THE IMPACT OF TECHNOLOGY ON HIGHER EDUCATION IN THE 21st CENTURY: A SYSTEMATIC LITERATURE REVIEW

Ahmad Shekib Popal, Dawit Negussie, Dr. Jabe Bekele Hirgo, Yohannes Negussie, Chisomo Tolani, Dr. Gurudutta P. Japee

ICCR Ph.D. Scholar from Afghanistan, S.D. School of Commerce, Gujarat University, Ahmedabad 380009, India
E-Mail: popalshekib@gujaratuniversity.ac.in /popalshekib@hotmail.com
Mobile #: +93 77 49 40 142

Research Scholar, S.D. School of Commerce, Gujarat University, Ahmedabad, Gujarat, India
https://orcid.org/0000-0001-7551-1700

Department of Educational Planning and Management, Wolkite University, Ethiopia.
Email: jabebekele2003@gmail.com

Lecturer at Meles Zenawi Leadership Academy
Mekelle, Ethiopia
Email: yohannesnegu19@gmail.com

Research Scholar, Computer Science, Gujarat University, Ahmedabad, Gujarat, India
tolanic6@gmail.com

Professor-Commerce, Head of Department of Advanced Business Studies, Gujarat University
E-Mail : drdutta@gujaratuniversity.ac.in
Mobile # : +919879109040

Abstract

In the ever-evolving landscape of 21st-century higher education, this article delves into the transformative role technology plays in reshaping how we acquire, disseminate, and apply knowledge. From the traditional chalkboards to interactive screens, the evolution has been revolutionary, woven into the fabric of our daily lives. The exploration draws on scholarly sources, navigating through digital tools, platforms, and strategies, from classrooms to online environments, and from augmented reality to artificial intelligence. The literature review assesses the remarkable transformation catalyzed by digital technologies, examining themes such as digital natives, blended learning, immersive technologies, adaptive learning, and data analytics. It uncovers both opportunities and challenges, addressing issues of equity and ethical considerations. The research questions focus on technology's impact on student engagement, learning outcomes, and equitable access. Objectives include elevating student digital literacy and enhancing teacher proficiency in online pedagogy. The methodology combines a comprehensive literature review with practical interventions and data analysis. The article concludes by emphasizing the dynamic nature of technology in education, acknowledging challenges, and calling for ongoing research and critical evaluation to shape the future of learning.

Keywords: Education, Technology, Digital Transformation, Student Engagement

1.   INTRODUCTION

In the 21st century, the pervasive influence of technology has become ingrained in the fabric of our daily lives, transforming the way we communicate, work, and learn (Author, Year). This era witnesses a profound shift in the educational landscape, marked by the extensive integration of information technologies in teaching and learning, thereby initiating a dramatic change in the educational paradigm (Serdyukov, 2015).

As we navigate the intersection of innovation and education, it is impossible to overlook the significant impact that technology has exerted on the evolution of learning. From traditional chalkboards to contemporary interactive screens, the educational journey has undergone a revolutionary transformation.

2.   LITERATURE REVIEW

The integration of information technologies in teaching has given rise to a burgeoning academic focus on sustainability and the indicators of world-class universities (Liu et al., 2019). Addressing the challenges posed by this complex issue necessitates the implementation of comprehensive strategies by countries and educators (Liu et al., 2019).

In the pursuit of more effective learning methodologies and the development of 21st-century skills, innovative approaches have emerged (Villalba et al., 2018). These skills encompass critical thinking, communication, collaboration, creativity, and information, media, and technology literacy (Villalba et al., 2018). Despite the demonstrated potential of tele collaboration in enhancing students' intercultural competence and other 21st-century skills, its full integration into university courses remains a challenge (Ferreira-Lopes et al., 2018).

European educational encounters with pioneering technologies in the 21st century amid global challenges have been documented (Kuzmenko et al., 2023). Furthermore, the advent of new educational technologies capable of generating Big Data has prompted stakeholders to adopt Big Data Analytics in the education sector (Shah & Choksi, 2019).

Tech students and faculty, with a 25-year trajectory of research leadership, are at the forefront of digital design, building simulation, engineering, and construction integration (Gamble et al., 2015). This collaborative effort has resulted in the successful acquisition of competencies and skills, positioning students as technological leaders in the modern industry (López et al., 2021).

Investigations into the development of students' 21st-century skills at a STEM research university emphasize the essential role of these skills for career readiness (Lavi et al., 2021). The integration of technology in higher education, particularly in teacher education, has become vital for preparing pre-service teachers for the 21st-century classroom, fostering deep engagement with content and authentic learning (West & Malatji, 2021).

The 21st century, compounded by the global COVID-19 pandemic, imposes new demands on teaching and learning (Zhong, 2017). Information literacy, media literacy, and information communication and technology literacy are identified as crucial skills for 21st-century learning, promoting life and career skills, as well as learning and innovation skills (Khlaisang & Koraneekij, 2019).

Mobile technology is recognized as an effective means to enhance students' skills, such as positive thinking, collaboration, and communication, representing a significant innovation in e-learning research areas (El-Sofany & El-Haggar, 2020). The evolving education system must consider new ways for learners to develop in the information and knowledge society (Cabezas-González et al., 2021).

National programs, such as the Israeli Information and Communication Technology (ICT) Program, highlight the imperative to adapt the educational system to the 21st century (Magen-Nagar & Maskit, 2016). Technology both complicates and liberates oral presentation pedagogy in higher education (Seau & Azman, 2021).

In the context of instructional software authoring tools courses, educational institutes continuously explore new ways and trends to improve teaching and ensure learning in the rapidly evolving world of information technology (Ibrahim et al., 2019). The advent of smart products and services necessitates the revision of education systems to produce a skilled workforce equipped with 21st-century skills (Simeunovic et al., 2022).

Teaching industrial engineering in the 21st century requires competencies oriented towards sustainable development, addressing challenges posed by information metrics, the Internet of Things, virtual and augmented reality, and Artificial Intelligence (Pérez-Rodríguez et al., 2022). The rise of Massive Open Online Courses (MOOCs) gains prominence, with their potential to reinvent learning in the 21st century (Asl, 2022).

Higher education institutions are urged to reconsider strategies for the delivery of political science degrees, acknowledging the need for innovative teaching practices and the integration of technology (Ahmad, 2020). The transition from traditional exam-oriented education to quality education in the 21st century brings attention to mental health issues among students (Yang, 2022).

The digital gap between higher education teachers and students, highlighted during the COVID-19 pandemic, underscores the necessity for university teachers to develop EdTech skills (Ortega-Ruipérez, 2022). Technological innovations, including ICT, are viewed as holding promise for revolutionizing access in societal institutions like schools and healthcare services (Bagga-Gupta et al., 2016).

The dynamic business environment and powerful market forces in the 21st century pose challenges for open universities, emphasizing the importance of quality and client-focused technology-enhanced education (Kooi & Ping, 2012). The centralization of digital strategies is advocated, acknowledging the transformative impact of modern technology on traditional educational methods and practices (Øvrelid, 2022).

Information technology emerges as a key factor in societal lifestyle changes, with countries recognizing computer learning as a primary course in compulsory education (Feng & Ha, 2016). The rise of Massive Open Online Courses (MOOCs) is highlighted as a response to the fast-paced evolution of technology and the growing demand for digital disruptions in education (Hooda & Malik, 2023).

While technology evolves rapidly in the 21st century, higher education institutions sometimes struggle to align with the changing requirements of the labor market (Karakolis et al., 2022). The ubiquity of information and communication technologies (ICTs) has significantly changed the procedures and courses in higher education institutions (Khajuria et al., 2023).

The adoption of Information and Communications Technology (ICT) in education is considered essential for supporting and optimizing the delivery of information in the 21st century (Sandhya et al., 2020). Quality teaching-learning processes in higher education are increasingly reliant on technology, impacting the development of necessary skills for the 21st century (Liesa-Orús et al., 2020).

Drawing from the perspectives of teachers and students, technology-enhanced pedagogy is explored through increased interaction, teacher orchestration, and collaborative learning (Hämäläinen et al., 2017). Strategies for delivering political science degrees in higher education need reconsideration, given the impact of technology and innovative teaching practices (Ahmad, 2020).

The growth in higher education enrolment necessitates effective information management, prompting the development of modern computer software and hardware to initiate and facilitate the formalisation process in universities (Li et al., 2021). The advent of digital technologies, particularly portable devices with internet connectivity, presents both opportunities and challenges for student learning in the 21st.

Curriculum and evaluation in outcome-based education (Japee, G., & Oza, P. 2021) have put stress on the methods needed to be used for the OBE where in (Japee,G.,2021)put a stress on quality education in post covid era.

OBJECTIVES:
- Elevate student digital literacy with interactive modules and core subject assessments.
- Enhance teacher proficiency in online pedagogy for effective virtual instruction delivery.
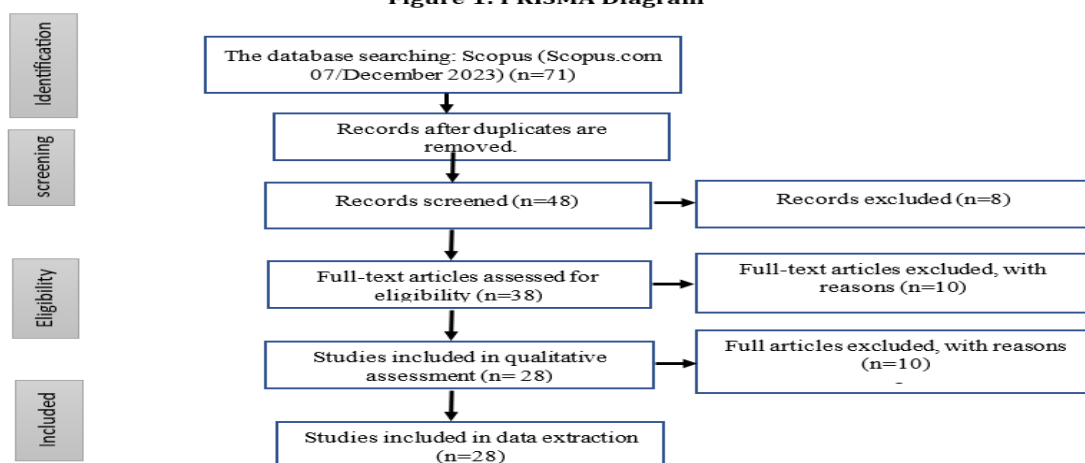
3.   METHODOLOGY

Systematic literature review using PRISMA method. Data extraction: in the data extraction phase, 71 papers were retrieved and limited to the following requirements (Dawit Negussie & Dr. Jabe Bekele Hirgo, 2023).
1. Articles must be original papers or review papers. Published reports.
2. The article must be in English and from the fields of social sciences, computer science, business, management and accounting, arts and humanities.
3. Extracted articles were published between the range of 2015-2023
4. The extracted paper was from all countries.
5. The database used to extract the articles was from Scopus database.
6. Keywords used to extract the articles are higher education, students, e-learning, education

Data tool and collection

The data of this study was in a textual form; in other words, it is secondary data. On December 07, 2023, Scopus academic search engine data were retrieved (https://www.scopus.com). Furthermore, through Advance search terms were used as TITLE-ABS-KEY(TECHNOLOGY AND 21st CENTURY AND HIGHER EDUCATION) AND (LIMIT-TO (OA,"all")) AND (LIMIT-TO (SUBJAREA,"SOCI") OR LIMIT-TO (SUBJAREA,"ARTS") OR LIMIT-TO (SUBJAREA,"COMP") OR LIMIT-TO (SUBJAREA,"BUSI")) AND (LIMIT-TO (DOCTYPE,"ar")) AND (LIMIT-TO (PUBSTAGE,"final")) AND (LIMIT-TO (EXACTKEYWORD,"Higher Education") OR LIMIT-TO (EXACTKEYWORD,"Students") OR LIMIT-TO (EXACTKEYWORD,"E-learning") OR LIMIT-TO (EXACTKEYWORD,"Education")) AND (LIMIT-TO (SRCTYPE,"j")) AND (LIMIT-TO (LANGUAGE,"English")) search terms. The result showed that 71 documents were retrieved.

Figure 1: PRISMA Diagram

The methodology for this research article involves a systematic approach to exploring the role of technology in 21st-century education, with a focus on addressing the identified research questions and objectives. The research design integrates literature review, data analysis, and practical strategies to enhance student digital literacy and teacher proficiency.

The research methodology involves a comprehensive review of scholarly articles, books, and pertinent literature that specifically addresses the influence of technology on education, concentrating on the themes introduced in the article's introduction and research questions. To ensure the relevance of the literature, studies published within the last two decades will be included, emphasizing the evolution of technology and its impact on crucial aspects such as student engagement, learning outcomes, and equitable access to educational technology. The synthesis phase will focus on summarizing and integrating key findings from the literature, establishing connections between various studies. This synthesis forms the foundation for exploring and addressing the research questions, providing a nuanced understanding of the multifaceted relationship between technology and education.

This methodology combines a comprehensive literature review with practical interventions and data analysis, providing a holistic understanding of the role of technology in education and addressing the identified research questions and objectives.

4. RESULT

The result section sets out a summary of the systematic literature review. The authors identified that up to date of 2023 reviewed.

This analysis reflects a comprehensive exploration of the transformative impact of technology on education in the 21st century. The introduction highlights technology's pervasive influence, particularly its role in reshaping communication, work, and learning. The literature review delves into key themes, such as sustainability, the development of 21st-century skills, and the challenges and opportunities presented by emerging technologies.

Noteworthy is the emphasis on the integration of information technologies in teaching, fostering innovative approaches to enhance critical thinking, communication, and collaboration skills. The acknowledgment of the digital gap during the COVID-19 pandemic underscores the urgency for educators to develop EdTech skills. The evolving role of MOOCs and the challenges faced by higher education institutions in aligning with the dynamic labor market highlight the need for adaptability.

Overall, the analysis presents a holistic view of the multifaceted relationship between technology and education, encompassing pedagogical innovations, workforce readiness, and societal changes.

**Figure 2: Published documents by year**
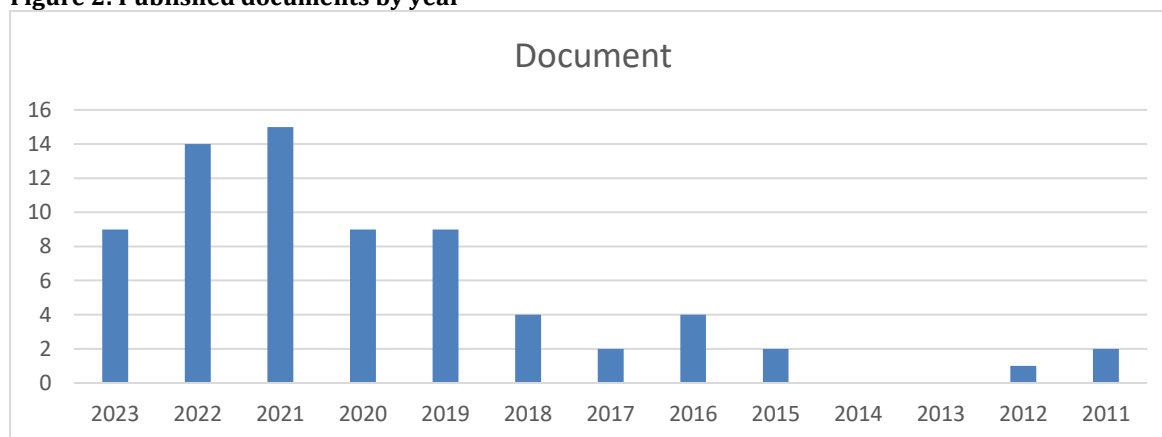
The data suggests variations in research output over the years, with some years experiencing peaks while others show lower or no research activity.

It's important to consider external factors such as global events, economic conditions, or changes in research funding that might influence the observed patterns.

A closer examination of the context surrounding the years with notable changes in research output could provide additional insights into the observed trends.

This analysis helps to understand the temporal dynamics of research output and can be valuable for identifying patterns and trends in the data.

Figure 3: Documents by country or territory
Compare the document counts for up to 15 authors/territories
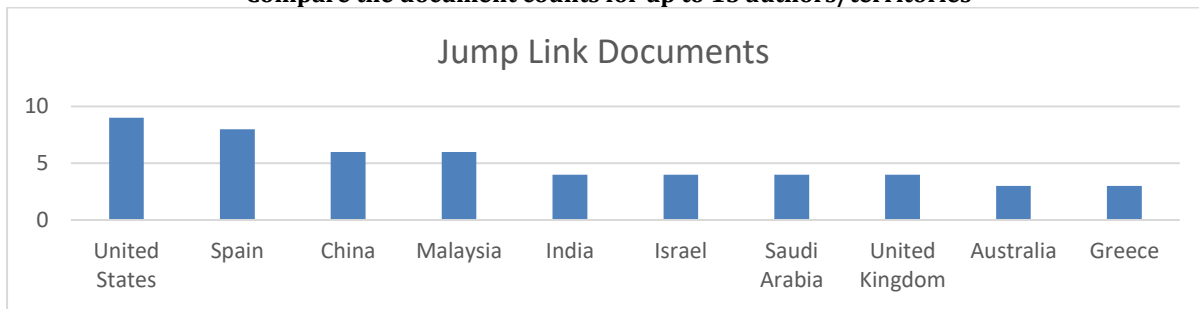
The distribution of documents across countries/territories indicates a diverse global research landscape.

The United States and Spain have a strong presence, with the highest document counts, suggesting robust research activities in these regions.

China, Malaysia, India, Israel, Saudi Arabia, and the United Kingdom have a similar level of research output, reflecting a balanced representation in the global research community.

Australia and Greece have lower document counts, suggesting a relatively smaller contribution to the research landscape compared to the other countries.

This analysis provides insights into the global distribution of research output, highlighting the varying levels of research activities in different countries/territories. It can be useful for understanding the geographical distribution of academic contributions and identifying regions with significant research output.

Figure 4: Document by subject area
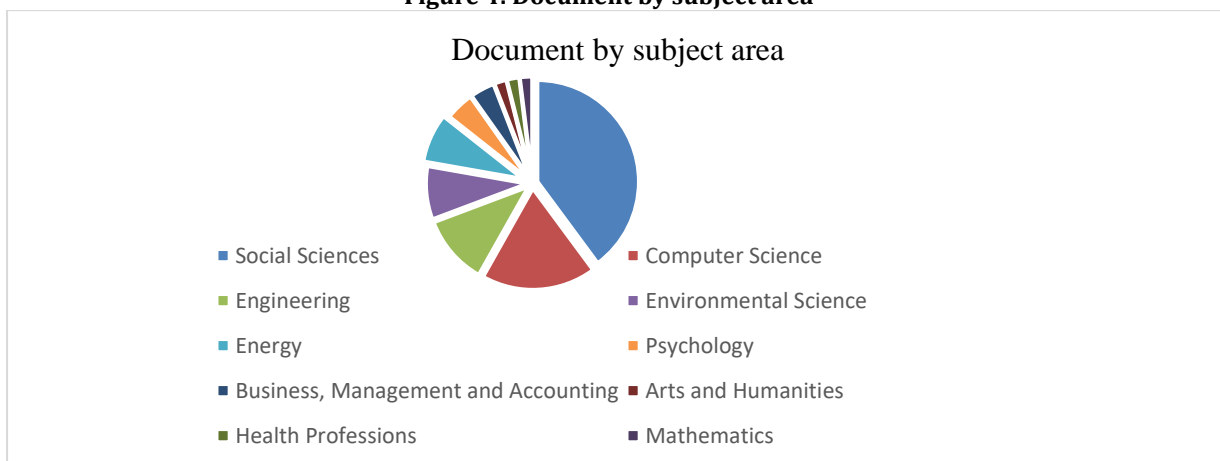
The distribution of documents across subject areas suggests a varied research landscape with a significant emphasis on Social Sciences and Computer Science.

Engineering, Environmental Science, and Energy also have notable representation, indicating a diverse range of research interests.

The lower document counts in Psychology, Business, Management and Accounting, Arts and Humanities, Health Professions, and Mathematics suggest a relatively smaller focus or output in these specific fields.

This analysis provides insights into the relative strengths and focuses of research across different subject areas, helping to identify where there might be more extensive academic activity or research interest.

5. DISCUSSION

Presented text underscores the profound and transformative impact of technology on education in the 21st century. The pervasive influence of technology is evident in the shift from traditional teaching methods to the extensive integration of information technologies, marking a revolutionary change in the educational paradigm. The literature reviews further highlights the multifaceted dimensions of this impact, ranging from the emphasis on sustainability and indicators of world-class universities to the emergence of innovative learning methodologies fostering 21st-century skills.

BIBLIOGRAPHY

[1] Ahmad, T. (2020). Improving political science degree programmes in the twenty-first century. *Review of Economics and Political Science*, *5*(3), 231–247. https://doi.org/10.1108/REPS-02-2019-0023

https://www.gapinterdisciplinarities.org/

[2] Asl, B. P. and M. P. (2022). *Cultural Translation, Hybrid Identity, and Third Space in Jhumpa Lahiri's Interpreter of Maladies22*. *30*(4).

[3] Bagga-Gupta, S., Dahlberg, G. M., & Winther, Y. (2016). Disabling and enabling technologies for learning in higher education for all: Issues and challenges for whom? *Informatics*, *3*(4). https://doi.org/10.3390/informatics3040021

[4] Cabezas-González, M., Casillas-Martín, S., & García-Peñalvo, F. J. (2021). The digital competence of pre-service educators: The influence of personal variables. *Sustainability (Switzerland)*, *13*(4), 1–14. https://doi.org/10.3390/su13042318

[5] Dawit Negussie, & Dr. Jabe Bekele Hirgo. (2023). Developing Servant Leadership Skills in Higher Education Leaders: A Literature Review. *International Journal of Advanced Research in Science, Communication and Technology*, 301–307. https://doi.org/10.48175/ijarsct-12449

[6] El-Sofany, H. F., & El-Haggar, N. (2020). The effectiveness of using mobile learning techniques to improve learning outcomes in higher education. *International Journal of Interactive Mobile Technologies*, *14*(8), 4–18. https://doi.org/10.3991/IJIM.V14I08.13125

[7] Feng, L., & Ha, J. L. (2016). Effects of teachers' information literacy on lifelong learning and school effectiveness. *Eurasia Journal of Mathematics, Science and Technology Education*, *12*(6), 1653–1663. https://doi.org/10.12973/eurasia.2016.1575a

[8] Ferreira-Lopes, L., Bezanilla, M. J., & Elexpuru, I. (2018). Integrating Intercultural Competence development into the curriculum through Telecollaboration. A task sequence proposal for Higher Education. *Revista de Educación a Distancia*, *58*. https://doi.org/10.6018/red/58/7

[9] Gamble, J. M., Gentry, R., Augenbroe, G., & Taul, S. (2015). Architecture and high performance building at Georgia tech: Teaching design + technology in the environmental context. *Journal of Green Building*, *10*(3), 67–86. https://doi.org/10.3992/jgb.10.3.67

[10] Hämäläinen, R., Kiili, C., & Smith, B. E. (2017). Orchestrating 21st century learning in higher education: A perspective on student voice. *British Journal of Educational Technology*, *48*(5), 1106–1118. https://doi.org/10.1111/bjet.12533

[11] Hooda, M., & Malik, V. (2023). *CATALYSING NPE-2020 'S VISION OF HOLISTIC AND MULTIDISCIPLINARY HIGHER EDUCATION WITH TECHNO-PEDAGOGICAL INNOVATIONS*. *August*. https://doi.org/10.5281/zenodo.8227257

[12] Ibrahim, M. Y., Yusof, M. R., Yaakob, M. F. M., & Othman, Z. (2019). Communication skills: Top priority of teaching competency. *International Journal of Learning, Teaching and Educational Research*, *18*(8), 17–30. https://doi.org/10.26803/ijlter.18.8.2

[13] Japee, G., & Oza, P. (2021). Curriculum and evaluation in outcome-based education. Psychology and Education Journal, 58(2), 5620-5625.

[14] Japee, G. (2021, August). New Directions in Higher Education in the Post COVID-19 Era-Global Perspective. In Proceedings of the 1st International Conference on Education, Humanities, Health and Agriculture, ICEHHA 2021, 3-4 June 2021, Ruteng, Flores, Indonesia.

[15] Japee, G. P. (2019). Predicament of Knowledge Society: An Inquiry. International Journal of Interreligious and Intercultural Studies, 2(2), 60-67.

[16] Karakolis, E., Kapsalis, P., Skalidakis, S., Kontzinos, C., Kokkinakos, P., Markaki, O., & Askounis, D. (2022). Bridging the Gap between Technological Education and Job Market Requirements through Data Analytics and Decision Support Services. *Applied Sciences (Switzerland)*, *12*(14). https://doi.org/10.3390/app12147139

[17] Khajuria, R., Sharma, A., & Sharma, A. (2023). A detailed survey regarding the usage of different ICT technology modes adopted by higher education institutions. *Indonesian Journal of Electrical Engineering and Computer Science*, *29*(3), 1634–1641. https://doi.org/10.11591/ijeecs.v29.i3.pp1634-1641

[18] Khlaisang, J., & Koraneekij, P. (2019). Open online assessment management system platform and instrument to enhance the information, media, and ICT literacy skills of 21st century learners. *International Journal of Emerging Technologies in Learning*, *14*(7), 111–127. https://doi.org/10.3991/ijet.v14i07.9953

[19] Kooi, L. T., & Ping, T. A. (2012). Assuring the quality of online teaching and learning: The case of Wawasan Open University. *Asian Association of Open Universities Journal*, *7*(1), 13–33. https://doi.org/10.1108/AAOUJ-07-01-2012-B002

[20] Kuzmenko, A., Chernova, T., Kravchuk, O., Kabysh, M., & Holubenko, T. (2023). Innovative Educational

Technologies: European Experience and its Implementation in the Training of Specialists in the Context of War and Global Challenges of the 21st Century. *Journal of Curriculum and Teaching*, *12*(5), 68. https://doi.org/10.5430/jct.v12n5p68

[21] Lavi, R., Tal, M., & Dori, Y. J. (2021). Perceptions of STEM alumni and students on developing 21st century skills through methods of teaching and learning. *Studies in Educational Evaluation*, *70*, 101002. https://doi.org/10.1016/j.stueduc.2021.101002

[22] Li, G., Alfred, R., & Wang, X. (2021). Student Behavior Analysis and Research Model Based on Clustering Technology. *Mobile Information Systems*, *2021*. https://doi.org/10.1155/2021/9163517

[23] Liesa-Orús, M., Latorre-Cosculluela, C., Vázquez-Toledo, S., & Sierra-Sánchez, V. (2020). The technological challenge facing higher education professors: Perceptions of ICT tools for developing 21st Century skills. *Sustainability (Switzerland)*, *12*(13). https://doi.org/10.3390/su12135339

[24] Liu, Z., Moshi, G. J., & Awuor, C. M. (2019). Sustainability and indicators of newly formed world-class universities (NFWCUs) between 2010 and 2018: Empirical analysis from the rankings of ARWU, QSWUR and THEWUR. *Sustainability (Switzerland)*, *11*(10). https://doi.org/10.3390/su11102745

[25] López, H. A., Ponce, P., Molina, A., Ramírez-Montoya, M. S., & Lopez-Caudana, E. (2021). Design framework based on tec21 educational model and education 4.0 implemented in a capstone project: A case study of an electric vehicle suspension system. *Sustainability (Switzerland)*, *13*(11), 0–22. https://doi.org/10.3390/su13115768

[26] Magen-Nagar, N., & Maskit, D. (2016). Integrating ICT in teacher colleges - A change process. *Journal of Information Technology Education: Research*, *15*(2016), 211–232. https://doi.org/10.28945/3512

[27] Ortega-Ruipérez, B. (2022). The Role of Metacognitive Strategies in Blended Learning: Study Habits and Reading Comprehension. *RIED-Revista Iberoamericana de Educacion a Distancia*, *25*(2), 219–238. https://doi.org/10.5944/ried.25.2.32056

[28] Øvrelid, E. (2022). Exploring the Alignment between Digital Strategies and Educational Practices in Higher Education Infrastructures. *Education Sciences*, *12*(10). https://doi.org/10.3390/educsci12100711

[29] Pérez-Rodríguez, R., Lorenzo-Martin, R., Trinchet-Varela, C. A., Simeón-Monet, R. E., Miranda, J., Cortés, D., & Molina, A. (2022). Integrating Challenge-Based-Learning, Project-Based-Learning, and Computer-Aided Technologies into Industrial Engineering Teaching: Towards a Sustainable Development Framework. *Integration of Education*, *26*(2), 198–215. https://doi.org/10.15507/1991-9468.107.026.202202.198-215

[30] Sandhya, S., Koppad, S. H., Anupama Kumar, S., Dharani, A., Uma, B. V., & Subramanya, K. N. (2020). Adoption of google forms for enhancing collaborative stakeholder engagement in higher education. *Journal of Engineering Education Transformations*, *33*(Special Issue), 283–289. https://doi.org/10.16920/jeet/2020/v33i0/150161

[31] Seau, L. S., & Azman, H. (2021). Integrating facebook as a web 2.0 tool in a responsive pedagogy for multimodal oral presentation skills. *GEMA Online Journal of Language Studies*, *21*(3), 103–124. https://doi.org/10.17576/GEMA-2021-2103-06

[32] Serdyukov, P. (2015). Does online education need a special pedagogy? *Journal of Computing and Information Technology*, *23*(1), 61–74. https://doi.org/10.2498/cit.1002511

[33] Shah, B. D., & Choksi, D. B. (2019). Big data analytics model for the education sector. *International Journal of Innovative Technology and Exploring Engineering*, *8*(12), 1785–1789. https://doi.org/10.35940/ijitee.L2834.1081219

[34] Simeunovic, V., Milic, S., & Pajrok, A. (2022). Higher Education in the Eyes of Economic Operators. *Sustainability (Switzerland)*, *14*(13). https://doi.org/10.3390/su14137973

[35] Villalba, M. T., Castilla, G., & Redondo-Duarte, S. (2018). Factors with influence on the adoption of the flipped classroom model in technical and vocational education. *Journal of Information Technology Education: Research*, *17*(October), 441–469. https://doi.org/10.28945/4121

[36] West, J., & Malatji, M. J. (2021). Technology Integration in Higher Education: The use of Website Design Pedagogy to Promote Quality Teaching and Learning. *Electronic Journal of E-Learning*, *19*(6), 629–641. https://doi.org/10.34190/ejel.19.6.2557

[37] Yang, L. (2022). Research on Strategies of Promoting Mental Health of Higher Vocational College Students Based on Data Mining. *Wireless Communications and Mobile Computing*, *2022*. https://doi.org/10.1155/2022/3719882

[38] Zhong, L. (2017). Indicators of Digital Leadership in the Context of K-12 Education. *Journal of Educational Technology Development and Exchange*, *10*(1). https://doi.org/10.18785/jetde.1001.03

https://www.gapinterdisciplinarities.org/