integration of electronic assessment technologies, intricately aligned with the overarching principles of authentic assessment. These versatile methods can be harnessed either individually or in tandem to augment and refine assessment practices. Moreover, these practices may include the judicious utilization of AI and gamification when contextually appropriate. These methods include infographic assignments, test utilization, portfolios, peer assessment, oral tests/interviews, contextualized questions, text-based AI chat, collaborative work, enhanced feedback, and synchronized tests. While AI can transform assessment, it is crucial to maintain human involvement for fairness, address potential biases, and ensure user-friendly tools. Consideration of bias and equity in AI-enabled assessments, with a focus on feedback and data privacy, is essential for enhancing the student learning experience.

As elucidated by Cardona and colleagues (2023), the infusion of artificial intelligence into educational paradigms holds the potential to redefine assessment practices, especially within the purview of formative assessment. This transformative evolution necessitates a nuanced approach, one that adeptly balances the pivotal role of human oversight. This approach places the onus on the welfare and growth of students, educators, and other stakeholders. The integration of AI, underpinned by its capacity for real-time feedback, adaptability to in-

dividual student aptitudes, and seamless assimilation of assessment within the learning continuum, stands as a transformative force.

Yet, it is imperative to retain human involvement to ensure fairness, mitigate potential biases, and grapple with the practical intricacies of AI's role in the educational milieu. The active engagement of educators and students in the design and evaluation of AI-augmented assessment tools is critical to ensure their utility and user-friendliness. Equally essential is the conscientious addressing of concerns linked to bias and equity in AI-enabled assessments, underlining the pivotal role of feedback loops in enhancing the student learning experience, while upholding the principles of data privacy and trust within AI systems. As evidenced by Kloetzer and colleagues (2021) "it is not possible to think of the mediation imposed by the computer technology simply as a change in the communication channel or interface. [...] this change impacts on the whole educational process, redefining it in a radical way" (p. 65).

The hybridization of traditional university assessment practices with online technologies and AI requires structural adjustments. These changes involve redefined roles for both faculty and students, modifications in time and space dynamics, and a greater emphasis on feedback and error management.

The effects of the ongoing paradigmatic shift in educational teaching and learning on assessment are manifold and should be interpreted systemically. The design of assessment, considered a fundamental element in the planning of the overall learning experience, undergoes changes that should be constructed in alignment and coherence with curriculum design (Biggs, 2003; Elkington, 2020), integrated with all components that collectively promote learning (Bamford et al., 2022).

Designing continuous assessment, even mediated by technologies, can foster cross-cutting skills and enhance graduates' employability, as evidenced by the extensive debate on authentic assessment and context-based learning. This emphasizes the role of authentic assessment in creating opportunities for students to develop skills and knowledge applicable to real-life and professional situations (Sambell et al., 2013).

The recent debate on promoting authentic and continuous assessment in higher education explores novel perspectives of technological

hybridization, leveraging the potential support of data-driven systems for teaching (Admiraal et al., 2020; Raffaghelli et al., 2021; Tonelli et al., 2018). On the other hand, it opens an emerging line of discussion regarding the perspectives of developing data literacy skills in the professional development of teaching staff and the importance of evaluative competence in initial teacher training programs. This competence should not only be supported and trained in formative assessment and the use of computer-based assessment tools but also in managing learning analytics and the effects of their feedback in the classroom and pedagogical approach (Gabbi, 2023).

Institutional intervention strategies and a systemic approach to professional learning and faculty development are needed, based on complex visions that combine managerial and technical skills with critical, systemic, and ethical capabilities related to datafication in learning (Raffaghelli & Stewart, 2020). In line with this, the joint Ph.D. program among Italian universities “Leadership, Empowerment, and Digital Innovation in Education and Learning” (LEDIEL), coordinated by the University of Bari since 2023 – conceived by Loredana Perla – aims to train professionals capable of redefining policies, practices, and innovative communities in university teaching based on leadership and middle management; empowerment and participatory logics in co-constructing models and tools of professional development with involved stakeholders; digital innovation and critically transformative reorganization of knowledge delivery, production, and consumption methods.

## References

- Admiraal, W., Vermeulen, J., & Bulterman-Bos, J. (2020). Teaching with learning analytics: How to connect computer-based assessment data with classroom instruction? *Technology, Pedagogy and Education*, 29(5), 577-591. <https://doi.org/10.1080/1475939X.2020.1825992>
- Agrati, L. S., & Vinci, V. (2022). Evaluative knowledge and skills of student teachers within the adapted degree courses. *Frontiers in Education*, 7, 817963. <https://doi.org/10.3389/feduc.2022.817963>

- Bamford, J., Moschini, E., & Tschirhart, C. (2022). *Understanding and Improving the Student Experience in Higher Education. Navigating the Third Space*. Routledge.
- Bereiter, C., & Sansone, N. (2022). The “new normality”: Digital technologies and learning environments beyond the emergency. *Qwerty. Open and Interdisciplinary Journal of Technology, Culture and Education*, 17(2), 5-9. <https://doi.org/10.30557/QW000054>
- Biggs, J. (2003, April 13-17). *Aligning Teaching and Assessing to Course Objectives* [Conference presentation]. Teaching and Learning in Higher Education: New trend and innovations, University of Aveiro.
- Boud, D. (2000). Sustainable assessment: Rethinking assessment for learning society. *Studies in Continuing Education*, 22(2), 151-167. <https://doi.org/10.1080/713695728>
- Cardona, M. A., Rodriguez, R. J., & Ishmael, K. (2023). *Artificial Intelligence and the Future of Teaching and Learning: Insights and Recommendations*. U.S. Department of Education, Office of Educational Technology. <https://www2.ed.gov/documents/ai-report/ai-report.pdf>
- Casalino, G., Grilli, L., Limone, P., Santoro, D., & Schicchi, D. (2021). Deep learning for knowledge tracing in learning analytics: An overview. *CEUR Workshop Proceedings*, Foggia, Italy, 2817. <https://ceur-ws.org/Vol-2817/paper11.pdf>
- Elkington, S. (2020). *Essential Frameworks for Enhancing Student Success: Transforming Assessment*. AdvanceHE. <https://www.advance-he.ac.uk/knowledge-hub/essential-frameworks-enhancing-student-success-transforming-assessment>.
- Fernández Río, J., López Aguado, M., Pérez Pueyo, A., & Hortigüela Alcalá, D. (2022). La brecha digital destapada por la pandemia del coronavirus: una investigación sobre profesorado y familias. *Revista Complutense de Educación*, 33(2), 351-360. <https://doi.org/10.5209/rced.74389>
- Gabbi, E. (2023). About or with teachers? A systematic review of learning analytics interventions to support teacher professional development. *Qwerty. Open and Interdisciplinary Journal of Technology, Culture and Education*, 18(2), 88-109. <https://doi.org/10.30557/QW000053>
- Grimalt-Álvaro, C., & Usart, M. (2023). Sentiment analysis for formative assessment in higher education: A systematic literature review. *Journal of Computing in Higher Education*. <https://doi.org/10.1007/s12528-023-09370-5>
- Grion, V., Serbati, A., Sambell, K., & Brown, S. (2020). Valutazione e feedback in DAD in tempo di emergenza: strategie d'azione nei contesti uni-

- versitari. In P. Limone, G. Toto, & N. Sansone (Eds.), *Didattica universitaria a distanza: tra emergenza e futuro* (pp. 75-90). Progedit.
- Iglesias i Estradé, A. M. (2019). Relació entre l'anàlisi del sentiment, els resultats acadèmics i l'abandonament als entorns virtuals d'aprenentatge. *Universitas Tarraconensis. Revista de Ciències de l'Educació*, 1(1), 19. <https://doi.org/10.17345/ute.2019.1.2622>
- Kastrati, Z., Dalipi, F., Imran, A. S., Pireva Nuci, K., & Wani, M. A. (2021). Sentiment analysis of students' feedback with NLP and Deep Learning: A systematic mapping study. *Applied Sciences*, 11, 3986. <https://doi.org/10.3390/app11093986>
- Kloetzer, L., Tau, R., Valterio, J., & Henein, S. (2021). Performing arts as a tool for university education during a pandemic: Moving from an in vivo to an in vitro modality. *Qwerty. Open and Interdisciplinary Journal of Technology, Culture and Education*, 16(2), 47-68. <https://doi.org/10.30557/QW000043>
- Mas-García, X., González-García, L., Gómez-Cardosa, D., & Garcia-Brustenga, G. (2023). 10 methods and activities for learning and assessment with generative AI. In *EADTU, The Envisioning Report for Empowering Universities* (7th ed.) (pp. 35-39). Zenodo. <https://doi.org/10.5281/zenodo.7993634>
- Mite-Baidal, K., Delgado-Vera, C., Solís-Avilés, E., Espinoza, A. H., Ortiz-Zambrano, J., & Varela-Tapia, E. (2018). Sentiment analysis in education domain: A systematic literature review. *CCIS*, 883, 285-297. [https://doi.org/10.1007/978-3-030-00940-3\\_21](https://doi.org/10.1007/978-3-030-00940-3_21)
- Mollick, E., & Mollick, L. (2023). *Assigning AI: Seven Approaches for Students with Prompts*. (September 23, 2023). <https://ssrn.com/abstract=4475995>. <http://doi.org/10.2139/ssrn.4475995>
- Paavola, S., & Hakkarainen, K. (2005). The knowledge creation metaphor – An emergent epistemological approach to learning. *Science & education*, 14, 535-557. <https://doi.org/10.1007/s11191-004-5157-0>
- Paavola, S., & Hakkarainen, K. (2014). Trialogical approach for knowledge creation. In S. Tan, H. So, & J. Yeo (Eds.), *Knowledge Creation in Education – Education Innovation Series* (pp. 53-73). Springer. <https://doi.org/10.1007/978-981-287-047-6>
- Perla, L., Felisatti, E., Grion, V., Agrati, L. S., Gallelli, R., Vinci, V., Amati, I., & Bonelli, R. (2020). Oltre l'era Covid-19: dall'emergenza alle prospettive di sviluppo professionale. *Excellence and Innovation in Learning and Teaching*, 2. <https://doi.org/10.3280/exioa2-2020oa10802>
- Perla, L., Scarinci, A., & Amati, I. (2021a). Metamorphosis of space into digital scholarship: A research on hybrid mediation in a university context.

- In L. Agrati, D. Burgos, P. Ducange, P. Limone, L. Perla, P. Picerno, P. Raviolo, C. M. Strake (Eds.), *Communications in Computer and Information Science*: Vol. 1344. Bridges and Mediation in Higher Distance Education (pp. 226-239). Springer. [https://doi.org/10.1007/978-3-030-67435-9\\_18](https://doi.org/10.1007/978-3-030-67435-9_18)
- Perla, L., Vinci, V., & Scarinci, A. (2021b). Hybrid mediation and digital scholarship in higher education. In G. Ubachs, S. Meuleman, & A. Antonaci (Eds.), *Higher Education in the New Normal: The Role of Online, Blended and Distance Learning* (pp. 58-70). EADTU.
- 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 G. Fulantelli, D. Burgos, G. Casalino, M. Cimitile, G. Lo Bosco, D. Taïbi (Eds.), *Communications in Computer and Information Science*: Vol. 1779. Higher Education Learning Methodologies and Technologies Online (pp. 267-279). Springer. [https://doi.org/10.1007/978-3-031-29800-4\\_21](https://doi.org/10.1007/978-3-031-29800-4_21)
- Raffaghelli, J. E., Grion, V., & De Rossi, M. (2021). Pratiche basate sui dati nella valutazione e l'analisi della qualità didattica: il caso dell'Università di Padova. *Qwerty. Open and Interdisciplinary Journal of Technology, Culture and Education*, 16(1), 58-79. <https://doi.org/10.30557/QW000036>
- Raffaghelli, J. E., Manca, S., Stewart, B., Prinsloo, P., & Sangrà, A. (2020). Supporting the development of critical data literacies in higher education: Building blocks for fair data cultures in society. *International Journal of Educational Technology in Higher Education*, 17, 58. <https://doi.org/10.1186/s41239-020-00235-w>
- Raffaghelli, J. E., & Stewart, B. (2020). Centering complexity in “educators’ data literacy” to support future practices in faculty development: A systematic review of the literature. *Teaching in Higher Education. Critical Perspectives*, 25(4), 435-455. <https://doi.org/10.1080/13562517.2019.1696301>
- Ritella, G., & Sansone, N. (2020). Covid-19: Turning a huge challenge into an opportunity. *Qwerty. Open and Interdisciplinary Journal of Technology, Culture and Education*, 15(1), 5-11. <https://doi.org/10.30557/QW000024>
- Rossade, K. D., Janssen, J., Wood, C., & Ubachs, G. (2022). *Designing Online Assessment – Solutions that Are Rigorous, Trusted, Flexible and Scalable*. EADTU.
- Sambell, K., McDowell, L., & Montgomery, C. (2013). *Assessment for Learning in Higher Education*. Routledge. <https://doi.org/10.4324/9780203818268>

- Sansone, N., & Grion, V. (2022). The “Triological Learning & Assessment Approach”. Design principles for higher education. *Qwerty. Open and Interdisciplinary Journal of Technology, Culture and Education*, 17(2), 10-28. <https://doi.org/10.30557/QW000055>
- Tømte, C. E., Fosslund, T., Aamodt, P. O., & Degn, L. (2019). Digitalisation in higher education: Mapping institutional approaches for teaching and learning. *Quality in Higher Education*, 25(1), 98-114. <https://doi.org/10.1080/13538322.2019.1603611>
- 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), 6-23. <https://doi.org/10.17471/2499-4324/1028>
- Unesco. (2023). *Preparing Teachers to Deliver Hybrid Education: A Framework for Latin America and the Caribbean*. Unesco & IDB.
- Williamson, B., Eynon, R., & Potter, J. (2020). Pandemic politics, pedagogies and practices: Digital technologies and distance education during the coronavirus emergency. *Learning, Media and Technology*, 45(2), 107-114. <https://doi.org/10.1080/17439884.2020.1761641>
- Yadegaridehkordi, E., Noor, N. F. B. M., Bin-Ayub, M. N., Affal, H. B., & Hussin, N. B. (2019). Affective computing in education: A systematic review and future research. *Computers & Education*, 142, 103649. <https://doi.org/10.1016/j.compedu.2019.103649>
- Zuccheraglio, C., Alby, F., & Marino, F. (2021). Teaching and learning during the Covid-19 pandemic: University students' perspective on phase 3. *Qwerty. Open and Interdisciplinary Journal of Technology, Culture and Education*, 16(2), 10-29. <https://doi.org/10.30557/QW000041>

