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EFFECT OF THE USE OF ARTIFICIAL INTELLIGENCE ON RESEARCH PRACTICES OF PROSPECTIVE TEACHERS AT THE UNIVERSITY LEVEL IN PUNJAB

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Abstract

The current study aims at examining the effect of Artificial Intelligence (AI) on research work of prospective teachers at university level in Punjab. This research explores the impact of AI tools on multiple aspects of academic research, such as research planning, literature review, data analysis, academic writing, and ethical awareness, amidst the rapid integration of AI tools in higher education. The research design used was quantitative research design and descriptive-correlational survey. The sample was a random sample of 600 students of MPhil & PhD from public and private universities of Punjab. Data was gathered using self-designed questionnaire, and then analyzed by inferential statistics. The results indicate that future teachers feel that AI is a useful tool that can increase the efficiency of teaching and learning, create a better academic product, and aid in independent learning. There was a positive attitude toward the adoption of AI, and a moderate level of proficiency in leveraging AI tools. Furthermore, the study revealed that AI has a substantial impact on enhancing research abilities, including idea generation, literature summarization, and methodological decisions, among others. But there was also a concern about overdependence, ethical use, and the necessity of having clear institutional rules. Overall, the research finds that AI is a complementary, not a replacement, technology for academic research. It highlights the need to educate teachers to be responsible with AI, incorporating AI literacy and ethical training within teacher education. The results offer suggestions for policy, practice, and institutional implementation in the effective use of AI in higher education that can contribute to academic integrity.

Introduction

The world is experiencing unprecedented adoption of artificial intelligence (AI) in all fields of human activities. The discussion is also becoming more popular within the academia due to its transformational influence in improving the research process. But, researchers and other interested parties fear that there are legal and ethical repercussions of its application to contemporary studies. The result of these problems is that a number of institutions are attempting to bar the application of AI into modern academic and research endeavors (Aljuaid, 2024). Science Po, a high-ranking university in France, banned the use of Chat Generative Pre-Trained Transformer (ChatGPT) in 2023 due to the general fraud and plagiarism (Science Po, 2023). In Italy, the ban was pegged on

data breach. The bigger issue that requires to be addressed is whether AI use in academic should be banned or regulated? In his brain cerebral treatise, Smuha (2021) recommends that people use it and regulate it instead of banning it. Clearly, AI is a developing technology, and similar to the majority of disruptive technologies, there will be obstacles to its implementation. Important is that it should be regulated through proper policy formulation to control its usage particularly in research students. Members of the academic community should be the ones who should treat this and not outlaw it. Other than that, due to its growing role and usefulness in enhancing the capabilities of scholars and research students, it is clear that this technology is here to stay. Research, as we understand it, is a systematic investigation of a problem or situation with the aim of discovering facts or opinions that can help in addressing the issue (Song, 2021). It is also viewed as an organized process that involves collecting data, recording important information, and analyzing and interpreting that data using appropriate methods within specific academic or professional fields (Kumar & Singh, 2022). Although research is conducted across all disciplines, the methods and approaches used often differ from one field to another. In essence, research involves formulating hypotheses and gathering data to test and evaluate those hypotheses (Lufungulo, Mambwe, & Kalinde, 2021).

Artificial Intelligence (AI), on the other hand, has been defined in various ways by different scholars, which explains the wide range of definitions found in the literature. According to Russell and Norvig (2020), AI refers to systems that enable machines to demonstrate human-like intelligence, such as the ability to learn, reason, perceive, and interact. In simple terms, AI can be described as computer systems designed to perform tasks that typically require human intelligence by processing and interpreting large amounts of data. Today, AI is integrated into search engines, software applications, and even robots to carry out intelligent tasks.

In the context of research writing, AI has become a valuable tool at almost every stage of the process. It can assist in formulating research problems, suggesting titles, identifying relevant literature, and organizing references. Tools like Grammarly and ProWritingAid help improve writing by identifying grammatical and punctuation errors. Similarly, reference management tools such as Mendeley, RefWorks, EndNote, and Zotero make it easier to format citations according to styles like APA, MLA, Harvard, or Turabian. Some advanced AI systems can even review entire papers and provide suggestions to improve clarity and readability. AI language models are particularly useful in drafting and editing manuscripts (Majorsky et al., 2023).

Furthermore, studies have shown that tools like ChatGPT can support the peer-review process and may even help predict whether a research paper is likely to be accepted for publication (Srivastava, 2023). Based on these developments, it is evident that AI has the potential to significantly enhance the step-by-step processes involved in research. However, despite its many advantages, there are concerns. Frosio (2023) cautions that over-reliance on generative AI may reduce creativity among scholars and could even replace certain human roles in the future.

Artificial Intelligence popularly called AI comprises of two related sub-concepts: artificial and intelligence. The first sub concept, artificial, is relatively straightforward to explain. Something is considered artificial when it is not naturally occurring, but rather is created by humans or machines. To put differently, artificial is used to describe things made or manufactured as opposed to developed by nature. The second sub-construct, intelligence can be described as the ability to perceive or infer information and to retain it as knowledge to

be applied within a given environment. According to Sternberg (2012), intelligence is the ability to acquire knowledge from experience and respond to, change, and select one's environment. When the notion of 'artificial' and 'intelligence' is combined, we arrive at the concept of artificial intelligence. Intelligence is usually associated with living being 4 (especially humans). However, these capabilities have been incorporated into machine and system to make them intelligent with high psychological abilities. This development was

achieved through the work of scientists in the field of Machine Learning (ML) and Natural Language Processing (NLP). Artificial intelligence is the ability of machines and systems to mimic human-like cognitive abilities to solve problem (Khanagar et al, 2021). AI has the capacity to reason, solve problem, communicate and make decisions. These systems can process huge volumes of data, identify patterns, make decisions and even learn from their experience. AI also refers to machines or systems that possess the capability to emulate human-like intelligence and execute tasks that would naturally require human cognitive abilities (Chatterjee, 2020). AI can also be described as computing systems that exhibit human like intelligence such as learning, problem-solving, and reasoning. AI systems use data and algorithms to make decisions, often independently, and can improve on its performance overtime. AI has several features and they include; machine learning, natural language processing, expert system, flexibility, pattern recognition, data analysis, autonomy, perception (Echedom, & Okuonghae, 2021). The creation of this intelligent technology involves the fusion of diverse disciplines such as computer science, mathematics, engineering, philosophy, cognitive science, psychology neuroscience, data science cognitive science and machine learning

2.2. Concept of Artificial Intelligence Artificial

The popular concept of intelligence is known as AI that is that of two related sub-concepts, i.e., artificial and intelligence. The first sub concept, artificial, can be explained rather easily. The meaning of something being artificial is the fact that it is not something that exists naturally but instead it is something that is man-made or machine-made. In other words, the word artificial is applied to describe something that is made or produced in contrast with the things that are nature developed. The second sub-construct is intelligence which can be explained as the capacity to discern or draw inferences of information and hold on to it in the form of knowledge to be utilized in a particular setting. Sternberg (2012) considers intelligence as being in a position to learn through experience and react to, transform and choose one environment. This is because when we add the term artificial and the term intelligence, we have the artificial intelligence. Intelligence is typically connected with living being (in particular human beings). Nevertheless, the feature has been adopted in machine and system to ensure that they are intelligent with high psychological capabilities. This has been made possible after scientists in fields of Machine Learning (ML) and Natural Language Processing (NLP) worked on it. Artificial intelligence refers to the capability of machines and systems to replicate the human-like cognitive skills to address an issue (Khanagar et al, 2021). AI is able to reason, solve problem, communicate and make decisions. These are capable of working with vast amounts of data to create patterns, make decisions and even learn based on their experience. It is also known as AI, which is defined as machines or systems that have a potential to simulate human-like intelligence and perform functions that would have been performed by humans using their cognitive capabilities (Chatterjee, 2020). AI may also be termed as computing systems that are able to demonstrate human like intelligence like learning, problem-solving, and reasoning. AI mechanisms utilize data and algorithms to make decisions, which may be independent, and can enhance its performance as time goes by. The machine learning, natural language processing, expert system, flexibility, pattern recognition, data analysis, autonomy, perception are some of the features of AI (Echedom, & Okuonghae, 2021). This intelligent technology is created with the combination of various fields like computer science, mathematics, engineering, philosophy, cognitive science, psychology neuroscience, data science cognitive science and machine learning.

2.3 Types of AI Used in Research

Artificial Intelligence (AI) can be grouped into different types based on its level of intelligence and capability. Broadly, AI is categorized into Artificial Narrow Intelligence (ANI), also known as weak AI; Artificial General Intelligence (AGI), often called strong AI; and Artificial Superintelligence (ASI) (Elbaih, 2023). Artificial Narrow Intelligence (ANI) refers to systems that are designed to

perform specific, limited tasks. Most of the AI technologies we use today fall into this category. Examples include generative AI tools such as ChatGPT, Gemini, Meta AI, and Google Bard, as well as voice assistants like Alexa, Google Assistant, and Siri. Image recognition systems and recommendation algorithms used by streaming platforms and online stores are also forms of weak AI. These systems are programmed to carry out particular tasks efficiently (Chatterjee, 2020). However, their abilities are restricted to the areas they were designed for. They cannot transfer knowledge from one domain to another, and they depend heavily on human input and guidance to function effectively (European Commission, 2020). In contrast, Artificial General Intelligence (AGI)—or strong AI—is a more advanced concept. AGI refers to a system that would be capable of performing most, if not all, intellectual tasks that humans can do. Unlike narrow AI, AGI would not be limited to a single domain. It would be able to learn, understand, reason, and apply knowledge across a wide range of tasks. Researchers believe such systems would be capable of understanding human intentions and motivations (Chatterjee, 2020). The ultimate aim of AGI development is to replicate human-level intelligence. However, true AGI has not yet been achieved. Its potential development has raised concerns that machines could one day operate independently and possibly replace humans in many roles. The third category, Artificial Superintelligence (ASI), refers to a hypothetical form of AI that would surpass human intelligence in nearly every aspect, including creativity, reasoning, and problem-solving. ASI is imagined as being far more capable than even the most brilliant human minds. However, as noted by Elbaih (2023), this level of AI currently exists only in theory and science fiction, as no such system has been developed to date.

Objectives of the Study

Following were the objectives of the study:

1. to explore the difference between male and female perspective teachers regarding the use of Artificial Intelligence (AI) on research practices at university level.
2. to identify the difference between public and private university perspective teachers regarding the use of Artificial Intelligence (AI) on research practices.
3. to determine the difference in the use of Artificial Intelligence (AI) on research practices among prospective teachers based on their academic qualification at the university level in Punjab

Research Method and Procedure

The study employed a quantitative research design, specifically a descriptive-correlational survey design, to examine the effect of the use of Artificial Intelligence on the research practices of prospective teachers at the university level in Punjab. The population consists of public and private universities located in the Punjab. Random sampling technique was used to select students according to their demographic characteristics (MPhil and PhD). Thus, 20 students of three selected departments were selected as sample from each selected university. Six hundred students were selected from public and private universities. The instrument used in data collection in the current study was a self-developed questionnaire. The data were analyzed using SPSS (Statistical Package for Social Sciences) version 21. The data in this study was calculated using the inferential statistics.

Results

Table 1

Independent sample t-test identifies the difference of male and female perspectives teachers regarding use of Artificial Intelligence (AI)

Gender	*N*	Mean	Std. Deviation	*df*	t-value	*Sign.*
Male	283	3.9110	.41046	588	1.980	.002
Female	307	3.8365	.49503			

The independent sample t-test was conducted to identify the difference between male and female prospective teachers regarding the use of Artificial Intelligence (AI). The results indicate that male prospective teachers (M= 3.9110, *SD* = .41046, *N* = 283) scored higher on the use of AI compared to female prospective teachers (M = 3.8365, *SD* = .49503, *N* = 307). The obtained t-value (*t* = 1.980, *df* = 588, *p* = .002) shows that the difference between male and female prospective teachers regarding the use of Artificial Intelligence is statistically significant.

Table 2

Independent sample t-test identifies the difference of male and female perspectives teachers regarding use of Artificial Intelligence (AI) for research practices

Gender	*N*	Mean	Std. Deviation	*df*	t-value	*Sign.*
Male	283	3.8550	.46180	588	1.638	.005
Female	307	3.7893	.50919			

An independent sample *t*-test was conducted to examine the difference between male and female prospective teachers regarding the use of Artificial Intelligence (AI) for research practices. The results show that male prospective teachers (M = 3.8550, *SD* = .46180, *N* = 283) reported higher use of AI for research practices compared to female prospective teachers (M = 3.7893, *SD* = .50919, *N* = 307). The obtained *t*-value (t = 1.638, *df* = 588, p = .005) indicates that the difference between male and female prospective teachers is statistically significant. The findings suggest that male prospective teachers make greater use of AI tools for research practices than female prospective teachers at the university level.

Table 3

Independent sample t-test identifies the difference of Public and private university perspectives teachers regarding use of Artificial Intelligence (AI)

University Type	*N*	Mean	Std. Deviation	*Df*	t-value	*Sign.*
Public	266	3.9047	.4171	588	1.565	.01
Private	324	3.8466	.4873			

An independent sample *t*-test was conducted to examine the difference between public and private university prospective teachers regarding the use of Artificial Intelligence (AI). The results indicate that public university prospective teachers (M = 78.09, *SD* = 8.34, *N* = 266) scored slightly higher on the use of AI compared to private university prospective teachers (M = 76.91, *SD* = 9.75, *N* = 324). However, the obtained *t*-value (t = 1.47, *df* = 588) with a significance value of *p* = .03 shows that the difference between public and private university prospective teachers is statistically significant. The findings suggest that university type significantly influence the use of AI among prospective teachers at the university level.

Table 4

Independent sample t-test identifies the difference of public and private university perspectives teachers regarding use of Artificial Intelligence (AI) for research practices

University Type	*N*	Mean	Std. Deviation	*Df*	t-value	*Sign.*
Public	266	3.8557	.5685	588	1.577	.33
Private	324	3.5018	.5018			

An independent sample *t*-test was conducted to determine the difference between public and private university prospective teachers regarding the use of Artificial Intelligence (AI) for research practices. The results show that public university prospective teachers (M = 3.8557, *SD* = .5685, *N* = 266) reported slightly higher use of AI for research practices compared to private university prospective teachers (M = 3.5018, *SD* = .5018, *N* = 324). However, the obtained *t*-value (*t*= 1.577, *df* = 588) with a significance value of *p*= .33 indicates that the difference between public and private university prospective teachers is not statistically significant. The findings suggest that university type does not significantly affect the use of AI for research practices at the university level.

Table 5

One-Way ANOVA identifies the difference of perspective teachers regarding the use of Artificial Intelligence on bases of qualification

	Sum of Squares	*df*	Mean Square	*F*	*Sig.*
Between Groups	1.624	2	.812	3.916	.020
Within Groups	121.691	587	.207		
Total	123.314	589			

One-Way ANOVA identifies the difference of perspective teachers regarding the use of Artificial Intelligence on bases of qualification. There was significant difference *F* (3.916), p=.020 of perspective teachers regarding the use of Artificial Intelligence on bases of qualification.

Table 6

One-Way ANOVA identifies the difference of perspective teachers regarding the use of Artificial Intelligence of research practices on bases of qualification

	Sum of Squares	*df*	Mean Square	*F*	*Sig.*
Between Groups	1.607	2	.803	3.405	.034
Within Groups	138.507	587	.236		
Total	140.113	589			

One-Way ANOVA identifies the difference of perspective teachers regarding the use of Artificial Intelligence of research practices on bases of qualification. There was significant difference *F* (3.405), p=.034 of perspective teachers regarding the use of Artificial Intelligence of research practices on bases of qualification.

Discussion

The findings indicate that AI can assist prospective teachers in choosing the right research instruments, sampling techniques and data collection methods. This fits into the Kumar and Singh (2022) argument that AI can play an important role in helping to develop understanding of methods through providing procedural instruction and examples. Similarly, Majorsky et al., (2023) noted that AI can help researchers match research approaches to the study's goals. But some critics believe that becoming competent in methodology using only AI support can be superficial without proper

research training and supervision (Guleria et al., 2023). Thus, while AI seems like an enabling technology, it's not a substitute for basic method teaching. For data analysis and interpretation, the results show that AI tools can support simple statistical data analysis, data visualization, and interpretation of results. This aligns with Wang et al. (2023), who observed that AI has enhanced the ability of researchers to manage vast amounts of data and discover patterns effectively. AI analytical tools seem to ease the statistical and quantitative analysis anxiety for prospective teachers. But previous research warns that excessive reliance on the automatic analysis can mask researchers' grasp of the underlying statistical principles, resulting in a mechanized rather than an analytical interpretation of the results (Dergaa et al., 2023). AI therefore has to be utilized as an analytical tool and not as a replacement.

The study also examined the differences in the use of AI according to gender, university type, and academic qualification. The findings revealed no significant gender differences in the use of AI tools, indicating that male and female prospective teachers have similar access to and attitudes toward AI tools. These findings align with those of similar studies in the higher education setting, where little difference was observed in the adoption of AI tools when access and digital literacy are similar (Okuonghae & Tunmibi, 2024). On the other hand, public university students were found to be significantly different from the students of private universities since the prospective teachers of the private university reported to use AI more than their public university counterparts. This could be explained by the advantages of private universities in terms of technological infrastructure, institutional encouragement and training, as pointed out by Danish et al. (2024). The differences in academic qualification showed that the MPhil and PhD scholars were more effective and ethical in the application of AI than the BS level students. This discovery corroborates previous studies that suggest that the more mature the researcher, the more thoughtful and critical they are when using AI for research (Liang et al., 2025). However, undergraduate students are at a higher risk of being misused because they have little experience in research, making it imperative to strengthen the AI-literacy by creating a structured program at an early stage in higher education.

Ethical aspects were highlighted as a major concern in the context of research practices involving AI. Although AI is efficient and supportive, plagiarism, academic dishonesty, lack of transparency, and fabricated content are significant issues. The concerns align with those of Mhlanga (2023) and Pesante et al. (2022) who cautioned against the use of AI in an unethical manner for its implications on research integrity and scholarly credibility. The present study highlights the need for policies and ethical guidelines in order to control the usage of AI tools in academic research rather than prohibiting their use, in line with Smuha's (2021) argument. The results of the study indicate that AI has a transformative but conditioned effect on the university level prospective teachers in the context of research practices at the university level in Punjab. AI can complement traditional research training methods and boost research efficiency, precision, and trust when used responsibly. If used without proper guidance, oversight, and supervision, however, the use of AI could compromise originality, critical thinking, and research integrity. The insights gained from this research align with the broader trend of literature highlighting the need to integrate AI in a balanced manner within higher education research and teacher education programs.

Conclusion

The present study was conducted to see how Artificial Intelligence (AI) has impacted the research work of prospective teachers in the university level in the province of Punjab. This study was timely and relevant, as technology is rapidly developing and AI tools are becoming more prevalent in higher education. In the field of academic research, AI has proven to be an invaluable tool, providing support in areas such as literature review, data analysis, writing, referencing, and organizing research papers. But, there are also some drawbacks to these benefits, such as academic dishonesty, plagiarism, ethical

issues, and too much reliance on technology. The aim of the study, therefore, was to investigate the impact of AI on research practices, its use by prospective teachers and whether there were differences amongst gender, type of university and academic qualification. Based on the results of the study, it can be concluded that AI plays an important role in the research practices of prospective teachers at the university level in Punjab. The use of AI tools was reported in various activities, including searching for relevant literature, enhancing language and grammar, handling references, organizing and interpreting data, and more. These tools have helped in streamlining the research process, saving time on repetitive tasks, and ensuring a well-organized and visually appealing research paper. Consequently, prospective teachers could concentrate more on conceptual understanding and organization of ideas than mechanical aspects of research writing. This illustrates how, when applied correctly, AI can be an effective academic tool to help build research skills.

Recommendation

There were following recommendations:

1. In the university, assessment should be changed so as to foster originality, critical thinking and reflective research skills. Reflective aspects could be part of assignments and/or research projects that require students to reveal what tools they used and justify their research choices in relation to AI. These will foster transparency and minimize dependence on AI-created content.
2. Capacity-building initiatives should be encouraged by providing resources for the development of AI training labs, access to licensed research software and ethical compliance systems by policymakers and higher education authorities in Punjab. Increasing equitable access to AI tools and training can help eliminate inequities among public and private universities, and maintain the same standards of research from school to school.
3. It is important that prospective teachers foster a healthy and responsible mindset towards the use of AI. Their goal should not be to use AI as a crutch for academic success, but to learn how to use it to make learning and work more efficient. Development of self-regulation, ethical responsibility and reflective research habits will help future teachers become equipped to be competent researchers and models of such for students in an increasingly technology-based educational context.

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