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The Evolution and Trend of The Use of Digital Assessment Instruments in Project-Based Learning in Online Learning Environment

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Abstract: This study examined the evolution and trends in the use of digital assessment instruments in project-based learning (PBL) in an online learning environment. A Systematic Literature Review (SLR) was conducted following PRISMA guidelines to ensure transparency and rigor. The review included 44 articles published between 2019 and 2024. The data collection process involved searching using various keywords and platforms such as Scopus and Google Scholar, facilitated by Publish or Perish (PoP), as well as article selection using Rayyan AI and Claude AI to ensure suitability to the study criteria. Data were analyzed using thematic synthesis to identify key patterns and trends in the application of these digital tools. Findings indicated the need for: (1) integration of various assessment modalities for effective online learning, (2) development of pedagogical frameworks that support new technologies, and (3) standardization of digital assessment systems. In addition, the review suggests further research to assess the long-term effectiveness and impact of new technology-based instruments on learning outcomes. The findings provide a comprehensive understanding of the evolution of digital assessment instruments in online learning and provide evidence-based recommendations for future development.

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Introduction

In the digital era, technology has significantly changed learning methods, especially in higher education. *Online learning* has become the main choice, especially since the Covid-19 pandemic that has made various educational organizations switch transitioning from face-to-face to virtual education. However, the transition also raises new challenges, especially in evaluating and assessing students' digital skills (Johar et al., 2023). One of the important aspects of online education is assessment, especially project-based assessment. This assessment allows students to demonstrate their understanding and skills through more complex projects compared to traditional exams. The integration of digital assessment instruments in project-based learning (PBL) has garnered significant attention in the context of online education. As digital learning environments evolve, assessment methods must also advance to ensure the accurate measurement of student competencies. However, despite the considerable potential of digital assessment tools, research findings indicate inconsistencies in their application and effectiveness (Kimmons, 2020). Many educators face challenges in effectively incorporating technology into their instructional practices, often restricting their use of digital tools to basic functionalities due to insufficient training and inadequate infrastructure. These limitations hinder the optimal implementation of digital assessment in

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online PBL settings, reducing its potential impact on student learning outcomes (Dinçer, 2024).

Digital skills are one of the main competencies needed by students in the modern workplace. Context online learning, project-based digital skills assessments allow students to demonstrate critical skills in using technology and collaborating effectively in a virtual environment. Although project-based assessments have great potential in evaluating these skills, challenges related to the development of effective digital instruments still need to be addressed. Although much research has been done the application of technology in the classroom, there are still few that specifically examine the use of digital instruments in project-based assessment., as done by (Tonelli et al., 2018) stated that digital technology has significant potential in the assessment process. The new assessment scenario is difficult to implement without technology support. digital technology in assessment, by highlighting its potential in project-based learning. This research identifies important elements and new assessment scenarios that can enhance the learning process, and highlights the necessity of the integration of technology in educational assessment practices. Furthermore, (Al-Abdullatif & Gameil, 2021) the results of their research show a positive relationship between the perception of ease of use (PEU) of pupils' digital devices and their utilization of a project-based learning approach (PBL). The positive relationship between students' perception of convenience (PE) towards the use of digital technology and self-efficacy (SE) with the integration of digital technology in PBL.

However, existing research often does not provide a thorough analysis of one of the elements influencing effectiveness of the instrument (Baker, 2005). In addition, there is a lack of studies that explore the perspectives of students and teachers in the use of these digital instruments. Further research is needed to understand how digital instruments can be optimized to enhance the caliber of project-based assessments within the framework of online learning. The use of digital instruments in project-based assessments aims to provide authentic and comprehensive feedback on students' skills, especially in a dynamic online environment. However, limitations in the validity, reliability, and effectiveness of digital assessment instruments often limit the use of these instruments in various educational contexts (Mejías-Acosta et al., 2024). Therefore, it is important to examine trends, gaps, and novelty in the development of project-based digital skills assessment instruments in virtual classrooms. This article aims to explore effective assessment strategies, analyze the development of digital instruments, and identify the latest trends and transformations in online learning assessment in higher education. These objectives are expected to provide insights for optimizing assessment practices to support student success in digital learning environments.

Research Method

This study used a systematic literature review (SLR) to explore the evolution and trends of the use of digital assessment instruments in project-based learning (PBL) within online learning environments. The method followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, as outlined by Liberati et al., (2009) to ensure the transparency, rigor, and replicability of the review process. The PRISMA framework allowed for a structured approach in selecting and synthesizing relevant literature, providing a comprehensive analysis of the subject matter. The steps to be explained below.

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Identification (searching)

Methodical searches are performed using Publish or Perish software that allows access to a wide range of academic databases and provides comprehensive citation metrics (Husaeni & Nandiyanto, 2022). The use of PoP was chosen because of its ability to identify influential articles based on citations and facilitate the initial screening process (Judge et al., 2021)." Systematic searches are carried out using Publish or Perish software that allows access to various academic databases. This tool was chosen because of its ability to conduct a comprehensive search and provide complete citation metrics for the article screening process. Systematic search using Publish or Perish was chosen because of its ability to access and analyze academic data from various databases comprehensively (Harzing -, 2016; Martín-Martín et al., 2018)). This software allows the evaluation of article quality based on citation metrics and simplifies the systematic screening process(Gusenbauer & Haddaway, 2019)

Table 1. The inclusion and exclusion criteria

Criterion	Inclusion	Exclusion
Temporal Coverage	Released in between 2019-2024 ensuring relevance to the latest developments in digital assessment technology	Under 2019
Publication Type:	○ Article Scopus-indexed journal ○ Articles in Google Scholar with a minimum of 10 citations ○ Scopus or Google Scholar-indexed conference proceedings ○ Accessible full-paper	○ Review articles/systematic reviews ○ Editorial and opinion Conference abstracts ○ Article without full-text Grey literature
Content Focus:	○ Instruments Digital Assessment in Learning Project-based ○ Validity and the reliability of digital instruments ○ Implementation of digital assessment in online learning ○ Skill measurement Project-based	○ Only conceptual without implementation ○ Not specific to digital assessments ○ Doesn't measure project skills
Methodology	○ Research Empirical with a clear methodology ○ Mixed-method, quantitative, or qualitative ○ Serves data Implementation Results	○ No clear methodology ○ No empirical data ○ Sample size not explained
Context	○ Higher education settings ○ Project-based learning ○ Online implementation	○ Education Basic/Intermediate (except relevant best practices) ○ Pure face-to-face learni

Database: Scopus period: 2019-2024. The keywords used for the Scopus search platform with PoP are 1) "online learning" OR "distance learning") AND "digital assessment" AND "project-based learning", 2) "online education" OR "distance education") AND "assessment" AND "Indonesia" AND "project" and 3) "virtual learning" OR "remote learning") AND "project-based learning" AND "digital assessment". As for google scholar, 4) "online learning", "digital assessment", "project-based learning" and 5) "e-learning", "assessment instruments", "project-based learning". The number of articles obtained from the search with keywords 1 and 2 and 3, each as many as 200 articles. Then from keywords 3 and 4 from the Google Scholar database obtained 100 articles each. So, the total of all articles had 800 articles.

Screening and Eligibility Criteria

The first step in the article screening procedure was to find 600 articles from the Scopus database using three distinct search terms. The remaining 550 unique articles are filtered by title and abstract after 50 duplicate articles have been removed. The 2019–2024 timeframe, the publishing type (Scopus articles with at least 10 citations), and the availability of complete papers were all taken into consideration during the screening process. And 200 articles from Google Scholar using two distinct search terms. obtained 6 duplicate articles. so, the total number tested was 194 from Google Scholar. The total for each database was 744 articles. 744 papers were vetted by the researchers at this point. The researchers first looked over the article titles because 387 of them had titles that had nothing to do with the study. The researchers next evaluated the abstracts of the articles; 157 were excluded because they had no bearing on digital assessment in higher education.

Eligibility Criteria

There were 203 articles about Using digital evaluation in higher education during the eligibility stage. Then, the researcher examined these papers by examining their complete texts to make sure they met the requirements for inclusion. 158 articles were eliminated at the conclusion of the stage because articles had no implementation data and were only conceptual.

Synthesis and results

At this point, the researchers had synthesized 47 publications. That met all inclusion criteria. These articles show a temporal distribution with the majority published in 2021 (14 articles), followed by 2020 (12 articles), 2022 (6 articles), 2023 (5 articles), 2019 (3 articles), and 2024(3 articles). The focus of the article content includes the creation and application of digital assessment tools, learning analytics, automated evaluation, and digital rubrics throughout higher education's online project-based learning environment. The steps of the literature review are depicted in Figure 1.

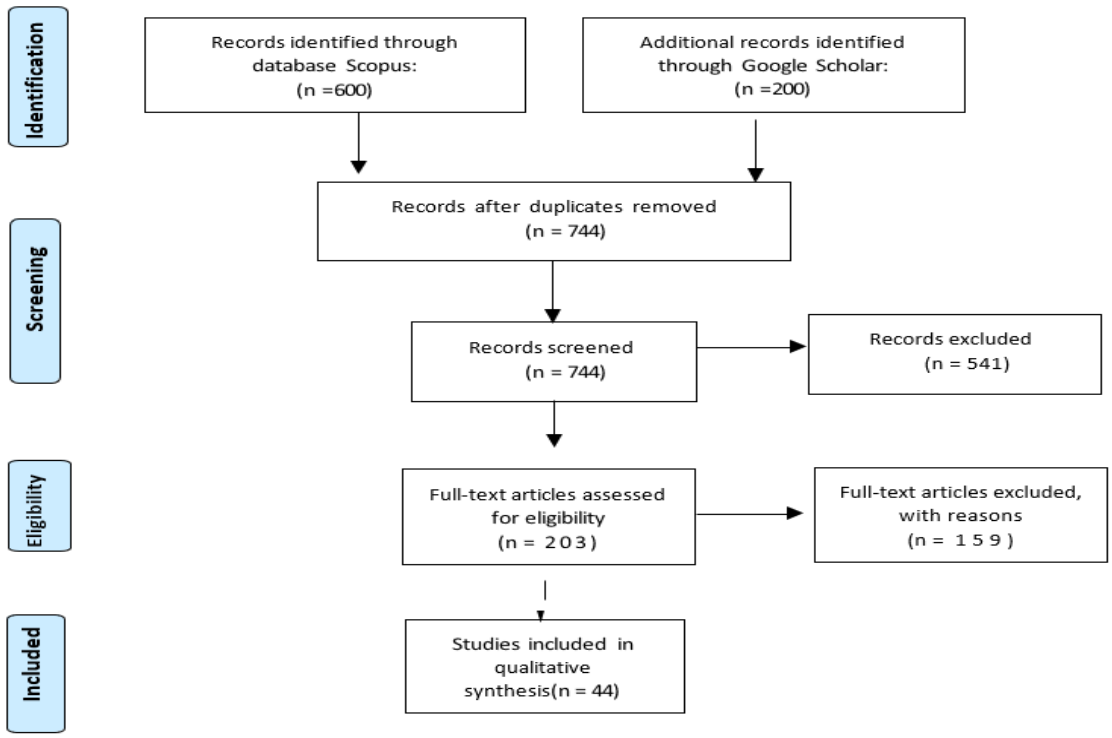

Figure 1. PRISMA flowchart illustrating the systematic review process

Data collection, data extraction, and data analysis

The data collection process involved conducting five rounds of searches using varied keywords and platforms such as Scopus and Google Scholar, facilitated by Publish or Perish (PoP). To enhance the selection process, Rayyan AI was used to efficiently identify articles that met the study criteria. This approach is consistent with the PRISMA protocol, particularly during the identification phase, where articles were carefully filtered, reviewed, and stored in RIS and CSV formats for further analysis. In the data extraction phase, both Rayyan AI and Claude AI were used to help identify and organize relevant data. The extracted data was then cross-checked using Chat PDF AI and manually verified for each synthesized article to ensure accuracy and alignment with the research objectives.

The data were analyzed using thematic synthesis (Thomas & Harden, 2008) which involved identifying emerging themes and subthemes related to the effectiveness of digital assessment instruments in educational contexts. This method allowed for the identification of patterns across the studies and helped connect findings to the objectives of the research. The results were then discussed in terms of their implications for digital assessment strategies. These steps align with the stages outlined in the PRISMA methodology, ensuring a comprehensive and transparent approach to analyzing the data in this study.

Results and Discussion

Types of digital instruments used for assessment in online learning in higher education

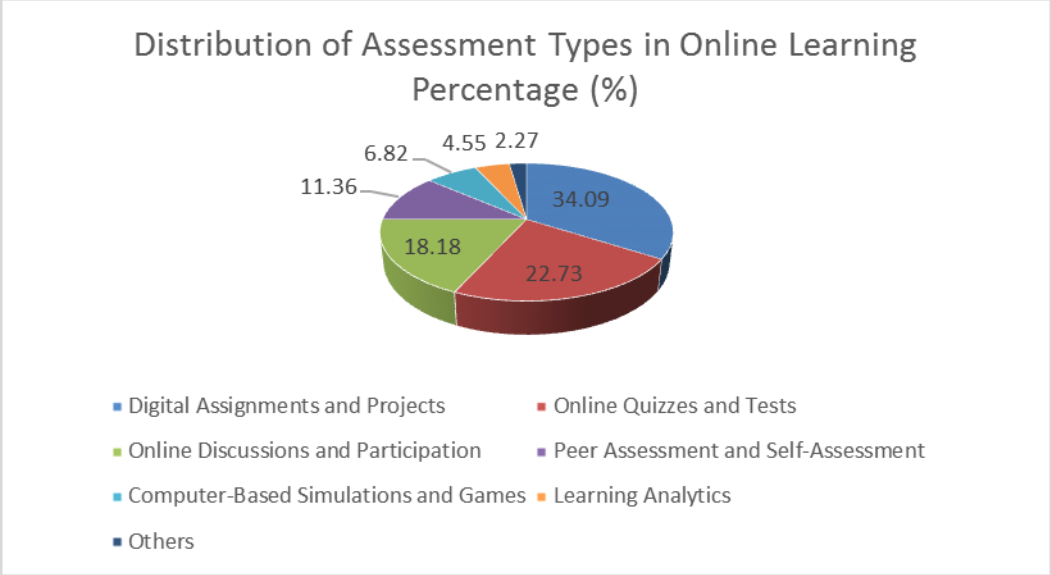

Figure 2. Distribution of Assessment Types in Online Learning

The dominance of online quizzes and tests (75%) is in line with the findings of (Wang, 2007) who reported the effectiveness of web-based assessments in higher education. (Gikandi et al., 2011) assert that online tests provide instant feedback and efficiency in formative assessment. For digital tasks and projects (68%), Redecker & Johannessen (2013) highlighted the importance of technology-based assessments for developing 21st century skills. Stödberg (2012) found that electronic portfolios allow for a more holistic assessment of student learning.

Online discussion (55%) as an assessment instrument is supported by research by Gikandi et al. (2011) which shows that asynchronous discussion forums increase engagement and analytical reasoning. Garrison & Cleveland-Innes (2005) emphasizes the role of online discussions of building acquiring knowledge communities. Regarding peer assessment

(32%), Liu & Carless (2006) identified its benefits in developing students' evaluative abilities. Nicol et al. (2014) added that online peer assessment improves the ability to provide constructive feedback. The relatively low simulation and games (20%) reflect the findings of de Freitas & Oliver (2006) on the complexity of implementing game-based assessment. However Connolly et al. (2012) affirmed its potential in increasing motivation and engagement. The use of learning analytics (15%) is still limited in accordance with Ferguson (2012) observation about implementation challenges in higher education. However, Gašević et al. (2015) highlight its potential in providing in-depth insights into the learning process. while in another study from 2016, they explored the application of learning analytics in improving student engagement and performance by leveraging real-time data to inform instructional practices (Gasevic & Pechenizkiy, 2016).

The analysis of 44 articles reveals the pattern of adoption of digital assessment instruments in relation to higher education's online learning environment. Bearman et al. (2023) identified high use online quizzes and tests (75%) as well as digital assignments (68%) in online learning shows the tendency of institutions to adapt traditional methods to digital platforms. In the context of distance learning, project-based digital assignments have proven to be very effective because they encourage student learning independence, the development of digital research skills, and virtual project management skills that are relevant to the digital world of work. In online learning, the adoption rate of online discussion and participation reached 55%. Huang et al. (2022) revealed that asynchronous discussion forums are very suitable for distance learning because they improve critical thinking skills, written argumentation, and digital communication. Montenegro-Rueda et al. (2021)) reinforce that in online learning, despite the challenges in combining summative and formative evaluations, virtual discussions enable collaborative gaining knowledge online knowledge construction.

The Evolution of Digital Assessment Instruments in Online Learning

A systematic review of 44 articles revealed a significant evolution in the development and implementation of digital assessments during 2019-2024. In the context of research methodology, the dominance of quantitative approaches (45.5%) provides empirical evidence on the effectiveness of various instruments, while qualitative studies (31.8%) and mixed methods (22.7%) provide a deeper contextual understanding (Bearman et al., 2023). A systematic review of 44 articles revealed a significant evolution in the creation and application of digital tests for online education throughout the 2019–2024 timeframe. Methodological analysis showed the dominance of quantitative approaches (45.5%), which provided empirical evidence on the effectiveness of various digital assessment instruments. (Bearman et al., 2023) underlined that the combination with qualitative (31.8%) and mixed method (22.7%) studies provides a comprehensive knowledge of the application and effects of digital evaluation in online education.

Trends and Transformations of Assessment Instruments

a) Initial Transition Phase (2019-2020):

The results of the review show the dominance of simple digitization with online quizzes (75%) and digital assignments (68%). Montenegro-Rueda et al. (2021) determined that the primary driver of this change was the epidemic, as evidenced by the increase in articles on online learning adaptation (7 articles in 2020).

b) Development Phase (2021-2022):

There is a significant shift towards a more integrated system. Huang et al., (2022) noted the decline of a single LMS platform from 10 articles (2019-2020) to 3 articles (2022-2024), marking the transition to a more adaptive multi-platform system. c) Innovation Phase (2023-2024): Zhang (2022) underscores the emerging edge of cutting-edge technology with

increased studies on: AI-based adaptive learning (12 articles); Mixed reality in learning (10 articles); AI-based automated grading (8 articles); Collaborative digital workspace (9 articles).

The assessment found that there has been a notable shift in the use of online assessment instruments. The initial period (2019-2020) was marked by the dominance of online quizzes (75%) and digital assignments (68%), which according to (Montenegro-Rueda et al., 2021) was driven by the need for rapid adaptation to during the pandemic, online education. Huang et al. (2022) noted that although the adoption rate of online discussion forums reached 55%, still challenges in effectively integrating formative and summative assessments in a virtual environment.

Temporal analysis shows a significant shift from simple digitization to more sophisticated systems. Zhang (2022) identified a drastic decline in the use of a single LMS platform from 10 articles (2019-2020) to 3 articles (2022-2024), marking the transition to a more adaptive multi-platform system. García-Peñalvo (2021) reinforced these findings by underlining the importance of developing an integrated assessment system that can accommodate different learning modalities. The 2023-2024 period marks the latest technological emergency in digital assessment. Ghani et al. (2021) recorded a significant increase in research on AI-based adaptive learning (12 articles), mixed reality (10 articles), and automated assessment (8 articles). Richardson et al. (2020) emphasized that the integration of this emergent technology provides opportunities for more effective personalization of learning and assessment.

The review also reveals some critical gaps that need to be addressed. Moncho Mas et al. (2021) identified the limitations of longitudinal studies and variations in the standardization of research instruments as major methodological challenges. Meanwhile, Redecker & Johannessen (2013) remains relevant in underlining the importance of an integrated framework for digital assessment, especially in the context of developing soft skills and competencies in the 21st century.

Based on these comprehensive findings, several recommendations can be formulated for future development. First, as suggested by (Daniar et al., 2023), it is believed that in order to provide a more thorough and individualized assessment of students' learning progress, an assessment system that incorporates various modalities and is supported by learning analytics must be developed. Second, referring to Gašević et al. (2015) implementation of emergent technologies needs to consider pedagogical aspects and institutional readiness. Third, it is necessary to conduct longitudinal research to assess effectiveness and enduring effects of various digital assessment instruments. The future development direction needs to focus on three priority areas: (1) strengthening the integration of AI and mixed reality in digital assessment, (2) developing adaptive assessment models that support personalized learning, and (3) standardizing the assessment system by considering pedagogical and technological aspects. Nicol et al. (2014) emphasized the importance maintaining constructive comments aspects the development of future digital assessment systems.

Considering trend analysis, some priority areas for development:

a) Technology: Strengthening the integration of AI in assessment, Development of mixed reality for immersive experiences and Improvement of learning analytics systems
b) Pedagogical: Development of adaptive assessment models, Strengthening collaborative aspects in online learning, Integration of formative and summative assessments.
c) Institutional: Human resource capacity development, Strengthening digital infrastructure, Standardization of the assessment system.

Findings from the review identified a noteworthy transformation to adopt digital assessment instruments. The initial period (2019-2020) was marked by the dominance of online quizzes (75%) and digital assignments (68%), which according to (Montenegro-Rueda et al., 2021) was driven by the need for rapid adaptation to online learning during the pandemic. Huang et al. (2022) noted that although the adoption rate of online discussion forums reached 55%, there are still challenges in effectively integrating formative and summative assessments in a virtual environment.

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According to the study's findings, creating a hybrid assessment system that combines multiple modalities and is supported by learning analytics is essential for providing a more thorough and individualized evaluation of students. This approach expands theoretical knowledge on evaluation by integrating diverse data sources to offer more accurate feedback. Moreover, the successful implementation of new technologies requires considering pedagogical and institutional readiness, highlighting the need for models that align technology adoption with learning theory. To effectively adopt these technologies, educational institutions must focus on infrastructure, teacher preparation, and strategic planning. Additionally, longitudinal research is necessary to evaluate the long-term impact of digital assessment tools and ensure their effectiveness and sustainability in educational contexts (Daniar et al., 2023; Gašević et al., 2015).

Future development directions need to focus on three priority areas: (1) strengthening the integration of AI and mixed reality in digital assessment, (2) developing adaptive assessment models that support personalized learning, and (3) standardizing assessment systems by considering pedagogical and technological aspects. Nicol et al. (2014) emphasized the importance of maintaining constructive feedback as a key aspect in the development of future digital assessment systems. This highlights the need for assessment systems that not only integrate advanced technology but also ensure that feedback mechanisms are built into the system to enhance student learning.

Conclusion

The findings of a thorough assessment of the literature of 44 articles (2019-2024) identified seven types of digital assessment instruments Higher education online learning: online tests (75%), digital assignments and projects (68%), online discussions and participation (55%), peer and self-assessment (32%), simulations and games (20%), learning analytics (15%), and

other instruments (10%). Temporal analysis shows the evolution from simple digitization (2019-2020) to integrated systems (2021-2022), to the adoption of emergent technologies such as AI and mixed reality (2023-2024). The findings indicate the need to: (1) integrate various assessment modalities for effective online learning, (2) develop a pedagogical framework that supports emergent technologies, and (3) standardize digital assessment systems. Additional investigation is required to assess the long-term efficacy and impact on learning outcomes, especially for cutting-edge technology-based instruments.

Recommendation

Based on these comprehensive findings, several recommendations can be formulated: first, there is a need to develop a hybrid assessment system that integrates various modalities with learning analytics support; second, the implementation of new technologies should consider pedagogical aspects and institutional readiness. In addition, longitudinal research is needed to evaluate the effectiveness and long-term impact of various digital assessment instruments. It is also important to maintain the constructive feedback aspect in the development of future digital assessment systems. These recommendations are primarily addressed to educational institutions, curriculum developers, educators, and researchers, who should collaboratively focus on these areas to improve assessment practices and enhance student learning outcomes.

References

Al-Abdullatif, A. M., & Gameil, A. A. (2021). The Effect of Digital Technology Integration on Students' Academic Performance through Project-Based Learning in an E-learning Environment. *International Journal of Emerging Technologies in Learning (iJET)*, *16*(11), Article 11. https://doi.org/10.3991/ijet.v16i11.19421

Baker, E. L. (2005). Technology and Effective Assessment Systems. *Teachers College Record*, *107*(14), 358–378. https://doi.org/10.1177/016146810510701414

Bearman, M., Nieminen, J. H., & Ajjawi, R. (2023). Designing assessment in a digital world: An organising framework. *Assessment & Evaluation in Higher Education*, *48*(3), 291–304. https://doi.org/10.1080/02602938.2022.2069674

Connolly, T. M., Boyle, E. A., MacArthur, E., Hainey, T., & Boyle, J. M. (2012). A systematic literature review of empirical evidence on computer games and serious games. *Computers & Education*, *59*(2), 661–686. https://doi.org/10.1016/j.compedu.2012.03.004

Daniar, A. V., Herdyastuti, N., & Lutfi, A. (2023). Analysis Effectiveness of Implementation Assessment as Learning on Metacognitive Skills. *IJORER : International Journal of Recent Educational Research*, *4*(6), Article 6. https://doi.org/10.46245/ijorer.v4i6.392

de Freitas, S., & Oliver, M. (2006). How can exploratory learning with games and simulations within the curriculum be most effectively evaluated? *Computers & Education*, *46*(3), 249–264. https://doi.org/10.1016/j.compedu.2005.11.007

Dinçer, S. (2024). Bridging the gap in technology integration in education: An examination of science teachers' competencies and needs. *Journal of Turkish Science Education*, *21*(4), Article 4. https://doi.org/10.36681/tused.2024.033

Ferguson, R. (2012). Learning analytics: Drivers, developments and challenges. *International Journal of Technology Enhanced Learning*, *4*(5/6), Article 5/6.

García-Peñalvo, F. J. (2021). Avoiding the Dark Side of Digital Transformation in Teaching. An Institutional Reference Framework for eLearning in Higher Education. *Sustainability*, *13*(4), Article 4. https://doi.org/10.3390/su13042023

Garrison, D. R., & Cleveland-Innes, M. (2005). Facilitating Cognitive Presence in Online Learning: Interaction Is Not Enough. *American Journal of Distance Education*, *19*(3), 133–148. https://doi.org/10.1207/s15389286ajde1903_2

Gašević, D., Dawson, S., & Siemens, G. (2015). Let's not forget: Learning analytics are about learning. *TechTrends*, *59*(1), 64–71. https://doi.org/10.1007/s11528-014-0822-x

Gasevic, D., & Pechenizkiy, M. (2016). Let's Grow Together: Tutorials on Learning Analytics Methods. *Journal of Learning Analytics*, *3*(3), Article 3. https://doi.org/10.18608/jla.2016.33.2

Ghani, A. B. A., Mahat, N. I., Omar, M. F., & Bakar, S. A. (2021). The Impact of COVID-19 Pandemic on Higher Education and Research: Learning from Experience and the Way Forward. *Journal of Sustainability Perspectives*, *1*(2), 94–102. https://doi.org/10.14710/jsp.2021.11747

Gikandi, J. W., Morrow, D., & Davis, N. E. (2011). Online formative assessment in higher education: A review of the literature. *Computers & Education*, *57*(4), 2333–2351. https://doi.org/10.1016/j.compedu.2011.06.004

Gusenbauer, M., & Haddaway, N. R. (2019). *Which academic search systems are suitable for systematic reviews or meta-analyses? Evaluating retrieval qualities of Google Scholar, PubMed, and 26 other resources*. https://doi.org/10.1002/jrsm.1378

Harzing -, A.-W. (2016, February 6). *Publish or Perish*. Harzing.Com. https://harzing.com/resources/publish-or-perish

Huang, J., Matthews, K. E., & Lodge, J. M. (2022). 'The university doesn't care about the impact it is having on us': Academic experiences of the institutionalisation of blended learning. *Higher Education Research & Development*, *41*(5), 1557–1571. https://doi.org/10.1080/07294360.2021.1915965

Husaeni, D. F. A., & Nandiyanto, A. B. D. (2022). Bibliometric Using Vosviewer with Publish or Perish (using Google Scholar data): From Step-by-step Processing for Users to the Practical Examples in the Analysis of Digital Learning Articles in Pre and Post Covid-19 Pandemic. *ASEAN Journal of Science and Engineering*, *2*(1), Article 1. https://doi.org/10.17509/ajse.v2i1.37368

Johar, R., Maisela, A., & Suhartati, S. (2023). Students' creative thinking skill through realistic mathematics education on straight-line equation. *Jurnal Elemen*, *9*(2), Article 2. https://doi.org/10.29408/jel.v9i2.7697

Kimmons, R. (2020). Current Trends (and Missing Links) in Educational Technology Research and Practice. *TechTrends*, *64*(6), 803–809. https://doi.org/10.1007/s11528-020-00549-6

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A., Clarke, M., Devereaux, P. J., Kleijnen, J., & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: Explanation and elaboration. *Journal of Clinical Epidemiology*, *62*(10), e1-34. https://doi.org/10.1016/j.jclinepi.2009.06.006

Liu, N.-F., & Carless, D. (2006). Peer feedback: The learning element of peer assessment. *Teaching in Higher Education*, *11*(3), 279–290. https://doi.org/10.1080/13562510600680582

Martín-Martín, A., Orduna-Malea, E., Thelwall, M., & Delgado López-Cózar, E. (2018). Google Scholar, Web of Science, and Scopus: A systematic comparison of citations in 252 subject categories. *Journal of Informetrics*, *12*(4), 1160–1177.

Mejías-Acosta, A., D'Armas Regnault, M., Vargas-Cano, E., Cárdenas-Cobo, J., & Vidal-Silva, C. (2024). Assessment of digital competencies in higher education students:

Development and validation of a measurement scale. *Frontiers in Education*, *9*. https://doi.org/10.3389/feduc.2024.1497376

Moncho Mas, V., Marco-Simó, J. M., & Cobarsí-Morales, J. (2021, January 29). *EHR Implementation: A Literature Review*. https://doi.org/10.1007/978-3-030-68418-1_1

Montenegro-Rueda, M., Rosa, A. L. la, Sánchez-Serrano, J. L. S., & Fernández-Cerero, J. (2021). Assessment in Higher Education during the COVID-19 Pandemic: A Systematic Review. *Sustainability*, *13*(19), 1–13.

Nicol, D., Thomson, A., & Breslin, C. (2014). Rethinking feedback practices in higher education: A peer review perspective. *Assessment & Evaluation in Higher Education*, *39*(1), 102–122. https://doi.org/10.1080/02602938.2013.795518

Redecker, C., & Johannessen, Ø. (2013). Changing Assessment—Towards a New Assessment Paradigm Using ICT. *European Journal of Education*, *48*(1), 79–96. https://doi.org/10.1111/ejed.12018

Richardson, J., Brush, T., Ottenbreit-Leftwich, A., Karlin, M., Leary, H., Shelton, B., Lowell, V., Exter, M., Strycker, J., & Shin, S. (2020). Innovations in Instructional Design and Technology Programs: A View from PIDT 2018. *TechTrends*. https://scholarworks.boisestate.edu/edtech_facpubs/312

Stödberg, U. (2012). A research review of e-assessment. *Assessment & Evaluation in Higher Education*, *37*(5), 591–604. https://doi.org/10.1080/02602938.2011.557496

Thomas, J., & Harden, A. (2008). Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology*, *8*(1), 45. https://doi.org/10.1186/1471-2288-8-45

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), Article 3. https://doi.org/10.17471/2499-4324/1028

Wang, T. h. (2007). What strategies are effective for formative assessment in an e-learning environment? *Journal of Computer Assisted Learning*, *23*(3), 171–186. https://doi.org/10.1111/j.1365-2729.2006.00211.x

Zhang, X. (2022). Demystifying the challenges of university students' web-based learning: A qualitative case study. *Education and Information Technologies*, *27*(7), 10161–10178. https://doi.org/10.1007/s10639-022-10974-0