A Systematic Review for the Implication of Generative AI in Higher Education

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Abstract—**The rapid advancement of genitive AI, like ChatGPT, has initiated a profound transformation in higher education. It offers customized learning experiences, automates administrative tasks, and provides personalized support to students and educators. Following PRISMA guidelines, this paper presents a systematic review that delves into the implications of genitive AI, a cutting-edge language model, in higher education. We adopted ChatGPT as an example of this study. It thoroughly examines the potential advantages and constraints of integrating ChatGPT into educational environments, assessing the quality of 35 selected articles and conducting a comprehensive meta-analysis of their findings. This study yields fresh insights into the multifaceted consequences of employing ChatGPT in higher education and underscores the intricate landscape associated with AI integration in academic settings. It emphasizes the imperativeness of addressing ethical, legal, and pragmatic challenges while capitalizing on the potential benefits of AI technology in education. Our systematic review reveals a consistent reservation trend regarding generative AI integration within educational contexts. These concerns encompass many issues, emphasizing the necessity for judicious implementation and robust safeguards to mitigate potential challenges.**

Index Terms—**Generative AI, ChatGPT, Education, PRISMA.**

I. Introduction

Artificial Intelligence (AI) has sparked a revolution in the educational sector. Traditional teaching methods have been transformed through the integration of AI technology. The emergence of AI has opened up new horizons for higher education, providing personalized and tailored learning experiences [9, 23]. Artificial intelligence has made significant contributions to education in the past decade. BLIPPAR, Paper Grader, and Coursera have successfully showcased the application in this domain [11]. These applications demonstrated the potential to enhance educators' ability to customize learning experiences based on learners' preferences. One noteworthy example is the Paper Grader, an AI-based automatic grading application designed to mark assignments efficiently within short periods. As a result, it allows teachers to dedicate more attention to valuable activities like lesson planning and curriculum development [32].

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Chatbots have emerged as one of the most successful applications of AI in the educational sector. They are computer programs capable of simulating human conversation through voice and text interactions. Within an educational context, chatbots have demonstrated their power as tools to enhance student learning experiences by providing personalized support. These intelligent virtual assistants also assist educators in updating the curriculum based on student preferences and make the admission process more efficient [27, 38]. Generative AI has brought about a tremendous transformation in the educational environment. Developed by OpenAI, ChatGPT is a natural language processing (NLP) model designed to generate human-like responses to various tasks [39],[8]. In the realm of higher education, Generative AI has the potential to enable self-directed learning. It enhances students' learning skills and assists educators in creating inclusive teaching environments. One of the key advantages of Generative AI is its ability to recommend learning resources that align with the needs of individual learners. This versatility makes Generative AI a valuable tool in promoting effective learning while alleviating the workload of educators [20, 60]. Intensive research has highlighted the potential benefits of utilizing Generative AI to transform educational methods. However, concerns have also been raised regarding data security, algorithmic bias, and ethical issues [7],[11]. One significant ethical concern in higher education pertains to plagiarism and copyright violations. To address this issue, universities in the UK have recently announced the availability of AI detector software capable of identifying written text generated by AI. These measures aim to uphold academic integrity and ensure proper attribution of original work [34]. Another significant challenge associated with Generative AI pertains to critical thinking and problem-solving skills. This arises because Generative AI can provide comprehensive details and examples for any given task, potentially discouraging students from engaging in independent research and investigation [13],[15]. Despite the experts' optimistic outlook on the transformative potential of Generative AI in various higher education disciplines, there are growing concerns regarding ethical issues. Therefore, the primary objective of this review is to examine the future prospects of Generative AI as a prominent example of Language Models (LM) in education based on the available evidence. Importantly, this review aims to identify potential benefits and limitations associated with implementing Generative AI in these domains.

II. Artificial Intelligence in Education

AI technology has significantly transformed teaching and learning, particularly with the rapid advancement of deep learning. In higher education, AI has proven to be highly effective in supporting students and enhancing teaching skills. Intelligent tutoring systems, chatbots, and grading software are prime examples of successful AI applications in higher education. These innovations have revolutionized the educational landscape by providing personalized assistance, automating administrative tasks, and delivering more accurate and efficient student feedback [29].

Intelligent tutoring systems (ITS) offer invaluable support to students by providing instant feedback without the need for direct teacher intervention. ITS holds substantial benefits in higher education institutions, especially when delivering virtual courses [7]. These systems can provide modules to many students, where individual teacher involvement may be logistically challenging or even impossible. This scalability ensures that students receive personalized guidance and assistance, regardless of class size, enabling a more efficient and inclusive learning environment. The use of ITS in higher education institutions has proven to be instrumental in overcoming the limitations of traditional teaching methods and enhancing the accessibility and effectiveness of virtual education [3].

ITS can identify individual students' skill gaps, enabling educators to tailor learning materials to their specific needs. One notable example of this is the SmartTutor, which was developed by the University of Hong Kong and aims to provide a personalized learning environment within higher education. SmartTutor has wirelessly integrated with the university's online learning platform, enhancing the overall learning experience for students. The results of implementing SmartTutor reveal the efficacy of this intelligent system in supporting students' academic growth. By utilizing ITS like SmartTutor, universities can optimize the delivery of educational content, adapt instruction to individual students, and foster a more productive and engaging learning environment [11].

AI has the potential to significantly enhance student engagement and motivation by employing interactive tools such as smart Sparrow. Smart Sparrow, an educational platform, has successfully taught biomedical education skills in Australia. Such integration with tertiary education, several universities in the USA and Australia adopted this platform as early as 2013 [31]. Researchers have observed that the implementation of smart Sparrow has not only accelerated student enrollment but also reduced dropout rates. The platform's interactive features and personalized learning approach contribute to a more immersive and effective educational experience, positively impacting student outcomes. Integrating AI-powered platforms like smart Sparrow demonstrates the transformative potential of AI in higher education, fostering student success and retention [31].

AI can streamline administrative tasks and eliminate repetitive duties, significantly reducing the workload of educators and administrative staff. Leveraging AI technologies, several time-consuming and routine tasks are managed efficiently. This enables educators and administrative staff to focus more on higher-value activities that require human expertise and creativity [4].

Consequently, implementing AI in educational institutions holds the potential to optimize operational efficiency, enhance productivity, and improve the overall work-life balance of educators and administrative staff. Replacing repetitive tasks with AI-powered solutions can free up valuable time and resources, allowing education professionals to allocate their efforts toward providing quality education and support to students [22].

Chatbots are intelligent software programs that simulate human conversation and provide appropriate responses. These chatbots enabled students to interact with them just as they would with actual human beings. Various chatbot frameworks are available, offering a wide range of implementation options. Some popular examples of chatbot frameworks include Rasa and Mobile Monkey [33]. These frameworks provide developers the tools and resources to create and deploy chatbot applications across different platforms and channels. By leveraging chatbots, educational institutions can enhance student engagement, provide instant support, and deliver personalized assistance on a scale. The availability of diverse chatbot frameworks enables flexibility and customization in developing interactive conversational agents tailored to specific educational contexts and requirements [15].

Chatbots play a crucial role in bridging the connection between educators and learners, enabling them to interact easily. These intelligent systems can provide students with accurate and timely answers to their queries. Chatbots can effectively understand and respond to a wide range of questions by leveraging natural language processing and machine learning algorithms. This not only enhances the learning experience but also relieves educators from the burden of repeatedly answering similar queries [5].

In 2018, Georgia State University developed its chatbot called "Pounce" to keep students engaged with the university, even during summer breaks [6]. The results of this initiative demonstrated the chatbot's potential to improve student graduation rates. The chatbot helped students stay connected and motivated throughout their academic journey by providing continuous support and guidance. The successful implementation of chatbots in educational institutions showcases the ability to enhance student engagement, retention, and academics. In 2022, the author in [50] suggests the integration of generative AI into chatbots to aid students with writing skills. The findings demonstrate that generative AI provides a substantial advantage in supporting students with proofreading, content revision, and post-writing feedback.

III. CHATGPT OVERVIEW

OpenAI released ChatGPT in November 2022. OpenAI is an organization dedicated to developing artificial general intelligence (AGI) to assist humanity. Founded in 2015 by Elon Musk and others, OpenAI aims to advance AGI technology [59]. ChatGPT, also known as GPT-3, is a generative pre-trained transformer (GPT) model family member. It is a large-scale, fine-tuned language model based on the architecture of GPT-3.5 and GPT-4 models [39] [29]. ChatGPT stands out as the dominant language AI model with an impressive parameter count of 175 billion, making it the most influential model in the field. It was trained using vast text data from sources such as Wikipedia, articles, books, and news. As a result, it excels in handling tasks related to NLP [58]. Access to ChatGPT is possible through various platforms, including messaging services, websites, smartphone apps, and API integration. Furthermore, it can handle multiple conversations simultaneously, making it highly versatile in its conversational capabilities [49] [56]. ChatGPT incorporates cutting-edge AI technologies, including supervised machine learning (ML), NLP, and reinforcement learning (RL). One of its notable features is the integration of RL with human feedback into NLP (RLHF). This unique combination enables the language model to deliver more coherent interactive responses and engage in meaningful conversations [55].

3.1 Potential Benefits and Limitations of Generative AI in Higher Education

A potential benefit can be gained from using generative AI with respect to meeting students' education. Researchers have showcased that students are more prone to engage in their courses. They identified three states: feeling autonomous, connected, and competent. Generative AI promises to bolster learners' autonomy, competence, and sense of connection in higher education, ultimately elevating students' motivation levels and fostering increased academic achievement [21, 43]. Generative AI assumes a crucial role in the realm of sport management education. For example, [24] utilizes generative AI to gather information pertaining to sport management education using open-ended qualitative questions. The results indicate that Generative AI is proficient at providing comprehensive, precise, and grammatically sound responses on topics related to sports management in response to concise queries. However, addressing the ethical concerns associated with its implementation is imperative.

In the medical domain, generative AI has been examined in various scenarios and contexts, as evidenced in [35] [36]. Generative AI evaluation took place in medical imaging within the framework of a medical imaging science course designed for first- to third-year undergraduate students. The outcomes underscore its inability to deliver accurate responses due to the model's limited knowledge and data on medical imaging [12]. Furthermore, as highlighted in [1], plastic surgeons utilized Generative AI to facilitate the composition of operative notes for plastic surgery procedures. The study emphasizes the efficiency and precision observed in the generated notes, and it reveals substantial satisfaction among surgeons who have integrated generative AI as an educational tool in contemporary plastic surgery practices.

Lastly, [28] evaluates generative AI's performance in radiology patient education materials. The model was employed to address patient inquiries related to radiology. The findings consistently indicate that generative AI produces educational content that is both inaccurate and incomplete. As a result, the feasibility of integrating it into educational curricula is questioned. The following paragraph lists the main advantages of generative AI in education.

- **Provide Autonomous Learning Environment**: Numerous studies have shown that language models have the potential to boost learners' motivation, leading to significant improvements in their academic performance [60]. In the case of university students, Generative AI can be particularly beneficial for enhancing writing skills and critical thinking abilities. By offering valuable resources and materials tailored to specific tasks, these models empower students to become more autonomous and enthusiastic participants in the learning process [19, 42, 45].
- **Personalized Feedback:** Personalized feedback is a crucial pedagogical approach that fosters student course engagement. Generative AI significantly enhances the learning process by offering tailored feedback according to individual student needs. This individualized feedback helps students identify errors and provides them with learning materials for future improvement. In higher education, Generative AI serves as an ideal tool for fulfilling students' competence needs by delivering personalized feedback [40][57].
- **Monitor Student Performance:** Tracking student performance is vital in promoting student motivation. Educators can effectively monitor students' learning journeys by utilizing assessment activities[52]. In higher education, it has been observed that assessment activities enhance educators' insights into students' learning abilities, enabling them to track the learning process closely. Generative AI can create quizzes, short answer questions, lesson plans, and curricula. By integrating these quizzes with learning resources, real-time feedback can be provided, offering scaffolding support. Consequently, universities can closely monitor student achievement [8].

A. Generative AI Limitation

- **Critical Thinking:** One potential concern is that Generative AI might harm students' critical thinking abilities by fostering excessive dependency. While Generative AI can certainly serve as a resource for medical students to access general medical information, there's a risk that overreliance on it might hinder their ability to think critically. This issue

becomes more pronounced when students start incorporating Generative AI-generated content into their clinical notes, potentially foregoing the internalized thought process crucial for accurate disease diagnosis [2, 20].

- **Ethical Issues:** Educators are grappling with ethical issues arising from using Generative AI, particularly concerning copyright and plagiarism concerns. Generative AI lacks a definitive method to establish the ownership of the text it generates. Of note, Generative AI can autonomously compose essays and assignments without requiring the student's personal input or unique intonation, a capability that raises significant ethical questions [13][36, 52].
- **Data Bias and Algorithm Bias:** One key concern is the potential for Generative AI to produce inaccurate information due to its training on a vast dataset that contains biases. The selection of data for Generative AI was driven by OpenAI researchers using user feedback, and this process, influenced by incorrect outputs, could lead to biased algorithmic behaviors. As a result, the model itself may incorporate certain biases [26][10].
- **Cybersecurity Risk:** Generative AI introduces notable cybersecurity concerns. One primary concern revolves around its vulnerability to inadvertently generating deceptive or harmful content. This susceptibility can result in the creation of false data or involvement in malicious discussions [47]. The exploitation of Generative AI's capabilities could lead to the generation of phishing schemes, spam, and various forms of malicious content, raising significant threats to individuals and entities alike. The model's responses may inadvertently disclose sensitive information shared in inputs, thereby triggering privacy concerns[30].

While Generative AI holds immense potential, it's imperative to exercise vigilance in light of these cybersecurity challenges. Implementing robust safeguards becomes paramount to mitigate their impact. Cybercriminals could manipulate the incorrect information they generate to influence educational institutions, potentially tarnishing their reputation.[47].

3.2 Methodology

This study systematically reviews the pros and cons of Generative AI in higher education. The review adheres to the guidelines outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).

A. Research objectives and research questions

While existing research sheds light on the advantages and constraints of integrating Generative AI into educational systems, a dearth of relevant systematic literature reviews is apparent. Therefore, this paper aims to fill this gap by conducting a comprehensive systematic literature review, guided by specific research questions, to offer fresh insights into the benefits and limitations of the Generative AI learning model in education.

Q1- Does the paper cover the benefit of Generative AI in terms of students, educators, and administrative tasks?
Q2- Does the author give or mention the actual case study about the benefit of Generative AI?
Q3- Does the paper cover all limitations of Generative AI in higher education?
Q4- Does the paper highlight the potential future and recommendations to mitigate the limitations of Generative AI?

TABLE I
ELIGIBILITY CRITERIA: INCLUSION AND EXCLUSION

Criteria	Inclusion	Exclusion
Language	Include only articles published in English.	Exclude translated article
Year of Publication	Include articles published after June 2020.	Exclude articles published before June 2020.
Study Type	Include Quantitative and quantitative studies published in peer-reviewed journals, conferences, and books.	Remove all non-review studies such as technical reports or web-based
Study design	Include studies that are designed in a way to answer the research question.	Exclude all studies that are not relevant to the research questions.

B. Information source and search strategy

This study considers three datasets: IEEE Digital Library, Google Scholar, and ScienceDirect. A combination of keywords was employed to explore studies on the potential of generative AI in education. These keywords include "generative AI in education," "generative AI in higher education," "generative AI in education," and "generative AI in education future prospects." The chosen databases, namely IEEE Digital Library, Google Scholar, and ScienceDirect were automatically searched to identify relevant articles. The search process adhered to PRISMA guidelines. The flow of the search procedure is illustrated in Fig. 1. The search aimed to evaluate the adherence to inclusion and exclusion criteria across Document Title (DT), Document Abstract (DA), Full Text (FT), and Index Terms (NT). The initial step involved selecting books, journal articles, and conference proceedings published in English between 2020 and 2023. The subsequent step encompassed an advanced search using a combination of keywords and index terms, enhancing the comprehensiveness of the search syntax. Certain articles were eliminated due to their mismatch with our predetermined inclusion and exclusion criteria. The search format used for IEEE was as follows:

[FT("ChatGPT")AND FT("Education")]OR [NT ("ChatGPT") AND FT("Higher Education") OR DT("Future Prospects")] OR [FT("Generative AI in education") And DT ("ChatGPT")] OR [FT("Generative AI in Education") OR NT("ChatGPT") And DA("Future Prospects")] OR [FT("Higher Education") OR NT("ChatGPT") And DA("Future Prosoects")]

Fig. 1.: IEEE search strategy.

C. *Study selection Result*

As illustrated in Fig. (2), the selection process encompasses manual and automated searches. The initial phase involved scrutinizing 631 articles from three datasets. Mandalay software was employed in the subsequent step to identify and eliminate duplicate references among the scanned articles. Furthermore, articles lacking complete full-text content were also excluded, leading to the removal of 406 articles.

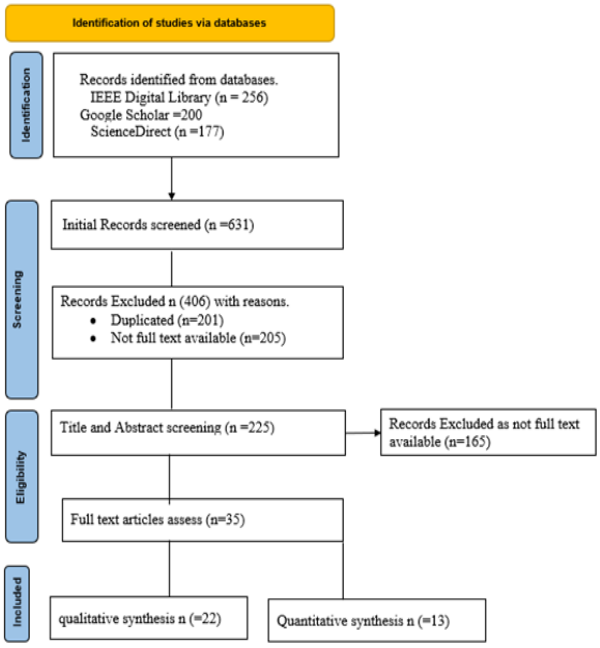

Fig. 2.: PRISMA flow diagram of selection studies.

To ensure thoroughness, three independent researchers conducted an assessment of the relevant articles. Abstracts and titles of 225 papers were meticulously reviewed during this phase—the final selection of articles adhered to predefined inclusion and exclusion criteria. Notably, there was a substantial consensus among the reviewers, with a concordance rate of 98%, regarding the assessment of abstracts and titles. Moving to the third stage, full-text articles were acquired, and the determination to assess them was based on the eligibility criteria. Among the reviews, it was determined that 165 articles were not pertinent to the research questions, leading to their exclusion from the systematic review. As we reached the concluding phase, the reviewers agreed to designate 35 articles for in-depth evaluation. Notably, there was a concurrence rate of 97% in the selection of full-text materials. Any disagreement was resolved by including a fourth reviewer in the screening process. Table 2 provides a Summary of the qualitative study's conclusions regarding the advantages and disadvantages of Generative AI in education. Table 3 summarizes quantitative studies where the advantages and disadvantages of Generative AI can be concluded from finding results. Both tables can be found in Appendix.

D. *Quality evaluation result*

We conducted a systematic literature review for qualitative and quantitative articles to address research questions. The reviewers (see the previous section) evaluate the quality of selected articles in unity; the studies are grouped into "Benefits" and "Limitations," where two Quality Evaluation scores (QEs) are raised for each group. QE questions are measured as very good (1), Good (0.5), and Not Good (0.1). The result of Quality evaluation score (QEs) for qualitative articles and quantitative articles can be seen in tables (4)(5) and Fig. (3), and Fig. (4).

TABLE IV
EVALUATION SCORES (QES) FOR QUALITATIVE STUDIES

Study_id	QEs1	QEs2	QEs3	QEs4	Total Scores
Debby R. E etal, 2023	very Good	Good	Good	Not Good	2.1
M. Firat, 2023	very Good	Good	Not Good	Not Good	1.7
Sharma etal, 2023	very Good	very Good	Good	Not Good	2.6
D. Mhlanga, 2023	very Good	Good	Not Good	Not Good	1.7
F. X. Risang, 2023	Good	Good	Not Good	Not Good	1.2
Y. K. Dwivedi etal, 2023	very Good	very Good	very Good	Good	3.5
M. Javaid etal, 2023	very Good	very Good	very Good	Not Good	3.1
D. Dalalah etal, 2023	Good	Not Good	very Good	Good	2.1
M.OM.Al hatrifi etal, 2023	very Good	very Good	Not Good	Not Good	2.2
P. P. Ray, 2023	very Good	Good	very Good	very Good	3.5
N., M. S etal, 2023	Good	Good	very Good	Good	2.5
Y., B. B etal, 2023	Good	Not Good	very Good	Good	2.1
Y., L. Y etal, 2023	Good	very Good	Good	Good	2.5
S. Sweeney, 2023	very Good	Good	very Good	Not Good	2.6
T. Alqahtani, 2023	very Good	Good	Good	Good	2.5
S. T. T. Jürgen Rudolpn, 2023	very Good	Good	Good	very Good	3
Z. Chenjia etal, 2023	Good	very Good	Good	Not Good	2.1
Z. Xiao, 2023	very Good	Not Good	very Good	Not Good	2.2
K. H. Frith, 2023	Not Good	Not Good	Good	Good	1.2
S. Popenici, 2023	Good	Good	Good	Good	2
M.Schönberger 2023	Good	Not Good	very Good	Good	2.1
Sullivan etal, 2023	Not Good	very Good	Good	very Good	2.6

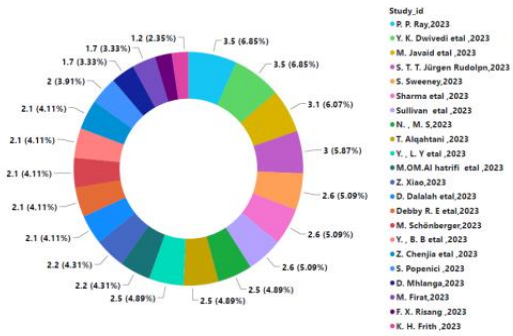

Fig 3. Total evaluation scores (QEs) for qualitative studies.

TABLE V
EVALUATION SCORES (QES) FOR QUANTITATIVE STUDIES

Study_id	QEs1	QEs2	QEs3	QEs4	Total Scores
P. Vanich-vasin, 2023	very Good	very Good	Not Good	Not Good	2.2
M. Hosseini etal, 2023	very Good	very Good	Good	Not Good	2.6
L. Zhou etal, 2023	very Good	very Good	Not Good	Not Good	2.2
M. C. Keiper etal, 2023	very Good	very Good	Good	Not Good	2.6
G. Currie etal, 2023	Good	Good	very Good	Not Good	2.1
A.M Abdelhady etal, 2023	very Good	very Good	Good	Not Good	2.6
C. J etal, 2023	Good	very Good	Good	Not Good	2.1
R. Yilmaz etal, 2023	very Good	Good	very Good	Not Good	2.6
I. S. Chaudhry etal, 2023	Good	very Good	very Good	Good	3
K. Malinka etal, 2023	very Good	very Good	Good	Good	3
J. De Winter etal, 2023	Good	Good	very Good	Not Good	2.1
Qureshi, 2023	very Good	very Good	Good	Not Good	2.6
J. Rudolph etal, 2023	very Good	very Good	very Good	Good	3.5

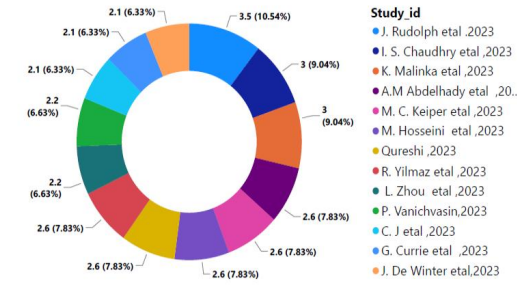

Fig. 4. Total Evaluation scores (QEs) for quantitative studies.

E. Statistical analysis

To summarize the findings of the included studies, a meta-analysis (we need a citation here for the meta) was conducted to gain a more precise insight into all the studies addressing the research questions. The result of the meta-analysis can be seen in Table 6. Despite the heterogeneity in the nature of these studies, some were combined to emphasize their consistency. Various metrics, such as the Odds Ratio (OR) and 95% confidence Intervals(95-CI), were employed to measure the results of the meta-analysis.

The OR is a statistical tool that evaluates the relationship between two variables or groups. We're examining the "Benefit" and "Limitations" groups in this context. The "Benefit" group encompasses studies illustrating the potential advantages of integrating Generative AI into educational environments. Conversely, the "Limitations" group comprises studies that underscore potential issues or risks in using Generative AI in education. The 95-CI is a statistical range that estimates the true value within which the odds ratio is likely to fall.

We visualize the results on a forest plot (citation needed) for 35 studies, each represented by a line. The blue shape corresponds to the effect size (OR, weight, and 95-CI). The vertical line is known as "No effect." Studies that cross this line towards the center indicate no significant differences between the Benefit group and the Limitations group.

Ten studies are located on the right side of the vertical line. These studies found that Generative AI has significant benefits in higher education. For instance, studies by P. Vanichvasin[53] and L. Zhou et. Al [60] acquired the highest OR and 95-CI. This can be attributed to the fact that enough participants in the questionnaire surveys agreed on the potential benefits of using Generative AI.

Debby R. E et al [14], Z. Chenjia et al 10, and M. Schönberger [46] crossed the "No effect" line, achieving an OR value of 1. This indicates that these authors have an equal perspective on Generative AI in terms of benefits and limitations in higher education.

Sixteen studies are located on the left side of the vertical line, which could be interpreted as these studies raising concerns about the implications of Generative AI in higher education. P. P. Ray [39] and S. Popenici [35] acquired the lowest values of OR. This implies that both studies strongly agreed on the limitations of adopting Generative AI in higher education.

The meta-analysis for all selected studies presents its findings visually through a blue diamond shape, encapsulating both the estimated point and the confidence interval. The overarching result of this meta-analysis underscores a prevailing trend across the included studies: the majority express reservations about the integration of Generative AI in educational contexts. These reservations encompass a range of substantial concerns, spanning ethical dilemmas, legal complexities, data biases, and algorithmic biases, see section 3.1.2.

TABLE VI
META-ANALYSIS RESULT

Study_id	O_R	Weight	Lower_C1	Upper_C1
Debby R. E etal	1	3.63	0.3828	2.96
M. Firat	1.7142	3.53	0.1928	5.0742
Sharma etal	1.1666	3.3	0.3262	3.4533
D. Mhlanga	1.7142	3.5	0.1928	5.0742
F. X. Risang	2	3.2	0.1466	5.92
Y. K. Dwivedi et al	0.5555	4.3	0.5866	1.6444
M. Javaid etal	0.8636	3.36	0.4364	2.5563
D. Dalalah etal	0.7142	3.70	0.5037	2.1142
M.OM.Al hatrifi etal	2	3.2	0.1466	5.92
P. P. Ray	0.3333	4.5	0.7261	0.9866
N. , M. S	0.5	3.5	0.6187	1.48
Y. , B. B etal	0.5	3.5	0.6187	1.48
Y. , L. Y etal	0.4285	3.83	0.6627	1.2685
S. Sweeney	0.7402	3.7	0.4913	2.1911
T. Alqahtani	0.4285	3.81	0.6627	1.2685
S. T. T. Jürgen Rudolpn	0.4285	3.86	0.6627	1.2685
Z. Chenjia etal	1	3.63	0.3828	2.96
Z. Xiao	0.8636	3.37	0.4364	2.5563
K. H. Frith	0.5	3.5	0.6187	1.48
S. Popenici	0.3333	4.5	0.7261	0.9866
M. M.Schönberger	1	2.5	0.3828	2.96
Sullivan etal	0.84615	2.68	0.4438	2.504
P. Vanichvasin	**4**	**2.2**	**0.0214**	**11.84**
M. Hosseini etal	2.3343	2.3	0.1064	6.9066
L. Zhou etal	**4**	**2.2**	**0.0214**	**11.84**
M. C. Keiper etal	0.6666	2.6	0.527	1.9733
G. Currie etal	1.7272	2.3	0.1904	5.1127
A.M Abdelhady etal	1.7274	2.3	0.1904	5.1127
C. J etal	2.3333	2.3	0.1064	6.906
R. Yilmaz etal	1.7272	2.3	0.1904	5.1127
I. S. Chaudhry etal	0.4285	3.8	0.6627	1.2685
K. Malinka etal	0.5	3.5	0.6187	1.48
J. De Winter etal	0.5757	4.3	0.5753	1.704
Qureshi	2.333	2.3	0.1064	6.906
J. Rudolph etal	1.5	3.25	0.2369	4.44

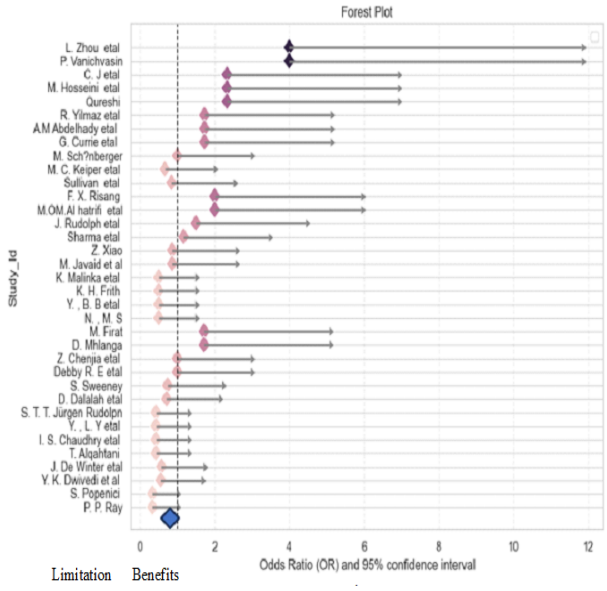

Fig. 6.: Forest Plot.

F. Discussion and recommendation:

✓ **Discussion**

The findings of this systematic review suggest that Generative AI has the potential to play a significant role in self-regulated learning within post-secondary education. The advantages and limitations of Generative AI in the context of higher education are multifaceted and warrant careful consideration [21, 43, 24, 35, 36]. As identified above, Generative AI can establish a self-directed learning ecosystem, amplifying students' motivation while nurturing their sense of autonomy, competence, and a deeper connection [17, 19, 42, 45, 40].

Furthermore, personalized feedback, a pedagogical cornerstone, assumes a pivotal role in augmenting student engagement and competence, and Generative AI is a valuable facilitator in this regard [40][57]. Additionally, it empowers educators to effectively track student performance, offering enhanced insights into their learning paths and ultimately fostering student achievement [8][52]. Conversely, the limitations and concerns surrounding Generative AI are equally significant. The potential for overreliance on the model, leading to a decline in critical thinking skills, is a concern. There are also ethical issues related to copyright, plagiarism, and content ownership generated by Generative AI. Data and algorithm bias due to the model's training data raise accuracy and fairness concerns. Cybersecurity risks, including the inadvertent generation of deceptive or harmful content, threaten individuals and educational institutions [2, 6, 10, 13, 36, 52].

As evidenced above, the literature seems to be more focused on potential drawbacks and challenges associated with Generative AI in higher education, especially regarding academic integrity. Academic dishonesty and concerns about cheating in exams have received considerable attention, with a clear emphasis on the negative implications of Generative AI's use in this context [13, 56, 32]. Furthermore, there is a pressing need for a more balanced and nuanced discourse concerning the risks and benefits associated with Generative AI in higher education. Often, stories related to academic misconduct and unethical behavior are presented sensationally, influencing not just the general perception but also the conduct of students. Given that Higher Education Institutions have limited influence over how these narratives are portrayed in the public sphere, educators and institutions should explore strategies to adapt assessment methodologies to reduce the potential for AI-assisted cheating. Previous research has indicated that the perception of available opportunities to engage in academic dishonesty elevates the likelihood of such behavior [63-65]. While various strategies to diminish the likelihood of cheating have been proposed, including redesigning assessment tasks to make them less vulnerable to AI tools, there remains uncertainty about the most effective approaches.

Regarding university positions on AI tools and their relationship to academic integrity, the literature often suggested the need for policy revisions, although the specifics of such revisions were often lacking. University policy changes usually require approval through governance committees and can be time-consuming, indicating that clearer policy positions may become more prevalent later. Determining acceptable and unacceptable practices when using Generative AI requires thoughtful consideration, especially as the availability and sophistication of such tools are unparalleled. Hence, the establishment of clear guidelines for both university staff and students on ethically appropriate Generative AI usage is imperative [66][67]. Moving forward, it is crucial to encourage a more balanced and constructive discussion on Generative AI in higher education, involving all stakeholders, with a particular emphasis on students. Student associations and partners can proactively collaborate with university staff to inform policy development, educational resources, assessment design, and communication strategies, thereby enhancing student engagement and retention. Incorporating a diverse range of voices in this discourse can lead to a more sophisticated conversation surrounding the integration of AI in education. Universities must equip students with the critical skills needed to effectively utilize AI tools, emphasizing the cultivation of unique abilities that AI cannot readily replace, thus enhancing their employability in an evolving job market.

✓ **Recommendations**

Based on the literature review's findings, the following section presents recommendations for integrating Generative AI within higher education, addressing the second research question.

- **Generative AI as a Teaching Aid**: It can be a valuable tool for educators, enhancing their teaching practices. Instead of merely relying on automated text generation, teachers can utilize Generative AI to spark creativity and gather innovative teaching ideas. This includes generating quiz questions, facilitating pro-contra discussions, or providing inspiration for role-playing exercises. Additionally, Generative AI can assist in creating customized learning materials, such as student assignments, and transform existing content into various formats like podcast scripts or instructional videos. It can also help streamline communication and course overviews and generate standardized text formats, such as event descriptions.
- **Generative AI as a Didactic Component**: Integrating Generative AI into the teaching approach can be advantageous while also addressing privacy concerns by restricting data exposure to the teacher. Transparency is crucial when using Generative AI to explore the potential and risks of AI systems, thus encouraging the cultivation of digital literacy among students. Didactic scenarios may include identifying fake news, moderating discussions, comparing summaries, evaluating different text formats and writing styles, and establishing criteria for effective scientific writing.
- **Use of Generative AI in Assessments**: The incorporation of Generative AI in assessments, such as written assessments, term papers, or presentations, poses challenges, notably an elevated risk of academic dishonesty. Present plagiarism detection software often struggles to recognize Generative AI-generated content as plagiarism.
- **Ethical Framework Development**: Higher education institutions should establish clear ethical frameworks for using Generative AI in educational settings. This framework should define guidelines for the responsible use of AI, ensuring that ethical considerations such as privacy, consent, and fairness are addressed. It should also include mechanisms for oversight and accountability. By developing ethical frameworks for using Generative AI in educational settings, higher education institutions can ensure that they use AI to respect human dignity, rights, and interests. They can also enhance the quality and effectiveness of their educational practices and outcomes. Ethical frameworks can also help higher education institutions anticipate and respond to future ethical challenges and opportunities that may arise from the advancement of AI in education.
- **Training and Awareness Programs**: Faculty, staff, and students should receive training and awareness programs about Generative AI and its capabilities. This education should cover the technical aspects of Generative AI, its ethical implications, and potential biases. This will empower the academic community to use Generative AI effectively and responsibly.
- **Legal Compliance**: Ensure that the integration of Generative AI complies with all relevant laws and regulations. This includes intellectual property rights, copyright, and compliance with educational standards. Legal experts should be consulted to navigate these complexities.
- **Diversity and Inclusion Considerations**: When using generative AI, be mindful of diversity and inclusion concerns. Ensure that the AI system does not discriminate or marginalize any group of students or educators. Efforts should be made to provide equitable access and support for all.

IV. CONCLUSION

The findings of this systematic review show that generative AI has potential in various educational contexts. For instance, it has been used effectively in sports management education to provide precise and comprehensive information. It has also facilitated the composition of operative notes in plastic surgery, showcasing efficiency and precision. However, in radiology, patient education materials revealed limitations, indicating that its application should be context-specific [2] [20]. Another noteworthy benefit is the potential to enhance students' academic success from diverse equity groups. Generational AI can help demystify academic conventions for non-traditional students, provide grammatical assistance to non-native English speakers, and assist those with accessibility needs in accessing educa-

tional content. The model can contribute to mainstreaming accessibility technology and improving engagement for students with disabilities [61][62]. Although integrating generative AI into higher education can offer valuable benefits, it also presents significant ethical, privacy, and educational challenges. These recommendations aim to strike a balance by promoting responsible use, transparency, and adaptability while mitigating risks and ensuring that generative AI enhances the educational experience for all stakeholders. The scope for future research into the role of generative AI, particularly ChatGPT, in higher education is immense and holds substantial promise. To further our understanding and tackle the emerging challenges, several crucial areas merit additional exploration, which are Longitudinal studies, Ethical Frameworks, Bias Mitigation, Student Involvement and Equity and Accessibility

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APPENDIX (A)

TABLE II
SUMMARY OF QUALITATIVE STUDY'S CONCLUSION.

Ref.	Advantages	Disadvantages
[14]	It Provides asynchronous communication. It delivers game-based assessments.	Plagiarism. It Could Lead to unfairness in assessment process.
[17]	Self-Personalized support and assessment. Real-time feedback increased accessibility and flexibility. Improve the use of open educational.	None
[48]	It can provide personal writing assistant. It is a very powerful translation tool. It could help students keep writing stories in their own words.	It might provide the incorrect answer to student question. It is hard to keep students encouraged with discussion. It is unable to perform the elementary mathematical operation. The model might have biases data so it could give the wrong result. Its student learns via supervised instruction
[8]	It Can transfer the educational landscape. It has potential to enhance the learning outcomes and improve student engagement. It can automate administrative tasks.	None
[40]	It can deliver self- learning in higher education. It accelerates the students' skills by providing the individualized feedback	Ethical issue Data security issue Algorithm bias Design Implementation,

Ref.	Advantages	Disadvantages
[16]	It can be used to accelerated learning as it could help student assimilate knowledge easily	Ethical issue Critical thinking issue It misses the transparency how model drives result
[21]	It can help students write essays and develop websites. It can assist the educator to automate routines tasks. It can encourage students to encourage in virtual environment	Plagiarized issue Data biases
[13]	It is tailored to student's needs. It can drive sufficient contextually answer to students' questions.	Generative Pre-trained Transformers model might be replacing educator's role. It can generate text that has both false positive and negative. The lack of transparency
[19]	It can positively enhance the learning environment in accounting education. It suggests integrating chatGPt into higher educational institutes.	None
[39]	Assist students to enhance their academic performance and engagement. Help the teacher to give recommendations for lesson plan. It provides online tutoring services.	Risk of overreliance It might be hard to control the quality of text generated by ChatGPT. Dataset bias and Generalization error. It might drive the hate speech and harm content.
[2]	It can significantly improve the grading and feedback. It provides the interactive learning environment.	Plagiarism, Ethical and social implications issue.
[36]	It has potential to boost student learning level.	Legal risk these including authorship disputes and data source legitimacy disputes
[50]	It can help students in writing skills by offering suggestions to enhance the context of sentence.	Authorship and plagiarism.
[52]	It can enhance the teacher supervisory support by providing students help they need that meet their preferences.	It increases the risk of academic dishonesty (AD).
[4]	It can help the researchers in writing. scientific articles. It can assist the educators to evaluate the student learning performance accurately. It can improve the grading students answers consistency.	Ethical issue, Algorithm Bias.
[51]	It can improve student learning. Enhance student learning and access.	There are several implications of using ChatGPT in education, like innovative design and integrity concerns
[46]	It can help the researchers in conduct scientific literature review. It could encourage student to interact with each other via open discussions	It might be generated randomly and incorrect information. It is hard to evaluate the accuracy and consistency of answered questions
[35]	None	Plagiarism problem, It could have a bad impact on students writing skills.
[56]	It aids lecturers to enhance teaching quality and improve instructional plans. It can deliver automated feedback of students' assignments.	It might be providing misleading answers to student's questions. The ethical and moral issue.

TABLE III
SUMMARY OF QUANTITATIVE STUDY'S CONCLUSIONS.

Ref.	No	Framework	Result
[53]	30 students	Qasi-experimental research	Chat bot has a significant impact on student learning and satisfaction.
[9]	844/students	Survey quantitative analyzed	The existence of risk and unforeseen limitation to accept using ChatGPT in higher education.
[60]	196 students	Questionnaire surveys	The university students required further guidance to learn how to use and integrate into ChatGPT in higher education.
[24]	60 participants	Generic qualitative inquiry	The finding shows pros and cons of employed ChatGPT in sport management classroom.
[12]	326 participants	Exam and written assignment tasks	The result shows ChatGPT is sufficient benefit in enhance learning environment while it can be a risk on academic integrity.
[1]	30 participants	Questionnaire via website	The result shows ChatGPT has potential in increase knowledge of plastic surgeons.
[57]	45 participants	Assignments in computer programming course	The finding ravel that ChatGPT doesn't make any difference on increase the student motivation when students given the challenging tasks.
[28]	50 participants	Questionnaire via Interventional Radiology (SIR) Patient Center website	The result shows ChatGPT has limitation in provide the accurate educational content.
[8]	Authors didn't mention	Assessment tools	The finding shows that ChatGPT is capable of writing assignments, report and case study for various level courses. Of undergraduate courses however, delivered assignments could not be comprehensive as human written.
[26]	Authors didn't mention	Czech tests and English Assignments,	The ChatGPT can accelerate the learning process however, it can easily damage the educational averment.
[54]	Authors didn't mention	National exams of VWO program In English reading comprehension topic	The finding ravel ChatGPT could expose student in assignment cheating.
[37]	24 students	Programming tasks	The experiment shows the students who use ChatGPT gain a higher score in less time than students who use textbooks, although they were not able to gain a perfect score due to the fact that ChatGPT generates inconsistent code.
[41]	Authors didn't mention	Review survey	It is not powerful tools to assist in design assignment questions.

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