Determination of the Artificial Intelligence readiness levels of pre-service teachers

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Abstract: *This study aims to determine "the artificial intelligence readiness levels of pre-service teachers". The research, which is based on the quantitative data collection method, was conducted with 247 "pre-service teachers", and examined whether the gender, age distribution and type of program they study create a significant difference in their artificial intelligence readiness levels. The results obtained from the research, "pre-service teachers" have high awareness of artificial intelligence readiness levels. Another result obtained from the study is that "the gender, age distribution and type of program" "don't create a significant difference" in their artificial intelligence readiness levels. It is recommended that "the artificial intelligence readiness levels of pre-service teachers" should be examined in larger groups by considering other variables.*

Keywords: teacher education, teacher training program, pre-service teacher, artificial intelligence, AI.

1. Introduction

Artificial Intelligence (AI) has stepped in the field of education not before it entered other areas such as economics, finance, and banking; thus, it can be argued that it is manifested in every area of life today (Ayanvale et al., 2024). In literature, *"artificial intelligence is defined as the ability of a system to correctly interpret external data, learn from these data, and use what it has learned to achieve specific goals and tasks through flexible adaptation"* (Kaplan & Haenlein, 2018). One of the points emphasized by most authors is that artificial intelligence systems exhibit behaviors that are indistinguishable from humans in every respect, and have *"cognitive, emotional, and social intelligence*" (Haenlein and Kaplan, 2019). "*Artificial intelligence includes the ability of a system to perceive data or to control, move, and change objects based on the information learned, and in this*

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respect, it is a broader concept than machine learning" (Kaplan and Haenlein, 2018). Artificial intelligence systems are divided into three groups by Kaplan & Haenlein (2018): (1) "*Analytical AI"* covers features equal to cognitive intelligence. AI systems in this group create *"a cognitive representation of the world and use previously learned information to make future decisions"*. (2) *"Human-Inspired AI"* is equal to *"cognitive and emotional intelligence"*. AI systems in this group can understand human emotions along with cognitive intelligence and use them in decision-making processes. Finally, the AI systems that have not yet been developed are described as (3) "humanized AI and include all characteristics such as cognitive, emotional, and social intelligence". Artificial intelligence systems have an undeniable impact on world education systems on a global scale. It is considered a necessity to display effective AI literacy and skills today in order for teachers and students to interact with AI in their future lives (Zhai et al., 2021; Chiu & Sanusi, 2024). It is for this reason that countries and policy makers should carry out the necessary reforms in education systems, and arrangements should be made "to create a positive school climate" where the symbiosis of teachers, students, school administrators and AI systems can flourish.

Zhang et al. (2023) state that the rapid development of the uage of artificial intelligence technologies will change the nature of in-class training radically and highlight the importance of learning and teaching processes. Teachers are now in the process of assuming a new role with their new partners, namely the artificial intelligence systems, which will share the responsible for teaching. This rapid change requires a revision of the pedagogy regarding the role of teachers in university teaching (Popenici & Kerr, 2017; Zhai et al., 2021). Teachers need to think about where they will use AI systems in their curriculum to teach students the terminal behaviors. They also need to think about how and for what purposes they will use these systems. Teachers and teacher educators must acquire the relevant competencies on how to integrate AI systems into the objectives, content, learning experiences and assessment stages, which are the elements of their curriculum. Teachers are among the most important stakeholders that influence the development of AI literacy behaviors and skills of students (Chiu & Sanusi, 2024). The aim of this study is to determine "*the readiness levels of pre-service teachers for artificial intelligence"*. To achieve this aim, answers are sought to the following questions:

1. "What is the readiness level of pre-service teachers for artificial intelligence?"
2. Do the following factors make a significant difference in AI readiness levels?
    - 2.1. "Gender,
    - 2.2. Age,
    - 2.3. Type of program of the pre-service teacher".

2. Method

This study preferred the quantitative method. Pre-service teachers from an academy that trains teachers in the north of Cyprus participated in the study. Data were collected on a *"voluntary"* basis at the academy where a total of 327 *"pre-service teachers"* are enrolled. In this context, 247 *"pre-service teachers"* participated in the study, 170 of whom are female (68.8%) and 76 of whom are male (30.8%), wheras 1 *"pre-service teacher"* did not specify his/her gender. 146 of *"the pre-service teachers"* are between the ages of 18-20 (59.1%), and 101 of them (40.9%) are 21 years old and above. 197 of *"the pre-service teachers"* are studying in the classroom teaching department (79.8%) and 50 of them are enrolled in the preschool teaching department (20.2%).

In order to achieve the research purpose, the *"AI Readiness Scale for Preservice Teachers"* scale (2024) was used, which was adapted into Turkish by Özüdoğru and Yildiz Durak. The *"5-point Likert-type scale was scored from 5 (Strongly Agree) to 1 (Strongly Disagree)"*. It can be stated that as the scores obtained from the scale approach 5, the readiness levels of *"pre-service teachers"* for artificial intelligence increase positively. The scale consists of *"18 items"* and *"4 sub-dimensions"* as "*cognition, ability, vision and ethics in teaching*". After obtaining the necessary permission for the use of the Turkish adaptation scale (Özüdoğru & Yildiz Durak, 2024), the data collection process was planned. The researchers filed an application to the ethics committee of the relevant institution, and having received the necessary permission they met with the *"pre-service teachers"*. The data collection process was carried out via Google Form. The participant *"pre-service teachers"* were first informed about the purpose of the study, then the relevant link was shared with them, and they were asked to answer each scale item sincerely and accurately. The application of the scale took approximately 10-15 minutes for each participant. All information about the participants was kept confidential by the researchers.

The data obtained from the research were analyzed in the "*SPSS package program"*. The distribution of *"pre-service teachers according to their gender, age and the type of program"* was calculated with frequency and percentage values, whereas the levels of readiness for artificial intelligence were found with Mean and standard deviation values. *"One-Sample Kolmogorov-Smirnov test"* was used to determine whether the data showed *"normal distribution"*. The findings revealed that the data did not comply with a "normal distribution" ($p<0.05$), therefore Nonparametric tests were preferred in the study. *"Mann Whitney U test"* was resorted to analyze whether there was a *"significant difference"* in the levels of artificial intelligence readiness of *"pre-service teachers"* according to their *"gender, age, and program type"*. *"Cronbach's Alpha reliability"* coefficient of the data obtained from the research was calculated as .945, which shows that the obtained data has a high level of reliability.

3. Results

3.1 Artificial Intelligence readiness level of pre-service teachers

Table 1 presents the findings obtained from the scale applied to *"determine the readiness levels of pre-service teachers for artificial intelligence"*.

Table 1. Mean Score of "Readiness Level of pre-service teachers for Artificial Intelligence"

Artificial Intelligence readiness level	N	Minimum	Maximum	Mean	Std. Deviation
Cognition	247	1,00	5,00	3,9466	,75809
Ability	247	1,17	5,00	3,9750	,78019
Vision	247	1,33	5,00	4,0040	,77534
Ethics	247	1,00	5,00	3,8850	,84695
Total score	247	1,33	5,00	3,9518	,68789

"The AI readiness levels of the pre-service teachers" were generally within the limits of *"I agree"* (M=3.95, SD=.687). Similarly, the readiness levels of the *"pre-service teachers"* for the cognition sub-dimension (M=3.94, SD=.758), as well as ability (M=3.97, SD=.780), vision (M=4.00, SD=.775) and ethics (M=3.88, SD=.846) sub-dimensions were also within the limits of *"I agree"*. The "vision" sub-dimension has the highest average score. These results reveal that the readiness of *"the pre-service teachers"* for the use of AI technologies in education is at a high level. The findings reveal that *"pre-service teachers"* are aware of the importance of artificial intelligence, can organize teaching environments with artificial intelligence technologies, know the strengths and limitations of artificial intelligence, and comprehend the relevant ethical responsibilities.

3.2 Artificial Intelligence readiness levels of pre-service teachers by gender

The artificial intelligence readiness levels of *"pre-service teachers according to their gender"* were analyzed using the *"Mann Whitney U test"*. Table 2 provides the findings obtained.

Table 2. Artificial intelligence "readiness levels of pre-service teachers by gender"

Sub-dimensions	Gender	N	Mean Rank	Sum of Ranks	U	P
Cognition	Female	170	119,99	20397,50	5862,500	,244
	Male	76	131,36	9983,50		
Ability	Female	170	122,58	20839,00	6304,000	,761
	Male	76	125,55	9542,00		

Vision	Female	170	121,25	20613,00	6078,000	,453
	Male	76	128,53	9768,00		
Ethics	Female	170	120,74	20526,50	5991,500	,360
	Male	76	129,66	9768,00		
Total	Female	170	120,09	20414,50	5879,500	,260
	Male	76	131,14	9966,50		

Table 2 shows that *"the gender of the pre-service teachers"* does not create a *"significant difference"* in their readiness levels for artificial intelligence (U=5879.500; p=.260; p>0.05). An examination of the findings manifests that *"no significant difference"* was found in *"the readiness levels of female and male pre-service teachers"* regarding the "cognition" (U=5862.500; p=.244; p>0.05), "ability" (U=6304.000; p=.761; p>0.05), "vision" (U=6078.000; p=.453; p>0.05) and "ethics" (U=5991.500; p=.360; p>0.05) dimensions. The findings also reveal that the gender variable does not create *"a significant difference"* for *"pre-service teachers"* in their awareness of the importance of artificial intelligence, usage of artificial intelligence in teaching processes, knowledge of the strengths and limitations of artificial intelligence, and understanding of ethical responsibilities.

3.3 Artificial Intelligence readiness levels of pre-service teachers by age

"The Mann Whitney U test" was used to analyze whether the age variable created *"a significant difference in the artificial intelligence readiness levels of pre-service teachers"*.

Table 3. Artificial Intelligence readiness level by age variable

Sub-dimensions	Age	N	Mean Rank	Sum of Ranks	U	P
Cognition	18-20	146	119,70	17476,00	6745,000	,252
	21 and above	101	130,22	13152,00		
Ability	18-20	146	116,90	17067,50	6336,500	,059
	21 and above	101	134,26	13560,50		
Vision	18-20	146	121,17	17690,50	6959,500	,448
	21 and above	101	128,09	12937,50		
Ethics	18-20	146	119,03	17378,00	6647,000	,185
	21 and above	101	131,19	13250,00		
Total	18-20	146	117,80	17198,50	6467,500	,101
	21 and above	101	132,97	13429,50		

Table 3 shows that "*the age of the pre-service teachers*" does not create a *"significant difference"* in their readiness levels for artificial intelligence (U=6467.500; p=.101; p>0.05). The findings obtained from the research revealed that the age variable does not create *"a significant difference in the readiness levels*

of the pre-service teachers" for the "cognition" dimension (U=6745.000; p=.252; p>0.05) and the "ability" (U=6336.500; p=.059; p>0.05), "vision" (U=6959.500; p=.448; p>0.05) and "ethics" dimensions (U=6647.000; p=.185; p>0.05).

3.4 Artificial Intelligence readiness levels of pre-service teachers by program type

The study examined whether the program type of *"the pre-service teachers explain a significant difference"* in their readiness levels for artificial intelligence. Table 4 shows the findings obtained from *"the Mann Whitney U analysis test"*.

Table 4. Artificial Intelligence readiness level by program type

Sub-dimensions	Program type	N	Mean Rank	Sum of Ranks	U	P
Cognition	Classroom teaching	197	123,24	24277,50	4774,500	,737
	Preschool	50	127,01	6350,50		
Ability	Classroom teaching	197	126,30	24881,00	4472,000	,313
	Preschool	50	114,94	5747,00		
Vision	Classroom teaching	197	126,13	24847,00	4506,000	,347
	Preschool	50	115,62	5781,00		
Ethics	Classroom teaching	197	123,18	24266,50	4763,500	,718
	Preschool	50	127,23	6361,50		
Total	Classroom teaching	197	124,88	24600,50	4752,500	,702
	Preschool	50	120,55	6027,50		

According to the findings obtained from the research, *"the program type of the pre-service teachers"* does not cause *"a significant difference"* in their readiness levels for artificial intelligence (U=4752.500; p=.702; p>0.05). In a similar vein, the type of program does not create a significant difference in their readiness levels for the "cognition" dimension (U=4774.500; p=.737; p>0.05), as well as "ability" (U=4472.00; p=.313; p>0.05), "vision" (U=4506.000; p=.347; p>0.05) and "ethics" (U=4763.50; p=.718; p>0.05) dimensions.

4. Discussions and conclusions

This study, which aimed to determine "the readiness levels of pre-service teachers for artificial intelligence", found high levels of readiness for the participants. It revealed that "pre-service teachers" have "a high vision for artificial intelligence technologies" and believe that they can undertake "the relevant ethical responsibilities". The results revealed that "pre-service teachers" are aware of the importance of using "artificial intelligence technologies" in education. The

importance of teacher training programs to be designed in a way that will equip "pre-service teachers" with the use of "artificial intelligence technologies" in education becomes evident.

The study also examined whether "gender, age, and program type" created a significant difference in "artificial intelligence readiness levels". The results revealed that "gender", "age distribution", and the "type of program" of "pre-service teachers" did not create "a significant difference" in terms of their "artificial intelligence readiness levels". In their study conducted with "pre-service teachers", Kalnina et al. (2024) concluded that age, gender, and level of education did not create a significant difference in the perception of artificial intelligence. Mart and Kaya (2024), in their study with "pre-service teachers", did not find a significant difference between the attitudes of "pre-service teachers" towards artificial intelligence and their literacy levels according to gender, and they concluded that there was "no significant difference" between the age groups in terms of positive attitudes of "pre-service teachers" and artificial intelligence literacy. Their finding supports the results of this study.

It is recommended that more research should be conducted on the use of artificial intelligence technologies in teacher education and that variables other than gender, age, and program type should be examined. It is also suggested that researchers focus on studies that will develop teacher training programs supported by *"artificial intelligence technologies"* and test their effectiveness.

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