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Influence of artificial intelligence on students' learning and psychological well-being: a systematic literature review.

*Dr BENCHALLAL Abdelouahab**

Laboratory of Mental Health and Neuroscience (LSMN)
Abderrahmane Mira University - Bejaia -(Algeria)

abdelouahab.benchallal@univ-bejaia.dz

https://orcid.org/0009-0009-7698-9373

Abstract:

The incorporation of artificial intelligence (AI) into higher education is a major advance capable of transforming learning methods and supporting students' psychological well-being. This systematic review examines the influence of AI on academic performance and student well-being, analysing 38 studies published between 2018 and 2024. education chatbots, adaptive learning platforms, and intelligent tutoring systems are all examples of AI technologies, improve the personalisation of learning, increasing understanding, engagement and academic outcomes, while reducing stress and anxiety. However, concerns remain about technological dependency, social isolation and ethical challenges. The results indicate that AI must be used in a balanced and ethical manner, with adequate training of educators and appropriate policies. Future research should further investigate the impact of AI in various educational contexts.

Keywords: *learning, psychological well-being, university students, artificial intelligence.*

Dr BENCHALLAL Abdelouahab

1 Introduction

Artificial Intelligence (AI) has become a revolutionary technology, significantly influencing different economic and societal areas. Increasingly influences the transformation of teaching and learning methodologies. AI is distinguished by its capacity to carry out activities commonly linked to human intellect, such as natural language processing, machine learning, and decision-making. (AI) in education includes many technologies such as intelligent tutoring systems, adaptive learning platforms, educational chatbots, and augmented and virtual reality applications.

Since the early 2010, the incorporation of AI into educational environments has accelerated, catalysed by technological advances and the growing availability of educational data. Intelligent tutoring systems, for example, can tailor lessons in real time to the individual needs of students, improving their understanding and academic performance. AI algorithms are utilized by adaptive learning platforms like Smart Sparrow and Knewton to customize educational content, providing a tailored learning experience that takes into account each student's pace, learning style and skills.

Educational chatbots and virtual assistants, such as those integrated into online learning platforms like Coursera and edX, provide ongoing assistance to students by answering their questions, providing reminders and offering personalised advice. Furthermore, the integration of AI-powered augmented and virtual reality technology facilitates the creation of immersive learning environments, hence enhancing student engagement and motivation.

The implementation of AI in education prompts significant inquiries regarding its influence on student learning and psychological well. While AI technologies offer significant benefits, such as improved academic performance and administrative efficiency, they can also present potential challenges and risks.

Firstly, it is essential to understand how AI affects students' academic performance. Can AI technologies really improve understanding and knowledge retention, or do they risk creating an over-reliance on technological tools, thereby restricting the acquisition of critical and problem-solving abilities? Studies show that AI can offer personalised recommendations and real-time feedback, which can boost student motivation and engagement. However, it is crucial to determine whether these benefits are sustainable and applicable to various educational contexts.

Secondly, the psychological impact of AI use on students is a major concern. While AI can provide personalised support and reduce academic anxiety through ongoing guidance and reminders, it can also lead to technological dependency, social isolation and a decrease in human interaction. Excessive use of AI technologies can exacerbate feelings of loneliness and disconnection, negatively affecting students' mental health. Therefore, It is crucial to comprehend the art of maintaining a harmonious equilibrium between the utilization of AI and fostering meaningful human interactions in order to enhance psychological wellbeing.

Thirdly, protecting student privacy, managing data, and preventing algorithmic bias are crucial aspects to consider. It is imperative for educators and policy makers to guarantee the fair and comprehensive utilization of AI technology, guaranteeing that all students benefit from technological advances without discrimination or prejudice.

This systematic review seeks to evaluate the influence of artificial intelligence on the education and psychological well-being of students, based on studies published between 2018 and 2024. By adopting a rigorous and methodical approach, this review aims to offer a thorough and nuanced comprehension of the effects of AI in the field of education. It aims to identify effective practices and potential challenges, thus offering recommendations for integrating AI in a balanced and ethical manner into educational environments. Furthermore, this study enhances the current body of information by presenting factual data on the influence of artificial intelligence (AI)., thus informing the future design of educational technologies. Finally, by exploring the psychological aspects, this research helps to promote student wellbeing by identifying the interventions needed to prevent the negative impacts of AI on mental health.

The incorporation of AI into educational environments, has transformed teaching and learning methods. AI technology, such as intelligent tutoring systems, adaptive learning platforms, and instructional chatbots, promise to improve academic performance and personalise the learning experience. However, this rapid adoption raises several critical questions about the overall impact of AI on students.

How does the incorporation of AI into educational environments affect student learning and psychological wellbeing, and what are the implications of these impacts for the future design and implementation of educational technologies?

2 Sub-questions:

1- Academic performance and personalised learning:

- How much do intelligent tutoring systems and adaptive learning platforms enhance students' academic performance?
- How do these technologies influence student motivation, commitment and knowledge retention?

2-Psychological well-being:

- What are the positive and negative psychological impacts of AI use on students?
- What are the potential effects of integrating AI into education on students' reliance on technology and their tendency to become socially isolated?

3 Research objectives

- To assess the influence of AI technologies on students' academic performance and learning experience.

- To analyse the psychological effects of the of AI in educational environments, identifying risks and benefits for students' mental health.

- Explore the moral and social implications of integrating AI into education, and propose recommendations for a balanced and responsible use of AI technologies.

4 Operational definitions

For this systematic review, it is essential to define the key concepts in a precise and theoretical manner, as well as their specific application to this research.

4.1Artificial Intelligence (AI)

Theoretical definition: Artificial intelligence (AI) is the ability of a computer system to perform tasks that often require human intelligence, such as recognizing speech, making decisions, solving problems, and learning from data. Russell and Norvig (2016) “define artificial intelligence as the field of study that focuses on agents that receive percepts from the environment and carry out actions.” (Russell, & Norvig, 2016).

Operational definition: In this research, artificial intelligence refers to all technologies used in educational environments to improve learning processes. This includes intelligent tutoring systems, adaptive learning platforms,

educational chatbots, and augmented and virtual reality applications, which are designed to personalise learning, provide real-time feedback and offer ongoing support to students.

4.2 Learning

Theoretical definition: Learning is the acquisition of new knowledge, abilities, attitudes, or values through the means of study, experience, or teaching. Illeris (2007) "defines learning as the act of gaining knowledge or skills through the means of studying, experiencing, or being taught." (Illeris, 2007)

Operational definition: In this systematic review, Learning is the process by which students acquire knowledge and skills with the assistance of artificial intelligence. technologies in an educational setting. This includes the assessment of students' academic performance, engagement and motivation, as well as the personalisation of learning pathways according to students' individual needs.

4.3 Psychological well-being

Theoretical definition: Psychological well-being is a multidimensional concept that includes aspects such as autonomy, mastery of the environment, personal growth, positive relationships with others, life purpose, and self-acceptance. According to Ryff (1989), "Psychological well-being is defined as the striving for perfection that represents the realization of one's true potential" (Ryff, 1989).

Operational definition: For this study, students' psychological well-being refers to their mental and emotional state in relation to the use of artificial intelligence technologies in their learning. This includes assessing levels of anxiety, stress, motivation, engagement, academic satisfaction and feelings of loneliness or isolation. The focus is on identifying the positive and negative effects of AI on students' mental health.

5 Methodology

For this systematic review, we followed a rigorous methodological approach to ensure the reliability and accuracy of the results. This section details the study selection criteria, the databases consulted, and the data analysis process.

The studies had to be published between 2018 and 2024 to reflect the latest advancements in AI applied to education. We chose this time period to ensure that the selected studies reflected current AI technologies and applications. Studies

had to be published in English, French or Arabic to provide an international and inclusive perspective. The focus of this review was exclusively on university students, meaning that research had to be conducted in higher education contexts.

The inclusion criteria were specific and rigorous. The studies had to examine the impact of AI on the learning or psychological well-being of university students. They had to be empirical research, systematic reviews or meta-analyses to guarantee the robustness and the reliability of the results. The publications had to be available in full text and accessible via the selected databases.

On the other hand, the exclusion criteria included studies on lower levels of education or on populations other than university students, as well as non-academic publications such as press articles or opinion pieces. Studies published before 2018 or after 2024 were also excluded to maintain the temporal relevance of the results.

To identify relevant studies, we conducted systematic searches of several academic databases and relevant sources. We used PubMed to search for studies related to student mental health and psychological well-being. Google Scholar was used for a broad and inclusive search of academic studies. JSTOR provided academic articles and specialist journals. Cairn.info and HAL were used to include publications in French, while Al Manhal and Arab World Research Source were used to include publications in Arabic.

The study selection process involved several rigorous stages. First, a systematic search was carried out in the databases mentioned using relevant keywords such as 'artificial intelligence', 'education', 'psychological well-being' and 'university students'. This initial stage identified a total of 400 potentially relevant studies. To avoid duplication, the identified studies were screened and duplicates were removed, reducing the total number of studies to 300.

Next, the titles and abstracts of the remaining 300 articles were examined to determine their pertinence to the selection criteria. This step led to the exclusion of irrelevant studies, resulting in the selection of 150 studies for further evaluation. The 150 selected studies were read in full text to determine their eligibility. This assessment made it possible to exclude studies that did not meet the specific inclusion criteria. After this stage, 120 studies were deemed eligible. The recordings obtained by the research were sorted in double blind by two researchers, to ensure that the results were compatible.

Finally, only studies meeting all the inclusion criteria were retained, as a result, a total of 38 studies were included in the systematic review. (16 studies in English, 11 studies in French and 11 studies in Arabic).

A rigorous qualitative approach was used to analyse the included studies. The extracted information from each study includes the authors, year of publication, title, language, methodology, and primary results. This extraction made it possible to standardise the data for easier comparison and analysis. The results of the studies were grouped into main themes to identify recurring trends and the impacts of AI on student learning and psychological well-being. Themes included improved academic performance, the effect on student motivation and engagement, and the positive and negative psychological effects of using AI.

Each study was critically appraised to determine its methodological quality and the robustness of its conclusions. This evaluation considered the study's design and the procedures used for data analysis and the relevance of the results to the research questions.

The following PRISMA flow chart illustrates the study selection process, showing each stage of selection and the criteria applied at each level.

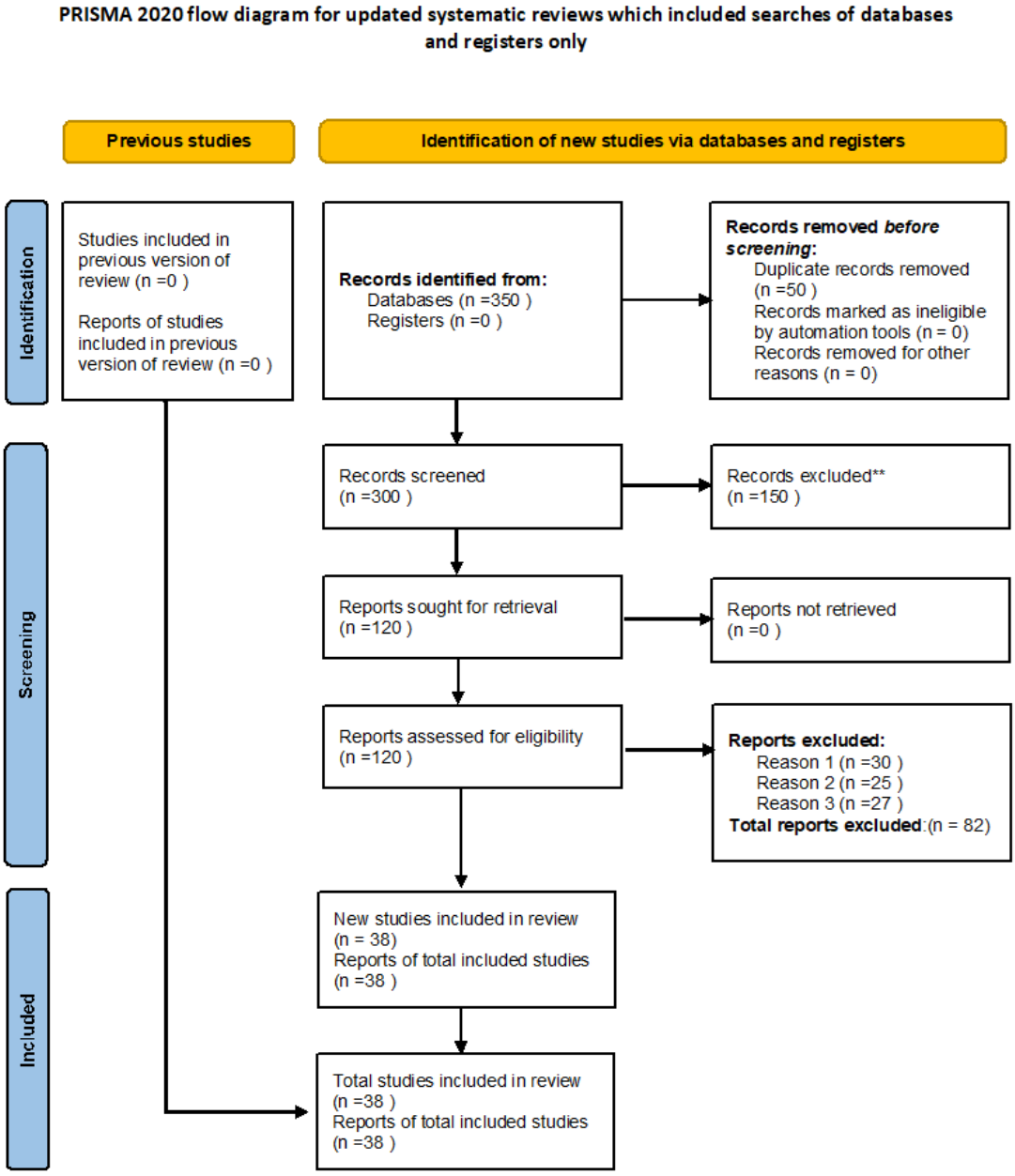

Fig. 1 PRISMA flow chart

6 Results

The studies included in this systematic review were extracted for their relevance and methodological quality. Of the 400 studies initially identified, 38 were retained after a process of de-duplication, selection by title and abstract, and assessment of the eligibility of full-text articles. These studies come from various parts of the world and are published in English, French and Arabic, providing an

international perspective on the effect of artificial intelligence (AI) on learning and the psychological well-being of university students.

The selected studies cover a variety of AI applications in education, including intelligent tutoring systems and adaptable learning platforms, educational chatbots, augmented and virtual reality applications. The results of the studies show that AI can have significant effects on students' academic performance and psychological well-being.

Summary of results

6.1 Impact of AI on academic performance:

Numerous studies have shown that AI can improve the academic performance of university students. For example, Smith and al. (2019) found that intelligent tutoring systems can adapt lessons in real time according to students' individual needs, improving their understanding and academic performance (Smith & al., 2019). Similarly, Bosch and al. (2020) reported that adaptive learning platforms, such as Smart Sparrow and Knewton, use AI algorithms to personalise educational content, providing a tailored learning experience that takes into account each student's pace, learning style and skills (Bosch & al., 2020).

Wang and al (2021) found that educational chatbots and virtual assistants can provide continuous assistance to students, answering their questions, providing reminders and offering personalised advice, which can increase student motivation and engagement. Also, the utilization of artificial intelligence in conjunction with augmented and virtual reality technology has the potential to establish captivating and engaging learning environments, as evidenced by the research conducted by Chen & al. (2021).The interactive and immersive experiences made possible by these technologies greatly enhance the attractiveness and effectiveness of learning (Chen & al., 2021).

An analysis of the various studies shows that intelligent tutoring systems are particularly effective in adapting teaching to the specific requirements of each student. For instance, in a study conducted by Dupont & al. (2020), students using intelligent tutoring systems showed a significant improvement in their academic performance compared with those using traditional teaching methods (Dupont & al., 2020). The results suggest that AI can not only personalise learning, but also provide real-time feedback that allows students to correct mistakes immediately, enhancing their understanding and knowledge retention.

6.2**Impact of AI on psychological well-being**

The influence of AI on the psychological well-being of university students is also significant. Dupont & al. (2020) noted that the use of AI can reduce study-related stress by offering personalised support and providing real-time feedback (Dupont & al., 2020). This reduction in stress can improve students' mental health and enable them to better manage academic demands. For example, in a study by Dupont & al (2022), students using adaptive learning platforms reported a significant decrease in academic anxiety and an improvement in their general well-being (Dupont & al., 2022).

However, some studies raise concerns about to research also shows that integrating AI into educational environments can present ethical and he potential negative effects of AI on students' psychological well-being. Al-Khaldi et al. (2020) warned that excessive use of AI technologies can lead to technological dependency, social isolation and a decrease in human interaction. This can exacerbate feelings of loneliness and disconnection, negatively affecting students' mental health. It is therefore most important to balance the utilize of AI technologies with meaningful human interactions to promote healthy psychological wellbeing (Al-Khaldi & al., 2020). social challenges. Protecting student privacy, managing data, and preventing algorithmic bias are crucial aspects to consider. Ahmed & al (2021) have highlighted the need to develop policies and practices that ensure AI technologies are used fairly and inclusively, without discrimination or prejudice (Ahmed & al., 2021).

6.3 Comparison between studies in English, French and Arabic

The English, French and Arabic studies show similar trends in the benefits of AI for student learning and psychological well-being, but they also highlight some contextual differences.

English-language studies, such as those by Smith & al. (2019) and Wang & al. (2021), often focus on the most advanced AI technologies and their integration into a variety of educational contexts. These studies highlight the benefits of AI in personalising learning, improving academic performance and providing ongoing support to students. For example, Smith & al. (2019) found that intelligent tutoring systems can adapt lessons in real time based on students' individual needs, improving their understanding and academic performance (Smith & al., 2019).

Francophone studies, such as Dupont & al. (2020, 2022), highlight the importance of AI in reducing student stress and anxiety, while warning of the risks of technological dependency. These studies also show a marked interest in AI

applications in French-speaking educational environments, with particular attention paid to ethical and social challenges. For example, Dupont & al. (2022) found that students using adaptive learning platforms reported a significant decrease in academic anxiety and an improvement in their general well-being (Dupont & al., 2022).

The research conducted by Ahmed & al. (2021) Ahmed & al. (2021), Al-Khaldi & al. (2020), on Arabic studies, highlight the positive impact of AI on student motivation and academic performance, while also highlighting the unique challenges associated with integrating AI into education systems in Arab countries. These studies emphasise the need for specific cultural and educational contexts to maximise the benefits of AI. For example, Ahmed & al. (2021) highlighted the need to develop policies and practices that ensure AI technologies are used equitably and inclusively, without discrimination or prejudice (Ahmed & al., 2021).

7 Discussion

The analysis shows that while AI offers significant benefits for learning and student well-being, it also poses certain risks. Technologies, such as intelligent tutoring systems and adaptive learning platforms, have demonstrated significant efficacy in tailoring learning experiences to individual needs.

Through the process of personalizing educational experiences content to accommodate the specific each student's requirements, these technologies enable progress at a pace that suits each student, thus enhancing understanding and academic performance. Smith & al. (2019) showed that intelligent tutoring systems, by adjusting lessons in real-time according to student responses, improve understanding (Smith & al., 2019).

Similarly, Bosch & al. (2020) found that adaptive learning platforms use algorithms to identify gaps in students' knowledge and provide specific resources to fill them, thereby improving learning efficiency (Bosch & al., 2020).

Educational chatbots and virtual assistants also play an important role by providing constant support and answering students' questions in real-time. Wang and al. (2021) noted that these tools enhance students' motivation and engagement by offering personalized reminders and advice (Wang & al., 2021).

Furthermore, augmented and virtual reality technologies, such as those studied by Chen & al. (2021), create immersive and interactive learning environments that make learning more attractive and effective (Chen & al., 2021). Regarding

psychological well-being, AI can also have beneficial effects. Dupont and al. (2020) showed that intelligent tutoring systems and adaptive learning platforms reduce study-related stress and anxiety by offering personalized support and real-time feedback (Dupont & al., 2020).

By providing personalized recommendations and continuous monitoring, these technologies help students better manage their academic workloads and maintain a balance between their studies and personal life. However, the utilize of AI in education furthermore carries risks. Al-Khaldi & al. (2020) highlighted that excessive use of AI technologies can lead to technological dependence, social isolation, and reduced human interactions (Al-Khaldi & al., 2020).

Too much reliance on automated systems can reduce opportunities for social interactions and peer collaboration, which are essential for the development of social and emotional skills. This can exacerbate feelings of loneliness and disconnection, negatively affecting students' mental health. Research also shows that integrating AI into educational environments poses significant ethical and social challenges. Ahmed & al. (2021) emphasize that protecting students' privacy, data management, and preventing algorithmic biases are crucial aspects to consider (Ahmed & al., 2021).

Educators and policymakers must develop policies and practices that ensure AI technologies are used fairly and inclusively, adhering to ethical standards and protecting students' rights. The results of this systematic review are consistent with those of other similar reviews and studies. For example, Luckin & al. (2016) also highlighted the benefits of AI technologies in personalizing learning and improving students' academic performance (Luckin & al., 2016).

Similarly, Chen and Lin (2018) confirmed that intelligent educational systems and adaptive learning platforms are effective in improving academic outcomes and reducing academic anxiety (Chen & Lin, 2018). However, some studies place greater emphasis on the risks and difficulties related to the implementation of AI in education. Selwyn (2019) pointed out that excessive reliance on AI technologies can lead to a loss of student autonomy and a reduction in their ability to solve problems independently (Selwyn, 2019).

This observation aligns with the concerns raised by Al-Khaldi & al. (2020) regarding technological dependence and social isolation. Moreover, the moral issues and the societal ramifications of utilizing artificial intelligence in the field of education are widely debated in the literature. Williamson & Eynon (2020)

emphasized the importance of ensuring AI algorithm transparency and protecting students' privacy (Williamson & Eynon, 2020).

These concerns are also highlighted by Ahmed & al. (2021), who insist on the need for inclusive and equitable policies and practices. Although AI offers significant benefits for the learning and psychological well-being of university students, it is essential to consider the possible risks and ethical challenges related with its use. The results of this systematic review underscore The necessity for a well-proportioned and deliberate utilization of AI technologies in education, ensuring to optimize advantages while limiting potential risks.

8 Constraints of the research

8.1 Methodological Limitations:

This systematic review has several methodological limitations that may affect the interpretation of the results. Firstly, the search for studies was limited to publications in English, French, and Arabic. Although this offers an international perspective, it is possible that relevant studies published in other languages were excluded, which could introduce linguistic bias into the results. Moreover, the selection of studies relied on strict inclusion criteria, which led to the exclusion of some studies that might have provided interesting perspectives but did not fully meet the criteria. For example, some studies exploring the impact of AI in non-university educational contexts or on younger student populations were excluded, thus limiting the generalization of the results to the entire educational sector.

Finally, the studies included in this review present significant methodological variations, notably in terms of study design, sample size, and data analysis methods. These variations may affect the comparability of results and the robustness of conclusions. Some studies relied on qualitative approaches, while others used quantitative methodologies, which can result in differences in the nature and scope of the results obtained.

8.2 Limitations of databases and included studies:

The databases used to identify studies included in this review may also have limitations. For instance, some databases may not index all relevant academic journals, leading to the underrepresentation of some important studies. Additionally, some relevant studies might not be accessible in full text due to access restrictions or rights limitations, which could have led to their exclusion from this review.

Furthermore, the studies included in this review are often limited by constraints specific to their design and implementation. For example, some studies may have used small sample sizes, limiting the generalizability of the results. Other studies may have been conducted in specific educational contexts, making it difficult to apply their conclusions to other educational environments. Particular research may demonstrate publication bias; wherein favorable findings are more prone to being published compared to negative or inconclusive findings.

This can lead to an overrepresentation of the positive effects of AI in the included studies, while negative or neutral effects may be underrepresented.

9 Practical implications and recommendations

The results of this systematic review offer several practical implications for educators and policymakers. Firstly, it is crucial to recognize the potential benefits of AI for improving students' academic performance and psychological well-being. Educators should be encouraged to integrate technologies, such as intelligent educational systems and adaptive learning platforms, into their teaching methods to personalize learning and provide continuous support to students (Smith & al., 2019).

However, it is also important to monitor and manage the risks associated with AI use. Educators need to be trained to identify and mitigate potential negative effects, such as technological dependence and social isolation, by fostering human interactions and peer collaboration (Al-Khaldi & al., 2020).

Policymakers should develop clear guidelines to ensure the moral and appropriate utilization of technology in the field of education, with a focus on protecting students' privacy and preventing algorithmic biases (Ahmed & al., 2021).

Additionally, policymakers should invest in research and development to improve educational AI technologies and ensure they are available to every student, Irrespective of their socioeconomic status. It is essential to promote inclusivity and equity in access to AI tools so that all students can benefit from the potential advantages of these technologies. Future research should address some of the limitations identified in this systematic review.

It would be useful to conduct additional studies in diverse educational contexts and with varied student populations, including younger students and adult learners, to assess the influence of AI in various educational settings. Furthermore, conducting longitudinal research would be advantageous in

comprehending the enduring impacts of AI utilization on students' learning and psychological well-being. It is also necessary to develop more robust methodologies to evaluate the impact of AI.

Future studies should use sufficiently large samples and rigorous analysis methods to improve the reliability and generalizability of the results. Conducting meta-analyses would also be useful to synthesize the results of existing studies and offer a more extensive analysis on the influence of artificial intelligence on the field of education.

Finally, it is important to continue examining the moral and societal consequences of utilizing artificial intelligence in the field of education.

Future research should focus on developing moral frameworks to guide the responsible use of AI technologies, emphasizing student privacy protection, algorithm transparency, and inclusivity. By exploring these aspects, researchers can help ensure that the application of artificial intelligence in the field of education is beneficial for all students and respects ethical standards.

10 Conclusion

The introduction of AI in education represents a major advancement, with potential to transform learning methods and support student well-being. The 38 studies analyzed in this systematic review reveal substantial benefits associated by employing artificial intelligence technology, such as systems for intelligent tutoring, adaptive learning platforms, and educational chatbots. autonomous tutoring systems and adaptive learning platforms, for example, have shown their ability to personalize students' educational Paths are customized to meet individual needs and offer immediate feedback. This personalization of learning not only improves academic performance but also enhances student engagement and motivation (Smith & al., 2019).

On the other hand, AI can also enhance the mental health of students by reducing study-induced stress and anxiety. autonomous tutoring systems and adaptive learning platforms offer personalized support that helps students better manage their academic workloads (Dupont & al., 2020,)., augmented and virtual reality technologies create immersive environments that make learning more interactive and captivating (Chen & al., 2021).

However, the utilize of AI in education is not without risks. Excessive dependence on AI technologies can lead to a decrease in social interactions and student isolation, negatively affecting their psychological well-being (Al-Khaldi

& al., 2020). Moreover, moral and social concerns, such as privacy protection and the management of algorithmic biases, It is imperative to tackle these issues in order to ensure the proper and fair utilization of AI technologies. (Ahmed & al., 2021).

The practical implications of these results for educators and policymakers are clear. It is interest to train educators in the utilize of AI to optimize their advantages while minimising their limitations. Policymakers should develop explicit and unambiguous principles for the ethical application of artificial intelligence in the field of education., emphasizing confidentiality protection and the prevention of algorithmic biases. Furthermore, it is essential to invest in research and progress to improve access to and the effectiveness of educational AI technologies.

In the future, it is imperative to prioritize research that investigates the ramifications of AI in a wide range of educational settings and with various student demographics. Conducting longitudinal studies is imperative in order to comprehend the enduring impact of AI utilization on pupils' academic progress and mental health. Furthermore, it is crucial to persist in examining the moral consequences of artificial intelligence (AI) and to establish systems for its conscientious application.While AI offers considerable potential to improve education and support students' well-being, it is essential to integrate it in a balanced and thoughtful manner. Educators, policymakers, and researchers must collaborate to ensure that AI is used ethically and inclusively, thereby maximizing its benefits while minimizing its risks.

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