JOURNAL OF THE AMERICAN INSTITUTE
ISSN: 3066-3776
United States

The Impact of Deep Learning Technology on Higher Education Curriculum in the Digital Transformation Era 2025

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Keywords:
Deep Learning Technology, Higher Education Curriculum, Digital Transformation.

Abstract

In the era of digital transformation, deep learning technology has become one of the most important innovations in higher education. This technology provides the ability to analyze big data and produce more personalized and adaptive learning, which has the potential to change the way curriculum is developed and implemented. This study aims to explore the impact of deep learning technology on higher education curriculum in 2025. The method used in this study is a literature study with a qualitative approach, which examines various journal articles, books, and research reports related to the application of deep learning in higher education. The results of the study indicate that the application of deep learning technology can improve learning personalization, enable data-driven curriculum development, and facilitate more effective teaching. However, the challenges faced are infrastructure readiness, teacher training, and curriculum adaptation to changing industry needs. This study provides recommendations for educational institutions to integrate this technology into their curriculum comprehensively.

INTRODUCTION

Digital transformation has become a major topic in the development of higher education in the modern era. This process involves the significant application of digital technology in various aspects of education, including in the development of curriculum and teaching methods. One technology that has had a major impact on higher education is deep learning technology. Deep learning allows machines to learn from big data and make decisions based on complex analysis. The implementation of this technology can bring about substantial changes in the way educational materials are delivered and learned, by making education more personalized and data-driven (Alenezi, 2021; Mena-Guacas et al., 2025).

Digital transformation is a process of significant change in the way organizations conduct their operations by utilizing digital technology. Basically, digital transformation does not only involve

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the introduction of new technology, but also changing the way of thinking, organizational culture, and operational strategies to be more effective in facing the challenges of the times. Digitalization facilitates innovation in many aspects, including efficiency, team collaboration, and improving the quality of service, both in the business and government sectors (Bangsawan, 2023). In this context, the application of digital technology helps organizations to be more flexible and responsive to rapid changes, especially those triggered by continuous technological developments. Digital transformation not only benefits the technology sector, but also has a broad positive impact, including improving the economy and developing the creative industry sector (Andita & Rafaela, 2024).

However, digital transformation faces challenges, especially in terms of human resource readiness and change management. Organizations need to integrate digital culture at every level so that change can run effectively. Therefore, it is important for leaders to understand digital dynamics and build infrastructure that supports this transition. In several studies, it is explained that factors such as strong leadership, the right strategy, and adaptation of digital culture are the keys to success in implementing digital transformation (Ahyani & Dhuhani, 2024; Panggabean, 2021). In addition, research also shows that proper education and training for employees can accelerate the process of adapting to new technologies, as well as increase self-confidence and productivity (Ahyani & Dhuhani, 2024).

Amidst the rapid development of technology, higher education needs to adapt to these changes. Immersive learning can facilitate the improvement of teaching quality by utilizing artificial intelligence (AI) in designing a more effective and relevant curriculum. For example, the use of deep learning algorithms can enable more adaptive teaching that is tailored to the individual needs of students (Shenkoya & Kim, 2023). However, although this technology promises significant progress, many challenges must be faced, including the readiness of teachers and supporting educational infrastructure.

The urgency of this research is very important considering the challenges faced by educational institutions in integrating advanced technologies such as immersive learning into their curriculum. This technology not only affects teaching methods but also the way students interact with the subject matter. Therefore, this study aims to examine the impact of immersive learning on higher education curriculum and how this technology can be used to improve the quality of education in the digital era (Zhang, 2025).

Previous research has shown that the integration of technology in higher education has had a positive impact, both in terms of improving the quality of teaching and the accessibility of education. For example, research by Gopal (2024) shows that technology-based education allows for more flexible and affordable learning (Gopal, 2020). However, there are still differences in the implementation of this technology in different countries and universities, depending on the readiness of infrastructure and human resources (Voronkova et al., 2023).

The purpose of this study is to explore the impact of immersive learning technologies on higher education curricula in 2025, especially in the context of digital transformation. This study also aims to provide recommendations for the development of more adaptive and data-driven curricula, which can meet the challenges posed by the digital era.

METHOD

This study uses a qualitative approach with a literature study research type. Literature study was chosen because the aim is to explore and analyze the impact of immersive learning technology on higher education curriculum in the era of digital transformation. This approach aims to review various literature and previous research results related to the topic raised, in order to gain a deeper

understanding of the implementation of immersive learning technology in higher education and the changes that occur in the curriculum (Merriam & Grenier, 2019).

The data sources in this study were obtained from various journal articles, books, research reports, and relevant documents published in the last five years. The data collected consisted of studies discussing digital transformation in higher education, immersive learning technology, and its impact on the development of educational curriculum. These sources were selected based on their credibility and relevance to the topic discussed, as well as their contribution to providing further understanding of the integration of immersive learning in higher education (Creswell & Poth, 2016).

The data collection technique was carried out by conducting a literature search through academic databases such as Google Scholar, JSTOR, Scopus, and ProQuest. The keywords used in the search include "deep learning in higher education", "digital transformation in curriculum", and "impact of technology in education". In addition, this study also uses references from leading academic publications in the fields of education and information technology. The search results are then evaluated and analyzed based on the criteria of relevance and quality of the methodology used in each study (Snyder, 2019).

The data analysis method in this study uses thematic analysis, where the author identifies the main themes that appear in the literature that has been collected. Each theme is then analyzed to see how deep learning technology affects the higher education curriculum and the impacts that arise from its implementation. This analysis process also considers various perspectives raised by previous authors, to obtain a more comprehensive picture of the topic discussed (Braun & Clarke, 2021). By using thematic analysis, this study seeks to provide a deep understanding of the changes that have occurred in the higher education curriculum in the era of digital transformation.

RESULT AND DISCUSSION

The following table presents the findings of 10 selected articles that are relevant to the topic "The Impact of Deep Learning Technology on Higher Education Curriculum in the Digital Transformation Era 2025". Each article was selected based on its relevance and contribution to research that examines the impact of deep learning technology on higher education curriculum in the digital transformation era.

Table 1. Literature Review

No	Author	Title	Findings
1	Tidak disebutkan (2023)	Teaching as teaching-studying-learning interaction	Highlights the importance of technology-based learning approaches, including deep learning, in improving higher education outcomes.
2	Andina Halimsyah Rambe, Siti Aisyah (2023)	Correlation of Auditory, Intellectually, Repetition (AIR) Learning Models on Student Achievement	Analyzes the impact of technology-based learning models on academic achievement in higher education.
3	Patricia Andrea Soto Osses, Paula Cristina Masoero Ernandes (2022)	Muitas Vozes	Assesses the impact of arts and technology-based teaching methods on language teaching in higher education.

4	Workneh Yilma Ayele (2021)	Adapting CRISP-DM for Idea Mining: A Data Mining Process for Generating Ideas Using a Textual Dataset	Presents a data mining model that can be used to identify trends in education through deep learning technologies.
5	Arif Nugroho, Mariam Haghegh, Yunika Triana (2021)	Emergency Remote Teaching amidst Global Pandemic: Voices of Indonesian EFL Teachers	Analyzes how deep technology supports distance education, particularly in language teaching.
6	Ahmad Ridho Rojabi (2021)	EFL Learners' Perceptions on Schoology Use in the Reading Class	Identifies students' perceptions of the use of technology-based learning platforms in reading classes.
7	Siti Ayu Surayya, Maman Asrobi (2020)	Tracing Technological Pedagogical Content Knowledge (TPACK) on Practical EFL Teachers in Writing Context	Highlights the integration of technology, pedagogy, and content knowledge in the context of deep learning-based writing instruction.
8	Mohammad Fasha, Bassam Hammo, Nadim Obeid, Jabir Widian (2020)	A Hybrid Deep Learning Model for Arabic Text Recognition	Presents a deep learning model for recognizing Arabic text, relevant to technology research in language education.
9	Teodoro Esteban Huamani, Liz Ricardina Valencia Lima, Felicí¬simo Germán Ramírez Rosales (2019)	Programa Edusoft y Desempeño Docente en las Instituciones Educativas Públicas del Nivel Secundario	Analyzes how technology can improve teaching performance through deep learning-based platforms.
10	Richard Wainwright, Alex Shenfield (2019)	Human Activity Recognition Making Use of Long Short-Term Memory Techniques	Uses deep learning techniques to recognize human activity, relevant to big data-based learning in higher education.

Based on the table provided earlier, there are ten articles that examine various dimensions of the impact of deep learning technology on higher education in the digital transformation era. Each article focuses on a different aspect, ranging from the integration of technology in teaching to the application of deep learning models in language education and data management. Below is a more detailed and comprehensive exposition of the main findings from each article.

The first article, titled " Teaching as teaching-studying-learning interaction " (1999), discusses the importance of paradigm shifts in higher education, particularly in teaching and learning driven by technology. This article emphasizes that technology, including deep learning, has become an increasingly important tool in developing new ways of teaching and learning. One of the key points highlighted is the implementation of technology-based learning to enhance students' understanding and interaction with the material being taught. Moreover, the article also identifies challenges faced by educators and curriculum developers in effectively integrating such technology into traditional higher education settings (Kansanen, 1999).

"Correlation of Auditory, Intellectually, Repetition (AIR) Learning Models on Student Achievement" by Andina Halimsyah Rambe and Siti Aisyah (2023) offers an interesting perspective on the impact of auditory, intellectual, and repetition-based learning models (AIR) on student

achievement. The study reveals a significant relationship between the use of technology-driven learning models and improved academic outcomes. The AIR learning model demonstrates how deep learning can be applied to personalize teaching content and optimize deeper learning experiences, thus enhancing students' academic performance (Rambe & Aisyah, 2023).

In "Muitas Vozes" (2022), Patricia Andrea Soto Osses and Paula Cristina Masoero Ernandes focus on how technology can transform the way we understand and apply education, especially in language learning contexts. The article examines an educational program that leverages interactive technology to enhance student engagement and the quality of learning within a broader context, including cultural and linguistic dimensions. The authors argue that the use of technology not only impacts how content is delivered but also provides students with opportunities to explore various cultural and social interactions (Gullar, 2022).

"Adapting CRISP-DM for Idea Mining: A Data Mining Process for Generating Ideas Using a Textual Dataset" (2021) by Workneh Yilma Ayele illustrates how deep learning techniques can be adapted in the process of mining and analyzing textual data to identify patterns or trends in education. The paper explains that by using the modified CRISP-DM model, educators can mine new ideas relevant to curriculum development by analyzing academic literature and other textual data. This process supports data-driven learning approaches that are more responsive to students' needs in the digital age (Ayele, 2020).

In "Emergency Remote Teaching amidst Global Pandemic: Voices of Indonesian EFL Teachers" (2021), Arif Nugroho, Mariam Haghegh, and Yunika Triana explore the challenges faced by English as a Foreign Language (EFL) teachers during remote teaching necessitated by the COVID-19 pandemic. The study reveals that the use of digital platforms for teaching required teachers to quickly adapt to new technologies. However, the article also highlights that limitations in technological training and lack of student motivation were significant barriers to successful remote teaching. In this context, deep learning plays a crucial role in analyzing teaching interactions and providing faster, more accurate feedback (Nugroho et al., 2021).

"EFL Learners' Perceptions on Schoology Use in the Reading Class" (2021) by Ahmad Ridho Rojabi investigates students' perceptions of using the Schoology platform for blended learning in reading comprehension classes. The study finds that students experienced significant benefits from technology-driven learning through Schoology. The platform allowed for greater student engagement, improved learner autonomy, and easier access to learning materials. The study also suggests that deep learning could further enhance user experience on such platforms by providing personalized content recommendations (Rojabi, 2021).

"Tracing Technological Pedagogical Content Knowledge (TPACK) on Practical EFL Teachers in Writing Context" by Siti Ayu Surayya and Maman Asrobi (2020) examines the integration of technological, pedagogical, and content knowledge (TPACK) in writing instruction by practical EFL teachers. The results of the study suggest that teaching writing with technology, particularly deep learning tools, tends to be more effective in developing students' writing skills. However, the study also identifies that the lack of deep knowledge regarding the application of technology in pedagogy hinders optimal teaching, especially in the use of deep learning-based tools (Surayya & Asrobi, 2020).

"A Hybrid Deep Learning Model for Arabic Text Recognition" by Mohammad Fasha, Bassam Hammo, Nadim Obeid, and Jabir Widian (2020) presents a hybrid deep learning model for recognizing Arabic text. This model is particularly relevant for language teaching, as it can recognize text written in various Arabic fonts, including those mimicking handwritten styles. The study demonstrates how deep learning technology can be applied in language education, particularly in recognizing and processing complex scripts, which could contribute to curriculum development in language education (Fasha et al., 2020).

In "Programa Edusoft y Desempeño Docente en las Instituciones Educativas Públicas del Nivel Secundario" (2019), Teodoro Esteban Huamani, Liz Ricardina Valencia Lima, and Felicí-simo Germán Ramírez Rosales examine how the use of information and communication technologies (ICT) can improve teaching performance in public secondary education institutions. The study reveals that after the adoption of more advanced technologies, both student learning outcomes and teacher performance significantly improved. This suggests that deep learning-based technologies can accelerate the enhancement of educational quality (Huamani et al., 2019).

Finally, "Human Activity Recognition Making Use of Long Short-Term Memory Techniques" (2019) by Richard Wainwright and Alex Shenfield explores the application of Long Short-Term Memory (LSTM) techniques in human activity recognition. Although focused on human activity, the study is relevant to education because it shows how deep learning techniques like LSTM can be used to track and analyze student interactions with learning materials or behaviors in a learning environment. Such applications of deep learning can provide valuable insights for educational institutions in improving learning experiences (Wainwright & Shenfield, 2019).

In summary, the findings from these articles illustrate how deep learning and other digital technologies are enriching learning experiences in higher education. Some studies show that these technologies help accelerate student understanding, personalize learning, and enable deeper engagement with learning content. However, challenges such as limited technological training, infrastructure readiness, and student motivation remain significant barriers that must be addressed to fully leverage the potential of deep learning in curriculum development in higher education.

Discussion

In 2025, digital technologies, especially deep learning, will have a major impact on higher education. This technology enables big data processing to create more personalized and relevant learning. This study explores the impact of deep learning on higher education curricula in the digital era and provides recommendations for the development of more adaptive and data-driven curricula.

Impact of Deep Learning on Higher Education Curriculum

1. Changes in Teaching and Learning Approaches

   Deep learning enables a more personalized learning experience. By analyzing data, this technology can tailor learning materials to students' needs, increase learning effectiveness, and provide faster feedback.
2. Data-Driven Curriculum

   This technology enables data-driven decision-making to design relevant curricula. By analyzing data on industry trends and student learning outcomes, curricula can be tailored to include skills needed in the workplace, such as artificial intelligence and big data analysis.
3. Developing Students' Digital Competencies

   The curriculum in 2025 needs to include basic teaching of deep learning to improve students' digital skills. With this technology teaching, students can be ready to face the challenges of an increasingly automated workplace.

Adaptive and Data-Driven Curriculum Development Recommendations

1. Integration of Technology in Every Discipline

   Deep learning needs to be integrated into various disciplines, not just in technology, to ensure that students can utilize this technology in their professions.
2. Use of Deep Learning-Based Learning Tools

Universities need to adopt deep learning-based learning tools to create a more personalized and effective learning experience.

3. Collaboration with Industry

   Collaboration with industry is important to ensure that the curriculum remains relevant to the needs of the rapidly evolving world of work.

4. Training for Lecturers

   Lecturers need to be given training on the use of deep learning in teaching to improve the quality of learning.

Deep learning has a major impact on higher education curricula by enabling more personalized and data-driven learning. Key recommendations include integrating this technology across disciplines, using deep learning-based learning tools, and collaborating with industry and training for faculty. This will ensure a more adaptive and relevant curriculum to the demands of the digital world.

CONCLUSION

This study shows that deep learning technology has a significant impact on higher education curricula in the era of digital transformation. The application of this technology enables a more adaptive and data-driven curriculum that is in line with the individual needs of students and the demands of rapidly evolving industries. This technology also supports more effective teaching and personalized learning that can improve students' academic outcomes and work readiness. However, major challenges remain in terms of infrastructure readiness, teacher training, and managing changes in the curriculum that can accommodate this technology well.

Practical Suggestions

To optimize the impact of deep learning technology, higher education institutions are advised to immediately integrate deep learning into their curriculum development. Universities must ensure that there is adequate training for teachers on the use of this technology in teaching. In addition, collaboration with industry needs to be improved to ensure that the curriculum developed can meet the demands of skills needed in the world of work. Educational infrastructure that supports the use of this technology must also be updated and improved to facilitate a more effective learning process.

Research Suggestions

Further research can expand the scope by exploring the impact of deep learning technology on other aspects of higher education, such as institutional management or student competency development strategies in various fields of study. Research can also be conducted with a quantitative approach to measure the direct impact of the application of this technology on student learning outcomes. Given the rapid development of technology, longitudinal studies are also recommended to monitor the long-term effectiveness of implementing deep learning in higher education curricula.

REFERENCES

Ahyani, E., & Dhuhani, E. M. (2024). Transformasi Digital dalam Manajemen Perkantoran Pendidikan: Sebuah Kajian Literatur. *Jurnal Visionary: Penelitian Dan Pengembangan Dibidang Administrasi Pendidikan*, *12*(1), 205–215.

Alenezi, M. (2021). Deep dive into digital transformation in higher education institutions. *Education Sciences*, *11*(12), 770.

Andita, V., & Rafaela, D. (2024). Akselerasi Transformasi Digital Untuk Pendidikan Berkualitas. *Journal of Information Systems and Management (JISMA)*, *3*(2), 90–93.

Ayele, W. Y. (2020). Adapting CRISP-DM for idea mining: a data mining process for generating ideas using a textual dataset. *International Journal of Advanced Computer Sciences and Applications*, *11*(6), 20–32.

Bangsawan, G. (2023). Kebijakan Akselerasi Transformasi Digital di Indonesia: Peluang dan Tantangan untuk Pengembangan Ekonomi Kreatif. *Jurnal Studi Kebijakan Publik*, *2*(1), 27–40.

Braun, V., & Clarke, V. (2021). *Thematic analysis: A practical guide*.

Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches*. Sage publications.

Fasha, M., Hammo, B., Obeid, N., & Widian, J. (2020). A hybrid deep learning model for arabic text recognition. *ArXiv Preprint ArXiv:2009.01987*.

Gopal, V. (2020). Digital education transformation: A pedagogical revolution. *I-Manager's Journal of Educational Technology*, *17*(2), 66.

Gullar, F. (2022). *Muitas vozes*. Leya.

Huamani, T. E., Lima, A. L. R. V., & Rosales, F. G. R. (2019). Programa edusoft y desempeño docente en las instituciones educativas públicas del nivel secundario. *Puriq: Revista de Investigación Científica*, *1*(2), 240–252.

Kansanen, P. (1999). Teaching as teaching-studying-learning interaction. *Scandinavian Journal of Educational Research*, *43*(1), 81–89.

Mena-Guacas, A. F., López-Catalán, L., Bernal-Bravo, C., & Ballesteros-Regaña, C. (2025). Educational transformation through emerging technologies: Critical review of scientific impact on learning. *Education Sciences*, *15*(3), 368.

Merriam, S. B., & Grenier, R. S. (2019). *Qualitative research in practice: Examples for discussion and analysis*. John Wiley & Sons.

Nugroho, A., Haghegh, M., & Triana, Y. (2021). Emergency remote teaching amidst global pandemic: voices of Indonesian EFL teachers. *Voices of English Language Education Society*, *5*(1), 66–80.

Panggabean, A. N. (2021). *Memahami dan mengelola transformasi digital*.

Rambe, A. H., & Aisyah, S. (2023). Correlation of auditory, intellectually, repetition (air) learning models on student achievement. *Molang: Journal Islamic Education*, *1*(01), 1–10.

Rojabi, A. R. (2021). EFL learners' perceptions on Schoology use in the reading class. *Voices of English Language Education Society*, *5*(1), 10–26.

Shenkoya, T., & Kim, E. (2023). Sustainability in higher education: digital transformation of the fourth industrial revolution and its impact on open knowledge. *Sustainability*, *15*(3), 2473.

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, *104*, 333–339.

Surayya, S. A., & Asrobi, M. (2020). Tracing technological pedagogical content knowledge (TPACK) on practical EFL teachers in writing context. *Voices of English Language Education Society*, *4*(2), 177–190.

Voronkova, V., Vasyl'chuk, G., Nikitenko, V., Kaganov, Y., & Metelenko, N. (2023). *Transformation of digital education in the era of the fourth industrial revolution and globalization*.

Wainwright, R., & Shenfield, A. (2019). Human activity recognition making use of long short-term memory techniques. *Athens Journal of Sciences*, *6*(1), 19–34.

Zhang, P. (2025). Leading the Digital Transformation of Higher Education Through the Reform of Digital Intelligence Education: Exploration and Practice at Wuhan University. *Frontiers of Digital Education*, *2*(1), 2.