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REVIEW

Educational Strategies for Addressing Student Anxiety and Depression through Artificial Intelligence: A Bibliometric and Conceptual Analysis

Estrategias Educativas para Abordar la Ansiedad y la Depresión Estudiantil a través de la Inteligencia Artificial: Un Análisis Bibliométrico y Conceptual

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ABSTRACT

Introduction: artificial intelligence (AI) technology has transformed education, positively impacting various academic tasks, including learning experiences and supporting students' mental health. However, user-related factors, particularly students and educators, have influenced the successful implementation of AI technology. Several studies have reported negative impacts, such as anxiety and depression, during online learning, which require further investigation.
Method: this study aimed to identify trends, clustering patterns, and thematic analyses regarding the impact of AI technology and the role of teachers in mitigating the risks of anxiety and depression. A systematic literature review (SLR) approach using the PRISMA protocol was employed to conduct an in-depth exploration. A total of 33 articles were retrieved from the Scopus database between 2017 and 2024 using the keywords "artificial intelligence," "AI," "anxiety," and "depression." The data were analyzed using VosViewer, Biblioshiny and thematic analysis.
Results: the main findings indicated that AI technology posed several disadvantages when implemented without proper preparedness and control. These included reduced social interaction, technological complexity, dependency, and loss of autonomy, biased feedback, and the misuse of information—all of which reinforced students' anxiety and depression. Proposed strategies involved early detection of stress indicators, the creation of inclusive and pressure-free learning environments, the integration of mental health awareness into curricula, access to information and counseling services, fostering positive and open relationships, balanced use of AI technologies, fair empathy and concern, and professional development for educators.
Conclusions: this study provides a theoretical framework and practical strategies for educators and policymakers to promote balanced or hybrid uses of AI technology. Future research should ensure that AI is utilized appropriately, particularly in reducing the risks of emotional disturbances and mental health issues.

Keywords: Artificial Intelligence; Anxiety; Depression; Educators; Mental Health.

RESUMEN

Introducción: la tecnología de inteligencia artificial (IA) ha transformado la educación, impactando positivamente en diversas tareas académicas, incluidas las experiencias de aprendizaje y el apoyo a la salud mental del estudiantado. Sin embargo, los aspectos relacionados con los usuarios, en particular estudiantes y educadores, influyen en el éxito de la implementación de la tecnología de IA. Diversos estudios han reportado efectos negativos, como ansiedad y depresión, durante el aprendizaje en línea, lo cual requiere una mayor investigación.
Método: el presente estudio tuvo como objetivo identificar las tendencias, los patrones de agrupamiento y los análisis temáticos en el contexto del impacto de la tecnología de IA y el papel de los educadores en la mitigación de los riesgos de ansiedad y depresión. Se empleó un enfoque de revisión sistemática de la literatura (RSL) utilizando el protocolo PRISMA para llevar a cabo una exploración en profundidad. Se recuperaron un total de 33 artículos de la base de datos Scopus, publicados entre 2017 y 2024, utilizando las palabras clave "inteligencia artificial", "IA", "ansiedad" y "depresión". Los datos se analizaron mediante las herramientas VosViewer, Biblioshiny y análisis temático.
Resultados: los principales hallazgos indicaron que la tecnología de IA presenta varias desventajas cuando se implementa sin una preparación y control adecuados. Estas incluyen la reducción de la interacción social, la complejidad tecnológica, la dependencia y pérdida de autonomía, retroalimentación sesgada y el uso indebido de la información, factores que contribuyen a intensificar la ansiedad y la depresión en los estudiantes. Las estrategias propuestas incluyen la detección temprana de indicadores de estrés, la creación de entornos de aprendizaje inclusivos y libres de presión, la integración de la conciencia sobre la salud mental en los planes de estudio, el acceso a servicios de información y asesoramiento, el fomento de relaciones positivas y abiertas, el uso equilibrado de tecnologías de IA, la empatía y preocupación justas, así como el desarrollo profesional del cuerpo docente.
Conclusiones: este estudio proporciona un marco teórico y estrategias prácticas para que educadores y responsables de políticas promuevan un uso equilibrado o híbrido de la tecnología de IA. Las investigaciones futuras deben garantizar un uso adecuado de la IA, en particular en lo referente a la reducción de riesgos relacionados con trastornos emocionales y problemas de salud mental.

Palabras clave: Inteligencia Artificial; Ansiedad; Depresión; Educadores; Salud Mental.

INTRODUCTION

Artificial Intelligence (AI) technology has gained significant attention in education. AI is viewed as a tool capable of enhancing the quality of learning by facilitating innovative instructional materials, enabling interactive assessments, and allowing for adaptation to students' characteristics. In addition to supporting administrative tasks and instructional processes, AI is also seen as contributing to the effective management of educational institutions. Several studies have confirmed that the integration of AI technology has aided academic needs and identified students' mental health conditions, which are essential for improving learning outcomes.[1,2] Moreover, AI has been recognized for its ability to analyze classroom learning behaviors and enhance students' mental capabilities well-being.[3,4]

Various AI-based applications, such as chatbots and ChatGPT, have often been linked to academic support and mental health satisfaction because of their practical and flexible nature.[5,6,7] These technologies offer personalized learning and early detection of mental health disorders.[8] Furthermore, AI is perceived to mitigate feelings of loneliness through interactive group-based learning and emotional support mechanisms.[9] Despite these benefits, some adverse effects have also been observed, including overdependence on technology and declining innovation and creativity. Consequently, monitoring and managing AI usage according to user needs and student characteristics is important.[10]

AI technology has also been reported to negatively impact students' psychological development and mental health.[11] A growing concern is the emergence of "AI anxiety," which manifests as fear, discomfort, and stress due to limited interaction and the complexity of AI tools. Among novice users, excessive exposure to AI technologies has triggered heightened mental health disturbances. Students have reported increased anxiety caused by issues related to autonomy, surveillance, ethical implications, and failure to use AI appropriately in academic environments. External factors and a lack of adequate understanding of AI often exacerbate such issues anxiety.[12] Further concerns include reduced learning capacity, slower responsiveness, and overreliance on AI. Students have also expressed concerns over data privacy, biased information, job manipulation, existential threats, ethical violations, and a lack of transparency.[13,14] These issues have broader health implications, with students experiencing heightened anxiety and behavioral changes.[15,16] In some cases, AI dependency has been found

to harm the mental health of adolescents due to the instant nature of information and the underdeveloped cognitive maturity of younger users.[17] Moreover, the absence of comprehensive institutional regulations and the limited capacity of teachers to implement AI have hindered its optimal utilization.[18]

Nonetheless, the negative impacts and mental health disturbances caused by AI can potentially be identified early through its integration in online learning. Prior studies have suggested that specific AI technologies can help diagnose and classify levels of depression and anxiety.[19,20] The role of educators and students' understanding of AI has been shown to improve self-efficacy, reduce anxiety, and facilitate appropriate feedback. For example, during the COVID-19 pandemic and restricted classroom environments, AI tools such as intelligent tutoring systems, chatbots, and virtual learning assistants contributed to students' psychological well-being. These tools helped ease students' psychological burdens caused by social isolation. Ethical awareness in AI use has also led to positive attitude changes, greater self-efficacy, and reduced anxiety levels.[15,21] However, research specifically focusing on students' mental health, particularly anxiety and depression, remains limited. In many cases, educational practices fail to consider students' psychological and emotional well-being, ultimately resulting in ineffective learning outcomes. Given the continuing expansion of AI use in education post-COVID-19, this study aims to identify the impacts and effective strategies for using AI to reduce anxiety and depression risks, affecting mental health and learning quality.[2] This study is essential for reinforcing learning practices that have remained passive during online learning. Research trends exploring the specific effects of AI on student anxiety and depression, as well as the role of educators and educational institutions, have not yet been sufficiently addressed. Drawing upon previous studies, this paper seeks to identify research trends, thematic resolutions, and appropriate AI implementations. Furthermore, the findings are expected to inform policy recommendations at both local and national levels, especially in the context of hybrid learning models.

METHOD

Research Design

This study employed a Systematic Literature Review (SLR) approach, which was designed to identify, analyze, and synthesize research in a clear, consistent, and structured manner.[23,24] This approach was chosen due to its comprehensive ability to identify and examine the relevance of Artificial Intelligence (AI) usage in a specific context, namely, student anxiety and depression.[25,26] The findings, which were categorized and confirmed based on the research objectives, provided a holistic and comprehensive overview. Additionally, its capability to bridge research gaps, especially in underexplored areas, allowed for deeper insights.[27,28] This flexible method has been widely adopted across various academic disciplines, including education. The study adopted the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework to ensure quality, objectivity, transparency, and replicability.[28] The adapted steps included identification, screening, eligibility, inclusion, and thematic analysis (see figure 1).

Data Collection

The primary data source for this study was the Scopus database. The primary considerations in using Scopus included minimizing selection bias and accessing the largest and most comprehensive database to support a systematic and efficient search process. Furthermore, it provided open access to relevant articles and strong coverage of social science literature. The search strategy utilized direct queries to retrieve relevant articles using the keywords: Anxiety, Depression, AI, Artificial Intelligence, and Education. This identification stage resulted in a total of 9,871 retrieved articles.

Table 1 presents the search query used in the Scopus database to generate articles relevant to the research objectives. The query was carefully constructed based on the research topic and subject, aimed at exploring the application of AI technology, particularly in addressing student anxiety and depression. Boolean logic was applied to ensure precision and accuracy in the results.

Table 1. Advanced searching query for Scopus database

Database	Keywords	Query Code
Scopus	Artificial Intelligence, AI, Depression, Anxiety, Education	"Anxiety" AND "Depression" AND ("AI" OR "Artificial Intelligence") AND "Education" AND PUBYEAR > 2017 AND PUBYEAR < 2024 AND (LIMIT-TO (SUBJAREA, "SOCI")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (PUBSTAGE, "final")) AND (LIMIT-TO (SRCTYPE, "j")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (OA, "all"))

To increase precision, filtering was conducted based on titles and abstracts that aligned with the research context, narrowing the results to 8388 articles. The next stage involved assessing the complete eligibility of each article. The inclusion criteria comprised the following: research focused on anxiety and depression, the subject of study being students, publication date between 2017 and 2024 to reflect AI advancements, English-

language articles, and full open-access availability (see table 2).

Table 2. Criteria for Inclusion and Exclusion

Aspects	Inclusion Criteria	Exclusion Criteria
Research Topics and Focus	Artificial Intelligence or AI in Education	Artificial Intelligence or AI in other fields
Research Subjects	Students of all levels of education	Students, non-human subjects
Publication Period	Range 2017-2024	Before 2017
Publication Language	Only the English language is selected	Other languages include Chinese, German, Russian, Japanese, etc.
Publication Sources and Quality	Document type: Article with journal source	Document type: review, book chapter, conference paper, conference review, book, note, short survey, data paper, editorial, erratum, letter
Accessibility	An article with an open-access status that can be accessed	Repository only articles: title, abstract, and keywords

Articles not meeting these criteria were excluded, resulting in 126 articles being retained for further review. Of these, 33 articles successfully passed the final selection stage and were exported in RIS and BibTeX formats for further analysis using VOSviewer and Biblioshiny. VOSviewer was employed to visualize data based on bibliometric distribution and research trends. Subsequently, Biblioshiny was utilized for its interactive interface and capability in clustering analysis, word clouds, and thematic interpretation. Thematic analysis was conducted to explore the role of educators in addressing student anxiety and depression and to understand the educational design in balancing the integration of AI technology in the classroom. The thematic analysis process involved identifying emerging themes from the selected documents and was carried out through reading, comprehension, theme identification, categorization, refinement, interpretation, and synthesis. The findings produced meaningful concepts illustrating how educational systems can manage the use of AI technologies while mitigating the risks of anxiety and depression.

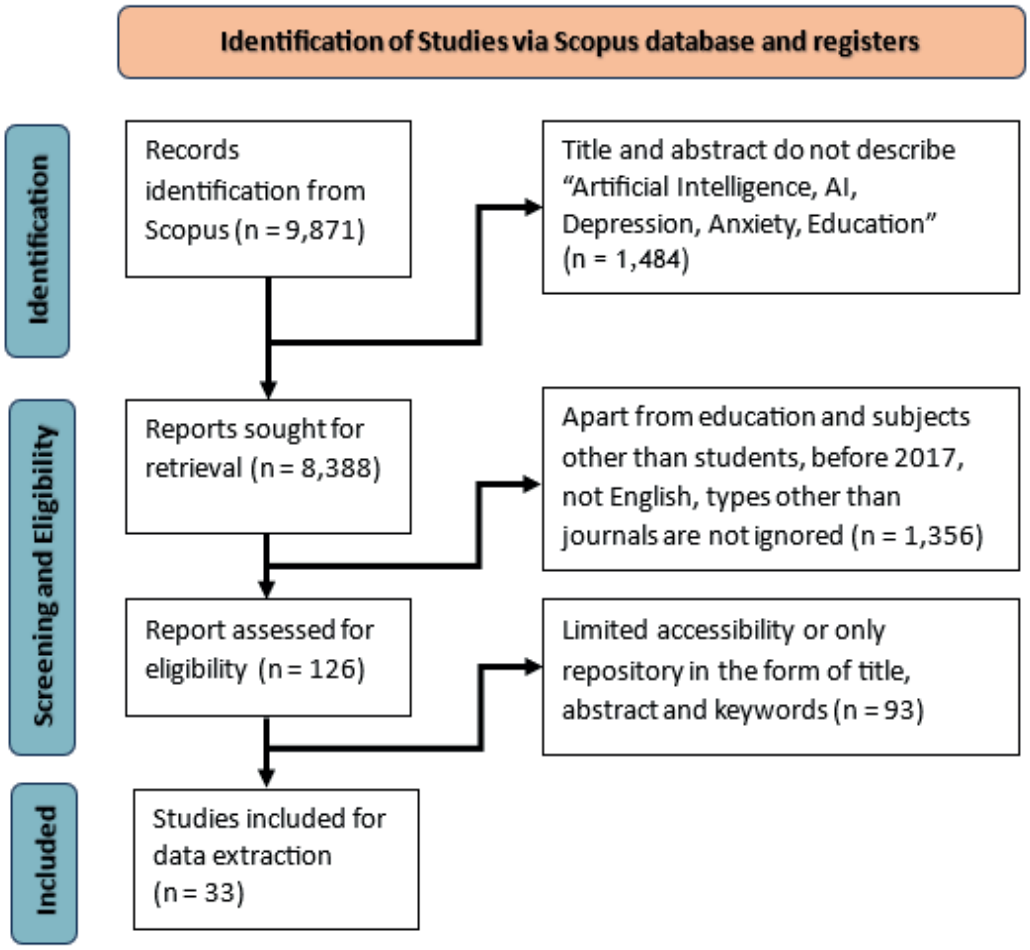

Figure1. Search flow using PRISMA protocol

RESULTS AND DISCUSSION

Data Collection Summary

The distribution by year indicated a significant trend in the massive use of AI technology in education. There was a noticeable increase in studies from 2017 to 2024 that addressed the use of AI in the context of depression and anxiety during the learning process (see figure 2). In 2020, 7 articles (21,21 %) discussed this topic, coinciding with the onset of the COVID-19 pandemic. The implementation of online learning shifted educational habits from face-to-face instruction to the use of digital technologies.[29] Issues related to access, infrastructure, and the capabilities of human resources contributed to increased anxiety and depression across all stakeholders—parents, teachers, school principals, students, and even government officials. The peak occurred in 2024, with 11 articles (33,33 %) highlighting that students and teachers experienced psychological issues in learning. This study confirmed that the data were collected during the COVID-19 pandemic (2020–2022), during which online learning policies were implemented.[30] Although this shift affected global education and marked the beginning of borderless learning transformation, such learning remains ineffective if anxiety and depression persist.

This study shows a significant increase in research interest in using AI technology to address mental health issues in education. The results demonstrate that the pandemic catalyzed the integration of AI in education, particularly in addressing emotional and psychological challenges. While the findings revealed a spike in publications in 2020, the highest number occurred in 2024, confirming that the psychological aspects of learning have become an increasing concern. The transition to online learning during the pandemic triggered substantial changes in educational systems and heightened emotional pressures for both students and educators.[31,32,33] The study indicates that mental health concerns, particularly anxiety and depression, remain critical issues in education, even with advanced technology adoption. This situation highlights the need for further research and the development of supportive strategies that balance technological advancement with emotional well-being.

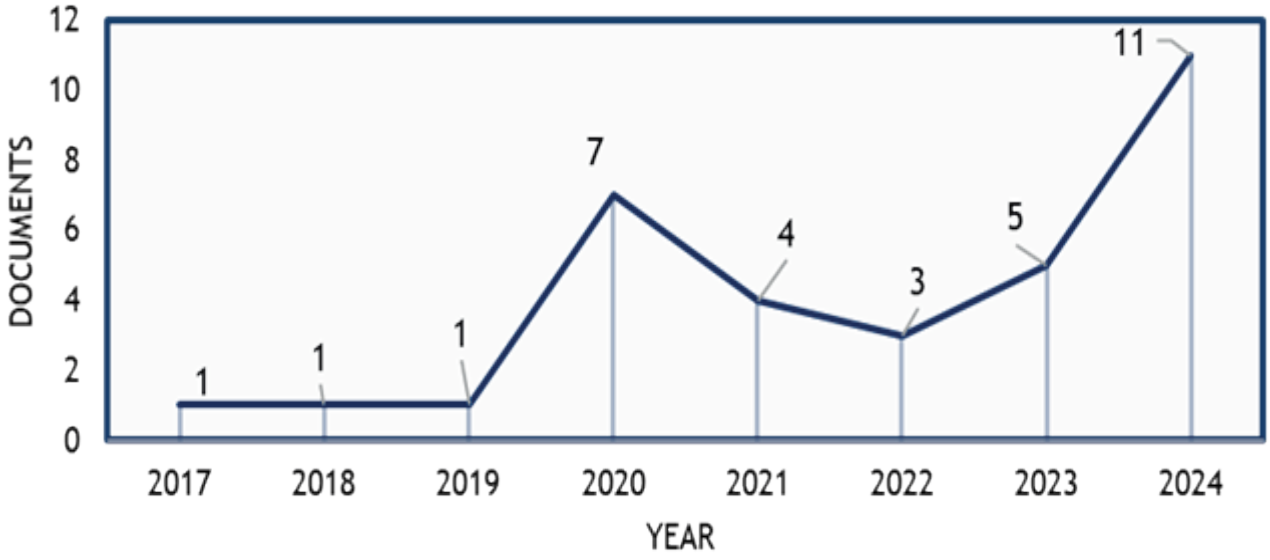

Figure 2. Distribution of Articles in 2017-2024
Source: Scopus database

The data were analyzed using VOSviewer to visualize clustering. The objective was to map research entities based on frequently occurring keywords. The data analysis process normalized citation data by utilizing the strength of association method to reduce bias. This analysis produced six clusters of 89 color items (see figure 3). Each item's size represents its frequency of occurrence in the data, indicating how often the topic is discussed. The edges, or connecting lines, represent the strength of co-occurrence between terms. Key parameters in the Network Visualization analysis included a resolution setting of 1.0 to control the granularity of cluster detection and a modularity score greater than 0,3. The red cluster (24 items) indicates the core topic, AI as an intervention. The blue cluster (17 items) represents the sub-theme of data analysis methods. The green cluster (16 items) shows specific topics related to social-emotional issues that exacerbate mental health problems. The yellow cluster (14 items) highlights the ethics and dynamics of AI usage. The purple cluster (12 items) illustrates behavioral impacts of AI use on mental health. Lastly, the light blue cluster (5 items) focuses on education quality and access disparities (see table 3).

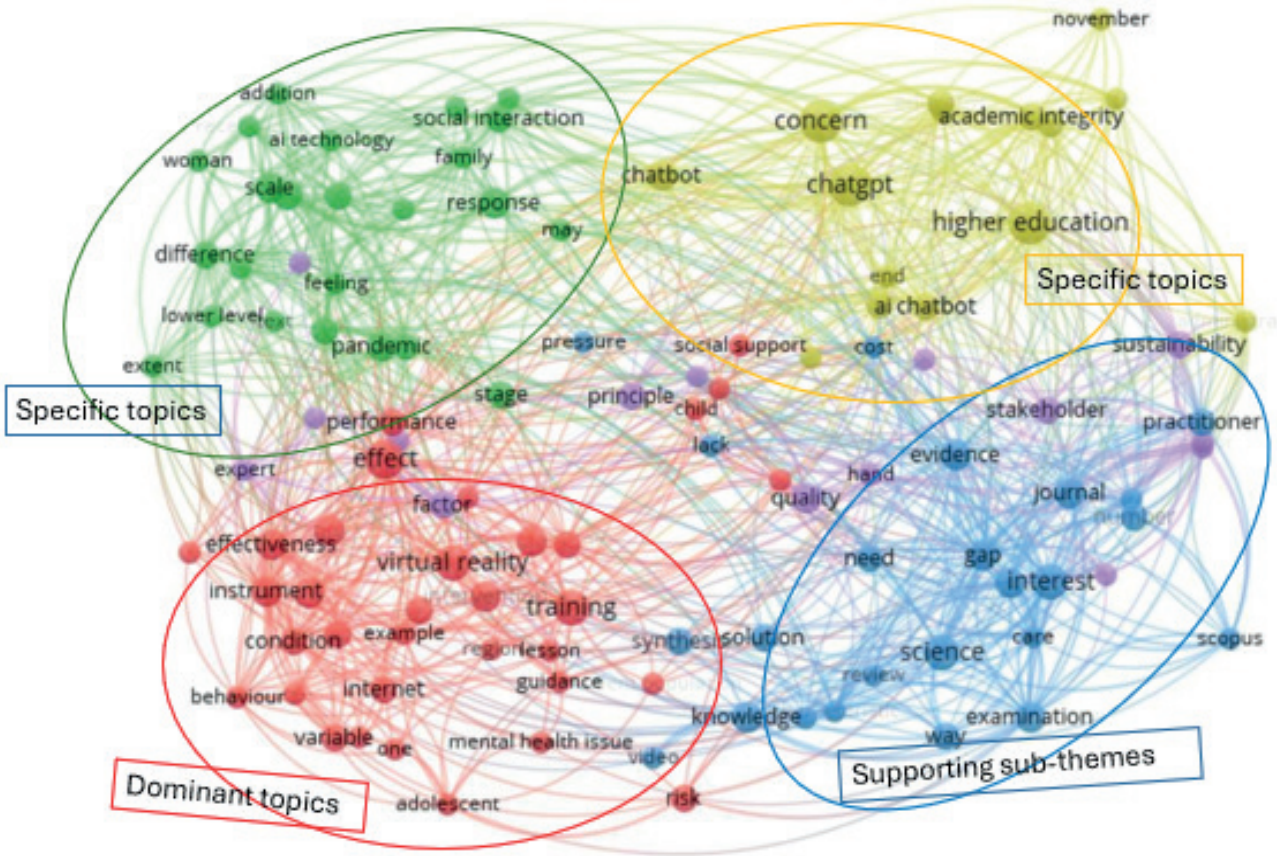

Figure 3. Keyword co-occurrence network showing six clusters
Source: VosViewer analysis

The dominant topic (red cluster) confirms that AI technology is essential for innovative interventions aimed at enhancing students' mental health and academic performance. These interventions are implemented through adaptive and contextual approaches. AI systems are expected to provide emotional support, guidance, and data-driven solutions tailored to individual conditions, attitudes, and characteristics, particularly for vulnerable groups such as women and first-year students. The effectiveness of AI in education heavily relies on users' understanding, training, and readiness to engage with the technology in a responsive and holistic manner. Although the COVID-19 pandemic exacerbated students' mental health issues, especially within the green cluster, this condition was not solely attributable to the pandemic. It was also intensified by other factors such as limited social interaction, family financial hardship, and changes in personal roles. These factors led to increased anxiety, loneliness, and stress.

The use of AI in education also raises ethical concerns, including academic integrity, the role of educators, and institutional governance, as reflected in the yellow cluster. Conversely, tools like chatbots and ChatGPT offer opportunities for innovative learning. However, long-term concerns regarding misuse, fairness, and the sustainability of the educational system persist. Several studies have highlighted that intensive digital behavior through social media and the internet is linked to increased mental health problems, including anxiety and reduced self-esteem.

Furthermore, issues related to the quality of education and unequal access remain widely discussed. Such disparities become especially critical in areas with limited resources, where students' mental well-being is more vulnerable. Adequate social support appears to play a role in maintaining students' mental health amid the ongoing dynamics of the educational process.

Positive and Negative Impacts of AI Technology in Education

Previous studies have confirmed the benefits of AI technology in education. These benefits include several key aspects. First, personalized learning, where AI provide materials and methods tailored to students' learning styles, abilities, and speeds. However, this requires monitoring to ensure that learning goals are achieved. [34] Second is accessibility, where AI enables students to access digital materials, simulations, and global information without limitations of time and space.[35,36] Third, learning efficiency, as the materials presented can be customized and equipped with adaptive exercises, resulting in more effective learning processes. Fourth, regarding cognitive support, AI tools such as chatbots or virtual tutors can help answer students' questions and

provide instant explanations. Fifth, inclusivity, as students from various regions can obtain equitable learning experiences. Sixth, instructional innovation, including interactive simulations, virtual reality, and gamified learning experiences. Lastly, there is data-driven decision-making, where teachers and institutions can use AI-generated data for more accurate pedagogical decisions.

Table 3. Clustering analysis, items, and cluster meaning

Cluster	Number of Items	Items/Term	Categorization
Cluster 1 (Red)	24	AI technology, attitude, capability, condition, daily life, deployment, effect, effectiveness, example, guidance, intervention, lesson, lower level, mental health issue, performance, previous study, solution, student population, task, training, understanding, virtual reality, woman	AI can be used to improve students' mental health and performance.
Cluster 2 (Blue)	17	bibliometric analysis, care, characteristic, evidence, examination, female, interest, journal, knowledge, literature review, need, practitioner, review, science, theme, video, way	Mapping of scientific studies and theoretical approaches related to AI and mental health.
Cluster 3 (Green)	16	college student, covid, difference, family, feeling, job, loneliness, pandemic, pressure, self, social interaction, socialization, stage, synthesis	The socio-emotional context of the COVID-19 pandemic worsens students' mental health.
Cluster 4 (Yellow)	14	academic integrity, administration, AI chatbot, chatbot, ChatGPT, concern, educator, higher education, opportunity, principal, stakeholder, sustainability, technological advancement, threat	Ethics and dynamics of AI use in education.
Cluster 5 (Purple)	12	adolescent, behavior, expert, increase, instrument, internet, risk, satisfaction, social media, systematic literature review, testing, validation	The impact of digital behavior on adolescent mental health.
Cluster 6 (Light blue)	6	access, child, educational process, inequality, quality, social support	The quality and gaps in access to education affect the mental well-being of children and students.

Challenges in using AI technology concerning students' mental health are visualized in figure 4, which highlights several key terms such as "anxiety," "social interaction," "loneliness," "social support," "human questionnaire," "autonomy," "behavioral cues," and "other related characteristics." These terms are linked to mental health concerns. The prominence of these terms in the visualization confirms their frequent occurrence in the data, signifying their importance. Anxiety refers to feelings of worry, fear, or excessive tension in response to specific situations, particularly when students perceive AI technology as a novel and overwhelming phenomenon. Students may experience stress when they cannot keep pace with technological developments necessary to support their learning. Social interaction refers to the frequency and quality of both face-to-face and online interpersonal relationships. Limited interaction, especially during digital learning, can contribute to feelings of loneliness and reduced social connectedness, further affecting students' psychological well-being.

Figure 4. Wordcloud of terms related to Mental Health
Source: Biblioshiny Analysis

Limited student engagement in social interactions causes social isolation, which triggers anxiety and depression. Loneliness is defined as the subjective feeling of being alone due to a lack of meaningful social connections, leading to a sense of alienation and worsening depression among students. Autonomy refers to individuals' degree of control and freedom in making decisions about their learning process. Dependence on AI technology can reduce students' sense of control over their learning, which acts as a trigger for feelings of helplessness and depression. Behavioral cues are non-verbal signals such as facial expressions, tone of voice, and gestures that indicate emotional states. AI technology often fails to detect these cues, especially for early intervention in mental health issues. Social support, whether emotional, informational, or practical assistance from others, is effective in preventing anxiety symptoms. Human questionnaires, which are survey instruments administered and interpreted by humans, aim to uncover emotional nuances that AI technology cannot automatically detect.

Although AI technology in education offers advantages such as personalized learning and expanded access, its implementation without sensitivity to socio-emotional dimensions triggers anxiety and depression in students. The pressure to adapt to new technologies causes a shift away from direct social interaction and the loss of psychological signals, leading to mental health disturbances in students.[21,37] Existing studies have classified the causal factors, risk triggers, and preventive measures, as summarized in table 4.

Table 4. Impact of AI technology and actions to address anxiety and depression

Impact of AI Technology	Actions to be taken
Reduction of social interaction	Hybrid approach (Technology and human interaction)
Complexity of technology	Technology training and literacy
Dependence and loss of autonomy	Increasing social interaction space
Constant feedback	AI-based psychological monitoring and human feedback
Misuse of AI technology and future career barriers	Ethics of using AI

Several AI technologies in learning that have been frequently discussed and linked to problems include algorithmic bias in adaptive learning systems, which occurs when content is inappropriate or excessive, leading to anxiety, feelings of unfairness, and decreased motivation. ChatGPT and AI chatbots are often used to supplement teachers; however, minimal interaction and a lack of emotional observation can result in dependency, social isolation, and emotional neglect among students. Emotional analytics for student performance, utilized to interpret expressions and provide feedback, can lead to privacy invasion, misdetection, and stress. Predictive analytics for student performance, which forecasts failure, contributes to academic stress, fear of failure, and labeling. AI-based Learning Management Systems (AI-LMS) diminish the social role of teachers, and dependence on these systems may cause alienation, loss of autonomy, and information overload.[38]

Based on the AI technologies used in existing studies, the main concerns identified are the reduction of social interaction, the complexity of technology, dependency, and loss of autonomy. Social interaction has emerged as a key concern in AI-based learning. Previous studies confirmed that social interaction is reduced in online or AI-mediated learning compared to face-to-face instruction. The communication quality between students and between students and teachers declines, resulting in feelings of isolation and loneliness, which increase the risk of anxiety and depression.[39,40,41,42,43,44,45] Furthermore, students and teachers report similar feelings when using new AI technologies. They express fear of failure, feelings of misuse due to AI complexity, and concern that AI may replace jobs in the future.[39,40,41,42,46]

The emotional support provided by the learning environment is insufficient.[46,47] Emphasizing a hybrid learning environment, in which AI technology and human interaction coexist, is necessary to reduce stress and anxiety levels. Interaction can decrease students' dependency on AI and promote its appropriate use.[42,45] AI technology offers personalized learning experiences; however, it also leads to increased dependency and a loss of autonomy.[43,48] Other aspects related to mental health include perfectionism, which may arise from feedback and evaluations generated by AI systems.[39,40,41,42,47,49,50] Therefore, maintaining a balance between technology use and human relationships, particularly within social interaction spaces, is essential. In addition, training and literacy in new AI technologies are needed to help users cope with technological challenges. Ultimately, the use of AI technology must follow ethical guidelines to prevent misinformation and the misuse of technology in future work settings.

Educators' Role in Supporting Students' Mental Health

Educators play a vital role in achieving learning objectives, especially by integrating AI technologies. They are expected to have the ability to identify mental health issues, particularly in ensuring that students do not experience prolonged depression or anxiety.[51,52,53] Previous studies have emphasized the role of educators as

facilitators and motivators in addressing students' mental health. Educators must demonstrate social concern, foster a supportive learning environment, develop self-awareness in AI technology literacy, and provide constructive emotional support.[54] Table 5 presents educators' key actions and roles in mitigating mental health risks among students caused by the use of AI technologies.

Table 5. The role of educators in reducing mental health risks in students

Strategies	Role of Educators	Description in the context of mental health
Early Identification and Intervention.[55]	Actively observe early signs of stress/ anxiety in students	AI technology cannot always read emotional signals; teachers must actively participate in early detection.
Creating a Supportive Environment.[56]	Create a safe, inclusive, and low-pressure learning space	Balancing the sometimes impersonal and competitive digital learning environment.
Integrating Mental Health Education.[56]	Insert materials or discussions about mental health in learning	Increasing student awareness will help them be more open to mental health issues and know how to manage stress.
Providing Access to Resources.[57]	Provide information and referrals to counseling services or mental health support applications.	Encouraging the use of technology appropriately to support students' psychological well-being.
Building Strong Engagement.[58,59]	Build positive and open relationships with students	Avoiding feelings of alienation due to AI-based learning that lacks humanistic involvement.
Promoting a Balanced Use of Technology.[57]	Encourage balanced and healthy use of technology	Helping students manage screen time, recognize digital stress, and not rely too much on AI.
Fostering Social Connections.[60]	Facilitate social interactions between students through collaborative activities.	Reducing the impact of social isolation due to reduced quality of online interactions.
Empathy and Emotional Support.[61]	Show concern and empathy for students' emotional conditions	Providing support that cannot be replaced by AI, especially when students experience emotional crises.
Professional Development.[62]	Improve one's capacity to understand the latest technology and psychological approaches.	So that educators can adapt to advances in AI while maintaining humanistic values in education.

Early identification and intervention strategies closely align with findings from Cluster 1, emphasizing the role of AI in detecting early signs of mental health issues, such as anxiety and depression. During the COVID-19 pandemic, research on utilizing AI as an intervention tool increased significantly due to the challenges of remote learning and students' emotional challenges. However, interest in this topic has persisted even after the pandemic subsided. Creating a supportive environment aligns with Cluster 3, which highlights the emotional pressures students faced during the pandemic. Feelings of loneliness, family-related stress, and limited social interaction exacerbated students' mental conditions. Therefore, establishing an emotionally supportive learning atmosphere is essential. The integration of mental health education remains consistent with findings in Cluster 2, which include conceptual and literature-based studies that underscore the importance of understanding mental health issues. Embedding mental health literacy into the curriculum prepares students to cope with psychological challenges more effectively. The strategy of providing access to resources connects to Cluster 6, which discusses disparities in access to education and social support. During the pandemic, children from underprivileged families were more mentally vulnerable due to technological limitations and a lack of supervision. Thus, equal access is critical for student well-being. The strategy of fostering strong engagement is reflected in Cluster 4, particularly regarding the use of AI technologies, such as ChatGPT and chatbots. While these tools can enhance engagement, they may also pose risks by diminishing human interaction.

The strategy of balanced AI usage emerges from the combination of Clusters 1 and 4, where the literature highlights the psychological pressure caused by rapid technological advancements. Post-pandemic research has begun to emphasize the importance of wise and mindful use of AI technologies to avoid adding mental burdens on students. Promoting social connection is emphasized and stressed in Clusters 3 and 5, which reveal that excessive reliance on technology can reduce social interaction and intensify loneliness, particularly among adolescents. The strategy of emotional support and empathy is associated with Clusters 1 and 4, which address AI's limitations in meeting students' emotional needs. In this context, the role of human educators becomes irreplaceable as a source of empathy. Finally, the professional development strategy for educators is supported by Clusters 2 and 4 findings, highlighting the necessity of continuous training to enable teachers to navigate technology while safeguarding student well-being. Many studies on AI technology in education were initially driven by the isolation and necessity of online learning during COVID-19 (2020–2022). Online and hybrid learning remain viable alternatives as part of ongoing educational transformation. However, these must be developed with mental health considerations in mind.

The empathetic role of human educators in supporting students' mental health cannot be entirely replaced by advanced technologies such as AI chatbots or ChatGPT. Findings from Cluster 4 indicate that while AI chatbots provide convenient access to information and instant responses, significant concerns remain about their limited emotional sensitivity. Chatbots cannot interpret non-verbal cues or complex emotional contexts, which are often essential for delivering meaningful psychological support (with keywords such as concern, threat, academic integrity, stakeholder, and educator emerging in this cluster). In contrast, human educators can recognize subtle behavioral changes, interpret body language, and offer genuine empathy through authentic interpersonal communication. In a learning environment that prioritizes mental well-being, the presence of teachers or lecturers who can demonstrate emotional care often becomes a critical factor in preventing anxiety, reducing loneliness, and building students' self-confidence. Studies in this cluster also highlight ethical and philosophical concerns about the widespread application of AI in higher education, including the potential erosion of human relationships and the diminished role of educators as supportive figures. Therefore, technologies such as ChatGPT should be viewed not as replacements for educators but as complementary tools that support informational, not emotional, needs.

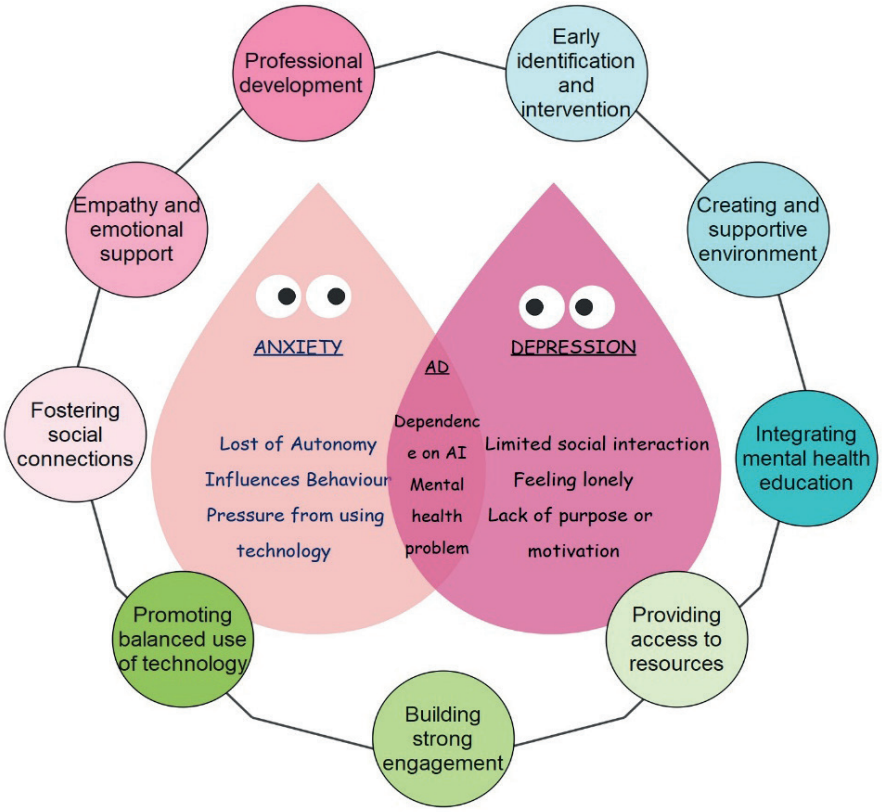

Figure 5. Nine strategies for coping with anxiety and depression

Counseling services to promote students' psychological well-being and enhance learning quality.[63] AI technologies can analyze student performance and learning styles to deliver personalized and adaptive recommendations. Educators are expected to integrate AI into the curriculum, guide responsible use, and facilitate interactive discussions. When implemented optimally, such strategies and the integration of AI in learning can reduce the mental health risks faced by students.[64] The educator's role in addressing student anxiety and depression is visualized in figure 5.

Students who experience mental health issues during the learning process are at high risk of failing to achieve their learning objectives. Artificial Intelligence (AI) offers various significant benefits in enhancing the quality of education. However, it also has the potential to reduce human interaction, create dependency, and promote individualism—factors contrary to future career development demands.[65] Moreover, limited skills in using AI technology can further exacerbate students' mental health problems. Generation Z students are generally accustomed to using AI technologies to solve real-life problems. In this context, educators play a crucial role in guiding students in problem-solving and the appropriate application of AI. Therefore, being aware of students' cognitive, psychomotor, and affective development and ensuring the fulfillment of their emotional

needs through balanced interaction has become a significant challenge in the digital era.[61] Empathetic and emotional support from educators is essential for students. When used effectively, AI technology can positively contribute to students' well-being throughout the learning process.

CONCLUSIONS

This study examined how educators can leverage artificial intelligence (AI) to mitigate student anxiety and depression through a bibliometric analysis of existing research. The findings indicate a growing body of literature on AI's impact on mental health, with a significant increase in studies since 2017, peaking in 2022-2024 due to the heightened reliance on digital learning during the COVID-19 pandemic. The analysis identified six key research themes, encompassing the role of AI in education, its implications for mental health, and the pandemic's influence on student well-being. Educators play a pivotal role in ensuring that AI is integrated effectively into learning environments while safeguarding students' emotional and psychological well-being. The study highlights several essential strategies, including early identification and intervention for mental health concerns, creating a supportive and inclusive educational atmosphere, incorporating mental health education into curricula, and ensuring access to relevant psychological and technological resources. Additionally, fostering strong student engagement, promoting a balanced approach to technology use, encouraging social connections, and enhancing educator professional development emerged as critical components in addressing student anxiety and depression within AI-enhanced educational settings.

This study provides a comprehensive framework for understanding the intersection of AI and education, underscores the necessity of active educator involvement in shaping AI's role as a tool for academic and emotional support. Practical strategies are outlined to help educators cultivate learning environments that optimize AI's potential and prioritize human empathy and meaningful interaction. While AI presents numerous opportunities for personalized learning and mental health support, its implementation must be carefully managed to prevent potential negative consequences, such as increased reliance on technology at the expense of essential human connections.

Despite its contributions, this study has certain limitations. The analysis is confined to English-language articles indexed in the Scopus database, which introduces a geographic and linguistic bias by underrepresenting research from the Global South. Moreover, the sample size is relatively small (n = 33), limiting the breadth of generalization. Furthermore, the study primarily focuses on anxiety and depression, leaving room for future research to explore other psychological and cognitive effects of AI integration in education. To address these gaps, future studies should employ specific and rigorous designs, such as mixed-methods evaluations of AI tools implemented in classroom settings, longitudinal tracking of students' emotional responses to AI-based interventions, and in-depth qualitative studies exploring student and educator experiences. Future work should also examine cultural and contextual variations in AI adoption and use, especially in underrepresented regions, to inform evidence-based, equitable, and ethical policies for AI integration in diverse educational environments.

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