Research Article

Investigating the Productivity of the Integration of AI in the Pakistani Educational System Centering ChatGPT

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Abstract

Artificial Intelligence (AI) is a burgeoning global technology with far-reaching implications across diverse industries, including education. Pakistan's educational system is at a crossroads, necessitating the integration of AI, notably through the use of ChatGPT, to enhance its effectiveness. This study undertakes a quantitative exploration of ChatGPT's impact on the Pakistani educational landscape, involving a cohort of 50 students and teachers. Through a rigorous comparative analysis, the aim is to decipher how ChatGPT influences the educational system. This research focuses on quantifiable data, encompassing student performance metrics, learning outcomes, and administrative efficiencies. By scrutinizing these data points, we seek to provide empirical evidence of ChatGPT's potential to catalyze positive change within Pakistan's education sector. As the world advances toward an AI-driven future, comprehending the tangible effects of AI technologies on education is pivotal. This study aspires to furnish valuable insights that will inform educational stakeholders and policymakers about the benefits and challenges of integrating ChatGPT, thereby facilitating informed decision-making for the future of Pakistani education.

Keywords: Education; ChatGPT; Comparative Analysis; Survey; Machine Learning in Education

Abbreviations

ML: Machine Learning; AI: Artificial Intelligence; LLM: Large Language Model

Introduction

In the context of Pakistan›s evolving educational landscape, the role of technology, particularly computers, has grown significantly over time. However, despite this progress, the utilization of Artificial Intelligence (AI) and related technologies in conjunction with traditional teaching methods has remained largely underexplored. This research initiative seeks to address this gap by proposing an integration of AI-based applications, including but not limited to ChatGPT, within the framework of Pakistani educational institutions. The primary objective of this research is to evaluate the efficacy and impact of such integration, placing a strong emphasis on gathering structured data through the methodology described herein. The rapid pace of technological advancement holds immense potential for Pakistan›s future prosperity, particularly in the field of education. While the use of computers has become commonplace in various academic disciplines, the integration of AI and its associated technologies presents a promising frontier that demands exploration. This research endeavor aims to bridge this technological gap by focusing on the incorporation of AI applications like ChatGPT into the existing educational infrastructure.

The central focus of this research is to assess the practical outcomes and productivity gains stemming from the collaboration between teachers, students, and AI systems. By examining how AI, and in this case ChatGPT, can assist and augment educational processes, we seek to comprehensively understand the benefits that can be derived from such integration. This study will delve into the tangible effects of AI involvement on educational practices and outcomes, aiming to elucidate its role in enhancing the learning experience.Our research methodology involves the collection of well-categorized data, as outlined in the research plan, and conducting a rigorous comparative analysis. We intend to gauge the impact of ChatGPT within the Pakistani educational context and evaluate how AI integration is perceived by both students and teachers. Through this comparative analysis, we aim to uncover insights into the effectiveness of AI-based educational support and its potential to revolutionize the way education is delivered and received in Pakistan.Ultimately, this research aspires to provide a comprehensive analysis of the data collected, shedding light on the extent to which ChatGPT and similar AI technologies have positively influenced the educational landscape in Pakistan. By doing so, we hope to pave the way for a more technologically

advanced, productive, and inclusive educational environment in Pakistan, harnessing the transformative potential of AI to drive educational excellence and prepare students for the challenges and opportunities of the future.

Related Work

The following literature review looks upon various studies centralizing the use of Artificial Intelligence in the education system of Pakistan, and around the world to get to build an understanding about any previous AI involvement in academic affairs on the wider scale so that a firm basis for the carrying out of this research can be established.

The article [1] presents a comprehensive analysis of artificial intelligence (AI) implementation in education, particularly focusing on student assessment. It explores the current AI landscape in education, its theoretical underpinnings, and its potential for assessment. The authors conduct a systematic review of relevant research papers, highlighting key findings and trends. Ethical considerations in AI development are emphasized for both educational and broader societal implications. The piece outlines distinctions between human and AI characteristics, advocating for a broader definition of AI. The applications of AI in education, from personalized learning to assessment and feedback generation, are discussed. The authors emphasize AI›s potential in enhancing education through tailored learning experiences and intelligent tutoring. Overall, the article underscores the need for collaborative efforts between educators and AI specialists to harness AI›s full potential in education.

The scientific article [2] examines the integration of AI, data analysis, and an LMS in online education for improved student learning. Focusing on a university in Ecuador, it proposes an LMS as a hub for learning resources. The integrated AI, data analysis, and LMS aim to create a virtual assistant, analyzing various data sources to offer personalized suggestions and engagement. Notably, the article addresses adapting education to pandemic challenges and underscores the role of ICT. It discusses leveraging big data and Hadoop for data analysis, suggesting that combining these technologies can provide adaptable learning experiences. Practical assessments demonstrate the model›s success in monitoring and aiding struggling students, enhancing active learning. In conclusion, the article highlights the potential of merging AI, data analysis, and LMS to enhance online education and meet evolving digital education needs.

According to the scientific study [3] the trajectory of education is intimately entwined with technological progress, particularly artificial intelligence (AI), with Singapore standing out as a proponent of such integration. AI holds the transformative promise to ameliorate educational challenges, a salient point highlighted by

the pandemic›s impact. Through real-time assessment, personalized learning experiences, and predictive analysis, AI can reshape education paradigms. Its implementations span virtual learning environments, intelligent virtual reality, and smart data analysis. Nonetheless, ongoing discourse encompasses AI›s educational role, urging the delineation of its scope and emphasizing content and learners over technology. Technological enhancement has already marked its presence. Intelligent tutoring systems (ITS) driven by AI offer tailor-made teaching and feedback, catering to individual student requisites. Despite benefits, the dichotomy between AI and human educators persists, necessitating the development of empathetic, socially adept robots to navigate this terrain. In conclusion, AI›s ascendancy in education is promising, addressing accessibility and personalization, yet its full potential hinges on further research and deft human-robot interplay management.

The article [4] comprehensively explores the present and potential applications of Open AI and Chat GPT within the educational sphere, envisioning a significant transformation in learning outcomes, engagement levels, and administrative functions. It underscores the untapped potential of Chat GPT in elevating education quality, while also emphasizing the critical need for ethical and practical considerations prior to AI integration. The study delves into the practical applications, spotlighting Chat GPT›s capacity to personalize learning experiences, monitor student progress, and provide automated feedback through intelligent tutoring systems. It further illustrates how the technology can enhance language learning via interactive practice and instant feedback, and discusses its potential across various educational domains, including virtual assistants, essay scoring, learning analytics, content creation, and intelligent teaching systems. The article concludes by stressing the importance of addressing ethical concerns and optimizing AI›s potential responsibly for education enhancement.

The article [5] addresses the underexplored use of ChatGPT, a large language model, in data science education. By integrating ChatGPT into a data science course and gathering student perspectives, the authors aim to highlight its benefits. These advantages encompass personalized learning, tutoring, writing enhancement, collaboration support, and critical thinking fostering. ChatGPT aids in generating coding solutions, clarifying concepts, and offering coding explanations. While the study reveals ChatGPT›s effectiveness in coding and explanation tasks, its performance varies with problem-solving requirements. Educators can benefit from ChatGPT for tasks like syllabus planning and teaching material suggestions. Yet, its limitations for grading and evaluating complex problem-solving skills are acknowledged. Despite study limitations, this work provides valuable insights into the potential and challenges of ChatGPT›s integration into data science education, suggesting future avenues for exploration.

The research study [6] explores the multifaceted applications of artificial intelligence (AI) in higher education (HE), categorizing AI utilization across 14 areas. The study reveals language learning as the dominant domain, followed closely by computer science and engineering, diverging from prior research that emphasized engineering. AI›s role in language learning, encompassing writing, reading, vocabulary acquisition, and automated feedback, is emphasized, along with its potential in managerial activities such as prediction and admissions, where it excels in uncovering hidden correlations. Notably, AI is predominantly directed towards students (72%), offering learning materials access, real-time responses, self-assessment opportunities, and personalized feedback, a departure from K-12 education where teachers are prioritized. The article suggests that the student-centric focus in HE may stem from research accessibility and shorter ethical review processes. However, it underscores the managerial potential of AI in HE, particularly in data collection and analysis, highlighting AI›s capacity to enhance various facets of higher education.

The article [7] assesses the potential benefits and drawbacks of integrating ChatGPT, a generative artificial intelligence tool, into education. Acknowledging its widespread adoption and capacity for complex tasks, potential benefits include personalized and interactive learning, formative assessment prompts, translation, and adaptive learning. Yet, limitations include the absence of human interaction, contextual understanding challenges, biases from training data, creativity limitations, and privacy concerns. Caution is advised in using ChatGPT, with the authors advocating for its integration alongside human instruction. They explore applications such as personalized tutoring, automated essay grading, and interactive learning. Concluding, the article urges acceptance of evolving technological landscapes and collaborative efforts among policymakers, educators, researchers, and tech experts to harness generative AI tools safely and constructively for enhanced education and student support.

The academic study [8] delves into the potential merits and drawbacks of incorporating ChatGPT, a generative AI tool, into the educational landscape. Recognizing its wide user adoption and adeptness in complex tasks, the article underscores potential advantages such as personalized and interactive learning, formative assessment prompts, language translation, and adaptive instruction. However, it also underscores limitations including the absence of human interaction, challenges in contextual understanding, biases ingrained through training data, creativity constraints, and privacy apprehensions. The authors advocate for judicious employment of ChatGPT, suggesting its integration alongside human-guided instruction. Applications explored span from personalized tutoring and automated essay grading to creating interactive and adaptable learning experiences. Concluding, the article impels the acceptance of evolving technological paradigms and emphasizes collaborative efforts involving policymakers, educators, researchers, and tech specialists. This collaborative synergy is deemed vital to harness

the potential of generative AI tools responsibly and beneficially, enhancing educational realms while ensuring student welfare in an increasingly technology-driven educational landscape.

Another research [9] offers a comprehensive examination of the potential applications of artificial intelligence (AI) in education, with a specific focus on chatbots and the ChatGPT system, which simulate human interactions and generate human-like text through natural language input. It underscores the advantages of cutting-edge chatbots like ChatGPT, including personalized learning, increased productivity, and enhanced student engagement. Nevertheless, the article delves into the ethical and practical challenges linked to AI›s educational use, such as algorithmic biases and data privacy concerns, emphasizing the necessity of ethical and responsible AI integration. The authors aim to provide insights into how AI can be effectively integrated into education for the benefit of both educators and students, emphasizing proper training and support for teachers. In conclusion, the article acknowledges AI›s potential to reshape teaching and learning, while also underscoring the importance of addressing ethical and practical issues for its responsible and ethical application in education.

Finally, the scientific article [10] details a case study centered around ScholarLite, a knowledge-based recommender system developed for academia using machine learning techniques. Focused on the Pakistani higher education context, ScholarLite employs probabilistic topic models, specifically Latent Dirichlet Allocation (LDA) and Author Topic Model (ATM), to provide recommendations for course allocation, research supervision, and industry-academia collaboration. Data collected from faculty resumes and research papers underwent preprocessing, including stop word removal, lemmatization, and stemming. The LDA and ATM models were trained on this data, and their performance was assessed using metrics like perplexity and log likelihood. The study showed LDA›s superior generative capacity and ATM›s ability to highlight authors› relevance to specific topics. ScholarLite effectively recommended project supervisors to students, identified potential research collaborators, and allocated courses based on faculty members› research interests. The system exhibited scalability, computational efficiency, transparency, and fairness. Future work involves extending the system to other programs, exploring diverse word token representation features, incorporating temporal dynamics, and refining recommendations. Acknowledgments go to the Higher Education Commission (HEC) of Pakistan for providing faculty data support.

All in all, the above described research studies indicate that there has been deep involvement of Artificial Intelligence in diverse educational affairs across the globe and in Pakistan. The aforementioned articles discuss distinguished strategies to experiment the use of modern generative AI especially the ChatGPT

in academic setups for the educational sector. These articles revolve around the development of novel academic AI based applications, ChatGPT influenced learning procedures, and other AI based models for the development of education in collaboration with modern AI.

Materials and Methods

This study employs a comprehensive research methodology divided into two sections, each of which is detailed below and visualized in Figure 1.

For the teachers

In Section 6.1, the research focuses on the perspective of teachers and their utilization of AI, specifically ChatGPT, for aiding lesson planning and crafting effective question papers for student assessments. Approximately 50 teachers participated, utilizing ChatGPT for continuous lesson planning over one month, and they were also encouraged to prepare exam questions with the assistance of this conversational AI model. Subsequently, the teachers were surveyed to gauge the effectiveness of ChatGPT in comparison to their conventional methods. Their responses were categorized into three distinct groups: 1. Highly Effective, 2. Slightly Effective, and 3. Not Effective. An in-depth analysis followed to derive conclusive results, as elaborated in the final section of this study.

For the students

In Section 6.2, the research parallels the approach taken with students. Around 50 students engaged with ChatGPT to aid their understanding of complex academic concepts and address academic challenges. These students were then surveyed to assess their satisfaction with the Chat model›s services and its overall helpfulness. Their responses were categorized into three fields: 1. Very Helpful, 2. Slightly Helpful, and 3. Not Helpful. The survey results were systematically compiled and serve as the basis for the eventual results, which are elaborated upon in subsequent sections.

This meticulously designed research methodology encompasses both qualitative and quantitative data collection, providing a robust framework for evaluating the impact of ChatGPT in the educational context. By categorizing responses and conducting thorough analyses, this study aims to offer comprehensive insights into the effectiveness of AI integration in education, dispelling any concerns about the methodology›s strength. It should also be noted that the resulting surveys categorized their responses based on the usage of ChatGPT in every prescribed field stated in the study, and a collectively evaluated categorization is then presented in subsequent figures for further understanding.

The survey results were then compiled to produce the eventual results discussed afterwards.
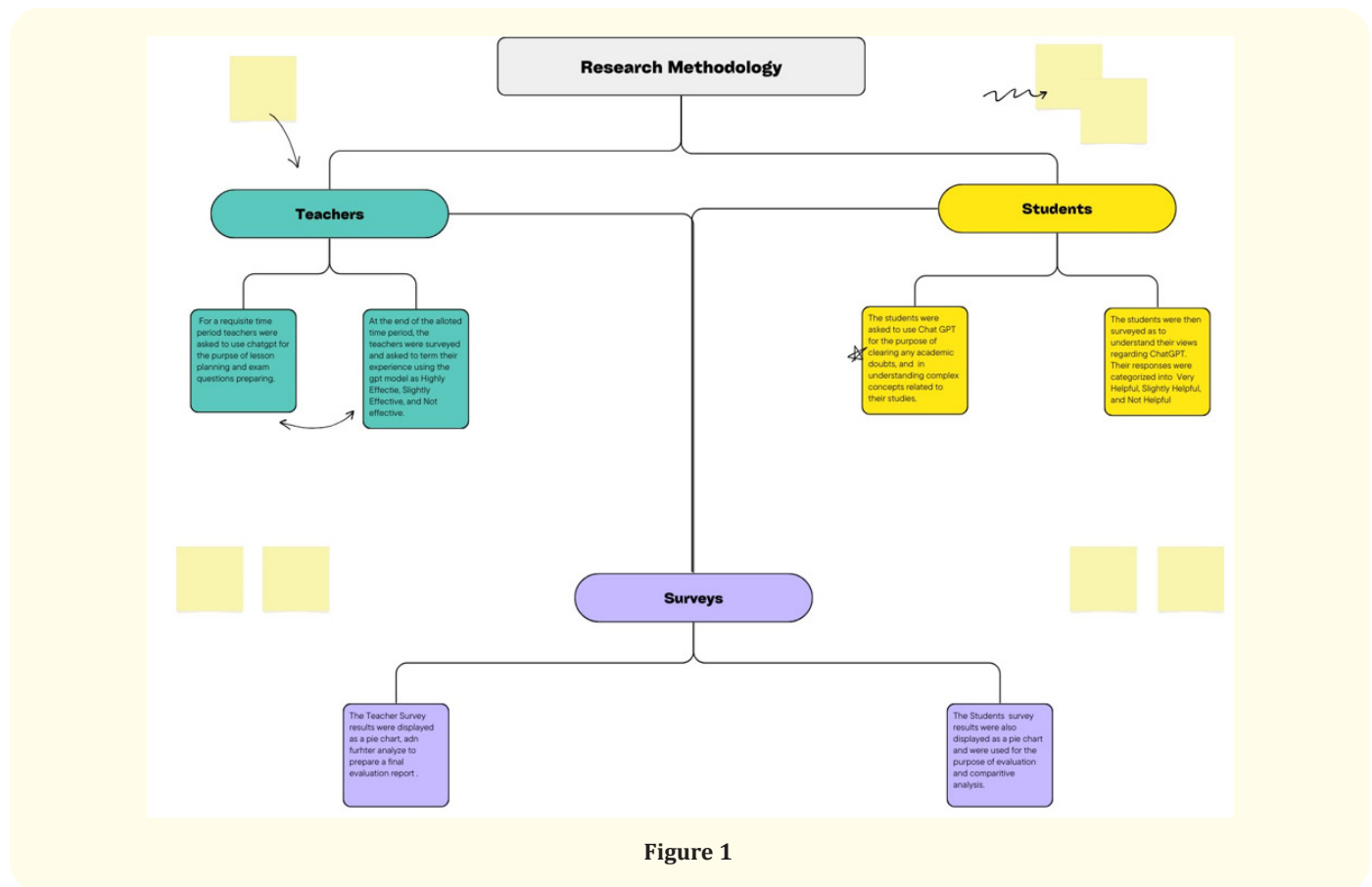
Figure 1

Results and Conclusion

The investigation, as described above, yielded compelling insights into the impact of ChatGPT on the educational system. While the findings affirmed its high positive influence, they also shed light on certain drawbacks. For teachers, the survey results were overwhelmingly positive, with a substantial 82% acknowledging the highly effective use of ChatGPT, while only a marginal 10% found it slightly effective, and a mere 8% categorized it as not effective, as depicted in Figure 2.
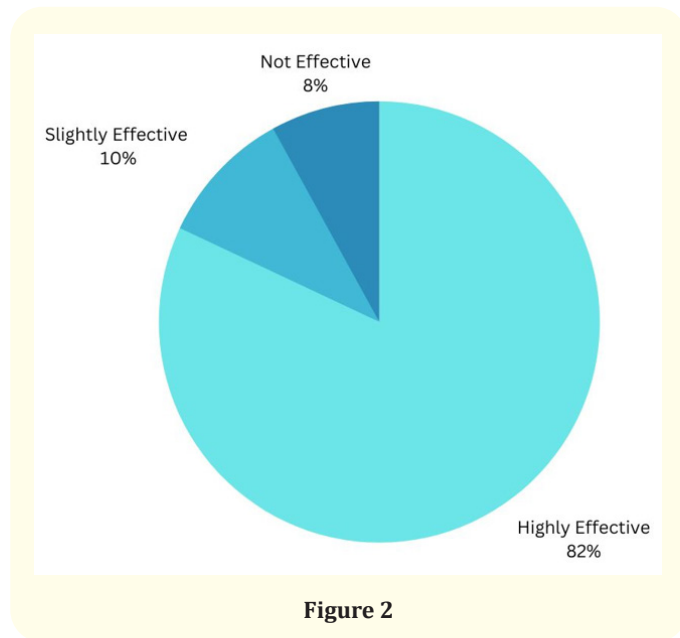

Figure 2

Likewise, the student survey underscored the general satisfaction with ChatGPT›s assistance. Responses were categorized as follows: Very Helpful (90%), Slightly Helpful (5%), and Not Helpful (5%), as illustrated in Figure 3.
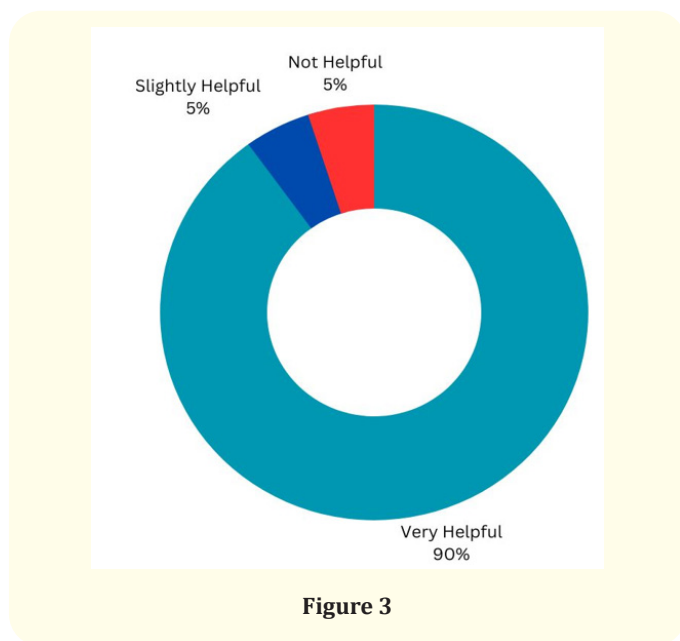

Figure 3

To further elaborate the results obtained through this investigation, out of the 50 students surveyed, a total of 45 students regarded their use of ChatGPT as Very Helpful, whereas only 2 students each regarded their experience as slightly helpful and not helpful. An exception to this was the response of 1 student who had regarded the use of ChatGPT in both the allotted fields Not Helpful and Slightly Helpful, believing that there are instances where the tool can offer minimal help and in other instances it can prove to be not helpful at all. Similarly, for the teachers section as well, a good number (41) of teachers from the total of 50 considered the use of Chat GPT Highly Effective. 5 teachers found them among those who considered Chat GPT a slightly helpful tool which could ease their life to some extent and be positively effective. Whereas, only a meagre number of 4 teachers regarded ChatGPT as an ineffective tool, falling in the Not Effective category of responses. A nuanced analysis of these outcomes reveals that the majority of the educational community finds ChatGPT and related AI and Machine Learning technologies highly satisfactory. However, the minority expressing dissatisfaction raised valid concerns. They apprehensively questioned the potential for these technologies to introduce falseness and excessive dependence within the academic sector (when asked for their reasons of opposition to the ChatGPT based education model), thereby compromising the originality of academic procedures. Additionally, there were concerns about the extent to which students might rely on ChatGPT for homework, potentially jeopardizing the authenticity of their submitted work. This poses a significant question regarding whether teachers can confidently assess and evaluate the originality of students› efforts.

Another interesting aspect of the results obtained was the similar percentage of people amongst students and teachers who regarded the use of ChatGPT as Slightly Effective and Not Effective for the teachers, and Slightly Helpful, and Not Helpful for the students. This suggested that there is an even proportion of people amongst both the categories who are negatively influenced or unimpressed by the Large Language Model (LLM) in ChatGPT, the difference is just in between the extent of dissatisfaction they have shown on record. To address these concerns and provide a more comprehensive understanding, further data collection and in-depth analysis are warranted.

Acknowledgment

Conflict of Interest

There is no conflict of interest which exists.

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