Jus et civitas	Vol. XII (LXXVI) No. 2/2025	61 - 68	A Journal of Social and Legal Studies

AI-Driven Digital Learning: The Key to Modern Student Performance

Iulia Adelina GHIȚĂ, Simona Georgiana EFTIMIE, Alina MĂRGĂRIȚOIU
Petroleum - Gas University of Ploiesti, Ploiești, Romania
ionita.adelina@upg-ploiesti.ro

Abstract: *In recent years, education has undergone a profound transformation driven by the rapid development of digital technologies and the integration of artificial intelligence (AI) into the learning process. From online platforms and adaptive applications to intelligent tutoring systems and virtual assistants, technology has redefined the way students learn, teachers instruct, and evaluate performances. This paper explores how AI-driven digital learning enhances student autonomy, fosters creativity, and enables personalized learning paths aligned with individual needs. Building on the pedagogical shift toward active learning, digital education promotes accessibility and flexibility, allowing students to engage with diverse resources anytime and anywhere (Okolugbo & Okolugbo, 2025; Nakunsong, 2024).*

Keywords: *AI-driven digital learning; challenges and ethical consideration; performance;*

DOI: 10.51865/JETC.2025.2.08

Introduction

In recent years, education has undergone a profound transformation, driven by the accelerated development of digital technologies and the integration of AI into the learning process. Nowadays, from online platforms and educational apps to virtual assistants and machine learning algorithms, technology had redefined the way students learn, professors teach, and evaluate performance. The adoption of emerging technologies in vocational education and training is crucial for connecting conventional education with the evolving demands of the modern labor market (Ghosh & Ravichandran, 2024).

Emerging technologies can significantly enhance our lives, but using technology is a process that have to be guided by responsibility and the legacy they create (Srinivasan et al., 2004; Srinivasan, 2008; Bergey, 2014). This change is not only technological but also pedagogical. Digital learning is not limited to the use of internet-connected devices, it also involves a profound *restructuring of the way knowledge* is constructed.

In the current context, the student is no longer a passive recipient of information but an active participant who explores, experiments, and collaborates in the virtual space. Dalsgaard & Ryberg (2023) presented a framework that categorizes digital learning spaces into four types: open connections, individual space, community of interest, and working group.

Building on this pedagogical shift, one of the most evident benefits of digital learning is *accessibility*. Students can learn anytime and anywhere using a variety of resources, such as educational videos, interactive simulations or adaptive tests (Okolugbo & Okolugbo, 2025). This flexibility allows for personalized learning paths, offering each student the possibility to progress at their own pace (Nakunsong, 2024).

Another major advantage is *learner autonomy*. Digital platforms encourage students to take responsibility for their own learning, to seek information, verify sources, and apply knowledge in practical context (Brugliera, 2024). At the same time, teachers have access to monitoring and assessment tools that provide detailed data on each student's progress.

This paper explores how emerging digital technologies are reshaping learning environments, fostering student autonomy, and creating opportunities for personalized learning.

AI-driven Learning Mechanism

AI-driven digital learning has emerged as a powerful tool for enhancing student performance in contemporary education. By leveraging artificial intelligence, learning experiences can be optimized, and both students and educators are provided with tools to improve engagement, understanding, and outcomes. The following mechanisms illustrate the key ways in which AI contributes to more efficient learning.

a) Cognitive mechanism: Personalized learning paths, Cognitive load

AI allows the adaptation of educational content to meet the individual needs of each student, facilitating learning at their own pace and helping to identify and address gaps in knowledge. Studies highlight the effectiveness of intelligent learning systems in enhancing both academic performance and students' skills. For instance, Ba et al. (2025) observed significant improvements in student performance and development determined by the use of Intelligent Tutoring System (ITS). For instance, a study by Al Nabhani et al. (2025) presented that AI-driven personalized content significantly enhanced student engagement and academic performance by adapting materials to *individual learning requirements*.

Ouyang et al. (2023) developed a model capable predict student performance in *collaborative learning activities* and delivering *personalized feedback* and recommendations, which contributed to enhance writing skills in CSCL settings. BERT used in collaborative learning analytics tool to automatically analyze student discussions, which enhanced collaborative engagement and improved performance (Zheng et al., 2023). Craig et al. (2025) describes ALEKS as an A-powered multi-agent system capable of autonomously analyzing data, iteratively refining solutions, and monitoring progress. Its functionality suggests significant potential in education, providing personalized learning through adaptive feedback and individualized learning paths. However, Sullins et al. (2013) identified a performance gap in use of ALEKS and performance.

Khanmigo is a generative AI tool that covers topics such as sciences, mathematics, coding, and the humanities, and provides step-by-step guidance to help students reach the correct answers (Shetye, 2024). Khanmigo was developed by Khan's academy in 2022 (Anand, 2023).

Cognitive load theory (CLT) explains the mental effort required by working memory to complete a task (Kalyuga & Liu, 2015). Building on this, cognitive load is categorized into intrinsic, extraneous, and germane types, each influencing learning differently: intrinsic load reflects the material's inherent complexity, while extraneous load arises from inefficient instructional design (Sweller, 2010).

Recent studies emphasize *the potential of adaptive artificial intelligence in education*. According to Hussain et al. (2025), students who use adaptive learning AI tools achieve significantly higher academic performance than those who study through traditional methods. The authors suggest that adaptive AI not only supports learning efficiency but also helps prevent cognitive overload, thereby enhancing overall academic achievement. Similarly, the study by Koć-Januchta et al. (2020) highlights the need to examine how cognitive load relates to usability in emerging textbook technologies.

b) Affective mechanisms: Emotion-aware learning, Predictive analytics for motivation

According to Neacșu and Suditu (2020), emotional-affective education underpins authentic behavior and the development of expressiveness, social integration, and moral awareness. Schools play an essential role in fostering these capacities by enriching students' emotional-affective repertoire, and creating a balanced and constructive learning environment. Badea and Suditu (2024) further emphasize that early educational experiences are essential for holistic

development and lay the foundation for lifelong learning, highlighting the need to address both emotional and cognitive dimensions early on.

In this context of AI-driven learning, these principles operationalize through systems that *monitor students' emotional states*. According to Govea et al. (2024), AI tools can detect student's emotions and adjust feedback and difficulty levels accordingly. Their study implemented a deep reinforcement learning model that improved emotion detection accuracy from 72.4% to 89.3%, real-time adaptability from 68.5% to 87.6% and learning personalization from 70.2% to 90.1% in a hybrid educational environment (Govea et al., 2024). In a complementary manner, predictive analytics for motivation allow AI to anticipate decreases in student engagement. Furthermore, as Suditu (2012) highlights, students' professional values and individual differences influence how they perceive and engage with learning tasks. AI-driven systems can leverage this insight further personalize learning paths, aligning emotional and value-based dimensions to enhance academic outcomes.

c) Creative mechanisms: Socio-constructive AI, Explainable AI, Instant feedback

AI tools can also foster creativity, critical thinking and collaboration among students. For instance, some AI-based platforms form *student groups based on compatibility in learning style, levels of knowledge, and emotional needs*. Using these characteristics, AI tools can facilitate dialogue by proposing thought-provoking topics that stimulate reflection and discussions, such as in virtual guided conversations. Moreover, one of the key advantages of AI system is their ability not only to identify incorrect answers but also to explain why the error occurred, what factors contributed to it, and what alternative solutions are available.

According to Afzaal et al. (2024), an Explainable AI (XAI) system developed recently; that integrates an algorithm capable of providing informative feedback and actionable recommendations to *support students' self-regulation*. Their research showed a positive impact on course performance, and the general recommendation significantly correlated with students' progress. Similarly, Angxuan Chen (2025) found that the group using explainable AI demonstrated a better understanding, even though the final task results were not significantly different. These findings suggest the importance role of XAI in *fostering deeper learning*.

Challenges and Ethical Consideration

The integration of AI across various field, including education, can be challenging for both students and teachers, while also offering opportunities to incorporate alternative methods that enhance the academic performance. In addition to the previous benefits, a study conducted by Leong and Zhang (2025) highlights concerns regarding *algorithmic fairness and academic integrity*. The authors emphasize the importance of transparency, privacy, fairness, and accountability in the design of AI systems. They advocate for the use of diverse datasets, ensuring the protection of sensitive student data to maintain *privacy, and support* the accommodation of diverse learning needs, including those *for students with disabilities*.

These ethical considerations are essential to ensure that AI-driven learning mechanisms remain trustworthy. Integrating transparency and fairness into AI systems (Leong & Zhang, 2025) not only strengthens academic integrity but also fosters a more inclusive and supportive learning environment, where all students can benefit from technological innovation without compromising their privacy.

Another challenge identified in recent research concerns the growing dependence on technology and the consequent *reduction in human interaction*. Many studies in the field indicate that one of the define characteristics of the iGen, or internet generation, is their constant digital connectivity. They frequently interact online with friends, use multiple apps, and share daily updates about their activities, such as where they go, what they eat, or how they dress.

This constant online presence has led to what researchers describe as *the selfie phenomenon*, characterized representations of themselves on social media (Ghiță, 2024).

At the same time, a major challenge for adults and teachers is to keep up with the digital fluency of iGen. As this generation constantly connect to media and internet, they require new and more engaging ways to absorb and process the information included in the curriculum. Traditional teaching methods are no longer fully effective, and educators must to adapt to meet the expectations and learning styles of this and future generations. This also means that teachers need to continuously develop their digital competencies and receive proper training to effectively use and integrate AI tools, making the learning process more dynamic, personalized, and efficient.

Conclusion

In conclusion, technology has redefined the way students learn, teachers instruct and evaluate students' performances. So, studies indicate that digital learning is not only limited to internet-connected devices' use, but also involves restructuring the way that knowledge is constructed.

An innovative aspect that AI tools could offer to the education process is adapting materials to individual learning requirements, helping students (and teachers or researchers) to monitor students' emotional state in order to improve their relation with learning process. Although AI is associated often with social disconnection, recently specialists have developed AI tools that could stimulate / create learning groups for students taking in consideration the compatibility in participants' learning style, levels of knowledge, and emotional needs.

Even if AI instrument could reduce human interaction and determine ethical dilemmas, when is ethically used, AI-driven learning does not replace educators but enhances the personalization and efficiency of learning. Ethical considerations are paramount to ensure that AI serves as supportive tool rather than a substitute for human instruction (Leong & Zhang, 2025).

Considering this perspective, the literature often categorizes learners by generational cohorts. In this regard, we noticed a series of studies meant to understand learning preferences for different generations and guide the tailoring of AI to diverse needs like:

- *Silent Generation* - McIntosh-Elkins et al., 2007; Henger & Henger, 2012;
- *Baby Boomers* - Jorgensen, 2003; Fingerman et al., 2012);
- *Generation X* - Kupperschmidt, 1998; Krahn & Galambos, 2014;
- *Millennials* - Stein, 2013; Kurz et al., 2019;
- *Z Generation* - Minzlaff et al., 2025;
- *Alpha Generation* - McCrindle, 2021.

The classification of generations according to specific characteristics and traits necessitates a fundamental *reevaluation of contemporary teaching methodologies*. These distinctions are not merely statistical; rather, they serve as essential benchmarks for understanding differences in behavior, values, and learning styles.

Although the temptation to attribute the perceived deficiencies of the educational process exclusively to generational differences may be strong, such an approach risks being comparison of generations without consideration of the context in which they raised. The contemporary student that have raised in a digital environment, exhibits a fundamentally different *relationship to information, time and learning* when compared to the student of the key-around-the-neck-generation.

This paradigm shift presents significant challenges, including a decline in concentration levels, an increased propensity for boredom, and a constant need for stimulation. In this contemporary context, the teacher's role has evolved to become that of a learning facilitator, necessitating the adaptation of teaching strategies to align with the diverse needs of students. Its student-centered teaching, methodological diversity, and openness to integrating a variety

of approaches, including Montessori, Waldorf, and Step by Step, characterize the pedagogical approach.

However, an imbalance arises when the responsibility for adaptation falls exclusively on the teacher. A crucial question frequently overlooked is: what is the student's role in this process? Authentic education is predicated on the principle of reciprocity. The student is not merely a recipient but also an active participant, *responsible for their own academic progression*. True balance in education is achieved when both the teacher and the student consciously assume their perspective roles in the learning process.

Teacher and students are co-participants to the learning process. Involving students in the process of establishing purposes, choosing learning methods and negotiating evaluation strategies they are more responsible and motivated.

The majority of students advocate for the integration of artificial intelligence tools into educational practice. Nevertheless, a critical question remains for both teachers and researchers: is dynamic, alternative teaching supported by digital technologies sufficient to solve the real problems facing education? The potential for this technology to reduce illiteracy, ensure genuine understanding, and improve performance, despite the absence of fully developed or practiced digital skills, is subject of considerable interest. Alternatively, there is a risk of perceiving technology as a comprehensive solution, overlooking the intricacies of the educational process.

It is imperative to acknowledge that the foundation for student progress is the establishment of a positive relationship. Education, by its very definition, is defined as a reciprocal interaction between at least two individuals, and the value of this interaction is reflected in the results achieved. It is important to note that performance is not an automatic outcome of using modern tools, rather, it is the result of a process that requires effort, commitment, and motivation from both sides.

Consequently, technology cannot be a substitute for the educational relationship; it can only provide supplementary support. In the absence of an authentic teacher-student connection, any pedagogical method, no matter how innovative, risks becoming superficial. The integration of digital tools into a robust relation framework, wherein the responsibility for learning is collectively assumed, has been identified as a key factor in achieving balance.

As experts in the field of education, teachers have a responsibility to facilitate the transition between generations by integrating new technologies in a balanced and thoughtful manner. However, this integration must be accompanied by a constant reminder of the student's role in their own learning process.

Artificial intelligence tolls should not be used as a substitute for intellectual effort, but as a means of support to improve performance and outcomes. Their purpose is not to fully solve school assignments, but to adapt the content to each student's learning style. For example, text written in a document can be transformed, with the help of digital applications, into a video presentation, an audio recording, or a concept map, thereby facilitating understanding and personalizing learning.

In this way, technology becomes a tool for deepening understanding, not for replacing it. When tasks are performed exclusively by these applications, without the student's active involvement, these is a risk of cognitive regression. Authentic learning requires effort, reflection, and participation, and technology must support this process, not replace it.

The potential benefit of incorporating AI tools into learning process could be exploring through further studies a deepen knowledge about implications of AI in human / social learning process. Is more than obvious that traditional paradigm of teaching – learning is not appropriate for present and future generations.

References:

Afzaal, M., Zia, A., Nouri, J., & Fors, U. (2024). Informative feedback and explainable AI-based recommendations to support students' self-regulation. *Technology, Knowledge and Learning*, 29(1), 331-354, https://doi.org/10.1007/s10758-023-09650-0

Al Nabhani, F., Hamzah, m. B., & Abuhassna, H. (2025). The role of artificial intelligence in personalizing educational content: Enhancing the learning experience and developing the teacher's role in a integrated educational environment. Contemorary Educational Technology, 17(2), ep573, https://doi.org/10.30935/cedtech/16089

Anand, P. (2023, March 16). Khan Academy creates GPT-4 based helper Khanmigo marking formal entry of AI into education. Dataquest. https://www.dqindia.com/khan-academy-creates-gpt-4-based-helper-khanmigo-marking-formal-entry-of-ai-into-education/

Ba, S., Yang, L., Yan, Z., Looi, C. K., & Gašević, D. (2025). Unraveling the mechanisms and effectiveness of AI-assisted feedback in education: A systematic literature review. Computers and Education Open, 100284, https://doi.org/10.1016/j.caeo.2025.100284

Badea, M., & Suditu, M. (2024). Modern Early Childhood Teacher Education: Theories and Practice: Theories and Practice. *IGI Global*.

Bergey, P. (2014). Entrepreneurship in emerging markets. *IEEE Engineering Marketing Review*, 42, 2-2. 10.1109/EMR.2014.2314538

Brugliera, P. (2024). The effectiveness of digital learning platforms in enhancing student engagement and academic performance. *Journal of Education, Humanities, and Social Research*, 1(1), https://doi.org/10.70088/xq3gy756

Chen, A. (2025). When learning analytics dashboard is explainable: An exploratory study on the effect of GenAi-supported learning analytics dashboard. *arXiv preprint arXiv:2506.16312,* https://doi.org/10.48550/arXiv.2506.16312

Craig, S. D., Hu, X., Graesser, A. C., Bargagliotti, A. E., Sterbinsky, A., Cheney, K. R., & Okwumabua, T. (2013). The impact of a technology-based mathematics after-school program using ALEKS on student's knowledge and behaviors. *Computers & Education*, 68, 495-504, https://doi.org/10.1016/j.compedu.2013.06.010

Dalsgaard, C., & Ryberg, T. (2023). A theoretical framework for digital learning in individual spaces, working groups, communities of interest, and open connections. Research in Learning Technology, 31, 3084, DOI: 10.25304/rlt.v31.3084

Fingerman, K. L., Pillemer, K. A., Silverstein, M., & Suitor, J. J. (2012). The baby boomers' intergenerational relationships. *The Gerontologist*, 52(2), 199-209, https://doi.org/10.1093/geront/gnr139

Ghiță, I. A. (2024). Exploring the selfie phenomenon: Psychosocial challenges and identity construction in Generation Z. *Jus et Civitas- A Journal of Social and Legal Studies*, 75(1), 43-48.

Ghosh, L., & Ravichandran, R. (1979). Emerging Technologies in vocational Education and Training. *Journal of Digital Learning and Education,* 4(1), 41-49, P-ISSN: 2798-1088, DOI: 10.52562/jdle.v4i1.975

Govea, J., Navarro, A. M., Sánchez-Viteri, S., & Villegas-Ch, W. (2024). Implementation of deep reinforcement learning models for emotion detection and personalization of learning in hybrid educational environments. *Frontiers in Artificial Intelligence*, 7, 1458230.

Henger, B., & Henger, J. (2012). *The silent generation: 1925-1945*. Author House.

Hussain, S. A., Ayub, F., & Ahmed, N. (2025). Cognitive load management through adaptive AI learning system implications for student focus and retention. *The Critical Review of Social Science Studies*, 3(3), 701-719, DOI: https://doi.org/10.59075/kpfrdv65

Jorgensen, B. (2003). Baby Boomers, Generation X and Generation Y? Policy implications for defence forces in the modern era. *Foresight*, 5(4), 41-49, https://doi.org/10.1108/14636680310494753

Kalyuga, S., & Liu, t. C. (2025). Guest editorial: Managing cognitive load in technology-based learning environments. *Journal of Educational Technology & Society*, 18(4), 1-8.

Krahn, H. J., & Galambos, N. L. (2014). Work values and beliefs of Generation X and Generation Y. *Journal of Youth Studies*, 17(1), 92-112.

Koć- Januchta, M. M., Schönborn, K. J., Tibell, L. A., Chaudhri, v. K., & Heller, H. C. (20200. Engaging with biology by asking questions: Investigating students' interaction and learning with an artificial intelligence-enriched textbook. *Journal of Educational Computing Research*, 58(6), 1190-1224.

Kupperschmidt, B. R. (1998). Understanding generation X employees. *JONA: The Journal of Nursing Administration*, 28(12) 36-43.

Kurz, C. J., Li, G., & Vine, D. J. (2019). Are millennials different? In Handbook of US consumer economics, *Academic Press*, 193-232, https://doi.org/10.1016/B978-0-12-813524-2.00008-1

Leong, W. Y., & Zhang, J. B. (2025). Ethical design of AI for education and learning systems. *ASM Science Journal*, 20(1), DOI:10.32802/asmscj.2025.1917

McCrindle, M. (2021). *Generation alpha*. Hachette UK.

McIntosh-Elkins, J., McRitchie, K., & Scoones, M. (2007). From silent generation to generation x, y, and z: strategies for managing the generation mix. In *Proceedings of the 35th annual ACM SIGUCCS* fall conference, 240-246, https://doi.org/10.1145/1294046.1294104

Nakunsong, T. (2024). Evolving K-12 digital education: Enhancing flexibility and access through online learning and virtual programs. Journal of Education and Learning Reviews, 1(5), 1-12, DOI:10.60027/jelr.2024.791

Neacșu, I., & Suditu, M. (2020). *Educația emoțional-afectivă. Noi explorări, noi strategii*. Iași: Polirom.

Okolugbo, T. O., & Okolugbo, N. M. (2025). Personalized learning in the digital age: Exploring the role of technology in tailoring education to individual student's needs. International Journal of Research, 12(4), 586-602, DOI:10.5281/ZENODO.15341827

Ouyang, F., Wu, M., Zheng, L., Zhang, L, & Jiao, P. (2023). Integration of artificial intelligenge performance prediction and learning analytics to improve student learning in online engineering course. *International Journal of Educational Technology in Higher Education*, 20(1), 1-23, https://doi.org/10.1186/s41239-022-00372-4

Minzlaff, K. A., Palmer, S., Fillery-Travis, A. (2025). The significance and challenges of turnover and retention of millennial professionals. *Journal of Work-Applied Management*, 17(1), 34-49, https://doi.org/10.1108/JWAM-07-2023-0062

Srinivasan, R., Lilien, G. L., & Rangaswamy, A. (2004). First in, first out? Effect of network externalities on pioneer survival. *Journal of Marketing*, 68(1), 41-57.

Srinivasan, R. (2008). Sources, characteristics and effects of emerging technologies: Research opportunities in innovation. Industrial Marketing Management, 37, 633-640.

Sullins, J., Meister, R., Craig, S. D., Wilson, W. M., Bargagliotti, A., & Hu, X. (2013). Is there a relationship between interacting with a mathematical intelligent tutoring system and students performance on standardized high-stake tests? Hnowledge Spaces: Applications to education. Springer, Berlin Heidelberg, 69-78.

Shetye, S. (2024). An evaluation of Khanmigo, a generative AI tool, as a computer-assisted language learning app. *Studies in Applied Linguistics and TESOL*, 24(1), 38-53.

Suditu, M. (2012). Students' professional values perception inventory-important dimensions of career orientation. *Procedia – Social and Behavioral Sciences*, 69, 1993-1997, https://doi.org/10.1016/j.sbspro.2012.12.155

Stein, J. (2013). *Millennials: The me me me generation*. Time magazine, 20, 1-8.

Sweller, J. (2010). Element interactivity and intrinsic, extraneous, and germane cognitive load. *Educational Psychology Review*, 22, 123-138, https://doi.org/10.1007/s10648-010-9128-5

Zheng, L., Long, M., Niu, J., Zhong, L. (2023). An automated group learning engagement analysis and feedback approach to promoting collaborative knowledge building, group performance, and socially ahared regulation in CSCL. *International Journal of Computer-Supported Collaborative Learning,* 18(1), 101-133, 10.1007/s11412-023-09386-0