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AI Language Models as Educational Allies: Enhancing Instructional Support in Higher Education

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Abstract. Incorporating artificial intelligence (AI) to support academic faculty is the main topic of the systematic literature review. The purpose of the study is to examine the potential advantages and disadvantages of such implementation, with a particular emphasis on how the use of AI in educational settings may impact teaching methods, individualised learning experiences, and administrative procedures. For the literature review, the Science Direct, Taylor & Francis, and Emerald Insight databases were carefully examined. In order to thoroughly analyse the integration of AI in instructional faculty support, each article was evaluated for its quality of content and relevance to the research questions. According to the findings, AI-driven tools like ChatGPT and intelligent tutoring systems have the potential to significantly improve instruction and foster adaptive learning, which would result in better educational outcomes. The use of AI can enhance administrative procedures and promote personalised learning for students. By highlighting its advantages and drawbacks, this study advances knowledge of AI's function in instructional faculty support for education. By highlighting critical gaps and difficulties, this study lays the groundwork for further research and the development of best practices for AI integration in educational contexts.

Keywords: Artificial Intelligence; Education; ChatGPT; Instructional Support

1. Introduction

The evolution of technology, specifically the transition from basic process automation to the realm of AI, has been nothing short of transformative (Chu et al., 2022; Xu et al., 2021). AI, with its cognitive mimicry of human mental processes, enables the real-time generation of original content in the form of texts, music, or images (Mukhamediev et al., 2022). This capacity has revolutionised industries, enhancing efficiency through task and process

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automation. In the domain of education, AI's impact has been profound; it has automated administrative tasks, acted as a tutoring system, and promoted collaborative learning for both students and educators (Çağataylı & Çelebi, 2022; Raj, 2022).

The application of AI in education has been widely explored across various domains, and its potential has been well-documented in scholarly literature. The integration of AI has been shown to boost teachers' self-efficacy in science instruction (Al Darayseh, 2023) and aid computer scientists when solving complex programming problems. Furthermore, AI-driven applications have exhibited promise in facilitating language acquisition, thereby aiding students in achieving fluency in foreign languages (Newar, 2022).

Despite the transformative potential, there are numerous challenges associated with AI use. AI's impact on education is tenuous (Gunawan et al., 2021; Hrastinski et al., 2019; Zawacki-Richter et al., 2019) and familiarity gaps impede the seamless integration of AI technologies. To bridge these gaps, comprehensive review studies are imperative. Although existing review papers have explored various facets of AI in higher education (AIHed), there remains a need for a more holistic analysis to comprehend AI's influence across all four educational domains—learning, teaching, assessment, and administration—and major learning outcomes. This study aims to fill these gaps by offering a panoramic evaluation on AIHed's opportunities and challenges to catalyse impactful discourse among researchers, policymakers, educators, engineers, and students regarding the future trajectory of AIHed.

This paper delves into the realm of AI in higher education (AIHed), encompassing intelligent tutoring systems, chatbots, robots, and automated assessment tools that amplify and enrich the educational experience. AIHed holds immense potential to revolutionise learning and teaching, rendering personalised and adaptable learning experiences, fostering educators' insights into students' learning trajectories, and enabling instant, machine-supported queries and feedback.

In this context, the central research objective is to investigate how AI integrates within the realm of faculty instructional support, including feedback generation, grading systems, and tutoring mechanisms. To fulfil this aim, a meticulous systematic review of scholarly articles from reliable databases such as Science Direct, Emerald Insight, and Springer is conducted. The study seeks to identify the diverse modes of instructional support that AI effectively influences, thereby contributing to a more comprehensive understanding of AI's role in enhancing higher education.

In subsequent sections, this paper closely evaluates the systematic review, the methodology employed, findings, and implications. Through this comprehensive analysis, the study aims to shed light on the transformative potential of AIHed and contribute to the ongoing conversation on the future of education in an AI-enhanced landscape.

2. Methodology

2.1 Selection Criteria

In this research study, a robust set of criteria were followed in the process of scholarly article selection. These standards made sure that the chosen articles adhered to the requirements of academic rigor and relevance while also aligning with the objectives of the research.

The inclusion criteria stipulated that the chosen articles had to come from peer-reviewed journals in order to ensure the reliability and accuracy of the data. Further, to guarantee that the literature was current, only journals published from 2020 were selected.

Additionally, it was essential that the articles contained certain keywords, such as "artificial intelligence," "education," "grading system," "tutoring systems," "feedback," and "faculty instructional support," to ensure that they were directly relevant to the research focus. This keyword requirement made it easier to include articles that directly contributed to the investigation of how artificial intelligence can support instructional faculty.

Articles that did not contain the designated keywords were also disqualified as they did not adhere to the established research framework. To ensure the credibility of the sources, exclusion criteria, on the other hand, covered academic articles from journals without a peer review. Journals published before 2019 were ignored in favour of the most recent and ongoing research developments. This research study's foundation is a cohesive, trustworthy, and pertinent dataset of scholarly articles built using carefully determined selection criteria. The integrity and reliability of the research findings were guaranteed by adherence to these criteria. After initially scrutinising and reviewing 171 journals, a total of 52 articles were included in the selection.

2.2 Search Strategy

The search strategy used in this study sought to comprehensively compile academic articles from reputable databases recognised for their credibility and impact. In order to do this, a methodical search of databases like Science Direct, Taylor & Francis, and Emerald Insight was required. Due to their track record of hosting peer-reviewed journals and publications pertinent to the research field, these databases were chosen. The search strategy used targeted queries with words and phrases related to the study's subject. The researchers made sure that articles directly related to the use of artificial intelligence in instructional faculty support were retrieved with this targeted approach.

2.3 Construction of the Database

Each scholarly article that was located using the search strategy was carefully examined and evaluated as part of the database construction process. All articles underwent a thorough evaluation to determine the quality of content, relevance to the research objectives, and compliance with the predetermined selection criteria.

The use of keywords within the articles was given special consideration when the database was being built. The presence of pertinent keywords, as described in the research framework, was a key factor in choosing the articles for inclusion. This step was crucial in ensuring that the chosen articles offered insightful analysis of the research topic and added to the overall breadth of the review.

3. Results

3.1 Location of Studies

The studies used in this research came from reputable, international scholarly databases. Databases with a large selection of peer-reviewed journals and high-impact publications, like Science Direct, Taylor & Francis, and Emerald Insight, were selected. The richness of the study's findings was increased by the perspectives on artificial intelligence in instructional faculty support that these databases offered.

The majority of the scholarly articles used in this study's sources came from the Science Direct database. Figure 1 displays a breakdown of database usage when examining the relationship between artificial intelligence and faculty instructional support.

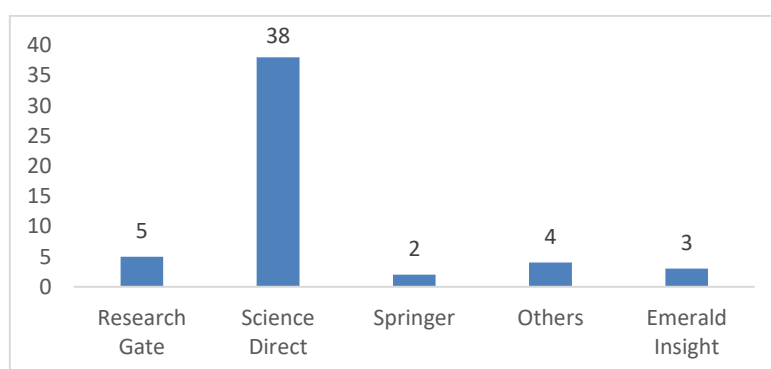


Figure 1: Contribution of Databases

Table 1 lists the top contributing papers and authors in the fields of instructional faculty support and artificial intelligence based on the total number of citations. In light of this, the list also showed that at the time of writing (2021), the Ouyang article "Artificial Intelligence in Education: The Three Paradigms" had 102 citations overall.

Table 1: Highest citations per paper

Paper	Year	Author	Citation
Artificial intelligence in education: The three paradigms	2021	Ouyang, F. & Jiao, P.	102

Student engagement with automated written corrective feedback (AWCF) provided by Grammarly: A multiple case study	2020	Koltovskaia, S.	98
A multi-perspective study on Artificial Intelligence in Education: grants, conferences, journals, software tools, institutions, and researchers	2020	Chen, X., Xie, H., & Hwang, G.-J.	97
So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy	2023	Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., Baabdullah, A. M., Koohang, A., Raghavan, V., Ahuja, M., Albanna, H., Albashrawi, M. A., Al-Busaidi, A. S., Balakrishnan, J., Barlette, Y., Basu, S., Bose, I., Brooks, L., Buhalis, D., & Carter, L.	89
Engaging with automated writing evaluation (AWE) feedback on L2 writing: Student perceptions and revisions	2020	Zhang, Z. (Victor)	86
ChatGPT for good? On opportunities and challenges of large language models for education	2023	Kasneci, E., Sessler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., Gasser, U., Groh, G., Günemann, S., Hüllermeier, E., Krusche, S., Kutyniok, G., Michaeli, T., Nerdel, C., Pfeffer, J., Poquet, O., Sailer, M., Schmidt, A., Seidel, T., & Stadler, M.	74
An automated essay scoring system: a systematic literature review	2021	Ramesh, D., & Sanampudi, S. K.	60
Using learning analytics to understand student perceptions of peer feedback	2020	Misiejuk, K., Wasson, B., & Egelanddsdal, K.	49
Machine translation systems and quality assessment: a systematic review	2021	Rivera-Trigueros, I.	47

Application of virtual reality teaching method and artificial intelligence technology in digital media art creation	2021	Gong, Y	37
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3.2 Research Methods

To ensure a thorough analysis of scholarly articles, the research methodology used is a systematic literature review approach. Each chosen article underwent a thorough evaluation that considered its calibre as well as how well it complemented the methodology and research focus. Useful insights were gathered from a variety of sources thanks to the systematic approach's use of information organisation and synthesis.

This study's decision to use the systematic literature review methodology was influenced by the research questions it aimed to answer. The transparency, accuracy, and replication of the chosen methodology are directly related to the study's objectives, which include a thorough investigation of AI's role in assisting instructional faculty. The systematic approach solidifies a compelling argument by combining data from various sources to mirror the evolving landscape of AI and its impact on educational support. This methodology enables a thorough examination of pertinent scholarly literature, illuminates crucial patterns and emerging trends, and provides a solid framework to address the research questions.

A thorough overview of how artificial intelligence can improve the capabilities of academic faculty was successfully provided by the systematic literature review approach when addressing the research questions. AI's potential for replication, openness, and meticulousness are the review's strongest points.

3.3 Source of Data

For the purpose of this study, data were gathered from a variety of scholarly sources, including journal articles and reliable online references. Collectively, these sources increased the dataset's depth and breadth. Editorial notes, white papers, and commentary were purposefully left out to ensure data accuracy. This methodical approach gave precedence to literature that had undergone academic validation and peer reviews, upholding the validity of the research findings and the scholarly integrity of the authors. To develop a thorough understanding of the ways in which artificial intelligence can assist academic faculty, the chosen data sources were carefully analysed.

4. Discussion

4.1 Artificial Intelligence

Artificial Intelligence is defined as a technological advancement that mimics human reasoning, providing ideas and information while streamlining processes and reducing the need for human intervention (Bozkurt et al., 2021). It combines science, robust datasets, algorithms, machine learning, and expert systems.

The application of AI in different sectors has been extensive. Gupta et al. (2023) emphasised its importance in clinical services, specifically in handling big data to improve healthcare practices. Di Vaio (2023) highlighted AI's role in supply chain management, inventory organisation, and logistics. The use of AI in education, according to Keiper (2023), led to more precise answers to brief questions and increased grammatical accuracy.

While there are many benefits to AI, some authors have expressed concerns about its drawbacks. According to Horodyski (2023), one disadvantage of the hiring process is the lack of human discretion. Tableau (nd) pointed out that AI usage can be costly, particularly when considering the risk of machine degeneration.

The complexity of AI and the potential for data processing, automation, and better decision-making to advance a number of industries are highlighted by these findings overall. Care should be exercised in order to address the challenges and limitations related to its implementation. Further research and ongoing advancement in this field are necessary to comprehensively understand the potential benefits of AI and minimise its drawbacks.

The analysis of AI's advantages and disadvantages demonstrates the diversity of this technological advancement. Horodyski's concerns surrounding the lack of human discretion remind us of the ethical issues, even though it is undeniable that AI has the potential to improve healthcare, supply chains, and education. The need for sustainable AI implementation is highlighted by Tableau's mention of cost and machine degeneration. Further, the importance of a balanced approach to AI adoption—one that maximises its benefits while addressing challenges and ethical implications—is stressed by this discussion.

4.2 Artificial Intelligence and Education

Existing academic literature makes a convincing case for the relationship between artificial intelligence and education. Al Darayseh (2023) investigated the adoption rate of AI usage among science educators by highlighting its potential to enhance instructional techniques. Cooper (2023) promoted the use of more effective assessment methods by highlighting the value of AI as a tool for developing quizzes, units, and rubrics. The use of AI in education for student learning, teaching strategies, management, and assessment was examined by Chiu (2023).

Jimenez (2021) also highlighted the potential for AI-powered intelligent tutoring systems to aid teachers and students in fully comprehending lessons. This serves as an example of how artificial intelligence can support personalised and flexible learning environments. In his study of the six levels of teaching and AI usage, Huang (2021) focused on the potential of AI to improve instructional strategies and academic results. Conversely, Mertala et al.'s (2022) study reveals that the usage of artificial intelligence tools in education requires further knowledge on technology as oftentimes both learners and students are misled by the information these tools provide.

These findings collectively suggest that the utilisation of AI in education holds promise for enhancing teaching practices, promoting personalised learning experiences, and optimising administrative processes. AI-driven tools and intelligent tutoring systems have the potential to facilitate more effective instruction, enable adaptive learning, and foster improved educational outcomes. It is evident that the application of AI in education is a dynamic area of research, with studies showcasing the benefits and possibilities that AI offers to educators and learners.

The research examined in this section sheds light on the revolutionary potential of AI in education. The different viewpoints, which range from improving instructional methods to individualised learning through intelligent tutoring systems, highlight AI's adaptability to different educational needs. The need for educators and students to be knowledgeable about these tools' capabilities is emphasised by Mertala's caution about the limitations of AI tools. With the caveat that proper training and ongoing research are necessary for effective integration, this section discusses AI's potential to reshape education.

4.3 Artificial Intelligence and Instructional Faculty Support

In this study, several articles were reviewed and analysed to further understand the connection between artificial intelligence and instructional faculty support. As elaborated in the previous literatures, instructional faculty support involves feedback generation, grading and scoring infrastructure, and tutoring systems. With artificial intelligence, these forms of instructional support can be processed faster with increased efficiency.

Artificial intelligence has been shown to enable process improvement, enhance teaching practices, and offer innovative solutions for faculty members. Several authors discussed the presence of artificial intelligence in education, emphasising the need to address ethical concerns and algorithms in the future (Alqahtani et al., 2023). The use of artificial intelligence in the classroom and faculty members' self-efficacy, attitudes, benefits, and behavioural intentions were found to be positively correlated by Al Darayseh et al. (2023).

Similar results were seen in the study by Halagatti (2023), which highlighted the advantages of integrating AI in schools. AI facilitates continuous, seamless, and just-in-time feedback on students' performance, which improves the learning process. One well-known AI programme discussed in the literature is ChatGPT, which was found to facilitate knowledge access through its human-like conversation interface (Deng et al., 2023).

The potential of AI to assist instructional faculty in education is highlighted by these findings. By providing prompt feedback and expanding access to information, the incorporation of AI technologies, such as ChatGPT, can promote more efficient and individualised learning experiences. It is clear that AI has the potential to improve instructional strategies, encourage student engagement, and generally raise academic standards.

An optimistic picture of AI's effects on instructional faculty support is presented by the research synthesis in this section. The associations between faculty attitudes and AI usage have been found to positively highlight AI's potential to promote more effective teaching methods. The continued need for personalised learning is supported by the emphasis on timely feedback and individual learning experiences. The discussion suggests that AI can be a catalyst for pedagogical innovation, although the ethical and algorithmic concerns raised by Alqahtani et al. remind us that responsible integration is imperative.

4.4 Artificial Intelligence and Tutoring Systems

One type of identified instructional support available for faculties in this study is tutoring systems. Tutoring systems are sophisticated, knowledge-based structures that aim to provide human-like knowledge.

This study reveals some literatures published in the past that discuss the linkage between artificial intelligence and tutoring systems. For instance, Mahdaoui's (2022) study focused on the benefits of including artificial intelligence in tutoring systems as a technique to create better rapport with students. On the other hand, Spitzer (2023) explored the possibilities of creating seamless tutoring systems during the height of pandemic in Austria. Consequently, Gobert (2023) and Castro-Schez (2021) also explored the potential of building competencies and new idea generation in the field of education.

Other literatures also discuss AI benefits: Arnau- González (2023) talks of introducing a RASA framework to create better dialogue flow and Newar (2022) details how AI can troubleshoot and debut a certain programming language. Gan's (2022) study also introduced a new model (KIEDLKD) that provides diagnosis and proficiency assessment for students to the faculty members.

The exploration of AI-powered tutoring systems opens a realm of possibilities for personalised education. Mahdaoui's focus on rapport, Spitzer's adaptation during the pandemic, and the potential for building competencies showcased by Gobert and Castro-Schez underscore AI's versatility in enhancing various educational dimensions. The mention of AI's role in dialogue flow and troubleshooting demonstrates its potential to create more engaging and effective learning experiences. However, as studies show, continuous monitoring and fine-tuning are necessary to ensure AI's positive impact.

4.5 Artificial Intelligence and Feedback

One of the identified instructional supports available for faculties in this study is feedback generation. Feedback serves as an important aspect of faculty support that is given to a student to further improve its performance.

In this study, there were several related literatures that were selected to better understand the linkage of artificial intelligence and feedback generation. For instance, Iftikhar (2022) explored an exploratory sequential framework in evaluating MT-FDP in the faculty's training programme at a university level in Pakistan. Zarei's (2023) study examined the integration of artificial intelligence with improvements for feedback on emerging sociotechnical systems.

Pannekoeke (2023) explored feedback generation using simulation-based learning in the healthcare industry. Consequently, Kazemier's (2021) study revealed that artificial intelligence helps in the development of futures literacy (FL) through instructional strategies and further research.

Meanwhile, findings from Celik's (2023) study show that there is a need for integration and the combination of technological and pedagogical knowledge with artificial intelligence tools to generate better educational purposes. Moreover, Udupa's (2022) study revealed that through artificial intelligence, faculty members can provide just-in-time and seamless feedback to the students. The integration of AI in generating feedback presents both opportunities and challenges. The varied applications, from faculty training to simulation-based learning, highlight AI's potential to enhance both theoretical and practical aspects of education. The emphasis on combining technological and pedagogical knowledge, as discussed by Celik, points to the importance of holistic AI implementation. While the promise of just-in-time and seamless feedback by Udupa is compelling, the potential for errors and misclassifications, as noted by Rivera-Trigueros (2021), serves as a reminder of AI's current limitations. This section reinforces the view that AI can significantly improve educational processes, but careful design and continuous refinement are crucial for its success.

4.6 Artificial Intelligence and Grading Systems

Another important aspect of instructional faculty support is the grading systems provided to the students. The timely release of grades is considered to be a crucial task for faculty members to help students and faculty members assess whether a certain subject matter is understood well or if there is still a need for some improvements.

In this study, the researcher was able to locate selected scholarly articles that discuss the linkage between artificial intelligence and grading systems. For instance, Ramnarain-Seetohul (2022) explored the usage of automated essay scoring systems (AES). Ramesh (2021) also supported this idea by stating that automated scoring systems reduce consumption time and address reliability issues but lack cohesion and coherence on tested essay exams. Uto (2021) also examined the reliability of automated essay scoring (AES) using a deep neural network (DNN-AED) method. Aside from the reliability issues, Mizumoto (2023) also tested the accuracy of the grammar and language translation of the exams using GPT.

Meanwhile, Zarei (2023) assessed the integration of artificial intelligence with the improvements for feedback on emerging sociotechnical systems. Rivera-Trigueros (2021), on the other hand explored the use of artificial intelligence as an aid to check foreign language exams but later revealed that more than half of the tested materials resulted in errors and misclassifications.

5. Conclusion

This paper set out on a thorough exploration of the field of artificial intelligence in higher education (AIHEd), examining its plethora of potential applications to improve administrative, teaching, learning, and assessment procedures. AIHEd has established itself as a dynamic field with promising prospects, despite not being without its difficulties, as is clear from the systematic review of scholarly articles.

As this study comes to a close, it is clear that the nexus of artificial intelligence and higher education (AIHEd) has the power to fundamentally alter the way that education is practiced. A thorough agenda for future research must be established in order to fully realise this potential and address the challenges it presents.

The investigation of novel theoretical perspectives is one of the directions for future research in AIHEd. Although the applications and effects of AI in education have been discussed in existing literature, new theoretical frameworks that delve deeper into the underlying mechanisms and dynamics of AI's influence are still needed. This is to think of AI not just as a tool but also as a transformative force that engages with cognitive processes, educational theories, and pedagogical practices.

Future research can concentrate on a variety of educational contexts, including informal learning environments, online learning platforms, and career training programmes. Examining how AI affects various learning scenarios, such as lifelong learning and professional development, can reveal opportunities and challenges specific to particular contexts.

Another crucial area for future research is the investigation of novel relationships and constructs within AIHEd. This requires exploring new variables and factors that affect how AI technologies are integrated and impact education.

New data collection and analysis methods must be developed in order to keep up with the rapid advancement of AI technologies. The use of chatbots, intelligent tutoring systems, and AI-driven educational platforms should all be considered for future research, and novel methods of collecting and analysing the data they produce should be investigated.

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