



Available online at: <http://www.advancedscientificjournal.com>

<http://www.krishmapublication.com>

IJMASRI, Vol. 6, issue 2, pp. 1092-1101, Feb. -2026

<https://doi.org/10.53633/ijmasri>

**INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY
ADVANCED SCIENTIFIC RESEARCH AND INNOVATION
(IJMASRI)**

ISSN: 2582-9130

IBI IMPACTFACTOR 1.5

DOI: 10.53633/IJMASRI

RESEARCH ARTICLE

**IMPACT OF ARTIFICIAL INTELLIGENCE ON UNIVERSITY STUDENTS' LEARNING
MOTIVATION, LEARNING STYLES, AND ACADEMIC ENGAGEMENT**

Ali Ahsan¹ Dr Khuda Bakhsh Khan² Anam Rana³ Muhammad Ashfaq Hassan Babar⁴ Aqeel Ahmed⁵

¹*M.Phil Scholar, University of Agriculture, Faisalabad, Punjab, Pakistan*

Email: aliahsan1251@gmail.com

²*Associate Professor Department of Education Govt. College University Faisalabad*

Email: khudabakhsh@gcuf.edu.pk

³*Govt. Associate College (W) 97/RBO Johal Adda, Sheikhpura Rd., Faisalabads*

Email: anamrana689@gmail.com

^{*4}*(Corresponding author) Ph.D. Scholar, Govt. College University Faisalabad*

Email: ashfaqhassan75@gmail.com

⁵*M.Phil Scholar, University of Agriculture, Faisalabad, Punjab, Pakistan*

Email: aqeel.ahmed5688@gmail.com

Abstract

Artificial intelligence (AI) is a relatively new phenomenon in the sphere of higher education that has rapidly evolved and transformed the practices of the teaching, learning, and assessment processes on the global scale. The practice of AI-based technologies in schools has created new opportunities of helping to motivate to learn among students, flexibilities of learning styles, and supporting academic interests. The provided journal article discusses the application of artificial intelligence in learning the part of university students where the center of focus is in learning motivation, learning styles, and academic engagement in postgraduate learners. The study design adopted was a quantitative study in which it was conducted at the University of Agriculture, Faisalabad (UAF) in Pakistan. Data about 140 male and female postgraduate students of the Faculty of Social Sciences were collected in a properly structured questionnaire. The data gathered was analyzed using statistical package of the social sciences (SPSS). The data interpretation was done by descriptive statistics measures, including frequency, percentage, mean and standard deviation. The findings reveal that AI-enriched learning environments positively influence the motivation of students to be able to learn, promote learning style elasticity and improve the overall engagement in learning. The paper concludes that the implementation of the

AI technologies in universities can be very successful and ethical, and, therefore, can have a great impact on the process of learning and achievement. The practical recommendations are also offered to policymakers, managers of universities, and educators to enable the sustainable introduction of AI to the educational institution.

Keywords: Teaching Artificial Intelligence, Learning Motivation, Learning Styles, Academic Engagement, Higher Education

Introduction

The fast development of artificial intelligence (AI) introduced many transformations in different fields, education being one of them. AI technologies are also steadily being applied in the higher education sector to improve the teaching and learning phases: efficiency, personalization, and student engagement. Intelligent tutoring systems, automated assessment systems, adaptive learning platforms, learning analytics and virtual academic assistants are AI-based systems redefining traditional educational practices. The technologies are intended to process vast volumes of data, learn by user interactions, and make informed decisions, which will facilitate personalized and effective learning experiences (Chen et al., 2020; Holmes et al., 2019; Zawacki-Richter et al., 2019). There are several problems that institutions of higher learning in the world are grappling with such as the needs of various students, growth in enrolment, scarcity of resources, and pressure on better learning outcomes. AI can be a solution to these issues because it allows sensitive learning solutions and is offered to learners, which can contribute to instant feedback and self-regulated learning. The adaptive algorithms allow AI systems to deliver content to individual learners according to their skills, preferences, and learning rate. This can lead to an increase in the level of student motivation, engagement, and academic success (OECD, 2021; Luckin et al., 2016).

A motivation to learn is a key to academic performance and retention of students. Students who are well motivated will find it easier to develop a deeper interest in learning materials, expend power on academic activities and have superior results. On the same note, the learning styles are significant towards the way students absorb information and how they engage with the instructional material. Conventional classroom environments are not usually effective at

accommodating the differences in the learning processes, which affects disengagement and decreased learning efficacy. The AI technologies can overcome this drawback by providing adaptable and customizable learning experiences that can support a wide range of learning styles (Schunk et al., 2014; Kumar and Silva, 2021).

Another important factor determining successful learning is academic engagement which comprises behavioral, emotional and cognitive aspects. Involved students actively engage in the learning, show interest and enthusiasm, and use higher-order thinking ability. Intelligent environments can facilitate academic engagement through interactive learning, real-time feedback, and data-driven feedback and insights that can be used to support the learning process in students (Bond et al., 2020; Dede, 2014).

The application of AI in higher education in the context of Pakistan is very young. Although there are universities that started using digital learning platforms and educational technologies, there is a relative lack of empirical studies on the effect of AI on the learning process of students. This lack of knowledge is more pronounced at the postgraduate level, as learners are supposed to practice independent learning that is research-related. It is important to explore the problem of the role of AI in the motivation of postgraduates, their learning styles, and academic interest to make informed decisions and design policies (UNESCO, 2019; OECD, 2021). University of Agriculture, Faisalabad (UAF) is one of the most popular universities in the public sector in Pakistan. The university has in the recent past made strides towards the adoption of digital technologies in teaching and learning. Nonetheless, there is limited systematic literature on how students view AI and the effects that it has on the learning process. This gap is

filled in this research since it focuses on how AI influences the learning experience of postgraduate students at UAF (Zawacki-Richter et al., 2019; Holmes et al., 2019).

The primary aim of the research is to investigate the effect of artificial intelligence on student learning in universities, particularly the learning motivation, learning styles, and academic involvement. The study concentrates on postgraduate students at the Faculty of Social Sciences and thus can inform a lot about the current views and use of AI technologies in the context of higher education in Pakistan. It can be assumed that the results of the study will add to the current literature on AI in education, and provide useful suggestions to educators, administrators, and policymakers (Chen et al., 2020; UNESCO, 2019).

2. Literature Review

2.1 Artificial Intelligence in Education as a Concept.

According to Chen et al. (2020) and Zawacki-Richter et al. (2019), artificial intelligence is a feature of machine and computer systems to execute tasks that human intelligence is normally used in, including learning, reasoning, problem-solving, and decision-making. In learning and teaching, AI is a practice that embraces deploying smart systems to enhance education. The educational tools based on AI can process the behavior of learners, modify learning material, and offer tailored feedback to improve learning results.

According to Luckin et al. (2016) and Holmes et al. (2019), an AI in education has changed a lot during the last 10 years because of the development of machine learning, natural language processing, and data analytics. One example of intelligent tutoring systems is the simulation of one-on-one tutoring by tailoring instruction according to the performance and responses of students. The system of learning management that incorporates AI analytics may monitor the performance of students, detect the knowledge gaps, and prescribe the relevant intervention. These technologies are designed to

enhance efficiency and effectiveness in the educational practices.

2.2 Artificial Intelligence and Motivation to learn.

According to Schunk et al. (2014), Kumar and Silva (2021), learning motivation is the combination of inner and outer forces that help the students be motivated to take part in the learning process. The motivation is crucial in defining the performance of students in terms of academic behavior, persistence and academic performance. Studies indicate that AI-enhanced learning systems may have a positive impact on the motivation of the students by offering them personalized learning processes, on-the-fly feedback, and interactive course material.

According to OECD (2021) and Luckin et al. (2016), AI systems have the ability to increase intrinsic motivation, increasing the level of learning engagement and relevance to the interests and goals of the students. Individualized courses enable students to study at their own pace, which results in less frustration and more confidence. Also, positive learning behaviors can be supported by AI-based feedback systems that can promote constant growth. Gamification components, performance analytics, and tracking of progress that is offered by AI can also be used to improve extrinsic motivation.

2.3 Learning Styles and Artificial Intelligence.

Dede (2014) and Chen et al. (2020) define learning styles as the most preferred methods of information processing and interaction with learning material in users. Ordinary learning styles would be visual, auditory, reading/writing, and kinesthetic preference. The conventional methods of instruction tend to follow a one-fits-all model and this might not work well in consideration of the differences in learning styles.

Both Holmes et al. (2019) and Zawacki-Richter et al. (2019) insist that the arrays of instructional materials in different formats, including videos, simulations, textual materials, and interactive activities, can be offered by AI technologies to support the needs of various types of learning.

Adaptive learning systems are capable of analyzing the interactions of the students and altering the delivery of the content. AI can also increase understanding, retention, and general satisfaction with learning by matching the instruction to the inclination of the learners.

2.4 Artificial intelligence and scholarly involvement.

Bond et al. (2020) and Fredricks et al. (2004) define academic engagement as active participation of students in the process of studying, both behavioral, emotional, and cognitive levels. Behavioral engagement means that the individual has a certain level of involvement in the academic work, emotional engagement is connected with the interest and enthusiasm, and cognitive engagement is connected with the application of deep learning strategies.

According to OECD (2021) and Kumar and Silva (2021), AI-enhanced learning environments have the potential to encourage academic engagement through interactive and engaging learning environments. Such features as real-time feedback, adaptive challenges, and data-driven insights may motivate the students not to forget and take an active part in their studies. Students who have studied with AI-supported learning tools also report a higher rate of engagement and satisfaction than students who have studied in a traditional learning environment.

2.5 Research Gap

Despite the possibilities that AI has made in the field of education, there are little empirical studies that investigate how the technology affects learning motivation, learning styles, and academic engagement in developing nations. In Pakistan, there is a lack of research on AI in higher education, particularly at the postgraduate stage. The proposed research aims to fill this research gap by offering empirical data on how AI has influenced the learning experience of postgraduate students at the University of Agriculture, Faisalabad.

3. Methodology

3.1 Research Design

The research design used in the study was a quantitative survey study to examine how artificial intelligence has been affecting the learning of postgraduate students. The choice of this design was to get numerical data which can be statistically analyzed to determine patterns and trends of the perceptions of the students.

3.2 Population and Sample

All of the post-graduate students who were studying at the Faculty of Social Sciences at the University of Agriculture, Faisalabad were considered the population of the study. The Dean Office was contacted to get a list of enrolled students. A sample of 140 post graduate male and female students has been chosen to be used as a sample of the study using a convenient sampling technique.

3.3 Instrumentation

A well-structured questionnaire that was created by the researcher was used to collect data. The questionnaire was divided into four major parts, including demographic data, AI use in learning, motivation to learn, learning style, and academic engagement. The measurement of items was based on a five-point Likert scale with strongly disagree (1) and strongly agree (5).

3.4 Data Collection Procedure

The questionnaire was conducted in both online and personal visits so as to get maximum response. The participants received information concerning the aim of the study and guaranteed anonymity and confidentiality.

3.5 Data Analysis

The data retrieved was analyzed by the Statistical Package of the Social Sciences (SPSS). Frequencies, percentages, mean, and standard deviation were used to describe the responses of the students and interpret the findings.

4. Results

The demographic characteristics have been established as 4.1.

The details of the demographic analysis showed that there was a balanced representation between the male and the female respondents. The majority of the respondents indicated to have frequent contact with AI-powered applications, including online learning platforms, online libraries, and automatic assessment systems.

Table 1: Gender-wise Distribution of Respondents

Gender	Frequency	Percentage
Male	72	51.4
Female	68	48.6
Total	140	100

4.2 Artificial Intelligence and Learning Motivation

The findings suggest that the students tended to value AI as an incentive to their learning. The large mean scores indicate that AI helped to boost the interest of students, motivate them to actively engage, and facilitate self-directed learning.

Table 2: AI and Learning Motivation

Item	Mean	SD
AI increases my interest in learning	4.01	0.76
AI motivates active participation	3.94	0.73
AI encourages independent learning	4.08	0.70

As demonstrated in Table 2, the respondents have very positive views regarding the role of Artificial Intelligence (AI) in promoting learning motivation. The mean score of the highest value (M = 4.08, SD = 0.70) was noted on the statement that AI encourages independent learning, and it means that

students believe that AI makes them more responsible in the process of their own learning.

On the same note, the response to the question, I am more interested in learning because of AI also got a high mean score (M = 4.01, SD = 0.76), as the effect of artificial intelligence-based tools makes the educational process more attractive and captivating. The graph Ai stimulates active engagement got an average of 3.94 (SD = 0.73), which implies that AI makes students more engaged in learning processes.

In general, the average scores of about 4.0 prove that AI produces a significant positive effect in the motivation of learners, their interest, engagement, and independence in learning.

4.3 Artificial Intelligence and Learning Styles

The students claimed that the AI-based learning spaces aligned with their learning styles and offered the flexibility of the learning speed and materials.

Table 3: AI and Learning Styles

Item	Mean	SD
AI supports my learning style	3.96	0.75
AI allows flexible learning pace	4.10	0.68
AI provides diverse resources	4.15	0.66

Table 3 shows the perception of respondents on the role of Artificial Intelligence to support the various learning styles. The mean score was the greatest in the case of “AI offers various resources (M = 4.15, SD = 0.66), as students are sure that AI can offer them a wide range of learning materials, which can be used by them with different preferences and capabilities. The fact that AI enables flexible learning pace also scored high mean (M = 4.10, SD = 0.68), which implies that AI gives the learner the opportunity to learn at their pace, which is particularly effective to both the fast and slow learners. Moreover, the item AI supports my learning style received a high

mean ($M = 3.96$, $SD = 0.75$) score indicating that the systems based on AI are viewed as flexible to the personal learning requirements. All in all, these findings indicate that AI can be used effectively in the personalization of education, which provides a high level of flexibility and a range of learning resources that can serve a wide range of learning styles.

4.4 Artificial Intelligence and Academic Engagement

The results further show that there is a positive correlation between the AI use and academic activity.

Table 4: AI and Academic Engagement

Item	Mean	SD
AI increases class engagement	4.02	0.72
AI helps maintain focus	3.89	0.78
AI enhances overall engagement	4.06	0.70

Table 4 gives the opinions of the respondents regarding the impact of Artificial Intelligence on academic engagement. The mean score on the highest score is seen on the item of AI improves overall engagement ($M = 4.06$, $SD = 0.70$), which implies that students believe that the use of AI can help to increase their overall engagement in learning activities. In a similar fashion, the mean score of the factor labeled as AI increases class engagement was high ($M = 4.02$, $SD = 0.72$), indicating that the interaction in the classroom becomes more engaging and participative with the help of AI-based tools. The source AI helps maintain focus had a small but positive average ($M = 3.89$, $SD = 0.78$), indicating that although the AI does assist in maintaining the focus, the effect that it produces is relatively moderate. Altogether, the results reveal that AI is positive and plays a significant role in improving academic engagement, participation, and focus of students in the course of learning.

5. Discussion

The results of this research show that artificial intelligence is important in the improvement of the learning motivation, learning styles, and academic engagement of postgraduate students. These favorable attitudes as stated by students imply that AI-based learning settings are beneficial in some real sense in higher education. The findings correspond to the current body of literature, which highlights the possibility of AI producing personalized, interesting, and efficient learning experiences.

The fact that the mean scores associated with learning motivation are large shows that AI tools can arouse the interest of students and make them feel the need to participate actively. Individualized feedback and adaptive learning opportunities seem to increase the confidence of students and their desire to work on learning assignments. In a similar vein, the research outcomes involving the learning styles indicate that the AI technologies are effective in support of the individual differences, since they provide efficient and diverse learning materials.

The use of AI also affected academic activity positively. Students can also be kept focused and cognitively engaged in their studies through interactive capabilities, real time feedback, and the avail of data driven insights generated by the AI platforms. This data highlights the significance of the incorporation of the AI technologies in a manner that facilitates student-centered learning.

This research was done to investigate the effect of artificial intelligence on the learning process of postgraduate students in universities, particularly in issues to do with learning motivation, learning styles, and academic engagement. The research conclusions offer a solid empirical support that artificial intelligence does have a great and beneficial part in the process of determining the learning experience of students in colleges. On the whole, the learners showed positive attitudes to AI-enabled learning environments, implying that AI systems can play an important role in enhancing the overall results of the education in case they are properly explored in educational practices.

The demographic analysis showed that the representation of both males and females in the study was quite symmetrical which enhances the generalizability of the results to any of the gender groups in the study set up. Besides, the majority of the respondents said that they were frequently exposed to AI-powered applications like web-based learning platforms, digital libraries, and automated evaluation systems. It means that postgraduate students in the University of Agriculture, Faisalabad, already know a digital and AI-based learning environment. This exposure is needed since the perception of AI as students can be affected by the extent to which the students have interacted and experience with technology. This, according to other past studies, is because familiarity with AI tools can improve the acceptance and perceived usefulness of technology among students in a learning setting, which might partially be the cause of positive reactions to the same in the current study.

Among the most important conclusions of the research is connected with the influence of artificial intelligence on the motivation to learn. The findings show that the means of the items that assessed the interest and active participation of the students as well as their independent learning are high. Such results may indicate that AI-based learning systems can be effective in arousing intrinsic and extrinsic motivation in postgraduate students. This finding is in line with the motivational theories that lay stress on the significance of autonomy, competence, and feedback in the maintenance of motivation among learners. These motivational needs seem to be facilitated by AI technologies because of their capability to provide personalized learning paths and mechanisms of immediate feedback that enable students to learn at their own rate and timely feedback on their academic activities.

Of interest is the discovery that AI enhances the interest of students in learning. Interest is one of the main aspects of intrinsic motivation and a close relation to greater engagement and more lasting academic persistence. The use of AI-based tools is usually interactive, contains multimedia content, and adapts to the requirements of various learners, which makes them more interactive than traditional lecture-

based teaching methods. The features can possibly decrease boredom and cognitive load, and make students more curious and willing to dig deeper into learning resources. The results align with previous research that had found previous results that AIs increased the degree of interest and enjoyment among learners.

And in a similar vein, the use of AI as an incentive to engage in active participation shows the possibility of technology to transform the students into active participants in the learning process rather than a passive recipient of information. AI-based platforms tend to motivate students to participate in solving issues, self-evaluation, and constant communication with educational materials. Such active participation is vital to effective learning especially in the postgraduate level when critical thinking and independent inquiry are prioritized. The results imply that AI may be used as a tool that will trigger the encouragement of learner autonomy and responsibility as a key characteristic of an effective postgraduate student.

It was also discovered that AI prompts independent learning as evidenced by the high means score of this item. The skill of independent learning is one of the most essential in higher education and it is particularly used in postgraduate studies where individuals are supposed to research, extract multifaceted information and take control of the learning process. Independent learning is facilitated through the use of AI technologies; those technologies provide access to resources on demand and recommendations, as well as the self-paced learning opportunity. The features make students gain control of their learning and acquire self-regulated learning skills, which are tightly connected with academic success.

Regarding the aspect of learning styles, the results show that AI-assisted learning environments are able to meet the preferred learning styles of students as well as provide them with flexibility in learning speed and material. It is a significant observation because the conventional teaching strategies tend not to focus on individual learning preferences. More specifically, postgraduate students

are a diverse group in terms of academic and cultural backgrounds, and that might affect their information processing and mastery of learning materials. By providing various forms of learning, including videos, simulations, text-based learning, and interactive games, AI technologies also offer students a chance to select the mode of learning that fits them.

The mean score is high in flexibility in learning pace indicating that students appreciate the fact that they can learn at their time and pace and in cognitive readiness. This adaptability comes in handy particularly to postgraduate students who tend to juggle academic needs with their careers, family or research duties. AI-based applications enable students to go over different materials, take breaks during learning, and study at a rate that fits their unique requirements. This kind of flexibility not only leads to a better understanding but also minimizes stress and anxiety that can be related to a fixed set of academic time.

Provision of varied learning materials using AI was also one of the strengths of AI-based learning settings. Having a broad range of resources available, students have the ability to study a subject in different angles, thus, developing critical thinking and increased comprehension. The discovery confirms learning theories of constructivism that focus on the significance of active knowledge building concerning exposure to various sources of information. This can be supported through the use of AI technologies that help to curate and suggest learning resources that students are interested in and which address their learning requirements.

The other significant aspect that this research concentrated on was academic engagement, and the results indicate that there is a positive connection between the use of AI and the level of engagement of students. The use of AI-supported learning environments has the potential to support behavioral, emotional, and cognitive engagement because the mean scores exceeded 1.5 in terms of class engagement, focus, and overall academic engagement. The behavioral engagement is observed when students actively participate in learning activities, emotional engagement is shown when

students display an interest and enthusiasm and cognitive engagement when the students show sustained attention and thorough processing of information.

The beneficial effects of AI on classroom interactions can be explained by the fact that AI-enhanced learning tools are interactive and engaging. Real-time quizzes, adaptive challenges, and real-time feedback are some of the features that ensure the students are constantly engaged in the process. The characteristics can also be used to minimize disengagement and distraction, common issues in the higher education, especially in technology mediated learning experience.

The fact that AI enables students to stay focused is especially timely nowadays, during the era of digital devices, students are frequently subjected to various distractions. Targeted learning The AI-based systems can contribute to focus by offering guided learning streams, objectives, and prompts. The learning analytics tools may also be used to assess the progress of the students and define which domains need the extra attention, thus promoting the sustained cognitive activity.

The overall academic engagement was seen to be increased as a result of the use of AI which indicates that the use of AI-based learning environments has the potential to provide a more comprehensive and supportive learning experience. Active students will have more motivation to put effort in their learning, persevere in difficult times, and record more academic success. The results of this research were in line with the increasing literature that serves to indicate the importance of AI in the creation of student-centered and engagement-oriented learning environments.

Although the results are positive, it is necessary to present the findings in the framework of the constraints of the study. The findings may not be relevant to other faculties across universities since a convenient sampling method was used and the research was confined to one faculty in one university. Along with that, the research was based on self-reported information, which could be affected by

the social desirability bias or subjective views of the students. Nevertheless, the similarity of the results in various aspects of the learning process indicates that the findings can give useful information on the prospects of AI in higher education.

Practically, the results of the research reveal the necessity to formulate a strategic and pedagogically informed approach to AI technology integration in higher education. Although AI can become an important tool to boost motivation in learning, support a wide range of learning styles, and encourage academic activity, it will be effective only through its implementation. The teachers and the leaders ought to make sure that artificial intelligence tools are coupled with the curricular goals and objectives and are supposed to facilitate productive learning in lieu of merely automating current procedures.

To sum up, the discussion has pointed out that artificial intelligence has a great potential in enhancing the learning experiences of postgraduate students in tertiary institutions. AI can be used to create more personalized, flexible, and effective learning environments by promoting motivation, supporting diverse learning styles, and promoting academic engagement. This research results have empirical evidence of integrating AI in Pakistani higher education institutions and a basis of future studies in the long-term and transformative impacts of AI in teaching and learning.

6. Conclusion

The researcher concludes the existence of the positive effect of artificial intelligence on the motivation to learn, learning styles, and academic engagement of the university students. Learning environments based on AI offer flexible, personalized, and engaging learning experiences that can be useful in boosting academic performance at the postgraduate level. The results indicate that AI has the potential to revolutionize the higher education in Pakistan, as long as it is applied in an efficient way.

7. Recommendations

1. Universities ought to invest in AI-based learning technologies to aid individualized learning.
2. The use of AI tools should be trained to faculty members to use effectively and ethically.
3. Policymakers ought to come up with guidelines to be used in integrating AI in higher education.

8. Constrains and Future studies.

The researchers also restricted the sample to postgraduate learners of one faculty of a single university, which can influence the aspect of generalizability. The studies of the future can involve several universities, and can utilize mixed-method designs, and can involve the investigation of the long-term effects of AI on the learning outcomes.

References

1. Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
2. Baker, T., & Smith, L. (2019). Educating for the future: Artificial intelligence in education. *International Journal of Educational Technology in Higher Education*, 16(1), 1–14. <https://doi.org/10.1186/s41239-019-0141-0>
3. Bond, M., Buntins, K., Bedenlier, S., Zawacki-Richter, O., & Kerres, M. (2020). Mapping research in student engagement and educational technology in higher education: A systematic evidence map. *International Journal of Educational Technology in Higher Education*, 17(1), 1–30. <https://doi.org/10.1186/s41239-019-0176-2>
4. Chen, L., Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review. *IEEE Access*, 8, 75264–75278. <https://doi.org/10.1109/ACCESS.2020.2988510>
5. Dede, C. (2014). The role of digital technologies in deeper learning. *Students at the Center:*

6. *Deeper Learning Research Series*. Jobs for the Future.
7. Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign.
8. Kumar, J. A., & Silva, P. A. (2021). Academic motivation and engagement in technology-supported learning environments. *Education and Information Technologies*, 26(2), 1–18. <https://doi.org/10.1007/s10639-020-10382-3>
9. Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed: An argument for AI in education*. Pearson Education.
10. OECD. (2021). *Artificial intelligence, big data and education*. OECD Publishing. <https://doi.org/10.1787/0bb0c3f3-en>
11. Schunk, D. H., Meece, J. L., & Pintrich, P. R. (2014). *Motivation in education: Theory, research, and applications* (4th ed.). Pearson Education.
12. UNESCO. (2019). *Artificial intelligence in education: Challenges and opportunities for sustainable development*. UNESCO Publishing.
13. Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education. *International Journal of Educational Technology in Higher Education*, 16(1), 1–27. <https://doi.org/10.1186/s41239-019-0171-7>
