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INVESTIGATION OF TEACHERS' AWARENESS OF ARTIFICIAL INTELLIGENCE¹

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Abstract

In this study, teachers' awareness of artificial intelligence (AI) was examined in relation to various variables: gender, participation in scientific projects, reading about AI, using technology in education, and keeping up with current technologies. Furthermore, the relationships between reading about AI, using technology in education, and staying updated on current technologies were investigated. The study employed a correlational survey design, a quantitative research method. Maximum variation sampling—a type of purposive sampling—was used to select the participants. Data from 744 teachers with diverse characteristics were analyzed using the SPSS 22.0 software package. The results indicate that teachers' AI awareness differs by gender in the sub-dimensions of "belief-attitude" and "relationality." Additionally, AI awareness was found to be higher among teachers who read about AI, participate in scientific projects, use technology in education, and keep track of current technologies. A weak, positive correlation was identified between reading about AI, using technology in education, and staying updated on current technologies. Based on these findings, several recommendations are provided.

Keywords: AI, Awareness, Technology, Teacher.

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Öğretmenlerin Yapay Zekâ Farkındalıklarının İncelenmesi

Öz

Bu çalışmada öğretmenlerin yapay zekâ (YZ) konusundaki farkındalıkları çeşitli değişkenler açısından incelenmiştir. Bu değişkenler cinsiyet, bilimsel projede yer alma, YZ hakkında okuma yapma, eğitimde teknoloji kullanma ve güncel teknolojileri takip etmedir. Ayrıca öğretmenlerin YZ hakkında okuma yapma, eğitimde teknoloji kullanma ve güncel teknolojileri takip etme arasındaki ilişki de incelenmiştir. Araştırmanın yürütülmesinde nicel araştırma yöntemlerinden biri olan ilişkisel tarama modeli benimsenmiştir. Çalışmanın örneklem seçiminde amaçlı örnekleme yöntemlerinden biri olan maksimum çeşitlilik örnekleme kullanılmıştır. Farklı özelliklere sahip 744 öğretmenin verileri SPSS 22.0 paket programı kullanılarak analiz edilmiştir. Araştırma sonucunda öğretmenlerin YZ farkındalıklarının inanç-tutum ve ilişkisellik alt boyutlarında cinsiyet değişkeni açısından farklılık olduğu belirlenmiştir. Ayrıca yapay zekâ farkındalıklarının, YZ hakkında okuma yapan, bilimsel projede yer alan, eğitimde teknoloji kullanan ve güncel teknolojileri takip eden öğretmenler lehine farklılık gösterdiği belirlenmiştir. Öğretmenlerin YZ hakkında okuma yapma, eğitimde teknoloji kullanma ve güncel teknolojileri takip etme arasında zayıf ve pozitif yönde ilişki bulunmuştur. Araştırma bulguları doğrultusunda öneriler sunulmuştur.

Anahtar Kelimeler: Yapay Zekâ, Farkındalık, Teknoloji, Öğretmen.

INTRODUCTION

Artificial intelligence (AI) has gained an important place among the innovations offered to humanity by advances in technology. AI technologies have become a necessity for people in daily life as in many areas. So what does “AI” mean? Before explaining this concept, it may be necessary to emphasize the concept of intelligence. While on the one hand, intelligence is defined as cognitive abilities that can be measured through IQ tests (Yadav et al., 2016), on the other hand, it is seen that the score obtained from an intelligence test cannot represent intelligence, and intelligence is defined as the capacity to solve problems, produce information, adapt, reason and use reason, which should be considered multidimensional rather than one-dimensional (Sönmez, 2014; Duman, 2015). In addition to these, it is also seen that intelligence is defined as competence in a subject and the ability to acquire knowledge to solve the problems encountered and the ability to reason about the acquired knowledge (Pannu, 2015).

The concept of AI was first used in 1956 by John McCarthy at the Dartmouth conference (Padoan & Plebani, 2022). According to McCarthy (2004), intelligence is ‘the computational part of the ability to achieve goals in the world’, while AI is ‘the science and engineering of making intelligent computer programs’. Pannu (2015) defines AI as the creation and development of intelligent machines and software that perceive, reason, collect information/data, learn, communicate, and manage objects. In addition, AI is used to describe a different and complex computer technology that can mimic some of the functions of the human brain, such as reasoning and critical thinking (Kunduru, 2023). Chen et al. (2020a) define AI as a field of study that results in computers, machines and other products that have a human-like intelligence with the ability to learn, adapt and make decisions, and the resulting innovations and developments. When these definitions are taken into account, AI enables machines or computers to collect data and obtain a result based on this data, rather than just fulfilling a command. The fact that these results are not affected by personal and temporary factors and are based on the data obtained, not emotions, reveals an advantage of AI in achieving more realistic results (Khanzode & Sarode, 2020). Thus, the error rate can be minimised (Jaiswal, 2021).

There are virtual reality learning and tools where AI is used in education. These areas are shown in Figure 1 (Nalbant, 2021).

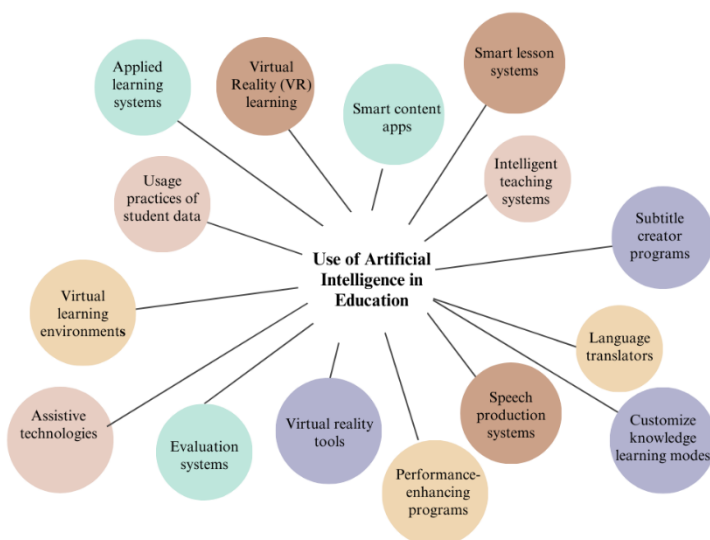


Figure 1. "Virtual reality learning and tools" where AI is used in education (Nalbant, 2021)

The integration of AI technologies into education makes it possible for learners to access various educational resources and, accordingly, to easily access plenty of information and information sources (Hwang et al., 2020; Guan, 2023). Virtual assistance is provided through tools or applications, paving the way for students to find answers to the questions they have (Asokan, 2022). Thanks to AI technologies, students are offered these opportunities at any place and time without a specific place and time frame (Asokan, 2022). Therefore, students can learn at their own level and learning pace (İşler & Kılıç, 2021). In addition, thanks to the use of AI technologies in education, it is possible to customise and personalize education in line with the needs and abilities of students (Chen et al., 2020a; Guo, 2020; Nalbant, 2021). This provides effective learning by increasing comprehension and retention in learning (Chen et al., 2020). It is also seen that AI can be utilized in providing students with the feedback they need during the education process (Guan, 2023). Based on this, it can be thought that AI in education can eliminate the misconceptions that students may have and complete the missing aspects in teaching. Furthermore, the use of AI technologies in education supports collaboration among students and enables collaborative learning (Li & Wang, 2020). In addition to these advantages of AI for students, some positive effects of AI in the educational process have been revealed through research. Accordingly, utilizing AI technology in education has positive effects on students' academic achievement (Erümit, 2014), foreign language speaking skills (Makhlouf, 2021), foreign language listening comprehension levels (Al-mawaly & AL-Jamal, 2022) and problem-solving skills (Erümit, 2014). In Figure 2, the benefits of the integration of AI into education for students are summarized based on the literature.

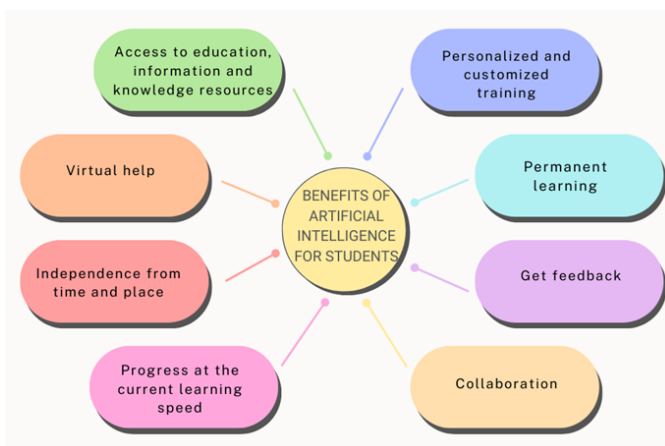


Figure 2. Advantages of AI for students

From the perspective of teachers, it is seen that the integration of AI into education provides convenience in terms of recording student data and tracking students (Chen et al., 2020a; Guo, 2020). By tracking students and monitoring their progress, students who need support can be easily identified by the teacher and necessary measures can be taken for these students (Khan et al., 2021). Thus, students in need of guidance can be identified in a short time and the support they need can be provided without wasting time. This opportunity offered by AI at the point of support needs and provision of support services facilitates and supports cooperation and communication between teachers and students (Kamalov et al., 2023). This integration helps teachers in reviewing, grading and evaluating the work done by students (Chen et al., 2020b; Guo, 2020; Asokan, 2022). Considering all these situations, it can be said that it saves time for teachers to teach effectively. In addition, thanks to AI applications, gamified teaching is provided and all students participate in the teaching process (Kuprenko, 2020). Considering that activities that attract the interest and participation of all students will help teachers in classroom management, it can be said that AI applications will help teachers in classroom management (İşler & Kılıç, 2021). Thus, the use of AI technologies in education reduces the burden of teachers and makes it possible for them to perform their teaching activities more effectively (Holmes et al., 2019; Nalbant, 2021). Figure 3 summarizes the benefits of integrating AI into education for teachers based on the literature.

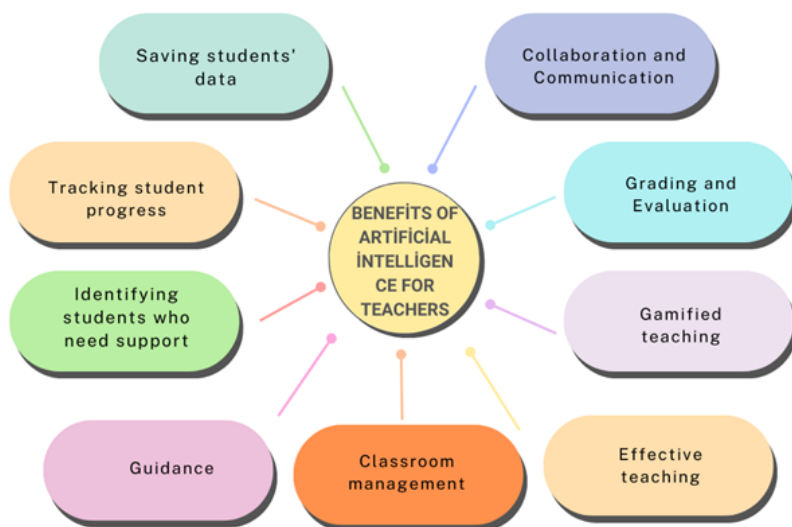


Figure 3. Advantages of AI for teachers

Given the benefits of the integration of AI into education for both students and teachers, it can be said that achieving higher quality in teaching activities can be supported by this integration. Considering the guiding role of teachers in the teaching process, it is thought that teachers have a significant impact on the integration of AI technologies or applications into education (Seufert et al., 2021). Teachers' having technological-pedagogical and content knowledge on how to utilise AI technologies or applications (Celik, 2023) and guiding their students on the effective use of these technologies or applications for their individual learning can be decisive for such integration. In addition to teachers' technological-pedagogical and content knowledge, their attitudes, perceptions, opinions, concerns and awareness regarding AI can also affect the integration of AI into education.

When the literature is examined, it is seen that teachers' attitudes towards AI (Aghaziarati et al., 2023; Eyüp & Kayhan, 2023; Sütçü & Sütçü, 2023; Pokrivcakova, 2023; Pörn et al., 2024), perceptions (Shin, 2020; Woodruff et al., 2023; Lee et al., 2024), opinions (Sütçü & Sütçü, 2023; Álvarez-Herrero, 2024) and concerns (Eyüp & Kayhan, 2023; Lee et al., 2024) have been widely investigated. In addition, it has been suggested in various studies that teachers' awareness levels should be improved in order to ensure technology integration (Ayçiçek & Karafil, 2021). The concept of awareness, which has an increasingly important impact on both social and technical research, is seen as an important element affecting human behaviour (Heath et al., 2002). Therefore, teachers' awareness of artificial intelligence can be expected to shape their behaviours in educational environments. Accordingly, it can be argued that research on teachers' awareness of artificial intelligence has an important place. According to some researchers, it is known that individuals' age, education and knowledge levels or perspectives affect their awareness (Bogdanova et al., 2021; Harisanty et al., 2024). Based on this, it is important to determine the various factors that affect teachers' awareness of artificial intelligence through research. Indeed, the measures to be taken to increase the factors that affect awareness positively and to eliminate the factors that affect it negatively will indirectly affect the integration of artificial intelligence in educational environments. However, when the studies on teachers' awareness of AI are examined, it is determined that they are limited to studies on AI knowledge awareness (Bogdanova et al., 2021), AI awareness of pre-service teachers (Agbo et al., 2022; AlKanaan, 2022) and awareness of teachers in only one branch (Hassab, 2023). It can be argued that this limitation gains importance when it is considered that teachers' awareness of AI may have determinative effects in various dimensions. The first of these dimensions is education policies. Accordingly, teachers, as a crucial stakeholder

of education, have an important place in the development and activation of AI education policies (Lee & Jeong, 2023). The second of these dimensions is the integration of AI into education. Teachers play a pivotal role for the effective achievement of learning goals through the integration process of AI into education (Saputra et al., 2023). The third dimension is the ability of students to grasp the value of AI. For this, teachers can utilize different strategies to help their students understand the value of AI (Nalbant, 2021). Finally, teachers and students' effective utilization of AI in education can be evaluated within these dimensions because the effective use of AI provides an advantage in dealing with subjects that are difficult to teach or learn (Hwang & Tu, 2021). Considering these dimensions in which AI can have possible effects, it can be said that the limitation in the research on teacher's awareness is an important gap. Based on this, in the related research, it was aimed to determine the awareness levels of teachers with different branches towards AI. In line with this purpose, answers to the following questions were sought:

1. Does teachers' awareness of AI differ according to their gender?
2. Does teachers' awareness of AI differ according to their involvement in a scientific project?
3. Does teachers' awareness of AI differ according to their reading on AI?
4. Does teachers' awareness of AI differ according to their use of technology in education?
5. Does teachers' awareness of AI differ according to their following current technologies?
6. Is there a relationship among teachers' reading about AI, utilising technology in education, and following current technologies?

METHOD

Research Design

In this study, in which teachers' awareness of AI is examined in terms of various variables and the relationship between these variables is discussed, comparison and correlational relational survey models, which are among the general survey methods, were used. While the comparison type relational survey model is used when examining whether the dependent variable changes across independent variable groups, the correlational relational survey model is used to determine the relationship between variable groups and the level and direction of the relationship (Karasar, 2012). The independent variables of the study consist of

teachers' gender, taking part in the project, reading about AI, using technology in education and following current technologies. The dependent variable of the study is teachers' awareness of AI.

Population and Sample

The population of this study consists of 3,976 teachers working in the province of Kars, where the research was conducted. It is noted that for a population size of 4,000, a minimum sample size of 351 is required at a significance level of .05 (Büyüköztürk et al., 2015). Accordingly, the 744 participants reached in this study represent a statistically sufficient sample size; however, since numerical sufficiency alone does not guarantee generalizability to the entire population—particularly in purposive sampling—the sampling process and the structure of the diversity within the sample are described in further detail. For the selection of participants, "maximum variation sampling"—a type of purposive sampling—was employed. Maximum variation sampling involves identifying diverse cases related to the research problem within the population and conducting the study based on these varied instances (Büyüköztürk et al., 2015). To ensure diversity and enrich the study group, care was taken to include teachers from various socioeconomic backgrounds, different school levels (primary, middle, and high schools), and diverse subject specializations, drawn from the provincial center, districts, and villages. During the data collection process, geographical distribution and accessibility were taken into account: teachers in the provincial center were reached via face-to-face surveys, while those in the districts and villages were reached through online surveys. Participation was based on a voluntary principle, and efforts were made to ensure a heterogeneous distribution in terms of gender, professional seniority, subject specialization, and school type. It is anticipated that the multifaceted diversity among teachers will yield more valid and in-depth data regarding their awareness of artificial intelligence. Furthermore, the primary objective of purposive sampling approaches—such as maximum variation sampling—is not to make precise statistical generalizations about the entire population, but rather to uncover common patterns and diversity across different contexts. Consequently, the findings obtained have been evaluated within the framework of the specific context in which the study was conducted and the limitations inherent to the chosen sampling method. The distribution of these differences is given in Table 1.

Table 1

Demographic characteristics of the participants

		<i>f</i>	%
Gender	Male	298	40
	Female	446	60
Professional Seniority	1-5 Years	240	32.3
	6-10 Years	138	18.5
	11-15 Years	133	17.9
	16-20 Years	125	16.8
	21 and over	108	14.5
Major	Preschool	63	8.5
	Primary School	213	28.6
	Quantitative Sciences	119	16
	Verbal Sciences	115	15.5
	Special Education	31	4.2
	Guidance and Psychological Counselling	23	3
	Information Technologies	16	2.1
	Physical Education	43	5.7
	Art Education	121	16.2
	Kindergarten	47	6.3
School Type	Primary School	258	34.7
	Secondary School	261	35.1
	High School	178	23.9

When Table 1 is examined, it can be said that the teachers in the sample differ in terms of gender, professional seniority, major and type of school they work in, and this provides diversity in the sample.

Data Collection Tool

The data collection tool of the study consists of two parts: Personal Information Form and Teachers' AI Awareness Scale.

In the personal information form, which is the first part of the data collection tool, the participants' gender (male, female), professional seniority (1-5 years, 6-10 years, 11-15 years, 16-20 years, 21 years and above), branch (preschool, primary school, quantitative sciences, verbal sciences, special education, guidance and psychological counselling, information technologies, physical education, art

education), type of school (kindergarten, primary school, secondary school, high school), taking part in scientific projects (yes, no), reading about AI (yes, no), utilizing technology in education (frequently, sometimes, never) and following current technologies in education (frequently, sometimes, never) were included. The branches of the participants were grouped according to quantitative sciences (mathematics, science, biology, chemistry, physics, etc.), verbal sciences (history, social sciences, geography, etc.) and other (music, physical education, visual arts, etc.).

The second part of the data collection tool is the Teachers' AI Awareness Scale. The scale was developed by Ferikoğlu and Akgün (2022). This scale consists of 51 items in five-point Likert-type scale. The scale consists of four sub-dimensions: Practical Knowledge, Belief-Attitude, Ability to Associate and Theoretical Knowledge. Ferikoğlu and Akgün (2022) calculated the general Cronbach's Alpha reliability value of the scale as 0.97. In order to determine the reliability of the data within the scope of the research conducted by us, the Cronbach's Alpha reliability value was examined through the SPSS 22.0 package program, and this value was calculated as .95. In addition, Cronbach's Alpha reliability value was determined as .89 for the Practical Knowledge sub-dimension consisting of 16 items, .90 for the Belief-Attitude sub-dimension consisting of 14 items, .86 for the Ability to Associate sub-dimension consisting of 10 items and .86 for the Theoretical Knowledge sub-dimension consisting of 11 items. Considering these values, it can be said that the data obtained are reliable.

Data Collection Process

For this study, ethical approval was obtained from the Social and Human Sciences Scientific Research and Publication Ethics Committee of Kafkas University (dated 07.06.2023, numbered 29). Following this ethical approval, official authorization was secured from the Kars Provincial Directorate of National Education to facilitate the participation of teachers in the study. Data were collected from teachers working in the city center through the in-person distribution of data collection instruments and voluntary participation forms. To reach teachers working in districts and villages, the same forms were converted into an online format (Google Forms) and distributed digitally. The data collection process took place between 06.11.2023 and 11.11.2023; for the online administration, measures such as IP restrictions and session controls were implemented to prevent duplicate participation. Regarding the distribution of participants by method and location, 410 teachers were reached through in-person surveys, and 348 teachers were reached via online surveys. In both data collection

methods, participants were informed that the study was based on voluntary participation and that they could withdraw at any stage. A total of 802 responses were received; of these, 44 individuals declined to sign the voluntary participation form or complete the survey. From the remaining 758 responses, 14 forms—containing outliers, incomplete entries, or erroneous markings—were excluded from the analysis based on established exclusion criteria. Thus, the analysis process was conducted using data from a total of 744 teachers. From a methodological standpoint, the fact that data were collected face-to-face in the provincial center, while being gathered online in districts and villages, meant that the mode of administration varied in conjunction with the geographical location. This constitutes a limitation of the study, as it introduces potential effects that may stem from the differences in data collection conditions.

Data Analysis

A total of 758 responses obtained by the researchers were first transferred to the Microsoft Excel 2016 package program. Then, 14 responses that were decided to be incorrectly or incompletely coded were excluded from the scope of the research. The analysis of the research was carried out with the data obtained from 744 participants.

The valid data obtained from the AI Awareness Scale of Teachers were analysed using the SPSS 22.0 package program. The Kolmogorov-Smirnov test (Durmuş, Yurtkoru, & Çinko, 2013), which is used for samples of 50 and above to determine whether the data were normally distributed, and the skewness and kurtosis values were examined and the values obtained are presented in Table 2.

Table 2
Normality test findings

Statistic	Kolmogorov-Smirnov		Skewness	Kurtosis
	df	<i>p</i>		
.132	744	.18	-.492	-.035

If the *p* value obtained as a result of the Kolmogorov-Smirnov analysis is greater than .05 and the skewness and kurtosis values are in the range of +2 and -2, it is accepted that the data have a normal distribution (Büyüköztürk, 2011; Durmuş et al., 2013; George & Mallery, 2010). Accordingly, when the results obtained in Table 2 are examined, it is seen that the Kolmogorov-Smirnov test values ($p>.05$) and kurtosis (-.035) and skewness (-.492) values support the normality assumption.

Investigation of Teachers' Awareness of Artificial Intelligence

After it was determined that the data had a normal distribution, the scores of the teachers' AI Awareness Scale and the sub-dimensions of this scale were analysed with Independent Samples T Test in terms of gender, taking part in a scientific project and reading from any source on AI. In addition, it was determined that the “never” option for the variables of utilizing technology in education and following current technologies for education, for which three different options (Frequently, Sometimes and Never) were presented to the teachers for coding, was not specified by the teachers. For this reason, the analyses for these variables were also analysed with Independent Samples T Test. In addition, correlation analysis was performed to find out whether there is a relationship between the variables, and if there is a relationship, the direction and strength of this relationship. Statistical significance value was accepted as $p < .05$ for all analyses. According to Durmuş et al. (2013) the Pearson correlation coefficient is interpreted as weak ($< .50$), moderate ($.50-.70$) and strong ($> .70$) if a relationship is detected ($p < .05$). Pearson correlation coefficient also provides information about the direction of the relationship. Accordingly, a negative coefficient indicates that the relationship is inversely proportional, while a positive coefficient indicates that the relationship is directly proportional.

FINDINGS AND INTERPRETATIONS

The Independent Samples T Test was used to examine whether teachers' awareness levels towards AI differed in terms of gender and the related findings are presented in Table 3.

Table 3

Examination of teachers' awareness of AI in terms of gender

Scale/Subdimension	Groups	N	$\bar{X}$	Sd	df	t	p
Practical Knowledge	Female	446	3.80	.47	742	1.379	.168
	Male	298	3.85	.56			
Belief-Attitude	Female	446	3.40	.59	742	2.272	.023*
	Male	298	3.50	.64			
Associativity	Female	446	3.40	.57	742	2.225	.026*
	Male	298	3.50	.63			
Theoretical Knowledge	Female	446	3.57	.54	742	.114	.909
	Male	298	3.58	.59			
Scale Overall	Female	446	3.56	.45	742	1.812	.070
	Male	298	3.63	.52			

* $p < .05$ level is significant.

According to Table 3, it is seen that there is no significant difference in the sub-dimensions of practical knowledge, theoretical knowledge and the overall scale according to the gender of the teachers ($p>.05$). In contrast, a significant difference was found in the sub-dimensions of belief-attitude and associativity ($p<.05$). It was determined that this difference was in favour of male teachers in the sub-dimensions of belief-attitude ($\text{Male}\bar{X}=3.50>\text{Female}\bar{X}=3.40$) and associativity ($\text{Male}\bar{X}=3.50>\text{Female}\bar{X}=3.40$). In this case, it can be said that male teachers have more advanced beliefs, attitudes and associations with AI than female teachers.

The results of the analysis conducted to determine whether there is a difference in the awareness levels of teachers with AI according to whether they are involved in a scientific project or not are presented in Table 4.

Table 4

Examination of teachers' awareness of AI in terms of taking part in a scientific project

Scale/Subdimension	Groups	N	$\bar{X}$	Sd	df	t	p
Practical Knowledge	Those who do	321	3.93	.49	742	3.055	.002*
	Those who do not	423	3.79	.50			
Belief-Attitude	Those who do	321	3.53	.68	742	2.226	.026*
	Those who do not	423	3.41	.58			
Associativity	Those who do	321	3.60	.67	742	3.830	.000*
	Those who do not	423	3.40	.57			
Theoretical Knowledge	Those who do	321	3.70	.63	742	3.158	.002*
	Those who do not	423	3.54	.53			
Scale Overall	Those who do	321	3.71	.54	742	3.509	.000*

Investigation of Teachers' Awareness of Artificial Intelligence

Those 423 3.56 .46
who do
not

p<.05 level is significant.

As shown in Table 4, teachers' AI awareness differed significantly by participation in a scientific project across all four subdimensions and the overall scale ($p < .05$). The differences favoured teachers who had participated in a scientific project for practical knowledge (participants: $M = 3.93$; non-participants: $M = 3.79$), belief-attitude ($M = 3.53$ and $M = 3.41$, respectively), associativity ($M = 3.60$ and $M = 3.40$, respectively), theoretical knowledge ($M = 3.70$ and $M = 3.54$, respectively), and the overall scale ($M = 3.71$ and $M = 3.56$, respectively). These findings indicate that participation in scientific projects is associated with higher AI awareness among teachers; however, the study design does not establish a causal effect.

The results of the analysis examining whether teachers' AI awareness differed according to whether they had read an article, book or webpage about AI are presented in Table 5.

Table 5
Examination of teachers' awareness of AI in terms of their reading about AI

Scale/Subdimension	Groups	N	$\bar{X}$	Sd	df	t	p
Practical Knowledge	Readers	399	3.91	.52	742	5.033	.000*
	Non-readers	345	3.72	.47			
Belief-Attitude	Readers	399	3.49	.60	742	2.338	.020*
	Non-readers	345	3.38	.62			
Associativity	Readers	399	3.53	.59	742	4.317	.000*
	Non-readers	345	3.34	.59			
Theoretical Knowledge	Readers	399	3.65	.55	742	4.101	.000*
	Non-readers	345	3.48	.55			
Scale Overall	Readers	399	3.66	.47	742	4.562	.000*
	Non-readers	345	3.50	.47			

p<.05 level is significant.

As seen in Table 5, it was determined that there was a significant difference in all sub-dimensions and the scale in general between the teachers who read about AI and the teachers who did not read ($p<.05$). In addition, these differences were found to be significant in practical knowledge (readers $\bar{X}$ =3.91>non-readers $\bar{X}$ =3.72), belief-attitude (readers $\bar{X}$ =3.49>non-readers $\bar{X}$ =3.38), associativity (readers $\bar{X}$ =3.53>non-readers $\bar{X}$ =3.34), theoretical knowledge (readers $\bar{X}$ =3.65>non-readers $\bar{X}$ =3.48) sub-dimensions and overall scale (readers $\bar{X}$ =3.66>non-readers $\bar{X}$ =3.50) in favour of teachers who read about AI. Based on this finding, it can be said that reading about AI through articles, books or web pages significantly affects teachers' awareness of AI.

In order to determine the teachers' use of technology in education, 'often', 'sometimes' and 'never' options were presented and it was determined that only 'often' or 'sometimes' options were preferred by the teachers. Therefore, Independent Samples *t*-test was used for the analysis of the two groups. The findings related to this analysis are presented in Table 6.

Table 6

Examination of teachers' AI awareness in terms of their use of technology in education

Scale/Subdimension	Groups	N	$\bar{X}$	Sd	df	t	p
Practical Knowledge	Often	413	3.87	.49	742	4.295	.000*
	Sometimes	331	3.70	.53			
Belief-Attitude	Often	413	3.48	.60	742	2.666	.000*
	Sometimes	331	3.35	.61			
Associativity	Often	413	3.51	.58	742	4.635	.000*
	Sometimes	331	3.29	.60			
Theoretical Knowledge	Often	413	3.63	.56	742	3.852	.000*
	Sometimes	331	3.46	.52			
Scale Overall	Often	413	3.64	.47	742	4.448	.000*
	Sometimes	331	3.47	.47			

* $p<.05$ level is significant.

As seen in Table 6, there are significant differences in all sub-dimensions and the scale in terms of teachers' utilisation of technology in education ($p<.05$). These differences are related to practical knowledge (often $\bar{X}$ =3.87>sometimes $\bar{X}$ =3.70), belief-attitude (often $\bar{X}$ =3.48>sometimes $\bar{X}$ =3.35), associativity (often $\bar{X}$ =3.51>sometimes $\bar{X}$ =3.29), theoretical knowledge (often $\bar{X}$ =3.63>sometimes $\bar{X}$ =3.46) sub-dimensions, and the scale in general (often $\bar{X}$ =3.64>sometimes $\bar{X}$ =3.47) in favour of teachers who frequently use

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technology in education. In addition, the fact that ‘often’ or ‘sometimes’ options were preferred by all the teachers allows us to comment on the teachers' utilization of technology in education. Accordingly, all the teachers benefit from technology in education, although the frequency of using technology varies.

‘Often’, ‘sometimes’ and ‘never’ options were presented in order to determine the status of teachers' following current technologies and it was determined that only ‘often’ or ‘sometimes’ options were preferred by the teachers for this variable. Therefore, Independent Samples *t*-test was used for the analysis of the two groups. The findings related to this analysis are presented in Table 7.

Table 7

Examining teachers' artificial intelligence awareness in terms of their ability to follow current technologies

Scale/Subdimension	Groups	N	$\bar{X}$	Sd	df	t	p
Practical Knowledge	Often	387	3.90	.53	742	4.373	.000*
	Sometimes	357	3.74	.47			
Belief-Attitude	Often	387	3.51	.62	742	3.338	.001*
	Sometimes	357	3.36	.59			
Associativity	Often	387	3.57	.60	742	6.298	.000*
	Sometimes	357	3.30	.56			
Theoretical Knowledge	Often	387	3.65	.58	742	4.086	.000*
	Sometimes	357	3.49	.51			
Scale Overall	Often	387	3.67	.50	742	5.175	.000*
	Sometimes	357	3.49	.44			

**p*<.05 level is significant.

As seen in Table 7, there are significant differences (*p*<.05) in all sub-dimensions and in the scale in terms of teachers' following current technologies. These differences are related to practical knowledge (often $\bar{X}$ =3.90>sometimes $\bar{X}$ =3.74), belief-attitude (often $\bar{X}$ =3.51>sometimes $\bar{X}$ =3.36), associativity (often $\bar{X}$ =3.57>sometimes $\bar{X}$ =3.30), theoretical knowledge (often $\bar{X}$ =3.65>sometimes $\bar{X}$ =3.49) sub-dimensions and the overall scale (often $\bar{X}$ =3.67>sometimes $\bar{X}$ =3.49) in favour of teachers who frequently follow current technologies. In addition, the fact that ‘often’ or ‘sometimes’ options were preferred by all teachers can be said that teachers follow current technologies, although their frequency varies.

Whether there is a relationship between teachers' reading articles, books and web pages related to AI, following current technologies for education and utilising

technology in education was examined by calculating Pearson correlation coefficient and the findings are presented in Table 8.

Table 8

Correlation findings between variables

N	Variables	r	p
744	Reading about AI - Following current technologies for education	.164	.000*
	Reading about AI - Utilising technology in education	.139	.000*
	Following current technologies for education - Utilising technology in education	.454	.000*

* $p < .05$ level is significant.

It was determined that there is a significant relationship between ‘reading about AI’ and ‘following current technologies for education’ ($p < .05$), and this relationship is weak and positive ($r = .164$) (Table 8). It was observed that there was a significant relationship between ‘reading about AI’ and ‘utilising technology in education’ ($p < .05$), and this relationship was weakly positive ($r = .139$). Finally, it was seen that there was a significant relationship between ‘following current technologies for education’ and ‘utilising technology in education’ ($p < .05$), and this relationship was weakly positive ($r = .454$). Therefore, it can be said that teachers' reading about AI, following current technologies and utilizing technology in education are directly proportional to each other.

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

Considering that the factors affecting teachers' artificial intelligence awareness levels may indirectly affect the integration of artificial intelligence in educational environments, it can be considered that the relevant study provides important findings about these variables. The findings obtained in this regard are discussed and suggestions are made.

While teachers' awareness of AI did not differ in the sub-dimensions of practical knowledge, theoretical knowledge and the scale as a whole according to gender variable, there was a significant difference in favour of male teachers in the sub-dimensions of belief-attitude and associativity. Based on these findings, it can be said that female and male teachers are similar in terms of theoretical knowledge and practical knowledge of AI. In contrast to this finding, the findings of the previous study conducted by AlKanaan (2022) show that female pre-service

teachers' awareness of using AI is at a low level. On the other hand, gender has been evaluated as an important determinant in the use of AI (Kim & Shin, 2021; Ofosu-Ampong, 2023). However, it has been determined by different studies that teachers' acceptance of using AI applications in teaching processes does not change in terms of gender (Al Darayseh, 2023) because artificial intelligence challenges gender stereotypes in a positive way (Manasi et al., 2022). The reason for this situation can be seen as the widespread use of AI in learning-teaching environments (Guan et al., 2020), its rapid transformation of education (Igbokwe, 2023), its widespread use in the development of learning-teaching tools (Crompton et al., 2024), its global impact (Gocen & Aydemir, 2020) and its increasing use (Wollny et al., 2021), attracting the attention of not only male teachers but also female teachers. It is also stated that the perception of the ease of use of AI is an important factor affecting the acceptance of AI (Scherer & Teo, 2019). Considering this situation, it can be argued that female teachers' awareness of AI practical knowledge was effective in achieving similar results with male teachers throughout the scale. In addition to these findings, it was determined that male teachers had more positive beliefs and attitudes towards AI than female teachers and also had a more positive difference in associating AI with human life. Considering that women's anxiety about tools with AI technologies and anxiety about learning AI is higher than men (Aytaç, 2022), it can be expected that this anxiety may negatively affect beliefs and attitudes towards AI. In addition, it can be argued that male teachers can associate AI with different areas of life more easily because their awareness of AI applications is more advanced (İçöz & İçöz, 2024) and they include AI applications more in their lessons (Yazıcı & Erkoç, 2023). Additionally, considering that men are more competent in artificial intelligence than women, it can be said that the research findings are supported (Ahn et al., 2022) because it has been shown that women are passive in the use of artificial intelligence-based tools (Ofosu-Ampong, 2023). In order to eliminate these differences between genders regarding AI, teachers can be given applied training sessions about AI. In addition, it should be taken into consideration that male and female teachers may have different support needs for AI. Therefore, it may be recommended that future research should focus on these support needs on the basis of gender.

It was determined that the AI awareness of the teachers who took part in a scientific project was significantly positive compared to the teachers who did not take part in a scientific project. Based on this, it can be said that teachers who take part in scientific projects encounter AI and applications related to AI. When focusing on interdisciplinarity in scientific project studies where teachers have the opportunity to collaborate and conduct research with teachers from different

disciplines is considered as an important element (Fomin, 2023), it can increase the opportunities for teachers to encounter the concept of AI and positively affect their awareness of this concept because interdisciplinary teacher studies increase the interaction between teachers and provide a collaborative working environment, they encourage them to think innovatively and improve practices (Mouraz et al., 2023). Another support for this is that teachers who participate in the interdisciplinary teaching process have transformational learning experiences (Veishene & Dsouza, 2022). Therefore, teachers can be expected to transform their learning-teaching environments with the innovative technologies they encounter. Considering that AI is also an innovative technology in education (Chen et al., 2020a; Kamalov et al., 2023), teachers' awareness of this concept may have increased. Based on this finding, research can be conducted to obtain detailed information about the place and importance of AI in these projects by investigating the trends of the subjects and objectives of the scientific projects in which teachers are involved. In addition, the cooperation between teachers working in different disciplines in these projects and the effects of this cooperation can also be addressed in future studies. Interaction and information exchange between teachers can be increased by encouraging teachers to participate in scientific projects where cooperation and communication between teachers is high.

It was determined that the AI awareness of teachers who read any articles, books or web pages on AI was higher than the teachers who did not read about the related subject. Reading about any subject can show that individuals are interested in that field. This situation depends on factors such as teachers' interest in technology and digitalisation, their perspectives and beliefs (Tobinski, 2022; Velandar et al., 2024). While these factors determine the interest of teachers, it can be expected that this interest will affect the reading about AI and, accordingly, the state of knowledge about AI. In addition, although teachers' demand for utilising AI in current life and learning is high, their demand for learning the concept and principles of AI is low (Kim & Han, 2020). Accordingly, considering that there is a significant gap in teachers' technological and content knowledge of AI (Yue et al., 2024), the determinants of these factors gain importance. Looking at the recent developments related to AI in general, it can be seen that this concept has gained importance and has been integrated with many fields. While the interest in the adoption and development of the use of AI for educational purposes (Chen et al., 2020a) has increased the knowledge sharing of experts in this field, it has enriched the opportunities of individuals who follow the developments in the field with increasing information resources to learn about the concept of AI. Therefore, it can be said that information sources such as social media, media,

web browsing or articles, books, journals have gained diversity in terms of AI. The neutral, negative or positive ways of presenting AI in these sources (Gherheş & Obrad, 2018) may also have an impact on the previously mentioned elements. Research can be conducted to obtain detailed data on teachers' sources of learning about AI and the effect of these sources on teachers' perceptions and awareness of AI. Based on these studies, various reliable and need-based information resources about AI can be created for teachers.

It was determined that as the frequency of teachers' utilisation of technology in education increased, their awareness of AI increased. The use and adoption of new technologies in education paves the way for the intensive use of AI (Chen et al., 2020a) because AI provides new opportunities and potentials for educational innovations (Chen et al., 2020b). These opportunities and potentials include creating intelligent learning environments such as detecting behaviours, providing learning recommendations, and building predictive models (Rowe, 2019; Chen et al., 2020c) and promoting a student-centered approach (Luan et al., 2020). Nevertheless, some teachers lack confidence in the use of AI in education (Lee, 2021) and believe that AI negatively affects teaching-learning quality and assessment (Shin, 2020). However, AI-based tools also provide new pedagogical opportunities for teaching-learning tools (Celik, 2023). Teachers can utilize AI to identify learners' affective and cognitive needs (Chen et al., 2021), improve learning performance (Papamitsiou & Economides, 2014), and monitor learners' learning processes (Wang & Zhao, 2020). In addition, AI-based tools provide significant convenience for teachers to plan and implement their lessons and evaluate the teaching process (Celik et al., 2022). Therefore, considering that learning-teaching environments will be rapidly surrounded by AI and its sub-fields (Ng et al., 2021), AI technologies may be one of the technologies that teachers benefit from in education. Therefore, teachers' utilization of technology in education may create awareness about AI. However, research on the place and importance of AI among the technologies used by teachers in education can be conducted to popularize AI in learning and teaching environments. On the other hand, teachers' access to AI technologies can also be investigated and important suggestions can be presented by researchers.

It was determined that teachers who follow current technologies have awareness of AI. Considering that the education sector is not independent from other sectors but is related to other dynamic sectors affected by information systems, the integration of technological developments into the education sector is inevitable (Owoc et al., 2021). Therefore, with this integration, teachers' need for new technologies in learning-teaching environments is increasing day by day (Szymkowiak et al., 2021) because adaptive learning methods are needed for the

education of new generation learners (Generation Z) who use social media and the internet intensively (Ding et al., 2017). While the use of current technologies in learning and teaching processes is of utmost importance, the use of AI in education is also evaluated in this direction (Satir & Korucu, 2023). Therefore, the rapid advancement in technology has accelerated the utilization of AI in the learning and teaching process (Hwang et al., 2020). It can be argued that this situation leads teachers to use AI in education. It can be said that the orientation that teachers are in with this development positively affects their awareness of AI. Based on this finding, it can be seen as an important area to conduct research on which technologies teachers follow and why, and the reflections of these situations on educational environments.

In conclusion, it was revealed that there was a significant relationship between teachers' reading from any source related to AI, following current technologies for education and utilizing technology in education. It can be argued that teachers' reading about AI affects them to follow current technologies and this effect paves the way for them to benefit from technology in education. The main reason why teachers read about AI is their curiosity about this field can be seen as an important factor because curiosity supports the development of interest (Hidi & Renninger, 2020) and in this way, the individual can be encouraged to acquire knowledge by reading about the subject of interest. However, it can be said that future research is needed to clarify this situation and to obtain detailed findings. Through these studies, it can be examined which reasons lead teachers to read and research about AI and to use these technologies in education.

Limitations of the Study

This research is limited to the 2023-2024 academic year. In addition, the research participants consisted of teachers working in a specific province. Research findings are limited to the data obtained with quantitative data collection tools. Although teachers were offered the options of 'Frequently, Sometimes and Never' in the data collection tool, no rating was made.

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GENİŞLETİLMİŞ ÖZET

Yapay zekâ kavramı ilk kez 1956 yılında, Dartmouth konferansında John McCarthy tarafından kullanılmıştır (Padoan & Plebani, 2022). McCarthy'ye (2004) göre zekâ, “dünyada hedeflere ulaşma yeteneğinin hesaplamalı kısmı” iken, yapay zekâ ise “akıllı bilgisayar programları yapma bilimi ve mühendisliği”dir. Pannu (2015) ise yapay zekâyı; algılama, muhakeme etme, bilgi/veri toplama, öğrenme, iletişim kurma ve nesneleri yönetme becerisine

sahip akıllı makinelerin ve yazılımların oluşturulması ve geliştirilmesi olarak tanımlar. Yapay zekâ, makine veya bilgisayarların yalnızca bir komutu yerine getirmesinin ötesine geçerek veri toplamalarını ve bu verilere dayanarak bir sonuca ulaşmalarını sağlar. Söz konusu sonuçların kişisel ve geçici etkenlerden etkilenmemesi; duygulara değil, elde edilen verilere dayanması, yapay zekânın daha gerçekçi sonuçlar üretme konusundaki avantajını ortaya koyar (Khanzode & Sarode, 2020). Böylece hata payı en aza indirgenebilir (Jaiswal, 2021).

Amaç ve Kapsam: Bu çalışmada, öğretmenlerin yapay zekâya (YZ) ilişkin farkındalıkları; cinsiyet, bilimsel projelere katılım, yapay zekâ hakkında okumalar yapma, eğitimde teknoloji kullanımı ve güncel teknolojileri takip etme gibi çeşitli değişkenler açısından incelenmiştir. Çalışmanın bağımsız değişkenlerini; öğretmenlerin cinsiyeti, bir projede yer alma durumları, yapay zekâ hakkında okuma yapmaları, eğitimde teknoloji kullanımı ve güncel teknolojileri takip etmeleri oluşturmaktadır. Çalışmanın bağımlı değişkeni ise öğretmenlerin yapay zekâya yönelik farkındalıklarıdır.

Yöntem: Öğretmenlerin yapay zekâya ilişkin farkındalıklarının çeşitli değişkenler açısından incelendiği ve bu değişkenler arasındaki ilişkinin ele alındığı bu çalışmada, genel tarama yöntemlerinden olan karşılaştırmalı ve ilişkisel tarama modelleri kullanılmıştır. Bu çalışmanın evrenini, araştırmanın yürütüldüğü Kars ilinde görev yapan 3.976 öğretmen oluşturmaktadır. 4.000 kişilik bir evren büyüklüğü için, 0,05 anlamlılık düzeyinde en az 351 kişilik bir örneklem büyüklüğünün gerekli olduğu belirtilmektedir (Büyüköztürk ve diğerleri, 2015). Bu doğrultuda, çalışmada ulaşılan 744 katılımcı, istatistiksel açıdan yeterli bir örneklem büyüklüğünü temsil etmektedir; ancak sayısal yeterlilik tek başına —özellikle amaçlı örnekleme yönteminde— tüm evrene genellenebilirliği garanti etmediğinden, örnekleme süreci ve örneklem içindeki çeşitliliğin yapısı daha ayrıntılı olarak açıklanmıştır. Katılımcıların seçiminde, bir tür amaçlı örnekleme yöntemi olan "maksimum çeşitlilik örnekleme" kullanılmıştır.

Bulgular: Bulgular, öğretmenlerin yapay zekâ farkındalığının "inanç-tutum" ve "ilişkisel" alt boyutlarında cinsiyete göre farklılık gösterdiğini ortaya koymaktadır. Ayrıca; yapay zekâ hakkında okumalar yapan, bilimsel projelere katılan, eğitimde teknolojiyi kullanan ve güncel teknolojileri takip eden öğretmenlerin yapay zekâ farkındalıklarının daha yüksek olduğu saptanmıştır. Yapay zekâ hakkında okuma yapma, eğitimde teknoloji kullanımı ve güncel teknolojileri takip etme arasında zayıf, pozitif yönlü bir korelasyon belirlenmiştir.

Tartışma ve Sonuç: Sonuç olarak, öğretmenlerin yapay zekâ ile ilgili herhangi bir kaynaktan okuma yapmaları, eğitim alanındaki güncel teknolojileri takip

etmeleri ve eğitimde teknolojiden yararlanmaları arasında anlamlı bir ilişki olduğu ortaya konmuştur. Öğretmenlerin yapay zekâ üzerine okumalar yapmasının, onları güncel teknolojileri takip etmeye yönlendirdiği ve bu durumun da eğitimde teknolojiden faydalanmalarına zemin hazırladığı söylenebilir. Öğretmenlerin yapay zekâ hakkında okuma yapmalarının temelinde, bu alana duydukları merakın önemli bir faktör olduğu düşünülebilir; zira merak, ilginin gelişmesini destekler (Hidi & Renninger, 2020) ve bu sayede birey, ilgi duyduğu konu hakkında okumalar yaparak bilgi edinmeye teşvik edilebilir. Bununla birlikte, söz konusu durumu daha net bir şekilde açıklayabilmek ve ayrıntılı bulgular elde edebilmek için gelecekte yapılacak araştırmalara ihtiyaç duyulduğu ifade edilebilir. Bu tür çalışmalar aracılığıyla, öğretmenleri yapay zekâ konusunda okuma ve araştırma yapmaya, ayrıca bu teknolojileri eğitimde kullanmaya yönlendiren temel nedenler incelenebilir.

Conflict of Interest Statement

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