Faculty of Natural and Applied Sciences Journal of Applied and Physical Sciences
Print ISSN: 3026-9857
www.fnasjournals.com
Volume 2; Issue 1; September 2024; Page No. 65-71.

Technology-Enhanced Learning and Curriculum Innovations: Strategies for Alternative Education and Sustainable Development

[1]Iroriteraye-Adjekpovu, J.I., & *[2]Nwabuaku, L.
[1]Department of Science Education, Delta State University Abraka, Nigeria.
[2]Department of Science Education, Delta State University Abraka, Nigeria.

***Corresponding author email**: *lnwabuaku@delsu.edu.ng*

Abstract
This paper examined the potential benefits of technology-enhanced learning (TEL) as a curriculum innovation for achieving sustainable development and alternative education. The study adopted the descriptive qualitative research approach and responded to two research questions by reviewing related works of literature. The concept of TEL was thus explored, as well as how it can be used to support equal opportunities for all students, enhance their engagement and motivation, and develop their critical thinking, and problem-solving skills. Furthermore, the study scrutinized the implications of curriculum innovations on alternative education models, particularly their capacity to promote social and environmental sustainability. It was suggested that the Nigerian government develop a national policy framework and action plan for TEL that aligns with the national vision, goals, and priorities for education and sustainable development. The research thus fills a knowledge gap that informs and guides education stakeholders on the need to integrate technology and innovative curriculum designs to advance sustainable development and alternative education.

Keywords: Alternative Education Models, Curriculum Innovations, Sustainable Development, Technology-Enhanced Learning.

Introduction

Curriculum innovations involve the introduction of new strategies, methods, or content to better or cater to the evolving needs and expectations of learners, educators, and society. These changes aim to enhance the educational experience and improve the overall outcome of education. The innovations in the curriculum may encompass the introduction of fresh knowledge, skills, or competencies needed for success in the 21st century. It may also involve the integration of new pedagogical approaches or theories, the adoption of cutting-edge technologies or media, the implementation of new policies or standards, and the tackling of emerging social or environmental challenges (Supraini et al., 2022). Contemplating curriculum innovations in Nigeria has become a necessary discourse if the Nigerian educational system must be improved upon such that it can be subservient to the needs and aspirations of the Nigerian people. As such, goals, objectives, content, methods, materials, assessment, or evaluation must all be well thought-out when considering a curriculum innovation that can meaningfully deliver sustainable national development. In negotiating for better student achievement, Widowati et al. (2023) pointed out that digital literacy is one of the factors that contribute to improving students' academic achievement when considering curriculum innovations. This study therefore hinges on the belief that educators can become successful drivers of sustainable development through useful and effective curriculum innovation such as Technology-enhanced learning. Sustainable development in this respect refers to the process of meeting the educational needs of the present without compromising in any way, the ability of future generations to meet their own educational and socio-economic needs (Sinakou et al., 2019). This concept thus bothers around three dimensions: economic, social, and environmental; and any form of innovation that seeks to engage the concept of sustainability must require the integration of these dimensions to achieve a reasonable level of well-being for mankind and its planet. To deliberate about driving sustainable national development through curriculum innovation therefore calls for an indebt consideration of alternative education models such as technology-enhanced learning (TEL) (Banga Chhokar, 2010).

Alternative education programs may be seen as forms of educational practices that differ from conventional education systems or methods, as they strive to push past the limits of traditional boundaries in education. When effectively applied, alternative education programs or practices can help to provide access and equity for marginalized or disadvantaged learners, offer choice and diversity for learners with different needs, interests, or preferences, and promote creativity and innovation such that the environment and learners' well-being are taken

Cite this article as:
Iroriteraye-Adjekpovu, J.I., & Nwabuaku, L. (2024). Technology-enhanced learning and curriculum innovations: Strategies for alternative education and sustainable development. *FNAS Journal of Applied and Physical Sciences, 2*(1), 65-71.

alike in the teaching-learning process. Alternative education programs may differ in philosophy, pedagogy, organization, or delivery depending on the objective that the educator aspires to achieve (Al-Ani, 2017). This study, however, focuses on the prospects of technology-enhanced learning (TEL) as a curriculum innovation strategy for driving alternative education and sustainable national development.

Technology Enhanced Learning (TEL) therefore refers to the practice of various technologies to support and enhance the teaching and learning process. TEL can benefit learners and teachers alike, from formal to informal education and online to face-to-face delivery by enhancing motivation, environmental conservation (by reducing the use of materials e.g. paper, whose end products constitute environmental pollution), facilitating collaboration, and improving learners' outcomes. TEL when effectively applied, thus has the potential to revolutionize education in ways that cannot be over-emphasized. However, it also presents challenges that involve technical and cost issues which must be addressed to fully harness its potential (Duval, et al., 2017). Nigeria faces numerous challenges in its education system, such as limited access to quality education, teacher methodologies, inadequate infrastructure, and learning resources (Ogunode, 2022). The country also faces challenges in its sustainable development agenda, such as poverty, inequality, and environmental degradation (Ike, 2017). To address these challenges, the Nigerian education system needs to understand the importance of adopting curriculum innovation strategies that can leverage the potential of technology to deliver quality education while maintaining environmental awareness. This study is necessary to bridge the knowledge gap required to understand technology-enhanced learning (TEL) as an alternative education model for curriculum innovation in Nigeria.

Research questions

1. What is Technology-enhanced learning, its' characteristics, advantages, and limitations?
2. What implications does curriculum innovation have on alternative education models?

Methodology

The study utilizes a descriptive qualitative research approach, which thoroughly analyzes relevant literature to investigate the research questions. This approach necessitates researchers to meticulously examine and analyze various pieces of literature while ensuring that any predetermined assumptions about the subjects are set aside to uphold an impartial and objective perspective. Based on the research questions which guided the study, works of literature were reviewed to establish a deep understanding of Technology-enhanced learning, its implications on curriculum innovation and as an alternative education model.

Technology Enhanced Learning (Tel): Definition, Characteristics, Advantages, Limitations and Challenges

The idea of Technology Enhanced Learning (TEL) is vast and ever-changing. It includes different definitions, features, benefits, drawbacks, and obstacles. Although TEL can be highly advantageous for both learners and teachers, it is essential to plan, execute, and evaluate it carefully to ensure its quality and effectiveness. While Technology-Enhanced Learning (TEL) may not be able to address every educational challenge, it has the potential to be a powerful and promising tool that can effectively support and enhance existing teaching methods. Additionally, TEL is not intended to replace human interactions but rather to facilitate and mediate valuable and authentic learning experiences. It is a flexible and dynamic process that can adapt and innovate to meet the evolving needs and expectations of learners, teachers, and society (Kori et al., 2014).

Definition of Technology-Enhanced Learning

The exact definition of TEL varies because different authors and organizations emphasize different aspects of the concept. However, in general, TEL refers to technology-enhanced learning (TEL) as any technology that enhances the learning experience. The term "Technology-Enhanced Learning" (TEL) encompasses both analogue and digital technologies. However, in recent times, TEL has been mostly linked with the use of computer-based technologies, including smartphones, tablets, laptops, desktops, interactive whiteboards, learning management systems, educational software, apps, games, simulations, virtual reality, augmented reality, and artificial intelligence (Passey, 2019). These technologies can be used to support various learning activities, such as accessing information, communicating with others, collaborating on projects, creating content, solving problems, reflecting on learning outcomes, and assessing learning progress (Kirkwood & Price, 2014).

Characteristics of Technology-Enhanced Learning

TEL has several characteristics that distinguish it from traditional learning methods. Some of these characteristics are:

i. Interactivity: TEL enables learners to interact with the learning content, the teacher, and other learners in various ways. For example, learners can click on hyperlinks, watch videos, listen to audio clips, answer questions, give feedback, chat with peers or instructors, participate in forums or blogs, play games or quizzes, and still maintain an excellent learning pace.

ii. Multimedia: TEL allows learners to access and create learning content in multiple formats and modalities. For example, learners can read text or images, view graphics or animations, listen to speech or music, and watch video or film clips.
iii. Adaptivity: TEL can provide learners with personalized and differentiated learning experiences based on their preferences, needs, abilities, interests, goals, and prior knowledge. For example, learners can choose their learning paths, pace, difficulty level, language, style, and feedback options.
iv. Accessibility: TEL can make learning more accessible and convenient for learners who may face barriers due to time, location, cost, disability, or other factors. For example, learners can access learning materials anytime and anywhere via the internet or offline modes, use assistive technologies or devices to overcome physical or cognitive challenges, and benefit from reduced tuition fees or open educational resources.
v. Collaboration: TEL can facilitate collaborative learning among learners who may be geographically dispersed or culturally diverse. For example, learners can work together on group projects, share ideas and resources, co-create content, peer-review each other's work, and engage in social learning networks.
vi. Innovation: TEL can foster innovation and creativity in both teaching and learning by providing new possibilities and opportunities for exploring new topics, methods, tools, and outcomes. For example, learners can experiment with new technologies or media, discover new information or perspectives, create original products or artifacts, and solve real-world problems. (Fominykh et al., 2022, Urbina et al., 2021, Aprea & Cattaneo, 2019, Fink & Heinze, 2010).

Advantages of Technology-Enhanced Learning

TEL has many advantages for both learners and teachers. Some of these advantages are:

a. Enhanced motivation: TEL can increase learners' motivation and engagement by making learning more fun, relevant, meaningful, and rewarding. For example, learners can enjoy the variety and richness of multimedia content, the challenge and feedback of interactive activities, the choice and autonomy of adaptive features, the convenience and flexibility of accessible modes, the social and emotional support of collaborative peers, and the satisfaction and recognition of innovative outcomes.
b. Improved outcomes: TEL can improve learners' outcomes by enhancing their cognitive, affective, and behavioural skills and competencies. For example, learners can develop their knowledge, understanding, memory, reasoning, problem-solving, critical thinking, creativity, communication, collaboration, self-regulation, metacognition, motivation, attitude, confidence, and performance.
c. Enriched pedagogy: TEL can enrich teachers' pedagogy by expanding their repertoire of teaching strategies, methods, resources, and assessment options. For example, teachers can use various technologies to deliver content, facilitate interaction, support differentiation, provide feedback, monitor progress, evaluate achievement, and promote reflection. (Savov et al. 2017, Karunathilake, 2017, Daniela et al. 2017, Dubey & Sahu, 2021, Nwabuaku, 2022).

Limitations and Challenges of TEL

TEL also has limitations and challenges that must be addressed and overcome. Some of these challenges include;

1. Technical issues: TEL may encounter technical issues that affect the quality and reliability of the technology itself or the network infrastructure that supports it. For example, there may be problems with hardware malfunction, software bugs, Internet connectivity, bandwidth, security, privacy, or compatibility.
2. Cost issues: TEL may incur cost issues that affect the affordability and sustainability of the technology or the resources that are required to implement it. For example, there may be expenses related to hardware acquisition, software development, content production, maintenance, upgrading, licensing, or subscription.
3. Human issues: TEL may face human issues that affect the attitudes and behaviours of the users or the stakeholders who are involved in or affected by it. For example, there may be resistance to change, lack of awareness, knowledge, skills, or confidence, low motivation, interest, or engagement, isolation, loneliness, or frustration.
4. Pedagogical issues: TEL may pose pedagogical issues that affect the effectiveness and appropriateness of the technology or the learning design that is applied to it. For example, there may be challenges with alignment, integration, adaptation, evaluation, or improvement. (Kirkwood & Price 2013, Petrucci et al., 2017, Sukackė 2019, Passey 2021, Iroriteraye-Adjekpovu & Nwabuaku, 2024).

Curriculum Innovations: Implications for Alternative Education Models

Alternative education models are increasingly being acknowledged and embraced as effective alternatives to traditional educational systems. These models provide unique approaches to learning that cater to diverse student needs, interests, and goals. Curriculum innovations play a pivotal role in shaping these alternative education models, as they provide flexibility, relevance, and creative approaches to teaching and learning (Chen, et al., 2021). The following can therefore be considered as the implications of curriculum innovations for alternative

education models such as Technology-Enhanced Learning, highlighting their potential to promote inclusivity, personalization, and sustainable development.

Inclusivity and Personalization:
Modern education models prioritize inclusivity and personalization, tailoring instructional strategies and content to meet the unique needs of each student. This approach moves away from the traditional one-size-fits-all approach and allows students to learn at their own pace and in ways that resonate with their learning styles. Additionally, these models recognize the importance of holistic development, encompassing not only academic subjects but also social-emotional learning, life skills, and personal growth. Experiential and project-based learning are often emphasized, enabling students to gain critical thinking, problem-solving, collaboration, and creativity skills. Learners also have the opportunity to co-create their learning experiences, choosing topics of interest and engaging in self-directed exploration. This empowerment fosters deeper engagement and motivation, as students connect their education to their aspirations and interests (Walkington & Bernacki, 2020, Alamri et al., 2021, Iroriteraye-Adjekpovu, 2022).

Sustainable Development:
New approaches to curriculum in alternative education have the potential to advance sustainable development. Alternative education models are increasingly recognizing the environmental, social, and economic challenges we face. As a result, fresh curricula are being designed to increase awareness, empathy, and engagement in sustainable practices. For example, alternative education curricula may feature environmental education and sustainability as fundamental elements. Students gain knowledge about how various systems are interdependent and how individual and collective actions impact local and global ecosystems. This method promotes a sense of responsibility and dedication to environmental stewardship. Innovations in alternative education curricula may also integrate social justice and equity as central themes. By examining issues of privilege, discrimination, and social inequalities, learners are encouraged to be catalysts for change in their communities. This emphasis on social justice equips students with the knowledge and skills required to confront societal challenges and strive toward a just and equitable world (Mulà et al., 2017, Leal Filho et al., 2019, Nwabuaku et al., 2023).

Collaboration and Community Engagement:
In innovative education approaches, the curriculum places a high priority on collaboration and involvement with the community. These models recognize the importance of establishing meaningful connections with the community, as well as the practical application of knowledge in real-life scenarios. Students are encouraged to engage in service-learning projects, internships, and partnerships with external organizations. This emphasis on collaboration and community involvement encourages students to become socially responsible by actively addressing community needs. Additionally, it provides a more comprehensive understanding of how classroom learning is intertwined with real-world experiences. These experiences enable students to acquire practical skills, expand their professional network, and develop a more comprehensive perspective on social issues (Graham, 2007, Scott & Scott, 2010, Blackmore et al., 2011, Willness & Bruni-Bossio, 2017). Simanjuntak et al. (2023) in support of learning technologies discovered that a positive relationship exists between students' independence and learning outcomes, and encouraged the utilization of technology-enhanced learning which promotes the learners' independence. Regardless of the limitations and challenges of implementing TEL, its benefit in the postmodern education milieu cannot be overemphasized. Through embracing these advancements, societies can cultivate individuals with a commitment to continuous learning, being equipped to navigate the intricacies of the 21st century and contribute to a sustainable and equitable future.

Conclusion
As the landscape of education evolves rapidly, it is crucial to continue exploring innovative approaches that prioritize the well-being and success of all learners. TEL has been explored in this light to refer to the different types of technologies, from analogue to digital, and from hardware to software that may be utilized to improve the teaching-learning process in unimaginable dimensions. It proposes many benefits for both learners and teachers, such as enhancing motivation, improving outcomes, and enriching pedagogy. Technology-enhanced learning thus offers Curriculum innovations in alternative education that can be instrumental in creating educational experiences that are relevant, empowering, and purposeful.

Suggestions
Based on the literature engaged in developing this study, the Nigerian educational system needs to adopt innovative strategies that can leverage the potential of technology-enhanced learning and curriculum innovations to provide alternative education opportunities for its diverse learners and to promote sustainable development goals. Some of these strategies include:

Cite this article as:
Iroriteraye-Adjekpovu, J.I., & Nwabuaku, L. (2024). Technology-enhanced learning and curriculum innovations: Strategies for alternative education and sustainable development. *FNAS Journal of Applied and Physical Sciences, 2*(1), 65-71.

i. Developing a national policy framework and action plan for TEL that aligns with the national vision, goals, and priorities for education and sustainable development
ii. Establishing a national coordination mechanism and partnership platform for TEL that involves relevant stakeholders from government, education sector, private sector, civil society, and international organizations
iii. Building the capacity of teachers, learners, and education managers to effectively utilize technology-enhanced learning (TEL) for teaching, learning, and administration
iv. Providing adequate infrastructure, equipment, connectivity, and power supply to enable access and use of TEL in various settings
v. Developing quality, relevant, and inclusive TEL content, materials, and resources that reflect the national curriculum standards and objectives
vi. Implementing innovative TEL pedagogies and practices that foster learner-centeredness, interactivity, collaboration, creativity, and problem-solving
vii. Integrating TEL into formal, non-formal, and informal education programs that cater to the diverse needs, interests, and preferences of learners
viii. Promoting TEL for lifelong learning and skills development that enhance employability, entrepreneurship, and citizenship
ix. Evaluating the impact and effectiveness of TEL on learning outcomes, learner satisfaction, teacher performance, and system efficiency
x. Enhancing the awareness, advocacy, and communication of TEL benefits and opportunities among various stakeholders.

References

Alamri, H. A., Watson, S., & Watson, W. (2021). Learning Technology Models that Support Personalization within Blended Learning Environments in Higher Education. *TechTrends, 65(1),* 62-78.

Al-Ani, W. (2017). Alternative Education Needs in Oman: Accommodating Learning Diversity and Meeting Market Demand. *International Journal of Adolescence and Youth, 22(3),* 322-336. DOI: 10.1080/02673843.2016.1179204

Aprea, C., & Cattaneo, A. A. (2019). *Designing Technology-Enhanced Learning Environments in Vocational Education and Training.* The Wiley Handbook of Vocational Education and Training, 373-393. https://doi.org/10.1002/9781119098713.ch19

Banga Chhokar, K. (2010). Higher Education and Curriculum Innovation for Sustainable Development in India. *International Journal of Sustainability in Higher Education, 11(2),* 141-152. https://doi.org/10.1108/14676371011031865

Blackmore, J., Bateman, D., Cloonan, A., Dixon, M., Loughlin, J., O'Mara, J., & Senior, K. (2011). *Innovative Learning Environments Research Study*. Victoria: Department of Education and Early Childhood Development, 1-61.

Chen, Z., Chia, A., & Bi, X. (2021). Promoting Innovative Learning in Training and Adult Education – A Singapore Story. *Studies in Continuing Education, 43*(2), 196-207. https://doi.org/10.1080/0158037X.2020.1772224

Daniela, L., Kalniņa, D., & Strods, R. (2017). An Overview on Effectiveness of Technology Enhanced Learning (TEL). *International Journal of Knowledge Society Research (IJKSR), 8*(1), 79-91. DOI: 10.4018/IJKSR.2017010105

Dubey, P., & Sahu, K. K. (2021). Students' Perceived Benefits, Adoption Intention and Satisfaction to Technology-Enhanced Learning: Examining the Relationships. *Journal of Research in Innovative Teaching & Learning, 14*(3), 310-328. DOI: https://doi.org/10.1075/pc.16.2.02dro

Duval, E., Sharples, M., & Sutherland, R. (2017). *Technology Enhanced Learning.* New York: Springer. https://doi.org/10.1007/978-3-319-02600-8

Fink, J., & Heinze, N. (2010). Characteristics of a Technology-Enhanced Learning Community: A Social Network Analysis in STELLAR European Network of Excellence. *7th International Conference on Applications of Social Network Analysis ASNA 2010* (p. 45).

Fominykh, M., Weidlich, J., Kalz, M., & Hybertsen, I. D. (2022). What do they TEL (L)? A Systematic Analysis of Master Programs in Technology-enhanced Learning. *International Journal of Educational Technology in Higher Education, 19*(1), 1-25. https://doi.org/10.1186/s41239-021-00305-7

Graham, P. (2007). Improving Teacher Effectiveness through Structured Collaboration: *A Case Study of a Professional Learning Community. RMLE online, 31*(1), 1-17. https://doi.org/10.1080/19404476.2007.11462044

Ike, P. (2017). Problems and Prospects of Secondary Education in Nigeria. *International Journal of Education and Evaluation, 3*(1), 44-51.

Iroriteraye-Adjekpovu, J. I (2022). Interactive Radio Response (IRR) Effectiveness in Small-class Size Chemistry Students Achievement. *Journal of Education, Society, and Behavioural Science, 35*(3), 32-38.

Iroriteraye-Adjekpovu & Nwabuaku (2024). A Comparative Study on the Effectiveness of Traditional and Computer-Assisted Instruction Methods in Determining Students' Achievement on Graph Plotting. *European Journal of Contemporary Education and E-Learning, 2*(1), 1-5. DOI: 10.59324/ejceel.2024.2(1).

Karunathilake, I. M. (2017). Technology Enhanced Learning with Limited Resources-Transforming Limitations into Advantages. *South-East Asian Journal of Medical Education, 11*(1), 1-2. DOI: 10.4038/seajme.v11i1.1

Kirkwood, A., & Price, L. (2013). Examining Some Assumptions and Limitations of Research on the Effects of Emerging Technologies for Teaching and Learning in Higher Education. *British Journal of Educational Technology, 44*(4), 536-543. https://doi.org/10.1111/bjet.12049

Kirkwood, A., & Price, L. (2014). Technology-Enhanced Learning and Teaching in Higher Education: What is 'Enhanced' and How Do We Know? A Critical Literature Review. *Learning, Media and Technology, 39*(1), 6-36. DOI: 10.1080/17439884.2013.770404

Kori, K., Pedaste, M., Leijen, Ä., & Mäeots, M. (2014). Supporting Reflection in Technology-Enhanced MulaLearning. *Educational Research Review, 11*, 45-55. https://doi.org/10.1016/j.edurev.2013.11.003

Leal Filho, W., Vargas, V. R., Salvia, A. L., Brandli, L. L., Pallant, E., Klavins, M., ... Vaccari, M. (2019). The Role of Higher Education Institutions in Sustainability Initiatives at the Local Level. *Journal of Cleaner Production, 233*, 1004-1015. https://doi.org/10.1016/j.jclepro.2019.06.059

Mulà, I., Tilbury, D., Ryan, A., Mader, M., Dlouhá, J., Mader, C., ... & Alba, D. (2017). Catalysing Change in Higher Education for Sustainable Development: A Review of Professional Development Initiatives for University Educators. *International Journal of Sustainability in Higher Education, 18*(5), 798-820.

Nwabuaku, L. (2022). Understanding Curriculum Theorizing in Post-Covid Era: Fundamental Issues and Prospects in Nigeria. *Journal of the Professional Association of Curriculum Theorists and Practitioners in Nigeria. 1*(1). 51-61. https://www.researchgate.net/publication/376436010

Nwabuaku, L. (2023). Teachers' Commitment as a Predictor of Students' Academic Performance in Biology. *Delsu Journal of Educational Research and Development 20*(1), 100-108. https://www.researchgate.net/publication/373924115

OGUNODE, N. J. (2022). Basic Education in Nigeria: Challenges and Way Forward. *Journal of Intellectual Property and Human Rights, 1*(2), 1-13.

Passey, D. (2019). Technology-Enhanced Learning: Rethinking the Term, the Concept and its Theoretical Background. *British Journal of Educational Technology, 50*(3), 972-986. https://doi.org/10.1111/bjet.12783

Passey, D. (2021). Possibilities, benefits, and limitations of embedding Technology Enhanced and Remote Teaching and Learning in Compulsory Education and Not Just Because of Covid-19. *Malta Journal of Education, 2*(1), 6-20. https://eprints.lancs.ac.uk/id/eprint/159781/

Petrucci, C., La Cerra, C., Caponnetto, V., Franconi, I., Gaxhja, E., Rubbi, I., & Lancia, L. (2017). Literature-Based Analysis of the Potentials and the Limitations of Using Simulation in Nursing Education: Methodologies and Intelligent Systems for Technology Enhanced Learning: *7th International Conference* (pp. 57-64). Springer.

Savov, T., Terzieva, V., Todorova, K., & Kademova-Katzarova, P. (2017). Contemporary Technology Support for Education. *CBU International Conference Proceedings, 5*, 802-806. http://dx.doi.org/10.12955/cbup.v5.1029

Scott, D. E., & Scott, S. (2010). Innovations in the Use of Technology and Teacher Professional Development in Online Learning Communities and Teacher Professional Development: Methods for Improved Education Delivery. *IGI Global*, 169-189. DOI: 10.4018/978-1-60566-780-5.ch010

Simanjuntak, M. P., Sihite, E. I., & Suyanti, R. D. (2023). The effect of blended learning with edmodo-assisted scientific approach on independence and science learning outcomes. *International Journal of Instruction, 16*(4), 135-154. https://doi.org/10.29333/iji.2023.1649a

Sinakou, E., Boeve-de Pauw, J., & Van Petegem, P. (2019). Exploring the Concept of Sustainable Development within Education for Sustainable Development: Implications for ESD Research and Practice. Environment. *Development and Sustainability, 21*(1). 1-10. https://doi.org/10.1007/s10668-017-0032-8

Sukackė, V. (2019). Towards Adoption of Technology-Enhanced Learning: Understanding its Benefits and Limitations. In CEUR Workshop Proceedings: IVUS 2019 International Conference on Information Technologies: *Proceedings of the International Conference on Information Technologies, Kaunas, Lithuania, April 25, 2019. CEUR-WS, 2470*, 86-90.

Supriani, Y., Meliani, F., Supriyadi, A., Supiana, S., & Zaqiah, Q. (2022). The Process of Curriculum Innovation: Dimensions, Models, Stages, and Affecting Factors. Nazhruna: *Jurnal Pendidikan Islam, 5*(2), 485-500. https://doi.org/10.31538/nzh.v5i2.2235

Urbina, S., Villatoro, S., & Salinas, J. (2021). Self-Regulated Learning and Technology-Enhanced Learning Environments in Higher Education: A Scoping Review. *Sustainability, 13*(13), 7281. https://doi.org/10.3390/su13137281

Walkington, C., & Bernacki, M. L. (2020). Appraising Research on Personalized Learning: Definitions, Theoretical Alignment, Advancements, and Future Directions. *Journal of Research on Technology in Education, 52*(3), 235-252. https://doi.org/10.1080/15391523.2020.1747757

Widowati, A., Siswanto, I., & Wakid, M. (2023). Factors affecting students' academic performance: Self-efficacy, digital literacy, and academic engagement effects. *International Journal of Instruction, 16*(4), 885-898. https://doi.org/10.29333/iji.2023.16449a

Willness, C., & Bruni-Bossio, V. (2017). The Curriculum Innovation Canvas: A Design Thinking Framework for the Engaged Educational Entrepreneur. *Journal of Higher Education Outreach and Engagement, 21*(1), 134-164.