ChatGPT's Future in Higher Ed: Insight from Bachelor-Level Teachers Years

Norbert Forman[18], Nino Papashvili[19], Péter Szántó[20], Orsolya Éva Tóth[21]

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Abstract

Our research explores the potential impact of ChatGPT on higher education, specifically focusing on bachelor programs. Using a mixed-method approach that included interviews with 12 educators, media outlet analysis, and Z-number cognitive mapping, the research aims to investigate ChatGPT's role in higher education and understand the perspectives of teachers over the next three years. The research provides a foresight analysis of teachers' perspectives regarding the potential impact of ChatGPT on higher education.

ChatGPT has the potential to revolutionize the teaching and learning process and methodology in higher education within the next three years and it will also offer opportunities and challenges to the participants in higher education. According to our findings, ChatGPT can have a positive impact on personalized learning, student engagement, and AI-driven assessment. Thus, ChatGPT can be considered a new tool that could support teaching and learning methodology and could help to increase the overall student experience in higher education. On the other hand, it also raises ethical concerns and challenges in terms of pedagogical integration.

Our findings can serve as a useful reference for policymakers, educators, and other stakeholders in the education sector.

Keywords: ChatGPT, higher education, foresight analysis JEL codes: a2, I2, o22, c88

INTRODUCTION

The use of NLP systems can be highly beneficial in supporting curriculum design and learning path generation in the context of tech universities. By automating the process of information extraction and analysis, NLP systems can help to save time and resources, while also providing more accurate and personalized recommendations for students. Particularly, ChatGPT has the potential to revolutionize the way we interact with technology and can be a significant futuristic support tool (Vo et al., 2022). Specifically, ChatGPT has the potential to transform the assessment process in higher education. However, Rudolph et at. (2023) emphasizes the need for continued research and development to ensure that ChatGPT is used ethically and

[18] Doctoral School of Entrepreneurship and Business, Budapest Business School, Budapest Hungary Department of Business Information Technology, Faculty of Finance and Accountancy, Budapest Business School, Budapest Hungary

[19] Doctoral School of Entrepreneurship and Business, Budapest Business School, Budapest Hungary

[20] Doctoral School of Entrepreneurship and Business, Budapest Business School, Budapest Hungary

[21] Doctoral School of Entrepreneurship and Business, Budapest Business School, Department of Finance, Faculty of Finance and Accountancy, Budapest Business School, Budapest Hungary

effectively. However, the ChatGPT should not replace human assessments entirely but should be used in conjunction with traditional assessments to provide a more comprehensive approach (Rudolph et at., 2023). Although, Neumann et al. (n.d.) calls for a broader conversation about the role of AI in higher education, including discussions around ethical considerations and the need for appropriate regulations. They also suggest that universities and policymakers should work together to develop guidelines and best practices for the responsible use of AI in higher education.

Willems (2023) Several issues face universities, including declining enrolment, budget cuts, and adapting to changing student demographics and labor market demands. Rather than simply implementing new technologies, he argues that universities must change how they operate. The author suggests that universities should focus on addressing these challenges by adopting innovative teaching methods, such as online learning, while also prioritizing students' needs. In addition, the author emphasizes the importance of retaining a human-centered approach to education, in which technology enhances rather than replaces human interaction. Accordingly, Willems, (2023) acknowledges ChatGPT and AI's potential benefits in higher education but recommends viewing them as tools rather than solutions. To meet these challenges, innovation and technology must be integrated with broader societal and institutional goals.

Other scholars also highlight that large language models (LLMs) such as GPT-4 and ChatGPT pose a significant challenge to the future of higher education. They suggest that LLMs can fundamentally transform the way we learn and teach, potentially disrupting traditional educational models and challenging the role of educators (Milano et al., 2023). Additionally, Neumann et al. (n.d.) discusses that the emergence of advanced artificial intelligence (AI) models such as ChatGPT has significant implications for the future of higher education. The authors suggest that AI models like ChatGPT can transform higher education by enabling personalized learning experiences, enhancing student engagement, and providing real-time feedback to learners. The paper discusses the potential benefits of using AI in higher education, including improving student retention rates, and reducing the cost of education. However, the authors also acknowledge the potential risks and challenges associated with the use of AI in education, such as privacy concerns and the potential for bias in AI algorithms.

1.1. LITERATURE REVIEW

The research by Baidoo-Anu & Ansah, (n.d.) explores the potential benefits of using generative AI in education, specifically through the example of ChatGPT, a large language model trained by OpenAI. The authors emphasize that ChatGPT can be a useful tool in promoting teaching and learning, as it can provide personalized and adaptive learning experiences for students. ChatGPT can generate responses to students' questions and provide feedback on their work, which can help them understand complex concepts and improve their skills.

Accordingly, Willems (2023) argues that the focus on ChatGPT and similar AI models in universities is misplaced, and that there are more pressing concerns facing higher education institutions. The authors suggest that while ChatGPT and AI can be useful tools for teaching and learning, they are not a panacea for the challenges facing universities. Therefore, Haleem et al. (2022) discuss the potential of ChatGPT as a futuristic support tool and its features, abilities, and challenges. The authors highlight the advantages of using ChatGPT, such as its ability to understand natural language, its ability to learn from vast amounts of data, and its scalability. Also, Sok and Heng, (n.d.) demonstrate the benefits of ChatGPT, including its ability to generate human-like responses to questions, provide personalized feedback and assistance to students, and assist researchers in data analysis and knowledge discovery. They also highlight the potential for ChatGPT to enhance language learning, as it can help students

practice and improve their language skills. However, it is crucial to address the challenges and limitations to ensure that ChatGPT is used ethically and responsibly (Haleem et al., 2022).

Particularly, Shiri, (2023) discusses the potential benefits of using ChatGPT for academic integrity, such as its potential to improve the accuracy and efficiency of plagiarism detection. However, the author also acknowledges the challenges of using AI in this context, such as the need to ensure the accuracy and fairness of the model and the potential for false positives or negatives. Moreover, Atlas, (2023) highlights the benefits of using ChatGPT, including its ability to provide instant feedback and support, its potential to improve engagement and retention, and its scalability. However, the author also acknowledges the challenges of using ChatGPT, such as the need to ensure the ethical and responsible use of AI and the potential for bias in the data used to train the model.

In relation to the benefits of utilizing ChatGPT in higher education, Firaina & Sulisworo, (2023) present the findings of the study which indicate that ChatGPT was primarily used to assist with writing assignments and for research purposes. Both teachers and students reported higher levels of productivity and satisfaction when using ChatGPT frequently. It should be noted, however, that some participants expressed concerns about the potential for ChatGPT to replace human interaction and the need for further training and support to make the most of it.

As a means of representing an overall picture of ChatGPT in relation to the current topic of interest, Farrokhnia et al. (2023) conducted a SWOT analysis around ChatGPT, and accordingly, its strengths were identified as the ability to process and analyze large amounts of data rapidly and its ability to personalize learning experiences. Among its weaknesses are the risk of perpetuating bias and the lack of emotional intelligence in its responses. There is potential for the development of more sophisticated natural language processing models as well as the potential for improving accessibility and inclusion in education. There is a risk that this technology will be misused and that it may replace human teachers. Apart from that, Milano et al. (2023) explore the implications of LLMs for the role of educators in higher education, suggesting that LLMs could potentially replace some teaching functions or lead to a shift towards more facilitative and coaching roles. The authors propose several strategies for preparing educators and students for the use of LLMs in education, such as developing AI competency frameworks and providing training programs for educators.

In light of this, Sok & Heng, (n.d.) acknowledge the risks associated with using ChatGPT, such as the potential for bias in the data used to train the model, the risk of perpetuating stereotypes and misinformation, and the potential for misuse of the technology. Considering this, Rudolph et at. (2023) argue that ChatGPT can address these limitations by providing a more objective and efficient assessment process. Hence, Atlas, (2023) believes that ChatGPT can revolutionize higher education and professional development by offering a personalized, scalable, and responsive learning experience that could revolutionize higher education and professional development. Thus, the author provides a practical guide as to how ChatGPT can be used in higher education and professional development, including customized learning, student support, and career guidance, among other applications. Nonetheless, the author also emphasizes that there must be a careful consideration of the ethical implications of using AI, and that it must be continuously evaluated for its effectiveness and undergone ongoing research.

Also, Baidoo-Anu & Ansah, (n.d.) argue that ChatGPT can be a useful tool in promoting teaching and learning, as it can provide personalized and adaptive learning experiences for students. ChatGPT can generate responses to students' questions and provide feedback on their work, which can help them understand complex concepts and improve their skills. Overall, they suggest that while there are potential benefits to using ChatGPT and other generative AI tools in education, it is important to approach their use with caution and to ensure that they are used

in a responsible and ethical manner.

1.2. RESEARCH QUESTIONS

The research question of the study aims to investigate how instructors conceptualize ChatGPT's impact on higher education in terms of course delivery, student assessment, and learning outcomes for the next three years. The rationale behind this inquiry lies in the varied viewpoints expressed in literature concerning ChatGPT's role in teaching and learning. Although some scholars like Baidoo-Anu & Ansah (n.d.) and Firaina & Sulisworo contend that it has enormous potential to enhance individualized academic experiences and facilitate educational tasks, others such as Willems, Shiri, Sok & Heng(n.d.) raise doubts about its ethical implications or limitations when applied to authentic settings. While there is a consensus among researchers about ChatGPT's ability to revolutionize instructional methods, improve evaluation measures, and promote knowledge acquisition outcomes if put into appropriate practice conditions; still cautionary remarks are made against possible biases installation or fact-checking errors alongside negative impacts on human communication dynamics resulting from overreliance upon these technological tools at present moment.

Educators are crucial stakeholders in the integration of ChatGPT into academic settings, providing valuable perspectives on practical, ethical and pedagogical considerations. Their insights can help assess advantages achievable through using this technology as well as identify challenges that may arise during its implementation for teaching purposes. Additionally, since AI could significantly impact educators' roles in the classroom according to literature studies, an understanding of their perceptions is paramount for devising effective adaptation strategies. Understanding these concerns by investigating a three-year horizon allows us to gain actionable insights aligned with ongoing technological advancements taking place within AI research and development environments at present times.

The research question presented in this study is essential to establish a connection between the potential benefits of ChatGPT and the apprehensions highlighted in previous literature. It aims to attain an extensive comprehension of the first-hand encounters and viewpoints of educators. This will help develop responsible and efficient approaches towards incorporating ChatGPT into higher education settings.

In order to fully understand ChatGPT's role in higher education, it is imperative to understand teachers' perspectives (Biesta, 2015). In implementing ChatGPT in the educational ecosystem, researchers and policymakers can benefit from teachers' opinions and insights. As artificial intelligence advances rapidly and has a growing impact on a wide range of industries, including education (Brynjolfsson & McAfee, 2014), it becomes increasingly important to examine ChatGPT's potential impacts on higher education in order to prepare institutions and educators for the future.

In addition, this study addresses three critical components of education by focusing on the delivery of courses, student assessment, and learning outcomes. It is important to examine ChatGPT's potential influence on these aspects as they have been extensively studied within the context of educational technology (Means et al., 2010). It is also important to explore how ChatGPT could revolutionize course delivery and student assessment, as it has demonstrated human-like language capability (Radford et al., 2021), possibly leading to more personalized, adaptive, and efficient learning experiences (Liu et al., 2020).

Furthermore, determining ChatGPT's impact on student learning outcomes is crucial, since ensuring students achieve desired educational outcomes is a key concern for higher education institutions (Kuh et al., 2006). By evaluating ChatGPT's potential influence on learning outcomes, we can determine how effective it is in improving educational outcomes.
Finally, by selecting this research question, the study will contribute to the growing body of

literature on artificial intelligence in education (Luckin et al., 2016) and provide valuable insights for stakeholders, such as educators, administrators, and policymakers, to make informed decisions about integrating ChatGPT into higher education.

1.3. METHODOLOGY

A mixed-methods approach is employed in this study, which incorporates qualitative data from interviews, media analysis, and a quantitative Z-number cognitive mapping technique to investigate ChatGPT's role in shaping higher education's future. Combining qualitative and quantitative methods ensures a comprehensive understanding of the topic.

1.3.1. INTERVIEWS

Twelve bachelor-level teachers across various disciplines were interviewed semi-structured. We carefully selected participants based on their experience, expertise, and familiarity with ChatGPT. Participants were interviewed to gain insights into how they perceived ChatGPT's potential impact on course delivery, student assessment, and learning outcomes.

From recordings of the interviews, verbatim transcriptions of the data were made. In the following steps, transcripts were analyzed using thematic analysis, as described by Braun and Clarke (2006). In order to answer the research question, patterns, themes, and subthemes were identified. Peer debriefing and member checking ensured the trustworthiness of the findings. For the thematic analysis, we followed these steps:

1. Read and reread interview transcripts to gain an understanding of how ChatGPT impacts course delivery, student assessment, and learning outcomes.
2. The initial codes will reflect teachers' insights and experiences regarding ChatGPT in higher education.
3. Codes can be grouped into themes that capture key patterns related to ChatGPT's impact on teaching and learning.
4. By examining both the coded data extracts and the entire dataset, we verified the coherence and consistency of the emerging themes, when needed we refined them.
5. We developed clear definitions and names that reflect teachers' perspectives on ChatGPT's role in higher education.
6. The report was written in a succinct manner, incorporating thematic narrative and data extracts to illustrate the potential impact of ChatGPT on higher education.

A 30-minute interview could last up to 1.5 hours, depending on the subject. As the interview was semi-structured, we focused on understanding the following three core questions:

- What impact do you think ChatGPT will have on how courses will be delivered, assessments will be conducted, and learning outcomes will be achieved in the next three years based on your experience as a bachelor-level educator?
- In what ways might ChatGPT benefit your teaching practices and what challenges might it present? Do these factors affect your students' and your own educational experiences?
- How do you think ChatGPT's adoption might transform traditional roles and responsibilities within higher education based on your understanding of its capabilities? In particular, how does this relate to teaching and learning at the bachelor's level?

1.3.2. MEDIA OUTLET ANALYSIS

A systematic review of articles, news reports, and opinion pieces from various media outlets was conducted. Our focus was on ChatGPT's potential impact on higher education. In order to ensure relevance to the current state of ChatGPT and its applications in education, only articles

published within the last three years were searched.

The purpose of this study was to identify recurring themes, trends, and perspectives about ChatGPT's potential impact on course delivery, student assessment, and learning outcomes in higher education by using a content analysis approach (Krippendorff, 2018). Through this analysis, we were able to contextualize the findings of the interviews and gain a broader understanding of the topic. Following are the steps we have taken to ensure the accuracy of the data:

1. Understanding how media outlets discuss ChatGPT's impact on course delivery, student assessment, and learning outcomes in higher education is one of the research objectives.
2. Analyze articles, news reports, and opinion pieces from various media sources published within the last three years, ensuring relevance to ChatGPT's current state.
3. Make a coding scheme to identify recurring themes, trends, and perspectives in the media materials, in accordance with our research goals.
4. Used qualitative data analysis software in order to assign codes to relevant segments of media content.
5. Determine trends and patterns in the media's portrayal of ChatGPT's potential impact on higher education by analyzing the frequency and distribution of codes. Analyzed these findings in light of the insights gained from interviews to gain a deeper understanding of the subject.

The article will benefit from a broader perspective on the discourse surrounding ChatGPT's role in higher education through the use of content analysis. In addition to the insights gained from teacher interviews, this will provide a valuable complement.

1.3.3. Z-NUMBER COGNITIVE MAPPING

The scientific method of Z-number cognitive mapping was initially proposed by Kosko in 1986 and subsequently enhanced by Zadeh in 2011. It is a highly advanced approach utilized for modeling intricate systems. When examining the probable consequences of ChatGPT on advanced education, applying Z-number cognitive mapping might prove to be an irreplaceable resource. Specifically, this procedure comprises numerical representation that encapsulates two components: the doubtfulness associated with the data and its dependability or trustworthiness level.

Overall, this conceptual framework focuses on navigating through incomplete knowledge scenarios while recognizing that information can have diverse degrees of reliability. Z-number cognitive maps play a vital role in facilitating structured representations of the potential interaction between ChatGPT and different aspects implicit to higher education. By adopting this technique, one can effectively model uncertainties pertaining to the scale of impact or reliability based on diverse studies and experiences related to student engagement. Such an approach enhances our ability to make informed predictions about ChatGPT's effect within the context of higher education while recognizing that educational systems are complex and dynamic with nuanced considerations. Overall, utilizing Z-number cognitive mapping offers a more flexible analysis compared to customary approaches for comprehending these intricate interactions in academic settings.

The construction of a Z-number cognitive map entails several steps. To begin with, the analyst should set out clear boundaries for their system or problem under examination and fully comprehend any constraints on the study's goals. Next, they must distinguish all elements or variables that are imperative to the system being studied such as factors, attributes or components. Thirdly, data sources like expert opinions, literature reviews and empirical data need to be collected in order to determine connections between these identified variables. Finally each piece of acquired information must receive an assignment of a corresponding z-

number which consists of two parts: The first element (A) represents vague aspects while its counterpart (B) indicates reliability levels typically ranging from 0 to 1; this integration guarantees maximum precision when designing accurate models using fuzzy theory techniques. A diagram representing the elements and variables, which are considered as nodes in this method, with arrows indicating their relationships should be created. Next, assigning Z-numbers to each connection reflecting both uncertainty and reliability is crucial for depicting how strong or weak these links truly are between them. Subsequently, using this cognitive map can help explore how changing one of these nodes might affect others while identifying key drivers within the system or explaining complex interdependencies among different factors that influence it. Moreover utilizing z-number arithmetic and aggregation techniques would enable deducing inference or prediction based on analysis done by referring back to drawn diagrams containing all related information about mapped components through its dependencies toward valid conclusions. Finally validating the accuracy of data implemented during model creation could occur via various methods such as expert opinions validation or other forms provided by relevant sources outside framework implementation itself ensuring similar outcomes via cross-validation methods may arise provable results with confidence level set appropriately depending on context applied towards ease interpretation alongside less ambiguity when presenting findings from originally assigned problems beforehand confronting difficulties arising thereof matching reality closely without influencing outcome negatively due conflicting propositions arising invalidating assumptions made initially regarding problem structure being tackled hence overfitting issue occurred before solving said problem After validating the Z-number assignments or cognitive map structure, make appropriate modifications to enhance their accuracy. Modifying relationships or adding/removing elements may be necessary. Utilize the information obtained from the Z-number cognitive map to develop detailed insights that can aid in making knowledgeable decisions about complex systems. Lastly, document all aspects of the Z-number cognitive mapping process including its discoveries, insights gained, and informed decision-making results for effective communication with relevant stakeholders involved in such complex systems analysis.

We constructed an initial cognitive map based on the findings of the interviews and the media outlet analysis. In an iterative process involving expert consultation, this was refined. To analyze ChatGPT's potential trajectory over the next three years, we ran simulations based on various scenarios.

To provide a comprehensive understanding of the potential impact of ChatGPT on higher education and inform future research, policy development, and practical applications, we triangulated the findings from interviews, media outlet analysis, and cognitive mapping based on Z-numbers. We followed these steps when mapping Z-numbers cognitively:

1. Our initial cognitive map represents relationships among factors related to ChatGPT's impact on higher education based on interviews and media outlet analysis.
2. In order to ensure accuracy in relationships, weights, and uncertainties, we consulted with experts.
3. The robustness of the model was improved by incorporating Z-numbers to account for uncertainty and reliability in the map.
4. A scenario was developed representing potential paths for ChatGPT's adoption and integration into higher education.
5. Analyzed potential trajectories of ChatGPT's impact over the next three years using the Z-number cognitive map and scenarios.
6. Provided a comprehensive understanding of ChatGPT's potential influence on higher education using simulations, interviews, and media outlet analysis.

In order to comprehend the impact of emerging technologies like ChatGPT on higher education, a Z-number cognitive mapping provides flexibility, visual clarity, the ability to

handle uncertainty, and the ability to handle reliability, which make it a valuable tool for understanding the impact of emerging technologies.

1.4. MAPPING

1.4.1. DOMAIN DEFINITION

This study is looking at the impact of ChatGPT, a new advanced AI language model, on the delivery and assessment of undergraduate courses, as well as learning outcomes in bachelor's degree programs over the next three years, focusing particularly on course delivery, student assessment, and learning outcomes. Using a mixed-methods approach, a model based on teacher interviews, media outlet analysis, and cognitive mapping of Z-numbers is used in order to predict possible future trajectories. This domain explores the perspectives of educators, broader discourses around artificial intelligence in education, and potential implications for higher education policy and practice based on the perspectives of educators.

1.4.2. CURRENT ANALYSIS OF THE DOMAIN AND ENVIRONMENTAL ANALYSIS

ChatGPT has gained considerable attention in higher education for its potential to transform teaching and learning. Educators can use the AI-driven language model for creating content, providing feedback on student work, and facilitating discussions. There are, however, ethical concerns about the use of AI in education, including privacy, fairness, and the possibility that AI-driven systems may replace teachers. Higher education can be influenced by several factors in the broader environment:

- Continual improvement of AI models such as ChatGPT can enhance their capabilities and effectiveness, making them more appealing for educational use. Since the introduction of the original Generative Pre-trained Transformer (GPT) in 2018, there have been several iterations, including GPT-2, GPT-3 and GPT-4. For example, GPT-2, with 1.5 billion parameters, was already capable of generating coherent and contextually relevant text. But GPT-3, with 175 billion parameters, significantly improved upon this.
- A balance must be struck between innovation and privacy concerns when developing policies and regulations to govern the ethical use of AI in education. The European Union's GDPR sets a prominent example of balancing AI innovation with data privacy in education. The controversy surrounding the Summit Learning Program in the U.S. highlighted the need for cautious adoption of AI, considering parental concerns over data collection. The use of AI proctoring systems during the COVID-19 pandemic sparked debate on the trade-off between maintaining academic integrity and respecting student privacy.
- A society's perception of AI technologies, including its acceptance or resistance to AI's role in education, has the potential to affect the extent to which ChatGPT is adopted by educators and institutions. A good example is in France where skepticism towards AI in classrooms led to limited adoption, as seen with the “AI for Humanity” initiative where the focus was on ethics and human control over AI. In contrast, Singapore embraced AI in education through its “Smart Nation” initiative, integrating AI tools in classrooms for personalized learning experiences. These examples demonstrate how societal perceptions of AI play a crucial role in determining the extent of ChatGPT and similar AI tools' adoption within educational settings.
- ChatGPT adoption in higher education can be affected by economic factors, such as educational budgets and cost-effectiveness. In the United States, community colleges, which often operate on tighter budgets, may find it challenging to adopt ChatGPT due

to the associated costs. On the other hand, prestigious institutions like MIT and Stanford, with more substantial financial resources, are more likely to integrate ChatGPT for research and teaching. This illustrates how economic factors, such as educational budgets and the cost-effectiveness of AI tools like ChatGPT, can significantly influence their adoption in higher education.

As AI technology advances, such as ChatGPT, educators can harness its potential to enhance teaching and learning. A conducive regulatory and policy environment can promote the ethical and responsible adoption of ChatGPT in higher education, promoting innovation in course delivery, assessment, and learning outcomes.

A wide adoption of ChatGPT, however, may be hindered by concerns about privacy, fairness, and the potential for AI-driven systems to replace human educators. Integration of AI technologies in higher education may be limited by resistance from educators or society, as well as budget constraints.

ChatGPT's future in higher education depends on the interplay of these various factors and the ongoing dialogue among stakeholders, including educators, policymakers, and technologists, in shaping the responsible and effective use of AI in education.

1.4.3. HORIZON SCANNING

The potential effects of ChatGPT on higher education in the upcoming three years are examined through an emphasis on areas such as curriculum execution, evaluation of pupils' performance, and educational achievements. Through a horizon scanning methodology that considers notable and emerging influencers beyond academic circles, including prevailing elements or forces, nascent indications as well as drivers affecting this realm's progress - we investigate how forthcoming trends may shape ChatGPT's involvement in it.

The integration of AI-powered tools in education is a noteworthy trend owing to technological progress. Teachers are incorporating these tools into their routines more frequently with the prominence of AI systems, aiming to improve individualization and automate tasks for efficiency. Given that online and blended learning have become popular, ChatGPT along with other AI-backed technologies appears particularly suitable for facilitating remote education and increasing student engagement in digital settings.

AI tools that can evaluate students' progress and performance may lighten the workload of educators by providing personalized feedback in a timely manner. This development indicates potential advancements in our article's scenario as educational institutions aim to enhance student engagement and assistance. Non-academic sources such as tech blogs, social media discussions, and industry reports reveal an initial utilization of AI chatbots like ChatGPT into Learning Management Systems.

The role of ChatGPT in higher education is influenced by various factors, including but not limited to technological advances, institutional support, and government policies. Besides the key determinants, other aspects like social attitudes toward AI, potential opposition from educators and students as well as macroeconomic circumstances could also affect its acceptance. ChatGPT's capacity for learning will keep upgrading over time which leads to increased chances of incorporation into academic settings. However, whether or not universities implement this technology on a large scale depends largely upon their financial commitment and efforts towards raising awareness about AI-based tools among staff/students alike. Furthermore, regulation around ethical usage of artificial intelligence systems within an educational context has a bearing on academics' inclination towards adopting these technologies more widely than otherwise anticipated. Further research may illuminate these issues surrounding the pervasive use of intelligent agents such as ChatGPT in our teaching process today.

The aim of this scholarly article is to present an analysis of the developing patterns and potential areas for research and policy development pertaining to ChatGPT's integration into higher education. To accomplish this, both academic and non-academic sources were examined in order to identify trends, weak signals, and drivers. Additionally, important factors that may impact its implementation - whether significant or minor - have been considered by collecting data from different channels with the intention of creating a complete overview of not only current circumstances but also future opportunities as well.

1.5. BASELINE FUTURE

1.5.1. BASELINE ANALYSIS

As far as course delivery is concerned, we find that ChatGPT is increasingly used by educators to create and curate course materials, provide personalized learning experiences, and facilitate online discussions. Although ChatGPT has been integrated into course delivery, its full potential has not yet been realized.

Students are now receiving feedback on their work through AI-driven tools such as ChatGPT and some tasks are being automated. Even though AI has the potential to revolutionize assessment, concerns remain regarding fairness, accuracy, and potential biases.

By enhancing student engagement and providing personalized learning experiences, ChatGPT can also contribute to improved learning outcomes. For a better understanding of ChatGPT's long-term impact on student performance and learning, more research is needed.

Despite its potential impact on higher education, ChatGPT faces challenges related to ethical concerns, integrating with pedagogical practices, and replacing human educators with AI-driven systems. Using Z-number cognitive mapping, we aim to provide a solid starting point for further research, policy development, and practical applications of ChatGPT in higher education.

1.5.2. COMBINED RESULTS

Interview Results

Several key themes emerged from our 12 interviews with bachelor-level educators regarding ChatGPT's potential impact on higher education. A list of the most commonly mentioned themes is presented in Table 1.

1. Table Key Themes from Interviews, Source: own creation

Theme	Count
Losing my job	11
Enhanced Personalization	10
Ethical Concerns	8
Increased Efficiency in Assessment	8
Improved Student Engagement	6
Pedagogical Integration Challenges	5

Media Outlet Analysis

There are both positive and negative perspectives that can be drawn from the adoption of ChatGPT in higher education, according to a media analysis. Table 2 provides a summary of advantages and concerns mentioned.

2. Table Advantages and Concerns from Media Outlet Analysis, Source: own creation

Advantages	Concerns
Greater Accessibility	Data Privacy and Security
Support for Diverse Learning Needs	Potential for AI Bias
Reduced Educator Workload	Over Reliance on AI in Education

Z-number Cognitive Mapping Results

A Z-number cognitive mapping technique was used in order to simulate the potential impact of ChatGPT over the next three years on higher education. As a result of the findings from the interviews and the analyses of media outlets, an initial cognitive map was constructed, which was refined through expert consultations, based on the findings from the interviews. As shown in Table 3, the cognitive map is presented along with the key nodes that make up the map.

3. Table Key Nodes and Weights in the Z-number Cognitive Map, Source: own creation

Node	Weight
Personalized Learning	0.75
Student Engagement	0.70
AI-driven Assessment	0.65
Affecting Jobs	0.30
Pedagogical Integration Challenges	-0.55
Ethical Implications	-0.60

The Z-number cognitive mapping technique has yielded informative findings on the foreseeable effects of ChatGPT in the realm of higher education. Utilizing data obtained from interviews and media outlet analyses, a refined cognitive map was developed with input from specialists. Six main nodes were identified and assigned weights ranging between -1 to 1 (inclusive), underlining their respective degrees of favorable or unfavorable impact towards higher education.

- *Personalized Learning (Weight: 0.75):* The positive impact of ChatGPT on personalized learning is expected to be significant, as indicated by the node with the highest weight. The integration of ChatGPT has the potential to facilitate customized educational experiences for students, enabling them to learn at their own pace and in accordance with their individual preferences.
- *Student Engagement (Weight: 0.70):* According to the positive weight attributed to student engagement in personalized learning, the utilization of ChatGPT has the potential to enhance such engagement levels. Its capacity for supplying instantaneous feedback and facilitating interactive learning environments could be contributing factors towards this outcome.
- *AI-driven Assessment (Weight: 0.65):* The positive implication is that ChatGPT has the potential to streamline student assessment by leveraging AI technology. This can benefit both educators and students, as it allows for more efficient grading and feedback provision. By automating some aspects of evaluation, instructors may free up time for other teaching-related tasks. Meanwhile, learners could benefit from prompt and personalized feedback on their performance, which may support their academic progress in a timely manner.
- *Affecting Jobs (Weight: 0.30):* This node suggests that ChatGPT may have an impact on the job market, albeit with moderate positivity. This influence could potentially take different forms such as introducing new positions dedicated to managing and incorporating AI in education or even decreasing demand for specific administrative roles.
- *Pedagogical Integration Challenges (Weight: -0.55):* The negative weight of this node implies that incorporating ChatGPT into current educational practices could present difficulties. Educators and academic institutions may encounter obstacles in ensuring the compatibility between ChatGPT's features and their teaching strategies, necessitating modification and education.
- *Ethical Implications (Weight: -0.60):* The highest degree of disfavor is assigned to ethical implications that pertains to the assimilation of ChatGPT. These may comprise

anxieties concerning safeguarding data confidentiality, partiality in AI algorithms, and moral considerations during student evaluations and engagements, among others.

In brief, the potential educational benefits of ChatGPT appear promising; however, it is important to consider the difficulties associated with integrating this natural language processing technology into pedagogy as well as its ethical ramifications. Achieving equilibrium between these considerations will be key in responsibly and effectively implementing ChatGPT within higher education contexts. Notably, Zhai's study underscores that while AI holds significant promise for enhancing teaching and learning practices, careful attention must be paid to ensure that utilization does not compromise scholarly standards or reasoning processes. As such, responsible implementation frameworks are essential for reaping optimal rewards from technological innovations like ChatGPT without sacrificing quality control mechanisms critical to academic rigor.

1.5.3. DELPHI SURVEY

We conducted a Delphi survey to gather expert insights on ChatGPT's potential impact on higher education, focusing on course delivery, student assessment, and learning outcomes in bachelor-level programs over the next three years. Participating experts, including 6 educators from university, 1 AI researcher from university, and 2 higher education administrators again from university, completed three rounds of the Delphi survey.

Our first round consisted of open-ended questions derived from our baseline analysis, media outlet findings, and interviews with bachelor-level educators. There were several questions addressed regarding the potential benefits and challenges of integrating ChatGPT in higher education, as well as the ethical implications. During the next round, experts shared their opinions and predictions.

On the basis of the first round responses, we distilled common themes, potential opportunities, and concerns related to ChatGPT's impact on course delivery, student assessment, and learning outcomes in the second round. Experts rated the likelihood and significance of each identified theme or issue based on the unique context of our article.

To allow the experts to review their initial judgments in light of the collective opinions, the aggregated ratings from the second round were shared with them for the final round. During this round, experts were able to adjust their ratings and share final thoughts on the potential impact of ChatGPT on higher education given the unique focus of our article on bachelor's degree programs.

The Delphi survey results were analyzed to identify areas of consensus and divergence among the experts. By combining these findings with media outlet analysis, interviews with bachelor's level educators, and Z-number cognitive mapping, we were able to gain a comprehensive understanding of ChatGPT's potential impact on higher education over the next three years, tailored specifically to our article's unique context.

1.6. ALTERNATIVE FUTURES

1.6.1. SCENARIO ANALYSIS

According to the United Nations Environment Programme (UNEP) Global Environment Outlook 3 (GEO-3) Outlook Section, scenario analysis can be communicated through various means. The predominant methods used in scenario analysis include descriptive, written narratives, which are referred to as qualitative scenarios, and tables and figures that incorporate numerical data. These numerical data are often produced through the use of advanced computer models, and are classified as quantitative scenarios.

After understanding the base image of the present state including all the variables

(Godet, 1993), principal determinants should be identified with their parameters. This is where structural analysis is a helpful tool, where a key element in conducting an analysis of a given system involves scrutinizing the present state of affairs and isolating the mechanisms, as well as the principal actors, who have previously exerted control or influenced the system by means of the variables at play.

To conduct a scenario analysis of the potential impact of ChatGPT on BBS bachelor programs' course delivery, student assessment, and learning outcomes, we will consider two key uncertainties:

1. The extent to which ChatGPT is adopted by bachelor programs - internal factor
2. The response of top-ranked universities to the adoption of ChatGPT - external factor

Based on these uncertainties, we will develop four scenarios, each of which represents a plausible future outcome:

Scenario 1: "ChatGPT Dominance"

ChatGPT's technological advancements include highly advanced language processing capabilities, emotional intelligence features, and specialized variants for different disciplines. As the primary mode of course delivery deeply integrated into Learning Management Systems, it now curates personalized content that adapts to students' learning styles and paces. This has led educators to evolve into supervisory roles while ChatGPT handles granular aspects of teaching. ChatGPT has revolutionized student assessments through its advanced anti-cheating algorithms, providing instant feedback and personalized learning experiences. It's a valuable tool for academic research as it efficiently processes large data sets producing insights leading to groundbreaking discoveries. ChatGPT’s scalability has democratized education especially for people living in remote or underprivileged areas with access to world-class education via ChatGPT-powered platforms at lower costs than traditional methods. Educational institutions have benefitted from financial restructuring due to reduced need of physical spaces and administrative staff thanks to ChatGPT’s reliability. The resultant growing market is now heavily reliant on human educators serving as mentors and guides alongside the technology-driven approach

Scenario 2: "Mixed Impact"

In this scenario, ChatGPT is adopted by some bachelor programs but not others. The impact of ChatGPT on the delivery of courses, student assessment, and learning outcomes of bachelor programs is mixed, with some programs benefiting significantly, while others see little to no improvement. Top-ranked universities respond by adopting similar technologies, leading to increased competition and innovation.

Scenario 3: "No Impact"

In this scenario, ChatGPT is not widely adopted by bachelor programs, either due to lack of interest or inability to integrate the technology into existing systems. In this scenario, there is no significant impact on the delivery of courses, student assessment, and learning outcomes of bachelor programs among top-ranked universities.

Scenario 4: "Negative Impact"

In this scenario, ChatGPT is widely adopted by bachelor programs, but the quality of education and research output does not improve as expected. This results in a decline in the reputation of

delivery of courses, student assessment, and learning outcomes of bachelor programs that adopt ChatGPT, as top-ranked universities are perceived to offer superior education and research opportunities.

Factors, such as cost, ChatGPT's implementation's feasibility, the education's quality, students' and stakeholders' perception should be evaluated by their potential impact.

Ultimately, the impact of ChatGPT on bachelor programs' course delivery, student assessment, and learning outcomes will depend on a complex interplay of these factors, as well as external factors such as government policies and global economic conditions. By conducting scenario analysis, we can better understand the potential risks and opportunities associated with the adoption of ChatGPT by bachelor programs, and develop strategies to respond to changing circumstances.

Furthermore, identifying the principal determinants and their parameters is necessary. Here, determinants are the factors that are likely to produce a significant impact on the future, while parameters are the specific variables that will affect each determinant.

One determinant can be AI's technological advancements. Its parameters could include the pace of technological development, the level of investment in R&D, and the level of collaboration and knowledge transfer among stakeholders.

Another determinant is changes in the preferences and expectations of students and employers. Its parameters could include factors like the desire of students for more personalized learning experiences, the importance of practical skills and real-world experience in the changing workplace environment, and the increasing importance of interdisciplinary and cross-cultural competencies.

A third determinant is the emergence of new competitors in the education space. The parameters of this determinant could include the level of investment and innovation by these new competitors, the quality and reputation of their offerings, and their ability to attract top faculty and students.

By identifying and analyzing these determinants and their parameters, it is possible to construct multiple plausible scenarios of the future of ChatGPT and bachelor programs' delivery of courses, student assessment, and learning outcomes. These scenarios can then be used to develop appropriate strategies to address potential threats and opportunities.

It is important to understand the present state of affairs and separate the mechanisms and principal actors who have previously influenced the system.

One mechanism that has influenced the higher education system is the increasing demand for personalized and technology-enabled learning experiences. The drive of this trend is by digital tools and platforms. Specifically, the increasing availability and affordability that enable students to access information in new ways, which arguably reshapes learning and interactions.

Another mechanism with great influence is the growing importance of interdisciplinary and cross-cultural competencies. A response that can be seen is how universities are creating new programs that integrate multiple disciplines in various education platforms. This results in new opportunities where students can acquire knowledge and experience through virtual collaborations for instance.

Principal actors who have influenced the higher education system in the past include universities, governments, employers, and students. Universities have traditionally been the primary source of higher education, but they face increasing competition not only from new entrants in the education space, but also alternative learning methods and employers decreasing demand for official qualifications and rather real experience. Here, the most important aspect is the skillset to get a certain task done. Employers also influence the system by shaping the demand for specific skills and competencies, and by offering internships and other experiential learning opportunities to students. Finally, students have the center role, since ultimately they decide upon their choices and preferences.

Lastly, a Trend Impact Analysis (TIA) is a useful technique for projecting the key measures of the researched theme. Starting with trends and impacts, one relevant trend that has emerged in recent years is the increasing use of artificial intelligence (AI) and machine learning (ML) technologies in many industries, including the education sector. Another trend is the growing demand for online education and distance learning, which has been accelerated by the COVID-19 pandemic. The use of ChatGPT in bachelor programs could potentially have several impacts on the delivery of courses, student assessment, and learning outcomes of these programs in comparison to top-ranked universities. On the one hand, the use of these technologies most likely will lead to more personalized and adaptive learning experiences, which will result in the improvement of student engagement. This could potentially make bachelor programs more competitive in the market.

On the other hand, the use of ChatGPT in education could also have some negative impacts on the course delivery, student assessment, and learning outcomes of bachelor programs. For example, it could lead to a lower and more vertically skilled faculty, since the technology is able to automate certain aspects of teaching and learning. This could potentially reduce the perceived value of bachelor programs and undermine their delivery of courses, student assessment, and learning outcomes.

Additionally, the growing demand for online education and distance learning could also impact the delivery of courses, student assessment, and learning outcomes of bachelor programs. With the emergence of the AI tools and online learning resources that are based on them, students have more options than ever before to pursue education outside of the traditional route of university education. This could potentially reduce the perceived value of bachelor programs and undermine their delivery of courses, student assessment, and learning outcomes.

To address the potential impacts of ChatGPT and other emerging trends, bachelor programs could consider several strategies. One strategy could be to invest in the development and integration of AI and ML technologies within their programs, while also ensuring that teaching staff have the necessary skills to use these technologies effectively. This could potentially enhance the perceived value of bachelor programs and improve their delivery of courses, student assessment, and learning outcomes in the market.

Another strategy could be to focus on developing more personalized and engaging learning experiences that leverage technology and other resources. This could help to differentiate bachelor programs from online learning platforms and position them as more valuable and attractive options for students.

Finally, bachelor programs could also consider investing in marketing and branding efforts to promote the unique value proposition of their programs. By emphasizing the benefits of a traditional university education, such as the development of critical thinking and social skills, bachelor programs could position themselves as more competitive options in the market.

In conclusion, the potential impact of ChatGPT and other emerging trends on the delivery of courses, student assessment, and learning outcomes of bachelor programs is complex and multifaceted. By conducting scenario analysis and developing proactive strategies, bachelor programs can position themselves to adapt and thrive in an increasingly competitive and dynamic educational landscape.

1.6.2. FUTURES WHEEL

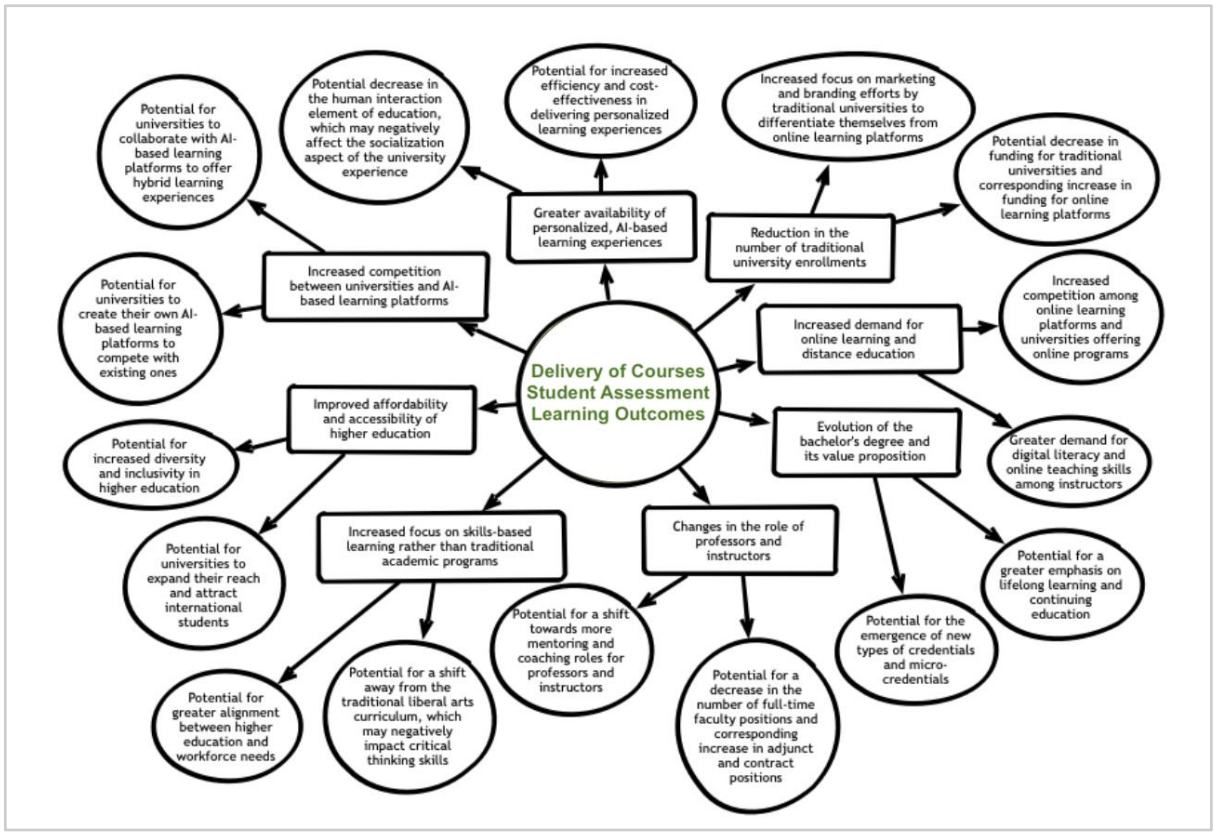
The subsequent section of this article will explore the application of the 'Futures Wheel' analysis, a potent analytical technique employed for comprehending and envisioning ChatGPT's potential impacts and evolution in higher education. The main objective of utilizing Futures Wheel in our research is to systematically recognize and scrutinize future consequences and interdependencies associated with emerging trends linked to ChatGPT.

The crux of Futures Wheel analysis centers on analyzing possible ramifications that may arise from various scenarios where ChatGPT operates, including present circumstances, hypothetical situations, as well as baseline prospects. This examination plays an essential role in unveiling how socio-technical changes within higher education could shape or be influenced by the emergence of ChatGPT technology.

One of the distinctive features that sets apart Futures Wheel from other analytical tools is its ability to provide a clear and vivid picture of the intricate potential impacts. Our examination adopts several graphical elements, such as colors, arrows with different widths and directions to convey diverse aspects. To illustrate, we use arrow width to represent a specific influence's strength or significance. By utilizing this visualization tool, we can demonstrate how different factors interconnect with one another while also pinpointing similar and opposing outcomes.

Moreover, it will allow us to group common outcomes into distinct domains including economic facets, social areas, technical factors among others seamlessly. This categorization plays an essential role in comprehending multi-faceted impacts more effectively as well as charting out better-informed strategies for integrating ChatGPT technology within higher education institutions.

1. Figure Key Nodes and Weights in the Z-number Cognitive Map, Source: own creation



One potential impact of ChatGPT on bachelor's program delivery of courses, student assessment, and learning outcomes is an increase in the demand for online learning and distance education. As more students seek convenience and flexibility in online learning, traditional universities may face a decline in enrolment (second impact). This could lead to a reduction in

funding and resources for universities that do not follow the trends. On the contrary, there will be an increase in funding and resources for advanced online learning platforms. (Futures Wheel spoke, 2). Additionally, instructors at traditional universities may need to develop digital literacy and online teaching skills to meet the demands of this new environment (Futures Wheel spoke 1, Second impact).

Recent studies have suggested that online learning has become increasingly popular in recent years, particularly because of the COVID-19 pandemic, which has resulted in campus closures and social distancing measures (Li & Lalani, 2021; Almahasees et al., 2021). Consequently, the demand for online learning will most likely continue to increase in the foreseeable future. However, some researchers have also noted potential drawbacks of online learning, such as lower levels of engagement and satisfaction compared to traditional in-person instruction (Freeman et al., 2014; Alqahtani et al., 2022). Therefore, it is important for universities and online learning platforms to consider the potential benefits and drawbacks of online learning and develop strategies to optimize students' learning experiences.

The second impact of a potential decline in traditional university enrollment could also have broader implications for the higher education landscape. For example, some experts have suggested that traditional universities may need to focus more on marketing and branding efforts to differentiate themselves from online learning platforms (Futures Wheel spoke 2, Second impact) (Munck, 2021).

In addition, universities may not only need to re-evaluate their value propositions, but also consider ways to increase the affordability and accessibility of higher education. (Futures Wheel spoke, 5). Furthermore, as traditional universities face increasing competition from online learning platforms, they may need to consider new ways to collaborate with these platforms to offer hybrid learning experiences (Futures Wheel spoke 4, Second impact) (Munck, 2021).

In conclusion, the first and second impacts of ChatGPT on bachelor's program delivery of courses, student assessment, and learning outcomes are interdependent and have far-reaching implications for the higher education landscape. It is clear that Universities and their online learning platforms will need to adapt to this changing environment. To do so, developing strategies that optimize the students' learning experience will be crucial in order to remain attuned to these developments. As with any other trends in history, continuous innovation will be the key to remain competitive in the future.

1.7. DISCUSSION

This discussion section examines the findings of our interviews, media outlet analysis, and Z-number cognitive mapping to understand how ChatGPT may impact higher education in the next three years, with an emphasis on course delivery, student assessment, and learning outcomes in bachelors-level programs. According to our interviews with bachelor-level educators, ChatGPT can improve student engagement and enhance personalization. Technology could be used to support diverse learning needs by providing customized learning experiences based on the strengths and weaknesses of each student. Some educators have expressed concerns about pedagogical integration challenges, emphasizing the importance of balancing human-led instruction with tools such as ChatGPT. Media outlets found ChatGPT's ability to provide instant feedback and support to facilitate advantages such as greater accessibility and reduced educator workload. When implementing ChatGPT in higher education, ethical implications, security, and potential AI bias must be carefully considered, as well as appropriate safeguards. Based on the interviews and media outlet analysis, the Z-number cognitive mapping results align with the insights from the interviews. ChatGPT may positively influence personalized learning, student engagement, and AI-driven assessment, but it also

raises ethical concerns and challenges in pedagogical integration.

According to all three sources, ChatGPT has the potential to significantly impact higher education in the next three years, offering both opportunities and challenges. By enhancing personalization, improving engagement, and increasing efficiency, the technology could revolutionize course delivery, student assessment, and learning outcomes. It is important to weigh these benefits against potential drawbacks, such as ethical concerns and pedagogical challenges associated with the integration of AI in the classroom. Educators, AI researchers, and policymakers will need to collaborate closely in order to successfully integrate ChatGPT in higher education. It is possible to leverage ChatGPT's potential benefits and address these concerns in order to contribute to the evolution of higher education, particularly in bachelor's programs, thus enhancing the learning experiences and outcomes of students.

The baseline synthesis centers on the present condition of ChatGPT's incorporation into advanced education. At present, ChatGPT serves mostly as an ancillary instrument to aid learning, furnish immediate feedback and sometimes support student evaluations. The artificial intelligence functionality of ChatGPT endorses individualized and adaptable learning opportunities that are priceless in academic contexts. Nonetheless, apprehensions exist regarding data confidentiality protection, ethical practice adoption, and inadequate empathic acumen found within ChatGPT's responses.

The future wheel of ChatGPT within the realm of higher education involves a multitude of pivotal progressions. Anticipated technological advancements hold promise for augmenting ChatGPT's sophistication, possibly incorporating attributes pertaining to emotional intelligence. The prospect of more comprehensive assimilation into Learning Management Systems harbors potential to revolutionize both instructional delivery and evaluative procedures. Given AI ethics requirements as well as concerns regarding privacy and data security in educational circles, developing policies must factor in responsible implementation initiatives accordingly. Lastly, welcoming ChatGPT integrations might substantively shift educator roles toward greater emphasis on facilitation and mentorship capacities.

To sum up, the discourse underscores that ChatGPT's incorporation into higher education is multifaceted. The primary synthesis elucidates the present applications of ChatGPT and their attendant apprehensions. On the other hand, the future outlook depicts how this technology could evolve potentially. While it is clear that ChatGPT has significant potential to revolutionize education, exercising caution during its transformation is crucial. To ensure ethical considerations and accessibility are preserved alongside technological advancements, stakeholders like educators, policymakers and technology developers should work collaboratively. Ultimately ,it should be aimed to harness ChatGPT's capabilities in a way that enriches educational experiences,reinforces educators,and equips students for contemporary world requirements.

CONCLUSION

Using ChatGPT, a large language model trained by OpenAI, in education has both advantages and disadvantages. Using ChatGPT, students can ask questions, get feedback on their work, and personalize their learning. There are challenges, including ensuring ethical and responsible use of AI, addressing possible bias in training data, and concerns about replacing human interaction with technology. While ChatGPT could detect plagiarism, accuracy and fairness need to be guaranteed. The use of ChatGPT has increased productivity and satisfaction with writing assignments and research purposes. While strengths include the ability to process large amounts of data and personalize learning experiences, weaknesses include the risk of perpetuating bias. By developing AI competency frameworks and providing training, educators could prepare for the use of LLMs in education. It must be continuously evaluated for efficacy and ethical

considerations when using ChatGPT, such as the potential for perpetuating stereotypes and misinformation. It is important to ensure that ChatGPT and other generative AI tools are used in a responsible and ethical manner while there are potential benefits to using them in education.

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