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Research Article

Investigation of Artificial Intelligence literacy levels of music teachers

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Abstract

The aim of this study is to determine the artificial intelligence literacy levels of music teachers. The research was conducted using the survey model under the quantitative research paradigm. While determining the study group, easily accessible case sampling technique, which is one of the purposeful sampling methods, was used and 132 music teachers working in public schools constituted the study group. In the data collection process, "Artificial Intelligence Literacy Level Scale" was used to measure the artificial intelligence literacy levels of music teachers. For the analysis of the data, normality analyses were performed first and accordingly, it was decided which statistical analyses to use and independent groups t-test and one-way Analysis of Variance (Anova) were used in the study. The artificial intelligence literacy levels of the teachers were examined in terms of various variables and the data were tabulated and reported. As a result of the research, it was determined that the average level of artificial intelligence literacy of music teachers was at a medium level. In terms of gender variable, it was determined that the artificial intelligence literacy levels of music teachers were higher than those of female music teachers in the "Artificial Intelligence Literacy Scale" general total and "Awareness" sub-dimension. According to the marital status variable, in the "Evaluation" sub-dimension, it was seen that single music teachers had higher levels of AI literacy compared to married teachers. However, there was no significant difference according to professional seniority, graduation status, faculty of graduation and frequency of internet use. However, it was concluded that the artificial intelligence literacy levels of music teachers who have knowledge about artificial intelligence, artificial intelligence programs and use artificial intelligence programs and these programs in music and music education are significant. It has been observed that there is a direct relationship between artificial intelligence literacy, knowledge and frequency of use, and as the level of knowledge and awareness increases, teachers' skills in evaluating and using artificial intelligence increase.

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Introduction

Although it is difficult to determine the exact starting point of any movement, but the Dartmouth Summer Research Project, which took place in America in 1956, is considered the event that started artificial intelligence as a research field (Moor, 2006). The concept of artificial intelligence is a computer system that performs cognitive tasks such as learning and problem solving (Loder & Nicholas, 2018), which are generally associated with the human brain (Russell & Norvig, 2010), and improves itself by utilising experiences (Obschonka & Audretsch, 2020). Although there are different

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definitions of artificial intelligence, the common view can be based on two basic concepts: "intelligent programming" and "humanoid responses" (Arslan, 2020).

With the advancement of global science and technology, artificial intelligence technology is expanding at a great pace, constantly updated and used in various fields (Pannu, 2015). Technological progress and changing the way society functions in the globalised world make it vital that modern technology, especially artificial intelligence, is used in education as it is used in other fields (Bamigbola, 2021). Artificial intelligence enables effective and efficient teaching through a variety of applications such as smart tutors for content delivery, providing feedback and progress monitoring (Roll & Wylie, 2016) and personalised instruction used to provide tailored support and increase awareness of knowledge gaps (Guan et al., 2020). In this direction, the fact that artificial intelligence offers personalised teaching applications for students and plays a supportive role in the educational process has made the integration of artificial intelligence applications into education inevitable.

Today, there are artificial intelligence tools that are widely used in schools and universities. It is possible to group some of them into three broad categories as student, teacher and system oriented by accepting that they combine more than one categorical feature. Student-oriented artificial intelligence tools are software that students use to receive and understand new information and respond to their individual needs. It is often referred to as 'intelligent tutoring systems' or 'applicable' and can be explained as organising and grading learning materials according to a student's needs; selecting strengths, weaknesses or gaps in knowledge; providing automatic feedback and facilitating collaboration between students (Baker & Smith, 2019). The most common examples of artificial intelligence systems for students can also be explained as online tutors or smart teaching systems (Miwa et al., 2014). Therefore, incorporating AI techniques into educational technologies can identify students' learning needs and make it possible to provide differentiated content, feedback and instruction (Luckin et al., 2022).

Teacher-oriented AI can help teachers reduce their workload, gain insights about students, and innovate in their classrooms. It allows teachers to automate tasks (assessment, plagiarism detection, management, feedback), gain insights into the progress of a class or student, and enable teachers to develop new teaching tools (Baker & Smith, 2019). Artificial intelligence training tools have been developed to help teachers focus on organising and reflecting on the use of classroom technology, helping teachers to effectively allocate their valuable time to the students who need it most and to analyse student work to identify what are the common problems of students in the classroom (Deshpande et al., 2023).

The most widely used category of system-oriented artificial intelligence in education is the systems that help to inform and make decisions made by those who manage and administer institutions or our education system as a whole (Baker & Smith, 2019; Khoalenyane & Ajani, 2024; Xu & Ouyang, 2022).

Artificial intelligence, which is now used in almost all fields, has started to be widely used in music education. The use of artificial intelligence technology in music education and developments in this field significantly affect traditional teaching approaches and methods and make them more diverse (Zhang et al., 2024). These advances may enable the emergence of new methods and trends in music education in the future. The use of artificial intelligence in music education provides opportunities for independent teaching, intelligent electronic musical instruments, intelligent music software, and online teaching and online assistance (Yu et al., 2003). Artificial intelligence-based music education can offer students the opportunity to improve their performance and better understand musical abilities while learning to play an instrument. It can also provide a personalised education process for students learning to play instruments (Arıcı, 2023).

There are various applications for the use of artificial intelligence in music education (Jiang, 2022). Some of these applications are Earmaster, Meludia for hearing education, Yousician, Musescore for instrument education, Vanido, Vacaloid, SingSharp for voice education, Tenuto, Chord Al for music theory, and AIVA and Amper Music to support general music education.

Purpose of the Study

The aim of this study is to evaluate music teachers' artificial intelligence literacy levels in terms of various variables. In this context, answers to the following sub-problems were sought;

- How are music teachers' artificial intelligence literacy levels?
- How is the distribution of music teachers' artificial intelligence literacy according to demographic variables (gender, marital status, professional seniority, faculty of graduation, daily internet use)?
- How is the artificial intelligence literacy of music teachers who have knowledge about artificial intelligence?
- How is the artificial intelligence literacy of music teachers who have knowledge about artificial intelligence programmes?
- How is the artificial intelligence literacy of music teachers who have knowledge about artificial intelligence programmes used in music and music education?
- How is the artificial intelligence literacy of music teachers who use artificial intelligence programmes used in music and music education?
- How is the frequency of use of artificial intelligence programmes by music teachers who use artificial intelligence programmes used in music and music education?
- How is the artificial intelligence literacy of music teachers according to their frequency of using artificial intelligence programmes?

Method

Research Model

This research, in which the artificial intelligence literacy levels of music teachers were examined, was structured with the survey model, one of the quantitative research method models. Survey research typically determines participants' views on a topic, event or its characteristics (Büyüköztürk et al., 2015, p. 177).

Working Group

While determining the study group of the research, convenience sampling, one of the purposeful sampling techniques, was used. Convenience sampling is "related to the fact that it is easier to include the individuals or groups to be researched in the research process or it is easier to access them" (Yıldırım & Şimşek, 2008). The study group of the research consisted of 132 music teachers working in public institutions. The demographic data of the study group are given in Table 1.

Table 1. Study group demographic information and knowledge and use of artificial intelligence

Gender	**f**	**%**	**Marital Status**	**f**	**%**
Female	77	58,3	Married	65	49,2
Male	55	41,7	Single	67	50,8
Total	132	100	**Total**	**132**	**100**
Graduation Status	**f**	**%**	**Graduated Faculty**	**f**	**%**
Bachelor's Degree	97	73,5	Faculty of Education	76	57,6
Master's Degree	33	25,0	Conservatory	34	25,8
Doctorate	2	1,5	Faculty of Fine Arts	22	16,7
Total	132	100	**Total**	132	100
Professional Seniority	**f**	**%**	**Daily Internet Usage**	f	**%**
1-3 years	42	31,8	0-60 Minutes	6	4,5
4-6 years	27	20,5	61-120 Minutes	28	21,2
7-9 years	17	12,9	121-180 Minutes	43	32,6
10 years and above	46	34,8	181-240 Minutes	30	22,7
Total	**132**	**100**	240 minutes and over	25	18,9
			Total	132	100
Having Knowledge About Artificial Intelligence	**f**	**%**	**To Have Knowledge About Artificial Intelligence Programmes**	**f**	**%**
Yes	53	40,2	Yes	52	39,4
Partially	70	53,0	Partially	45	34,1
No	9	6,8	No	35	26,5

Total	**132**	**100**	**Total**	**132**	**100**
To Have Knowledge About Artificial Intelligence Programmes Used in Music/Music Education	**f**	**%**	**Using Artificial Intelligence Programmes Used in Music/Music Education**	**f**	**%**
Yes	19	14,4	Yes	20	15,2
Partially	32	24,2	Partially	27	20,5
No	81	61,4	No	85	64,4
Total	**132**	**100**	**Total**	**132**	**100**
Artificial Intelligence Programme Usage	**f**	**%**			
1 programme usage	74	56,1			
2 programme usage	16	12,1			
3 programme usage	23	17,4			
4 programme usage	12	9,1			
5 or more programme usage	7	5,3			
Total	**132**	**100**			

Data Collection Tools

In the study, data were collected through Google Form. Data collection tool "Artificial Intelligence Literacy Scale" developed by Wang et al. (2022) and adapted into Turkish by Çelebi et al. (2023) and 'Demographic Information Form' created by the researchers were used.

Artificial Intelligence Literacy Scale

The scale consists of 12 items and 4 sub-dimensions. In the reliability analysis of the "Artificial Intelligence Literacy Scale" adapted into Turkish by Çelebi et al. (2023), Awareness; 0.72, Use; 0.74, Evaluation; 0.76, and Ethics; 0.72 values were obtained for the sub-dimensions of the scale in the calculation of Cronbach's Alpha internal consistency coefficient. For the overall total reliability of the scale, a coefficient of 0.85 was calculated. The items in the scale were scored from 1 to 7. A seven-point Likert scale consisting of 'Strongly Disagree' and 'Strongly Agree' options was used in the scale. Since the 2nd, 5th and 7th items were 'negative items', they were reversed during the analysis. The overall total reliability coefficient of the 'Artificial Intelligence Literacy Scale' of this study was determined as α .82.

Data Analysis

Normality distribution was examined in the analysis of the data. In the normality distribution analysis, it was seen that the values for the overall total of the artificial intelligence literacy scale were Skewness -,167 and Kurtosis -,686, and for the sub-dimensions; Awareness; Skewness -,071 and Kurtosis -,347, Usage; Skewness -,340 and Kurtosis -,252, Evaluation; Skewness -,845 and Kurtosis ,080, and Ethics; Skewness -,459 and Kurtosis -,603, respectively. Normally distributed data are between -1 and +1; -1.5 and +1.5; -2.0 and + 2.0 (Büyüköztürk, 2012; George & Mallery, 2010; Tabachnik & Fidell, 2015). In the analysis of the data, t-Test for independent groups and One Way Analysis of Variance (One-way ANOVA) test were performed.

Ethics Committee

Before the data collection phase, ethical approval was obtained from the Ethics Committee of the Social and Human Sciences Research and Publication Ethics Committee of Kafkas University on 09/07/2024 with approval number 59.

Findings

Findings on Artificial Intelligence Literacy Levels of Music Teachers

Table 2. Artificial Intelligence Literacy Levels of Music Teachers

Item		**n**	$\bar{X}$	**SD**
1	I can distinguish between smart devices and non-smart devices.	132	6,40	1,23
2	*I don't know how Artificial Intelligence technology will help me.	132	4,30	1,97
3	I can define the artificial intelligence technology used in the applications and products I use.	132	4,33	1,85
4	I can skilfully use artificial intelligence applications or products to help me in my daily work.	132	4,16	1,95
5	*Learning to use a new AI application or product is often difficult for me.	132	4,96	1,81

6	I can use artificial intelligence applications or products to improve my work efficiency	132	5,24	1,76
7	After using an AI application or product for a while, I can evaluate its capacity and limits.	132	5,16	1,74
8	I can choose the most appropriate one from a variety of AI applications or products for a given task.	132	5,00	1,77
9	I can choose the appropriate one among the various solutions offered by artificial intelligence	132	5,12	1,78
10	I always follow ethical principles when using AI applications or products.	132	5,44	1,76
11	*I never pay attention to privacy and information security issues when using artificial intelligence applications or products.	132	5,46	1,83
12	I am always careful not to misuse artificial intelligence technology.	132	5,33	1,88
Total		**132**	**5,07**	**1.77**

When Table 2 was analysed, it was determined that the mean artificial intelligence literacy level of music teachers was at a medium level with a rate of 5.07.

Findings Related to Music Teachers' Gender and Artificial Intelligence Literacy

Table 3. t-Test results according to gender of music teachers

Scale	Gender	n	$\bar{X}$	SD	df	t	p
Artificial Intelligence Literacy Scale Total	Female	77	59,10	11,77	130	-2,160	,030*
	Male	55	63,80	13,03			
Awareness	Female	77	14,45	3,09	130	-2,899	,000*
	Male	55	16,10	3,41			
Usage	Female	77	13,80	3,95	130	-1,959	,052
	Male	55	15,18	4,01			
Evaluation	Female	77	14,67	4,90	130	-1,690	,096
	Male	55	16,16	5,10			
Ethics	Female	77	16,16	3,72	130	-0,269	,789
	Male	55	16,34	3,72			

*p<.05

When the artificial intelligence literacy levels of teachers are analysed in Table 3, a significant difference was found in the "Artificial Intelligence Literacy Scale General Total" and "Awareness" sub-dimension, except for the "Usage", "Evaluation" and "Ethics" sub-dimensions of the artificial intelligence literacy scale, according to the gender variable. This result was found to differ significantly in favour of male teachers ($t_{general\_total(130)}$=-2,160; p<.05). According to these findings, male teachers' artificial intelligence literacy levels are higher than female teachers.

Findings Related to Marital Status and Artificial Intelligence Literacy of Music Teachers

Table 4. t-Test Results According to Marital Status of Teachers

Scale	Marital Status	n	$\bar{X}$	SD	df	t	p
Artificial Intelligence Literacy Scale Total	Married	65	59,24	13,28	130	-1,656	,100
	Single	67	62,82	11,47			
Awareness	Married	65	14,86	3,59	130	-,962	,338
	Single	67	15,41	3,03			
Usage	Married	65	14,16	3,87	130	-,588	,558
	Single	67	14,58	4,18			
Evaluation	Married	65	14,40	5,22	130	-2,041	,043*
	Single	67	16,16	4,70			
Ethics	Married	65	15,81	4,04	130	-1,306	,194
	Single	67	16,65	3,33			

*p<.05

In Table 4, when the artificial intelligence literacy levels of the teachers were analysed according to marital status, no significant difference was found in the "Artificial Intelligence Literacy Scale" overall total, and in the "Awareness", "Usage" and "Ethics" sub-dimensions of the scale, and a significant difference was found only in the "Evaluation" sub-

dimension of the scale. According to this result, the artificial intelligence literacy levels of single teachers are higher ($t_{general\_total(130)}$=-2,041; p<.05).

Findings Related to Music Teachers' Professional Seniority and Artificial Intelligence Literacy

Table 5. One-Way Variance (Anova) Analysis Results According to Teachers' Professional Seniority

Scale	Professional Seniority	n	$\overline{X}$	SD	F	p
Artificial Intelligence Literacy Scale Total	1-3 years	42	60,83	10,78	,639	,591
	4-6 years	27	61,48	13,21		
	7-9 years	17	64,58	10,80		
	10 years and above	46	59,71	14,09		
Awareness	1-3 years	42	15,19	2,74	2,332	,078
	4-6 years	27	15,18	3,76		
	7-9 years	17	16,88	3,51		
	10 years and above	46	14,43	3,32		
Usage	1-3 years	42	14,19	3,63	,693	,558
	4-6 years	27	13,85	4,67		
	7-9 years	17	15,58	3,41		
	10 years and above	46	14,41	4,19		
Evaluation	1-3 years	42	15,45	4,00	,971	,408
	4-6 years	27	16,18	5,81		
	7-9 years	17	16,00	4,85		
	10 years and above	46	14,34	5,41		
Ethics	1-3 years	42	16,00	3,76	,158	,925
	4-6 years	27	16,25	3,40		
	7-9 years	17	16,05	3,73		
	10 years and above	46	16,52	3,91		

p>.05

When the artificial intelligence literacy levels of the teachers are analysed in Table 5, no significant difference was found in the general total and other sub-dimensions of the artificial intelligence literacy scale according to the professional seniority variable **(p>.05)**.

Findings on music teachers' graduation status and Artificial Intelligence literacy

Table 6. One-way variance (ANOVA) analysis results according to teachers' graduation status

Scale	Graduation Status	N	$\overline{X}$	SD	F	p
Artificial Intelligence Literacy Scale Total	Bachelor's Degree	97	60,37	13,09	,598	,552
	Master's Degree	33	62,81	10,45		
	Doctorate	2	65,50	16,26		
Awareness	Bachelor's Degree	97	15,04	3,25	1,788	,171
	Master's Degree	33	15,18	3,45		
	Doctorate	2	19,50	2,12		
Usage	Bachelor's Degree	97	14,28	4,35	,173	,841
	Master's Degree	33	14,69	2,92		
	Doctorate	2	13,50	4,94		
Evaluation	Bachelor's Degree	97	15,12	5,13	,233	,792
	Master's Degree	33	15,72	4,77		
	Doctorate	2	16,50	6,36		
Ethics	Bachelor's Degree	97	15,91	3,79	1,514	,224
	Master's Degree	33	17,21	3,41		
	Doctorate	2	16,00	2,82		

p>.05

When the artificial intelligence literacy levels of the teachers were analysed in Table 6, no significant difference was found in the general total and other sub-dimensions of the artificial intelligence literacy scale according to the graduation status variable **(p>.05).**

Findings Related to Music Teachers' Faculty of Graduation and Artificial Intelligence Literacy

Table 7. One-way variance (anova) analysis results according to the faculty of graduation of teachers

Scale		SS	df	MS	Graduated Faculty	n	$\bar{X}$	SD	F	p	Scheffe
Artificial Intelligence Literacy Scale Total	B.G	254,725	2	127,363	Faculty of Education	76	61,67	12,44			
	W.G	20162,790	129	156,301	Conservatory	34	61,70	12,49	,815	,445	-
	Total	20417,515	131		Faculty of Fine Arts	22	57,95	12,69			
Awareness	B.G	27,882	2	13,941	Faculty of Education	76	15,52	3,36			
	W.G	1418,383	129	10,995	Conservatory	34	14,76	2,99	1,268	,285	
	Total	1446,265	131		Faculty of Fine Arts	22	14,40	3,59			
Usage	B.G	5,590	2	2,795	Faculty of Education	76	14,50	3,87			
	W.G	2115,471	129	16,399	Conservatory	34	14,02	4,64	,170	,843	
	Total	2121,061	131		Faculty of Fine Arts	22	14,50	3,63			
Evaluation	B.G	70,288	2	35,144	Faculty of Education	76	14,90	5,12			
	W.G	3237,189	129	25,094	Conservatory	34	16,52	4,43	1,400	,250	
	Total	3307,477	131		Faculty of Fine Arts	22	14,72	5,42			
Ethics	B.G	100,703	2	50,352	Faculty of Education	76	16,73	3,59			
	W.G	1703,539	129	13,206	Conservatory	34	16,38	3,71	3,813	,025*	**1-3**
	Total	1804,242	131		Faculty of Fine Arts	22	14,31	3,64			

*p<.05, B.G: Beetwen Groups, W.G: Within Groups, S.S: Sum of Squares, M.S: Mean Square

When the artificial intelligence literacy levels of the teachers are analysed in Table 7, no significant difference was found according to the graduated faculty variable except for the 'ethics' sub-dimension of the artificial intelligence literacy scale ($F = 3,813$; $p < 0.5$). According to the result of Scheffe post-hoc test, a significant difference was found between teachers who graduated from the faculty of education (16,73±3,59) and the faculty of fine arts (14,31±3,64) in the "ethics" sub-dimension.

Findings on music teachers' frequency of daily internet use and Artificial Intelligence literacy

Table 8. One-Way Variance (Anova) Analysis Results According to Teachers' Frequency of Daily Internet Use

Scale	Daily Internet Usage	n	$\bar{X}$	SD	F	p
Artificial Intelligence Literacy Scale Total	0-60 Minutes	6	54,83	12,98		
	61-120 Minutes	28	59,64	10,65		
	121-180 Minutes	43	61,04	12,26	,636	,638
	181-240 Minutes	30	62,66	11,87		
	240 minutes and over	25	62,24	15,41		
Awareness	0-60 Minutes	6	12,16	2,92		
	61-120 Minutes	28	14,78	2,60		
	121-180 Minutes	43	15,46	3,63	1,497	,207
	181-240 Minutes	30	15,33	3,11		
	240 minutes and over	25	15,48	3,65		
Usage	0-60 Minutes	6	12,83	4,21	,690	,600
	61-120 Minutes	28	13,60	4,51		

	121-180 Minutes	43	14,46	4,09		
	181-240 Minutes	30	14,80	3,48		
	240 minutes and over	25	14,96	3,98		
Evaluation	0-60 Minutes	6	14,16	3,54		
	61-120 Minutes	28	15,89	3,45		
	121-180 Minutes	43	14,90	4,85	,246	,912
	181-240 Minutes	30	15,33	5,60		
	240 minutes and over	25	15,52	6,43		
Ethics	0-60 Minutes	6	15,66	3,88		
	61-120 Minutes	28	15,35	3,81		
	121-180 Minutes	43	16,20	3,84	,933	,447
	181-240 Minutes	30	17,20	2,96		
	240 minutes and over	25	16,28	4,12		

p>.05

When the artificial intelligence literacy levels of the teachers are analysed in Table 8, no significant difference was found in the general total and other sub-dimensions of the artificial intelligence literacy scale according to the daily internet usage frequency variable (p>.05).

Findings related to artificial intelligence literacy levels of music teachers who have knowledge about Artificial Intelligence

Table 9. One-way variance (ANOVA) analysis results regarding artificial intelligence literacy levels of music teachers who have knowledge about Artificial Intelligence

Scale		SS	df	MS	Having Knowledge About AI	n	$\bar{X}$	SD	F	p	Scheffe
Artificial Intelligence Literacy Scale Total	B.G	4407,367	2	2203,684	Yes	53	67,88	10,89			**1-2**
	W.G	16010,148	129	124,110	Partially	70	57,15	11,23	17,756	,000*	**1-3**
	Total	20417,515	131		No	9	51,22	11,81			
Awareness	B.G	246,825	2	123,412	Yes	53	16,81	3,35			
	W.G	1199,440	129	9,298	Partially	70	14,05	2,79	13,273	,000*	
	Total	1446,265	131		No	9	13,77	3,03			
Usage	B.G	406,370	2	203,185	Yes	53	16,26	3,39			**1-2**
	W.G	1714,691	129	13,292	Partially	70	13,50	3,81	15,286	,000*	**2-3**
	Total	2121,061	131		No	9	10,11	3,75			
Evaluation	B.G	508,871	2	254,436	Evet	53	17,52	3,79			
	W.G	2798,606	129	21,695	Kısmen	70	14,12	5,17	11,728	,000*	
	Total	3307,477	131		Hayır	9	11,22	4,99			
Ethics	B.G	99,156	2	49,578	Evet	53	17,28	3,47			
	W.G	1705,086	129	13,218	Kısmen	70	15,47	3,65	3,751	,026*	**1-3**
	Total	1804,242	131		Hayır	9	16,11	4,40			

*p<.05, B.G: Beetwen Groups, W.G: Within Groups, S.S: Sum of Squares, M.S: Mean Square

When the artificial intelligence literacy levels of music teachers who have knowledge about artificial intelligence are examined in Table 9, a significant difference is seen in the "Artificial Intelligence Literacy Scale" overall total and other sub-dimensions **(*p<.05).** According to the Scheffe post-hoc test result, it is seen that there are significant differences between the general total, "Awareness", "Usage" and "Evaluation" sub-dimensions of the artificial intelligence literacy scale of teachers who have knowledge about artificial intelligence. It was determined that the mean scores of the teachers who had knowledge about artificial intelligence were higher than the teachers who said "partially" and "no", and those who had knowledge about artificial intelligence "partially" were higher than the teachers who had no knowledge. In terms of the "ethics" sub-dimension, there was a significant difference between the teachers who had knowledge about artificial intelligence and the teachers who had "partially" artificial intelligence, while there was no significant difference between the teachers who had no knowledge about artificial intelligence and the other groups.

Findings regarding the artificial intelligence literacy levels of music teachers who have knowledge about Artificial Intelligence programs

Table 10. One-way variance (anova) analysis results regarding artificial intelligence literacy levels of music teachers who have knowledge about Artificial Intelligence programs

Scale		SS	df	MS	Know. AI Programs	n	X̄	SD	F	P	Scheffe
Artificial Intelligence Literacy Scale Total	B.G	5305,175	2	2652,587	Yes	45	69,02	9,79			
	W.G	15112,340	129	117,150	Partially	52	59,69	11,18	22,643	,000*	
	Total	20417,515	131		No	35	52,85	11,52			
Awareness	B.G	324,081	2	162,040	Yes	45	17,15	3,20			**1-2**
	W.G	1122,184	129	8,699	Partially	52	14,71	2,78	18,627	,000*	**2-3**
	Total	1446,265	131		No	35	13,20	2,83			
Usage	B.G	470,941	2	235,470	Yes	45	16,75	3,22			
	W.G	1650,120	129	12,792	Partially	52	13,96	3,68	18,408	,000*	
	Total	2121,061	131		No	35	11,94	3,82			
Evaluation	B.G	556,524	2	278,262	Yes	45	17,95	3,17			
	W.G	2750,953	129	21,325	Partially	52	14,67	5,04	13,048	,000*	
	Total	3307,477	131		No	35	12,80	5,44			
Ethics	B.G	99,819	2	49,910	Yes	45	17,15	3,35			
	W.G	1704,423	129	13,213	Partially	52	16,34	3,49	3,777	,025*	**1-2**
	Total	1804,242	131		No	35	14,91	4,16			

*p<.05, B.G: Beetwen Groups, W.G: Within Groups, S.S: Sum of Squares, M.S: Mean Square

When the artificial intelligence literacy levels of music teachers who had knowledge about artificial intelligence programs were examined in Table 10, a significant difference was found in the "Artificial Intelligence Literacy Scale", overall total and other sub-dimensions (*p<.05). According to the results of Scheffe post-hoc test, a significant difference was found in the general total and "Awareness", "Usage", and "Evaluation" sub-dimensions of the artificial intelligence scale, and it was revealed that the teachers who had knowledge about artificial intelligence programs had higher scores than the teachers who had 'partially' and had no knowledge about artificial intelligence, and the teachers who had "partially" knowledge about artificial intelligence had higher scores than the teachers who had no knowledge. In the "ethics" sub-dimension of the artificial intelligence scale, a significant difference was found between the teachers who answered "yes" and "no", and it was found that teachers who had knowledge about artificial intelligence programs had higher mean scores than teachers who did not have knowledge about artificial intelligence programs. Thus, as the level of artificial intelligence literacy increases, awareness, use, evaluation and ethical sensitivity increase significantly.

Findings regarding the artificial intelligence literacy levels of music teachers who have knowledge about AI programs used in music and music education

Table 11. One-way variance (ANOVA) analysis results regarding artificial intelligence literacy levels of music teachers who have knowledge about AI programs used in music and music education

Scale		SS	df	MS	Use AI Programs	n	X̄	SD	F	p	Scheffe
Artificial Intelligence Literacy Scale Total	B.G	2321,087	2	1160,544	Yes	19	68,47	11,00			
	W.G	18096,428	129	140,282	Partially	32	64,78	11,87	8,273	,000*	
	Total	20417,515	131		No	81	57,85	12,01			
Awareness	B.G	189,398	2	94,699	Yes	19	17,31	3,11			**1-2**
	W.G	1256,867	129	9,743	Partially	32	16,15	3,19	9,720	,000*	**2-3**
	Total	1446,265	131		No	81	14,23	3,09			
Usage	B.G	236,324	2	118,162	Yes	19	16,52	3,33			
	W.G	1884,737	129	14,610	Partially	32	15,75	3,32	8,088	,000*	
	Total	2121,061	131		No	81	13,33	4,09			
Evaluation	B.G	253,308	2	126,654	Yes	19	17,47	4,23	5,350	,006*	

	W.G	3054,169	129	23,676	Partially	32	16,75	4,47			
	Total	3307,477	131		No	81	14,20	5,13			
	B.G	18,661	2	9,330	Yes	19	17,15	3,98			
Ethics	W.G	1785,582	129	13,842	Partially	32	16,12	3,37	,674	,511	-
	Total	1804,242	131		No	81	16,07	3,78			

*p<.05, B.G: Beetwen Groups, W.G: Within Groups, S.S: Sum of Squares, M.S: Mean Square

In Table 11, a significant difference was found in the overall total and other sub-dimensions, except for the "Ethics" sub-dimension in the artificial intelligence literacy level scale of teachers who have knowledge about artificial intelligence programs used in music and music education **(*p<.05).** According to the results of Scheffe post-hoc test, a significant difference was found between the teachers who answered "yes" and the teachers who answered "partially", and between the teachers who answered "partially" and the teachers who answered "no" in the artificial intelligence literacy levels, "Awareness", "Usage" and "Evaluation" sub-dimensions of teachers who have knowledge about artificial intelligence programs used in music education. Thus, it can be said that as artificial intelligence literacy increases, "Awareness", "Usage" and "Evaluation" will also increase.

Findings related to artificial intelligence literacy levels of teachers using artificial intelligence programs used in music and music education

Table 12. One-way variance (ANOVA) analysis results of artificial intelligence literacy of teachers using AI programs used in music and music education

Scale		SS	df	MS	Using AI Program	n	$\bar{X}$	SD	F	p	Scheffe
Artificial Intelligence Literacy Scale Total	B.G	2907,999	2	1454,000	Yes	20	67,90	12,12			
	W.G	17509,516	129	135,733	Partially	27	66,96	9,49	10,712	,000*	
	Total	20417,515	131		No	85	57,57	12,13			
Awareness	B.G	245,739	2	122,869	Yes	20	16,95	3,31			
	W.G	1200,526	129	9,306	Partially	27	17,00	3,12	13,203	,000*	
	Total	1446,265	131		No	85	14,12	2,96			**1-2 2-3**
Usage	B.G	251,469	2	125,735	Yes	20	16,15	3,66			
	W.G	1869,591	129	14,493	Partially	27	16,29	2,79	8,676	,000*	
	Total	2121,061	131		No	85	13,35	4,09			
Evaluation	B.G	358,210	2	179,105	Yes	20	17,55	4,03			
	W.G	2949,267	129	22,863	Partially	27	17,48	3,11	7,834	,001*	
	Total	3307,477	131		No	85	14,07	5,33			
Ethics	B.G	24,465	2	12,233	Yes	20	17,25	3,97			
	W.G	1779,777	129	13,797	Partially	27	16,18	3,43	,887	,415	-
	Total	1804,242	131		No	85	16,02	3,73			

*p<.05, B.G: Beetwen Groups, W.G: Within Groups, S.S: Sum of Squares, M.S: Mean Square

In Table 12, the level of artificial intelligence literacy of teachers using artificial intelligence programs used in music and music education differed significantly in the general total and other sub-dimensions, except for the "ethics" sub-dimension (*p<.05). According to the results of Scheffe post-hoc test, there was a significant difference between the teachers who partially used and did not use the programs for music and music education compared to the teachers who partially used and did not use the programs for music and music education.

Findings of music teachers' artificial intelligence literacy levels according to the frequency of using AI programs

Table 13. One-way variance (ANOVA) analysis results of music teachers' artificial intelligence literacy according to frequency of use of AI programs

Scale		SS	df	MS	AI Programme Usage	n	$\bar{X}$	SD	F	p	Scheffe
Artificial Intelligence Literacy Scale Total	B.G	5238,975	4	1309,744	1 program	74	55,67	11,54	10,959	,000*	**5-1** **4-1** **3-1**
	W.G	15178,540	127	119,516	2 programs	16	64,87	12,02			
	Total	20417,515	131		3 programs	23	67,60	7,94			
					4 programs	12	69,83	9,36			
					5 programs	7	72,71	12,39			
Awareness	B.G	242,187	4	60,547	1 program	74	14,08	2,87	6,386	,000*	**4-1**
	W.G	1204,078	127	9,481	2 programs	16	15,93	3,66			
	Total	1146,265	131		3 programs	23	15,78	2,72			
					4 programs	12	18,00	3,01			
					5 programs	7	17,57	4,75			
Usage	B.G	452,397	4	113,099	1 program	74	12,83	3,91	8,608	,000*	**5-1** **4-1** **3-1**
	W.G	1668,663	127	13,139	2 programs	16	14,87	3,81			
	Total	2121,061	131		3 programs	23	16,60	2,23			
					4 programs	12	17,16	2,88			
					5 programs	7	17,42	4,68			
Evaluation	B.G	679,308	4	169,827	1 program	74	13,35	5,29	8,206	,000*	**5-1** **4-1** **3-1**
	W.G	2628,169	127	20,694	2 programs	16	16,93	4,15			
	Total	3307,477	131		3 programs	23	17,43	2,95			
					4 programs	12	18,50	2,93			
					5 programs	7	19,57	2,43			
Ethics	B.G	144,218	4	36,054	1 program	74	15,40	3,88	2,758	,031*	**3-1**
	W.G	1660,025	127	13,071	2 programs	16	17,12	2,72			
	Total	1804,242	131		3 programs	23	17,78	3,01			
					4 programs	12	16,16	4,23			
					5 programs	7	18,14	2,85			

*p<.05, B.G: Beetwen Groups, W.G: Within Groups, S.S: Sum of Squares, M.S: Mean Square

In Table 13, it is seen that there is a significant difference in the level of artificial intelligence literacy of teachers, general total and other sub-dimensions according to the frequency of use of artificial intelligence programs (*p<.05). According to the results of Scheffe post-hoc test, it was seen that teachers using artificial intelligence programs more than one and using more frequent programs had a positive effect on artificial intelligence literacy, usage and evaluation sub-dimensions. However, there was no significant difference in "Awareness" and "Ethics" sub-dimensions.

Conclusion and Discussion

It was determined that music teachers' artificial intelligence literacy was at a medium level. This may be related to both the recent widespread use of artificial intelligence technology and the fact that individuals have recently started to use this technology and the use of artificial intelligence technology in education is relatively new.

When the artificial intelligence literacy levels of music teachers were analyzed according to the gender variable, a significant difference was found in the "Artificial Intelligence Literacy Scale Total" and "Awareness" sub-dimensions of the artificial intelligence literacy scale, except for the "Usage", "Evaluation" and "Ethics" sub-dimensions. According to these results, it was concluded that the artificial intelligence literacy levels of male teachers were higher than the artificial intelligence literacy levels of female teachers. Elçiçek (2021) found that in the artificial intelligence literacy levels of high school, associate degree and undergraduate students, the artificial intelligence literacy levels of male students were higher than female students. However, Mart and Kaya (2024) found that there was no statistical difference in the attitudes towards artificial intelligence and artificial intelligence literacy levels of pre-service preschool teachers and Banaz and Maden (2024) found that there was no statistical difference in the attitudes towards artificial intelligence and artificial

intelligence literacy levels of pre-service Turkish teachers. In this direction, it can be said that gender differences vary depending on different variables such as participant groups, occupational fields and education levels. Although the finding that males have higher artificial intelligence literacy levels is evident in the research and literature, other studies have not found significant differences in the gender variable. It is thought that this situation can be explained by the effect of roles related to individual differences and interests.

When the artificial intelligence literacy levels of music teachers were analyzed according to marital status, a significant difference was found in the "Evaluation" sub-dimension of the "Artificial Intelligence Literacy Scale". According to this result, it was determined that the artificial intelligence literacy levels of single teachers were higher. Erbir (2021) found that the digital literacy levels of single nurses were higher in the digital literacy levels of nurses, and Kandemir and Azizoğlu (2024) found that the attitudes of single nurses towards artificial intelligence were higher in the attitudes of nurses towards artificial intelligence. However, Kalınkol and Anılan (2023) concluded that there was no difference in the digital literacy levels of classroom teachers regarding marital status. In this direction, the occupational groups of individuals and the contexts within these occupational groups may differ. Although it has been determined in the related research and literature that single individuals have high levels of both artificial intelligence and digital literacy/attitudes, marital status has not been seen as a specific factor in other studies on occupational groups.

When the artificial intelligence literacy levels of music teachers were examined according to the professional seniority variable, no significant difference was found in the total and other sub-dimensions of the artificial intelligence literacy scale. Aksakal et al. (2024) found no significant difference in classroom teachers' attitudes towards artificial intelligence and Irgatoğlu et al. (2024) found no significant difference in school administrators' digital literacy levels according to seniority variable. However, Erbir (2021) found that the digital literacy levels of nurses with less than 10 years of seniority, Korkmaz and Akçay (2024) found that the digital literacy levels of preschool teachers with a professional seniority between 12-17 years, and Pitel and Turcanu (2024) found that the digital competencies of young Moldovan doctors were higher. In this direction, it can be said that the impact on artificial intelligence, digital literacy and digital competencies of individuals working in different professional groups varies. Individuals who are newer in their profession may have grown up more intertwined with technological developments in the current technological age. In addition, individual differences and the impact of occupations on technology use may allow individuals to use technology in a more advantageous way.

When the artificial intelligence literacy levels of music teachers were analyzed according to the graduation status variable, no significant difference was found in the general total and other sub-dimensions of the artificial intelligence literacy scale. Similarly, Uygun et al. (2024) did not find a significant difference in the graduation status of teachers. However, Aksu (2024) found that teachers with postgraduate education are more knowledgeable about artificial intelligence, Üretmen (2024) found that English teachers with master's and doctorate degrees use artificial intelligence more effectively, and Zhao et al. (2022) found that primary and secondary school teachers with master's and doctorate degrees have higher artificial intelligence literacy levels. Graduation status of artificial intelligence literacy and more effective use of artificial intelligence have varied in different studies. In this direction, it is thought that individuals with more advanced education can increase their ability to understand technology, use technology, and adopt and use technology more effectively.

When the artificial intelligence literacy levels of music teachers were examined according to the faculty of graduation variable, no significant difference was found except for the ethical sub-dimension of the artificial intelligence literacy scale. Similarly, Taşkıran et al. (2024) found that there was no significant difference in the artificial intelligence attitudes of classroom teachers in the type of faculty they graduated from, and Tor et al. (2022) found that there was no significant difference in the digital literacy levels of students receiving undergraduate education and formation education. However, Buzkurt (2021) found that the digital school literacy levels of preschool teachers who graduated from the faculty of education were higher than the teachers who graduated from the faculty of open education. In line with these results, the quality of the trainings received by individuals and the trainings they received for the development of their digital skills may be an important factor for the type of faculty they graduated from.

When the artificial intelligence literacy levels of music teachers were analyzed according to the frequency of internet use variable, no significant difference was found in the general total and other sub-dimensions of the artificial intelligence literacy scale. Similarly, Banaz and Maden (2024) concluded that there was no significant difference in the frequency of internet use in the artificial intelligence attitudes of prospective Turkish teachers. However, Karacan-Doğan, Doğan, and Çetinkayalı (2024) concluded that those who use the internet for 241 minutes or more daily have higher attitudes towards artificial intelligence than students who use the internet for 61-120 minutes; Yüksekkaya (2023) concluded that preschool teachers who use the internet for three hours or more daily have higher digital literacy levels than teachers who use the internet for three hours or less daily; similarly, Sarıkaya (2024) concluded that Turkish teachers who use the internet for 6 hours or more have higher digital literacy levels. However, Elçiçek (2024) found that students who used the internet for 0-2 hours had higher artificial intelligence literacy levels than students who used the internet for 3 or more hours. In some studies, it was observed that the frequency of internet use did not affect the levels of artificial intelligence and digital literacy, and in some studies, although it was seen that it was in favor of individuals who used the internet longer, in some studies, it was seen that those who used the internet less had higher levels of artificial intelligence and digital literacy than individuals who used the internet more. In this direction, it is thought that the effect of frequency of internet use on artificial intelligence and digital literacy may vary depending on the duration of daily internet use, how and why individuals use the internet.

When the artificial intelligence literacy levels of music teachers who have knowledge about artificial intelligence and artificial intelligence programs were examined; a significant difference was found in the general total and other sub-dimensions of the artificial intelligence literacy scale. The fact that music teachers who use artificial intelligence and artificial intelligence programs have higher levels of artificial intelligence literacy than teachers who do not have knowledge about artificial intelligence and artificial intelligence programs shows that awareness in education and training can significantly increase their ability to use application knowledge effectively for the technological age. Similarly, Salas-Piclo et al. (2022) found that teachers trained in using artificial intelligence and artificial intelligence technologies in order to update their knowledge, practices and digital competencies before and after service benefited students as a result of the training, Chounta et al, (2022) stated that Estonian K-12 teachers have limited knowledge about artificial intelligence, but teachers perceive artificial intelligence as a tool that supports them in accessing, implementing and using multilingual content, Han et al. (2020) stated that artificial intelligence technology is a suitable method to help primary school teachers' classroom activities and problem-based learning. In today's digital age, it is thought that teachers' effective use of artificial intelligence technology in the teaching process will increase the knowledge and skills of teachers and may have an impact on the teaching process in classroom activities. However, developing strategies to support teachers' use of artificial intelligence technology in education and training processes can maximize its potential in education when ethical rules are taken into consideration.

A significant difference was found in the artificial intelligence literacy levels of music teachers who have knowledge about artificial intelligence programs used in music and music education and who use artificial intelligence programs for music and music education, except for the ethical sub-dimension of the artificial intelligence literacy scale, in the overall total and other sub-dimensions of the scale. In addition, a significant difference was observed in the overall total and sub-dimensions of the artificial intelligence literacy scale in the variable of music teachers' frequency of using artificial intelligence programs. Li and Wang (2022) used artificial intelligence-supported music education for students to learn musical instruments, and as a result of the study, their academic performance was higher than students studying in traditional classes, similarly, Yang (2020) proposed an artificial intelligence-based teaching method to overcome the shortcomings of traditional music teaching methods, and in his experimental research, artificial intelligence-supported music education can effectively improve the quality of traditional music teaching method and effectively promote the development of music education, Again, Li (2024) integrated artificial intelligence technology support into university music education and training systems and concluded that students' academic performance, sight reading, ear training and music theory success increased, while Jamal (2023) concluded that artificial intelligence has the potential to transform teacher education given careful implementation and ethical requirements. It can be said that teachers who

have knowledge about artificial intelligence programs in music and music education and use these programs will have higher artificial intelligence literacy levels, use technology effectively and innovatively in classroom lessons and education and training processes, and increase the performance of both teachers and students by exceeding the limits of traditional methods. In this direction, it reveals the necessity of including artificial intelligence technology in education and training processes in order to increase the quality of music education.

Recommendations

Artificial intelligence applications in education offer a personalized education opportunity unlike traditional education. In this direction, for the results obtained within the scope of the research;

- Organizing supportive training programs for teachers to recognize and use artificial intelligence technologies
- Making artificial intelligence technology-supported music education practices a part of both undergraduate and graduate education curricula
- Organizing trainings, seminars and workshops in order to increase music teachers' skills in the use of artificial intelligence technology and applications
- Providing music teachers with access to artificial intelligence-supported music programs in schools
- Music teachers using artificial intelligence-supported digital materials in classroom activities.

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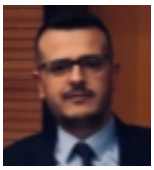

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