Research Article

Impact Of Ai Training On The Level Of Ai Knowledge Among Prospective Teachers

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ARTICLE INFO	ABSTRACT
	In this 21st century, education has seen tremendous change and transformation. From classrooms to boardrooms, the shift from paper and pencil to touchscreens is here to stay, and it is never going to go back. Teachers, being the cornerstone of this development, need to stay ahead of the students. According to the Global Student AI Survey 2024 released by the Digital Education Council, around 86% already use AI in their studies, and 54% of them use it on a daily or weekly basis (Rong & Chun, 2024). Therefore, this shows the urgency for teachers to integrate AI into teaching and learning. This experimental study aims to investigate the effects of training prospective teachers with AI on their knowledge level and literacy. Specifically, it aims to showcase the importance of training prospective teachers with AI tools. This study follows a quasi-experimental design with a two-group pretest and posttest design. The findings highlight the differences in the AI knowledge levels of the prospective teachers before and after the training. **Keywords:** Artificial intelligence, teacher training, teacher education, AI literacy, and digital literacy, pre-service teachers

Introduction

The rapid advancement of AI in various sectors pushes for a change in education, mainly in its pedagogical and assessment approaches. This evolution dictates that teachers and educators integrate AI in their classrooms, which includes understanding AI's capabilities and limitations and ethical concerns in integrating AI. AI has been a catalyst for positive change in the field of education. AI has been able to provide true personalized experiences. AI-based adaptive learning platforms analyze real-time student performance, identifying knowledge gaps and adjusting content, difficulty, and instructional sequencing dynamically (Sein Minn, 2022). Hyper-personalization, driven by data-driven algorithms, aims to optimize student outcomes and reduce the frustrating 'one-size-fits-all' approach (Dutta et al., 2024). AI is a powerful tool that reduces the workload of the teachers tremendously. There are tools that can automatically grade the students' work and give real-time feedback, tools that can lessen the administrative everyday tasks, tools that can help with curriculum planning and lesson planning, and tools that can create vibrant and engaging content for teaching. AI can make education more accessible and inclusive. This is evident because of the different needs, styles, and patterns of learners in the classroom. These advancements include AI-powered tools that offer real-time feedback and adaptive learning pathways, which are particularly beneficial for students with diverse learning styles and accessibility requirements, thereby bridging educational gaps (Lata, 2024).

It is crucial for teachers to learn these skills and competencies for teaching children. Studies show that teachers lack knowledge and skills to teach using AI (Nazaretsky et al., 2022). There were several reasons for this major limitation, such as the readiness of the teacher, poor attitude towards learning AI, absence of proper training in AI, inadequate infrastructure, or inadequate funding (ISTE, 2023). AI knowledge is the ability to understand and grasp AI fundamentals and principles, analyze AI tools, and utilize ethical procedures correctly when using them. It ensures a responsible and effective use of AI for better teaching and learning (Wang et al., 2023). Knowledge of AI is important because it provides an ethical stewardship, where the teachers know how to use AI and what to use and what not to use (Pragya Mishara, 2024).

Literature Review

In an experimental study done by Bogdanova et al. (2021), titled 'Forming Teachers' Awareness Of Knowledge in the Field of Artificial Intelligence', the main objective was to develop a methodology that would form awareness and knowledge for teachers on artificial intelligence. The results suggest that using interactive and collective learning tools, teachers will be able to visualize the theoretical materials, aid in memorization and mastery, and enhance student involvement. The implications of the study include the effectiveness of training methodology in forming the awareness of knowledge of AI among pre-service and in-service teachers (Bogdanova et al., 2021). A narrative overview by Ng et al. (2023) provides a conceptual adaptation of frameworks related to teachers' digital and AI competencies in the post-pandemic period. The authors discussed how the pandemic catalyzed a shift in the teaching methodologies and that teachers lack the necessary competencies to handle AI. They stress the need for digital competencies for teachers for the sake of assessments, curriculum, and professional development. Since AI provides opportunities to improve teaching qualitatively and quantitatively, knowledge on AI and the pedagogical methods using AI is a must for educators (Ng et al., 2023). A study done by Velander et al. (2023) explored the understanding of the Swedish in-service teachers and teacher educators. The study used a mixed-methods approach, such as online questionnaires and focus group discussions, to gather the understanding of the teachers' literacy towards AI. The results of the analysis provided a clear picture that the AI-related content knowledge is mostly through incidental learning rather than intentional learning. The teachers had misconceptions about AI and its applications. The teachers had little to no content knowledge about AI concepts. The study concludes with suggestions to implement intentional learning opportunities for teachers, such as workshops, courses, focus group discussions, and practical work (Velander et al., 2024).

A systematic review was done to provide a comprehensive view on the goals, data findings, discussions, and ethical procedures used in all the studies related to artificial intelligence. This study was done by Salal-Pilco et al. in 2022 with 30 research articles from 16 different countries. The authors claimed the importance of AI teaching and knowledge in this AI-driven world, presenting both the advantages and the limitations of using AI in education. The review was mostly done on the papers where the sample would be either pre-service or in-service teachers. Based on their findings, they stressed the importance of preparing the pre-service teachers for the digitalized education and providing continuous professional development for the in-service teachers to enhance the knowledge and skills of AI (Salas-Pilco et al., 2022).

Objectives:
1. To examine the impact of the intervention on prospective teachers' knowledge about AI.
2. To find the levels of knowledge of AI among prospective teachers based on:
a. Gender
b. Educational qualification
c. Type of institution

Hypotheses
1. There is no significant difference in the impact of the intervention on prospective teachers' knowledge of AI between the experimental and the control group.
2. There is no significant difference in the levels of knowledge of AI among prospective teachers based on gender.
3. There is no significant difference in the levels of knowledge of AI among prospective teachers based on educational qualification.
4. There is no significant difference in the levels of knowledge of AI among prospective teachers based on the type of institution.

Methodology

This study was done using the quasi-experimental method, consisting of an experimental group and the control group. The experimental group and the control group were selected under the same criteria, such as the type of institution, area, and year of study. The groups were from two different private colleges located in an urban area, affiliated with the Tamilnadu Teachers Education University. The participants of both the groups were the prospective teachers belonging to Year I of the B.Ed. degree. The number of participants was 46 in each group. The participants of the experimental group were given rigorous training on the basics of artificial intelligence and 25 AI tools that are used for teaching and learning processes. Pre-tests and post-tests were held by the invigilator, giving ample time for the participants to complete them. The training period was 36 hours, excluding the pre-tests and post-tests.

The tool used for the study was the 'Basic AI Questionnaire'. The 'Basic AI Questionnaire' tool was developed by the invigilator in the year 2023. The questionnaire has 15 questions with four different choices each. The questions were based on the basic concepts of AI, such as types, applications, and ethics of AI. The validity and the reliability of the questionnaire were calculated to be 0.863 and 0.929, respectively.

The participants' consent was taken before the study, and the pretest was held. The invigilator provides the intervention where the participants of the experimental group are taught AI basics and tools, while the control group participants continue with the regular B.Ed. curriculum. After the intervention, the post-test was held.

Analysis and Interpretation
Table 1: Frequency Table for the Experimental Group with the variable 'Knowledge of AI' among prospective teachers based on '

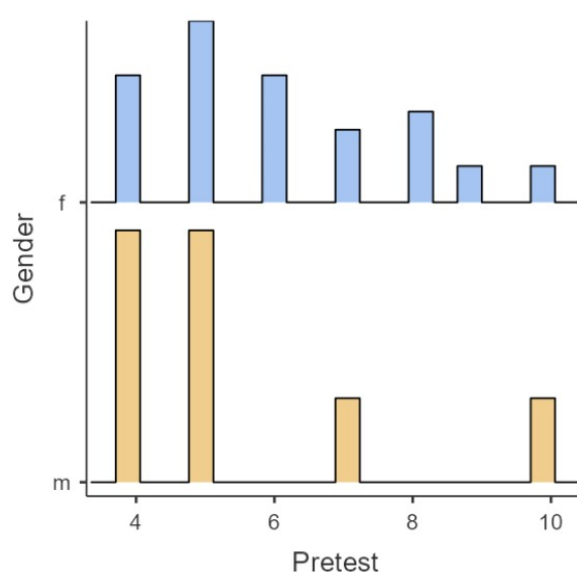|	Gender	N	Mean	Median	SD	Min.	Max.
Pretest	**Female**	38	6.13	6.00	1.74	4	10
	Male	8	5.50	5.00	2.07	4	10
Post-test	**Female**	38	12.76	13.00	1.40	11	15
	Male	8	12.25	11.50	1.83	10	15

Gender'

Figure 1: Histogram of the Pretest Scores for the 'Knowledge of AI' based on Gender
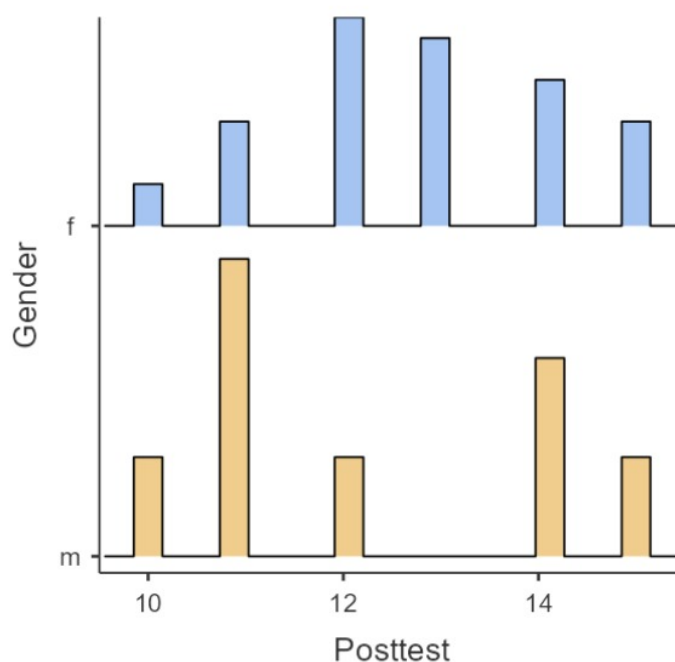

Figure 2: Histogram of the Post-Test Scores for the 'Knowledge of AI' based on Gender
From table 1, figure 1, and figure 2, it can be analyzed and interpreted as the following:

● There are 38 female participants and 8 male participants who make up the experimental group.
● The mean scores of the pretest among the males and females have a difference of 0.63, showing the female prospective teachers have scored higher than the male prospective teachers.
● The mean scores of the post-test among the male and female prospective teachers have a difference of 0.51, showing a consistent rise of the female prospective teachers above the male prospective teachers.
● The difference in median scores of the pretest between both genders is 1. This shows that both the male and female prospective teachers started out similarly.
● But there is a significant increase in the median scores in the post-test scores after the intervention. There is a difference of 1.5, showing that the female prospective teachers have an increase in mean over male prospective teachers.
● The difference between the pre-test and post-test mean and median scores shows a rise in the knowledge level of the AI after the intervention.
● Low standard deviation points out that scores are closer to the mean value and are not highly dispersed. This shows the consistency of scores during both the pretest and the post-test.
● The minimum value obtained by female and male prospective teachers is 4, and the maximum is 10 during the pretest. The minimum value obtained by female prospective teachers is 11, and the maximum is 15 during the posttest, but the minimum value obtained by male prospective teachers is 10, and the maximum is 15 during the post-test.

Table 2: Frequency Table for the Experimental Group with the variable 'Knowledge of AI' among prospective teachers based on 'Educational Qualification'

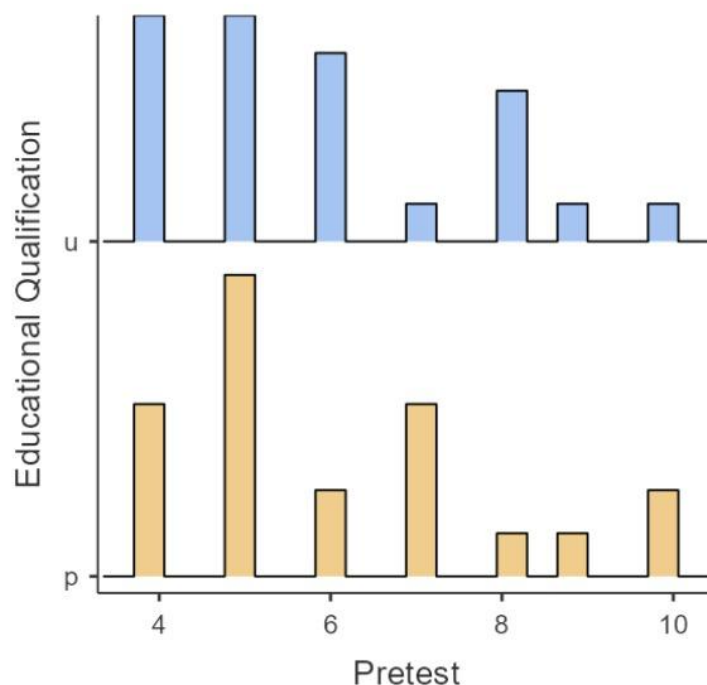|	Educational Qualification	N	Mean	Median	SD	Min.	Max.
Pretest	**UG**	25	5.96	6	1.74	4	10
	PG	21	6.10	5	1.89	4	10
Post-test	**UG**	25	12.96	13	1.57	10	15
	PG	21	12.33	12	1.32	10	15

Figure 3: Histogram of the Pretest Scores for the 'Knowledge of AI' based on Educational Qualification
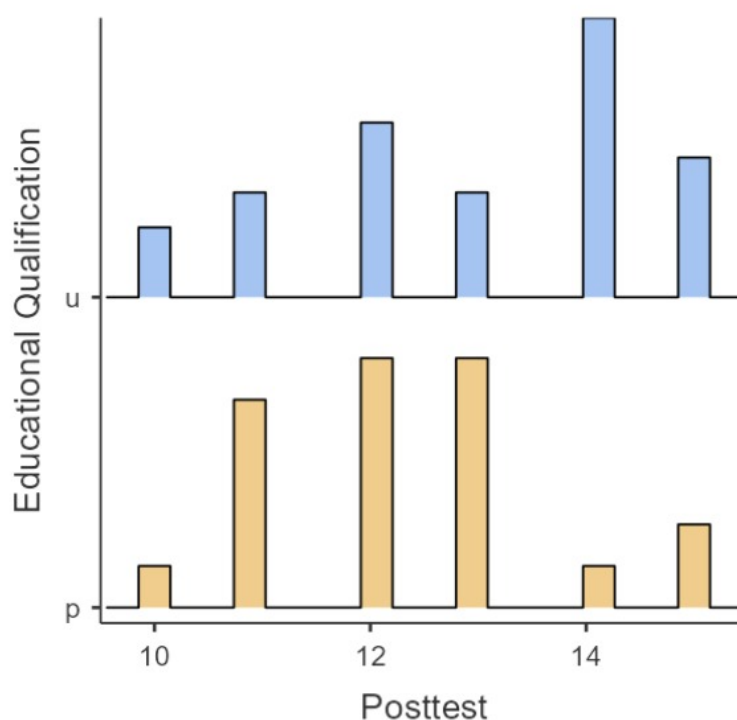
Figure 4: Histogram of the Post-Test Scores for the 'Knowledge of AI' based on Educational Qualification

From table 2, figure 3, and figure 4, it can be analyzed and interpreted as the following:
● There are 25 undergraduate (UG) participants and 21 postgraduate (PG) participants who make up the experimental group.
● The mean scores of the pretest among the PG and UG have a difference of 0.14, showing the Postgraduate prospective teachers have scored higher than the Undergraduate prospective teachers.
● The mean scores of the post-test among the UG prospective teachers and PG prospective teachers have a difference of 0.63, showing an increase of the UG prospective teachers above the PG prospective teachers, proving the effectiveness of the intervention. This increase could be due to the intrinsic motivation of the UG participants and their ability to understand the concepts easily.
● The difference in median scores of the pretest between both UG prospective teachers and PG prospective teachers is 1. This shows that both the UG prospective teachers and PG prospective teachers started out similarly.
● There is no significant increase in the median scores in the post-test scores after the intervention. There is a difference of 1, showing that both the UG prospective teachers and PG prospective teachers have ended similarly even after the intervention.
● Low standard deviation points out that scores are closer to the mean value and are not highly dispersed. This shows the consistency of scores during both the pretest and the post-test.
● The minimum value obtained by UG prospective teachers and PG prospective teachers is 4, and the maximum is 10 during the pretest. The minimum value obtained by UG prospective teachers and PG prospective teachers is 10, and the maximum is 15 during the post-test.

Table 3: Frequency Table for the Experimental Group with the variable 'Knowledge of AI' among prospective teachers based on 'Type of Institution'

	Type of Institution	N	Mean	Median	SD	Min.	Max.
Pretest	**Government**	14	5.79	5.50	1.63	4	9
	Private	18	6.06	5.00	2.15	4	10
	Government-aided	14	6.21	6.00	1.53	4	10
Post-test	**Government**	14	12.00	12.00	1.18	10	14
	Private	18	13.17	14.00	1.76	10	15

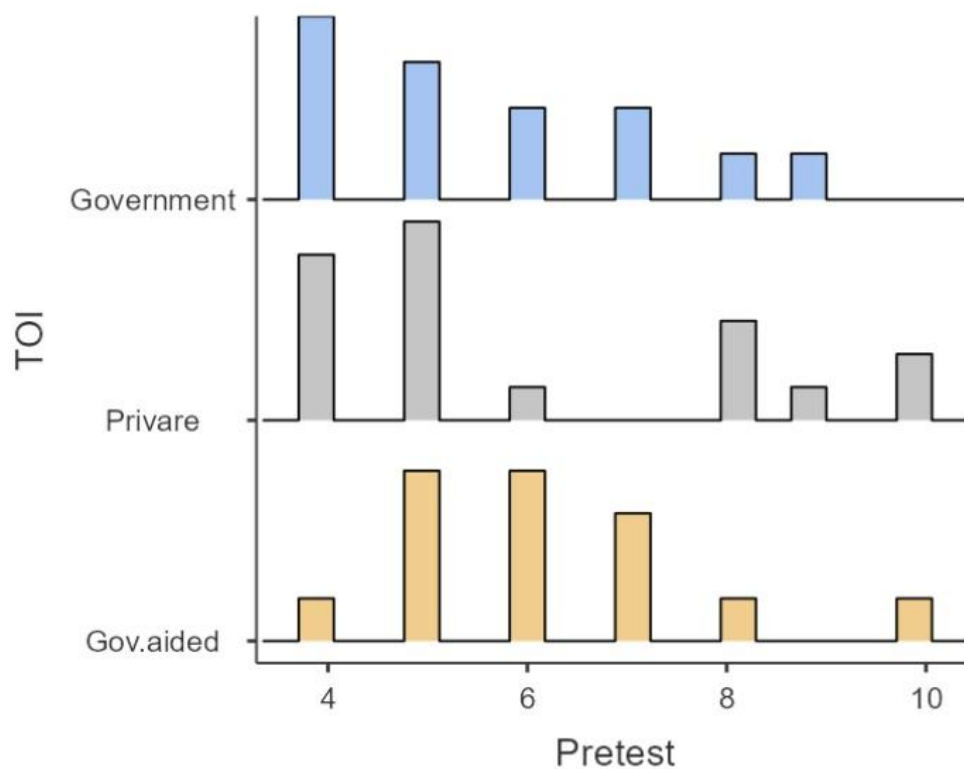|	Government-aided	14	12.71	13.00	1.14	11	15

Figure 5: Histogram of the Pretest Scores for the 'Knowledge of AI' based on Type of Institution
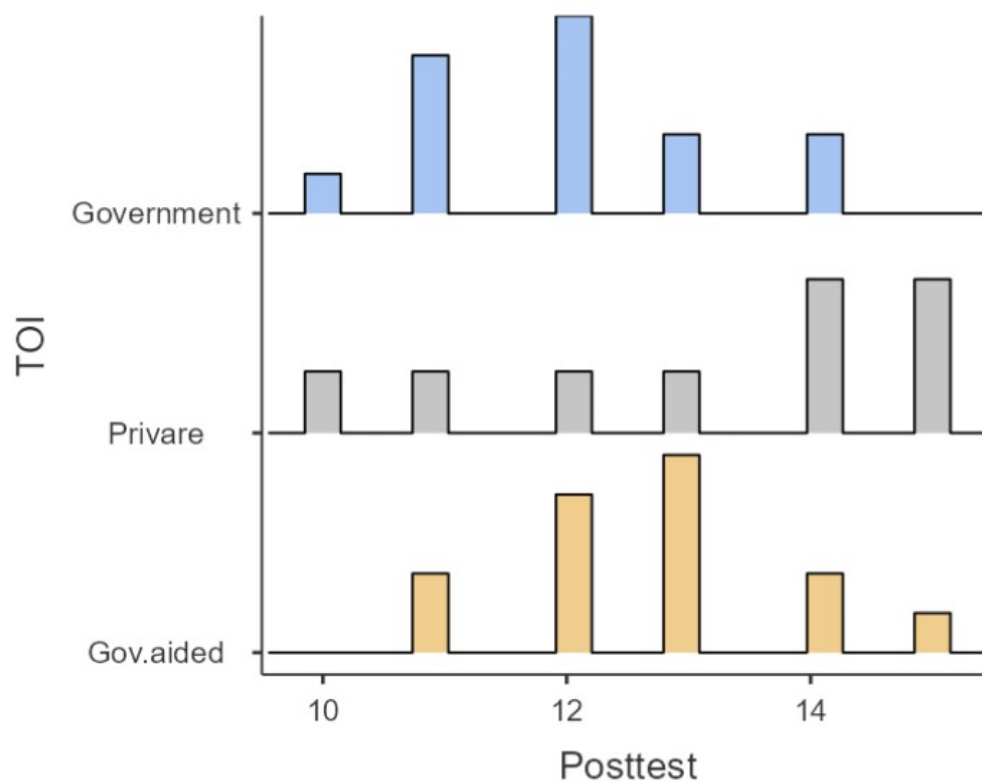
Figure 6: Post-Test Scores for the 'Knowledge of AI' based on Type of Institution

From table 3, figure 5 and figure 6, it can be analyzed and interpreted as the following:

● There are 14 prospective teachers from Government institutions, 18 prospective teachers from Private institutions and 14 prospective teachers from Government-aided institutions that make up the experimental group.
● The mean scores of the pretest among the participants have a difference, showing that the prospective teachers belonging to the Government-aided institutions have a higher level of knowledge of AI compared to the prospective teachers belonging to the Private and Government institutions.
● But the mean scores of the post-test among the prospective teachers have yet another difference, showing a rise among the prospective teachers from Private institutions when compared to the prospective teachers from Government and Government-Aided institutions.
● There is a difference in median scores of the pretest between the prospective teachers from all the institutions. The median score for the prospective teachers from Government-aided institutions is higher than that of prospective teachers belonging to the Private and Government institutions.
● But there is a significant increase in the median scores in the post-test scores after the intervention. There is a difference of 2 points showing that the prospective teachers belonging to Private institutions have an increase in the level of knowledge after the intervention over other prospective teachers.
● The difference between the pre-test and post-test mean and median scores shows a rise in the knowledge level of the AI after the intervention.
● Low standard deviation points out that scores are closer to the mean value and are not highly dispersed. This shows the consistency of scores during both the pretest and the post-test.
● The minimum value obtained by all the prospective teachers is 4, and the maximum is 10 during the pretest. The minimum value obtained by prospective teachers Government-aided is 11 and the maximum is 15 during the posttest, but the minimum value obtained by other prospective teachers is 10 and the maximum is 15 during the post-test.

Table 4: T-Test for the Experimental Group with the variable 'Knowledge of AI' among prospective teachers based on 'Gender'

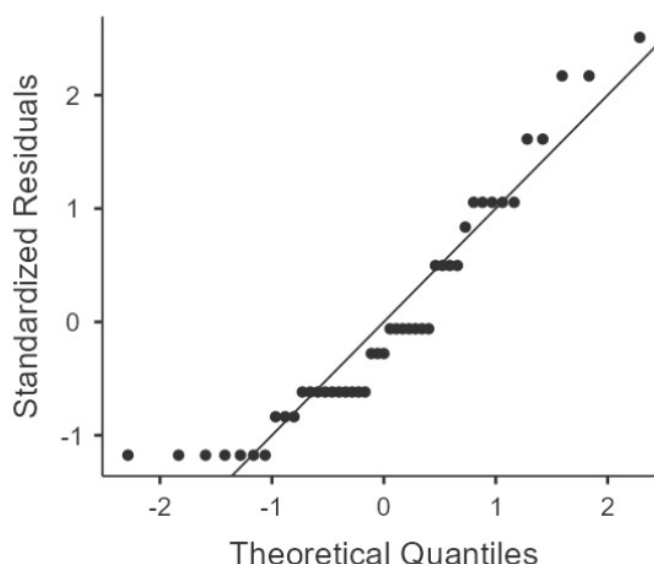| Independent Samples T-Test - Gender				
	T-tests	**Statistic**	**df**	**p**
Pretest	**Student's**	0.903	44.0	0.372
	Welch's	0.805	9.21	0.441
Post-Test	**Student's**	0.891	44.0	0.378
	Welch's	0.747	8.81	0.474

Figure 7 : Q-Q Plot of the Pretest Scores for the 'Knowledge of AI' based on Gender
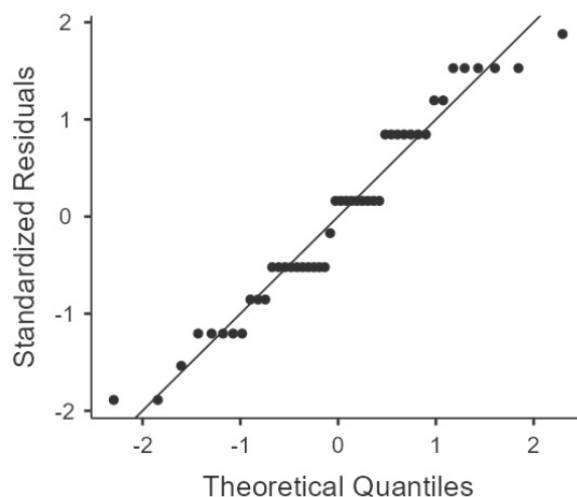
Figure 8 : Q-Q Plot of the Post-test Scores for the 'Knowledge of AI' based on Gender

From table 4, figure 7, and figure 8, it can be analyzed and interpreted as the following:
● For the pretest, since the p-value is greater than 0.05, the null hypothesis is accepted, showing that there is no significant difference in the level of knowledge of AI when it comes to the gender of the person.
● For the post-test, since the p-value is greater than 0.05, the null hypothesis is accepted, showing that there is no significant difference in the level of knowledge of AI when it comes to the gender of the person after the intervention.
● For the Q-Q plots, since the points are clustered around the reference line, it shows that the assumption of the normality of the variable is supported. Hence, the parametric tests can be used for explaining the variable. The resulting plot is adjacent to the diagonal line, pointing out that it is falling under expected bounds.

Table 5: T-Test for the Experimental Group with the variable 'Knowledge of AI' among prospective teachers based on 'Educational Qualification'

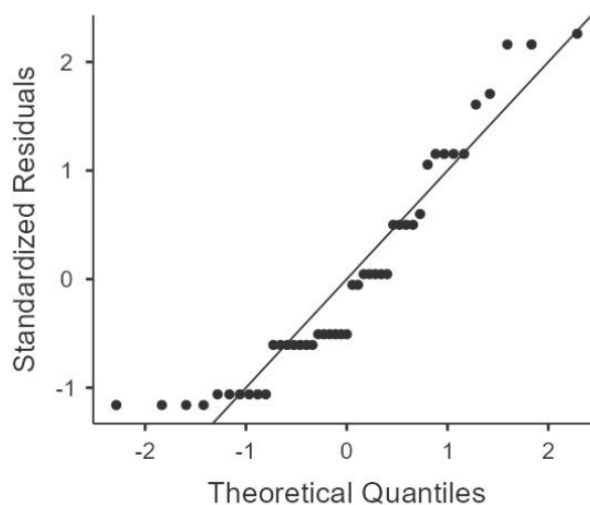| Independent Samples T-Test- Educational Qualification				
	T-Tests	**Statistic**	**df**	**p**
Pretest	**Student's**	0.252	44.0	0.802
	Welch's	0.250	41.2	0.804
Post-test	**Student's**	1.451	44.0	0.154
	Welch's	1.474	44.0	0.148

Figure 9 : Q-Q Plot of the Pretest Scores for the 'Knowledge of AI' based on Educational Qualification
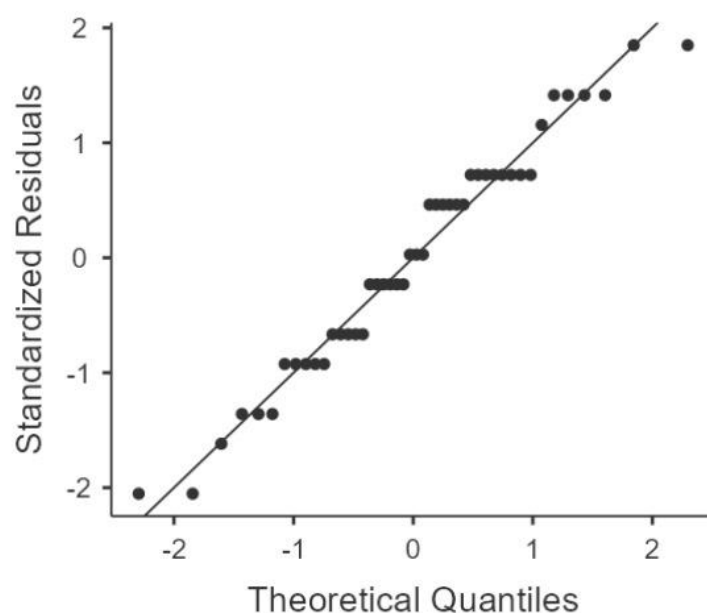
Figure 10 : Q-Q Plot of the Post-test Scores for the 'Knowledge of AI' based on Educational Qualification

From table 5, figure 9, and figure 10, it can be analyzed and interpreted as the following:
● For the pretest, since the p-value is greater than 0.05, the null hypothesis is accepted, showing that there is no significant difference in the level of knowledge of AI when it comes to the educational qualification of the person.
● For the post-test, since the p-value is greater than 0.05, the null hypothesis is accepted, showing that there is no significant difference in the level of knowledge of AI when it comes to the educational qualification of the person after the intervention.
● But there is a notable difference in the p-value between the pretest and the post-test. The pretest p-value is around 0.8, which shows that it is a high probability and it is consistent with the null hypothesis most of the time. The p-value for the post-test (after the intervention) is around 0.1, which shows it is of low probability, and it has a marginal significance since it is less consistent in supporting the null hypothesis.
● For the Q-Q plots, since the points are clustered around the reference line, it shows that the assumption of the normality of the variable is supported. Hence, the parametric tests can be used for explaining the variable. The resulting plot is adjacent to the diagonal line, pointing out that it is falling under expected bounds.

Table 6: F-Test for the Experimental Group with the variable 'Knowledge of AI' among prospective teachers based on 'Type of Institution'

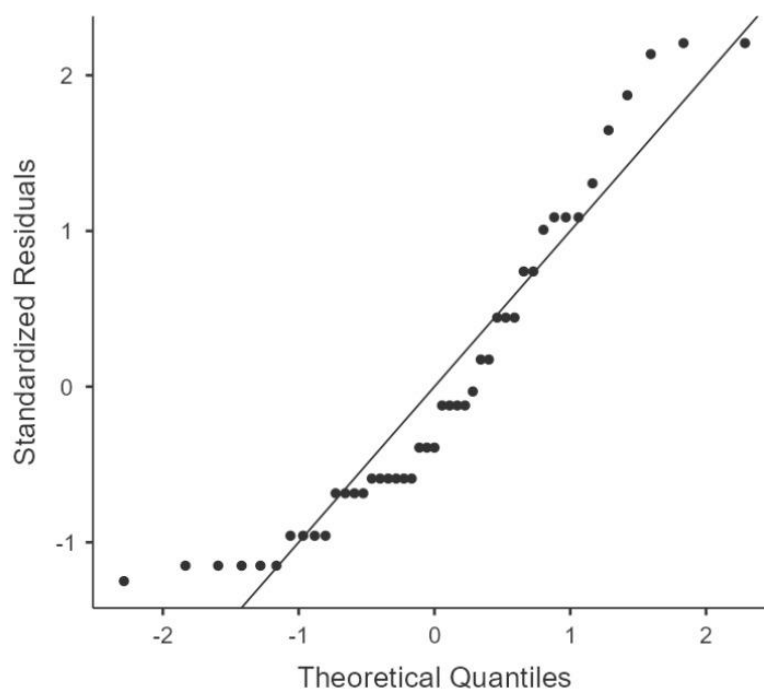| ANOVA - Type of Institution							
	Sum of Squares	**df**	**Mean Square**	**F**	**p**	**η²**	**η²p**
Pretest	1.32	2	0.660	0.197	0.822	0.009	0.009
Post-test	10.8	2	5.38	2.65	0.082	0.110	0.110

Figure 11 : Q-Q Plot of the Pretest Scores for the 'Knowledge of AI' based on Type of Institution
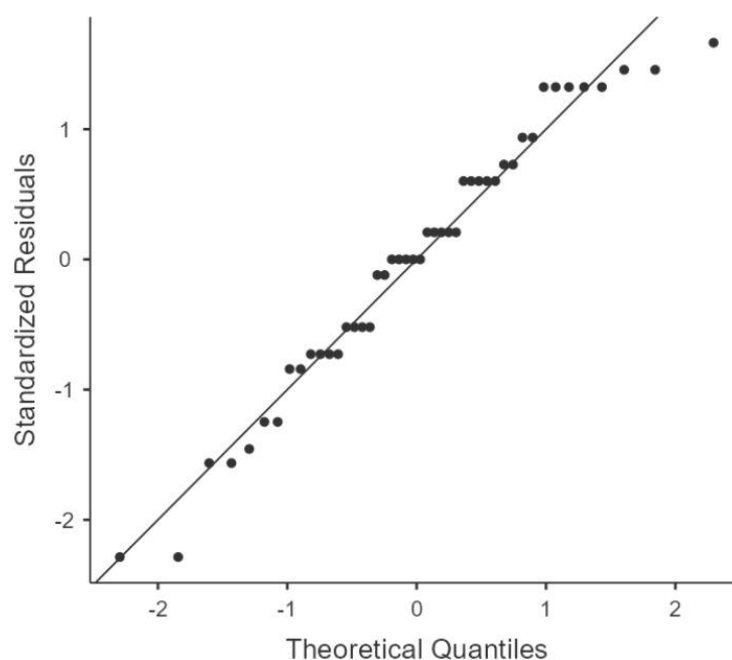

Figure 12 : Q-Q Plot of the Post test Scores for the 'Knowledge of AI' based on Type of Institution

From table 6, figure 11, and figure 12, it can be analyzed and interpreted as the following:
● For the pretest, since the p value is greater than 0.05, the null hypothesis is accepted, showing that there is no significant difference in the level of knowledge of AI when it comes to the type of institution the person is from.
● For the post test, since the p-value is greater than 0.05, the null hypothesis is accepted, showing that there is no significant difference in the level of knowledge of AI when it comes to the type of institution the person is from, after the intervention.
● The effect size eta-squared (η^2) and partial eta-squared ($p\eta^2$) is 0.0 to 0.1, it shows the minimal effect and non-trivial proportion of variance. This means that the intervention has a very small effect on the outcomes when it comes to the type of institution the prospective teacher is from.

● For the Q-Q plots, since the points are clustered around the reference line, it shows that the assumption of the normality of the variable is supported. Hence, the parametric tests can be used for explaining the variable. The resulting plot is adjacent to the diagonal line, pointing that it is falling under expected bounds.

Table 7: T-Test for the Assessment of the variable 'Knowledge of AI' among prospective teachers from experimental and control groups

	T-Tests	Statistic	df	p	Mean difference	SE difference
Pretest	**Student's t**	0.173	90.0	0.863	0.0652	0.376
	Welch's t	0.173	90.0	0.863	0.0652	0.376
Post-test	**Student's t**	18.954	90.0	<.001	6.4130	0.338
	Welch's t	18.954	87.4	<.001	6.4130	0.338

From the above table, it can be interpreted that since the p-value is greater than 0.05, this shows there is no significant difference in the values between the pretests of the experimental group and the control group. This shows that both the groups have almost the same level of knowledge of AI to begin with. Nevertheless, the p-value is less than 0.05, which shows that there is a significant difference between the post-tests of both the experimental and the control groups.

Table 8 : T-Test for the Assessment of the variable 'Knowledge of AI' among prospective teachers from experimental and control groups

Group Descriptives				
	Group	N	Mean	Median
Pretest	**Experimental**	46	6.02	5.50
	Control	46	5.96	5.50
Post-test	**Experimental**	46	12.67	13.00
	Control	46	6.26	6.00

The group descriptives table shows the differences in the knowledge level of the prospective teachers. From the mean value, it shows that the experimental group has a slightly greater value (i.e. 0.06) than that of the control group in the pretest. Also, in the post-test, the mean value of the experimental group (12.67) is far greater than the control group, showing the impact of the training held. There is an increase in the mean value for the control group between the pretest and post-test. This could be due to the heightened awareness the control group participants would have received during the testing and potential sensitization to the research topic after the pretest.

Discussion

This quasi-experimental study was done to prove there is a difference in the awareness and the knowledge gained by the prospective teachers after the intervention. The analysis provides an in-depth evaluation of all the factors concerning the level of knowledge of AI among prospective teachers. According to the analysis above, the prospective teachers of the experimental group do not have any major significant differences before and after the intervention in terms of gender, educational qualification, and the type of institution the prospective teacher belongs to. There is a significant difference in the post-test scores when compared to the control group. To begin with, the control group and the experimental group have almost the same mean value, showing that the prospective teachers from the control group and the experimental group have the same level of knowledge and awareness of AI. After the intervention, the mean value of the experimental group is higher than that of the control group. This shows the effectiveness of the training among the prospective teachers in the control group. The results of the study indicate the significance of training the prospective teachers with appropriate AI knowledge and tools.

Suggestions

● The study can be done with more factors and dimensions related to AI, such as the readiness of using AI, the confidence in integrating AI in teaching, the development of skills with the learning of AI, and such.

● As the study points out the importance of giving a general awareness of AI to the prospective teachers, all the institutions can have a mandate on implementing such AI training workshops or courses for their students.
● In the same note, school administrations can take up a faculty development program for their in-service teachers to stay updated with new technologies like AI.
● This study could also be done among the in-service teachers from various types of schools across districts.
● AI pedagogy in the contemporary education system can also be explored as a type of research.

Conclusion

AI is reshaping the educational landscape, where it has become inevitable for teachers to use AI in their classrooms. Teachers should have a multi-dimensional commodity that includes knowledge, skills, values, attitudes, personal qualities, and lifelong learning. Teachers, just like doctors, have a constant need to keep updating themselves in all aspects of teaching and learning. Research shows that teachers do have a strong interest in learning AI, and they have common prior knowledge about AI. 90% of students use AI for various reasons, teachers use grammar and other writing tools (Varshney et al., 2025). From the study, it is evident that pre-service teachers need formal training or a course on AI, as it would help them to adapt to the changing scenario in schools. With AI, teachers can bring the whole world into the classroom, changing the impossible to possible in a few clicks.

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