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THE PREDICTIVE POWER OF PRESERVICE TEACHERS' READINESS LEVELS FOR ARTIFICIAL INTELLIGENCE SUPPORTED INSTRUCTIONAL DESIGN ON LESSON PLANNING COMPETENCIES

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Abstract:
The purpose of this study is to examine the predictive power of pre-service teachers' readiness levels for artificial intelligence-supported instructional design on their lesson planning competencies. The sample of the study, in which the relational survey model, one of the quantitative research designs, consisted of 412 pre-service teachers from different departments studying at the Faculty of Education of a state university in Turkey. "Artificial Intelligence Assisted Instructional Design Readiness Scale" and "Lesson Planning Competency Scale" were used as data collection tools. Descriptive statistics, independent sample t-test, one-way ANOVA, Pearson correlation and multiple regression analyses were used to analyze the data. The findings revealed that pre-service teachers had high levels of both AI-supported instructional design readiness and lesson planning competencies. In addition, it was determined that their level of AI-supported instructional design readiness predicted their lesson planning competencies significantly and strongly. These results point to the need to support pre-service teachers' digital pedagogical competencies and the importance of increasing artificial intelligence-based instructional design-oriented practices in teacher training programs.

Keywords: artificial intelligence assisted instruction, readiness level, lesson planning competence, pre-service teacher

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1. Introduction

Twenty-first century education marks a period in which knowledge production and sharing are redefined in digital ecosystems supported by artificial intelligence. This shows that the transformation in educational environments is not only a technological but also a pedagogical change in basic assumptions. Zawacki- Richter *et al.* (2019), in their systematic review of the use of AI in higher education, state that this transformation has led to radical restructuring in teaching processes. Similarly, Li, Wang, and Gao (2021) emphasized the potential of AI to personalize learning processes, make instructional design data-driven, and redefine the role of teachers. In this context, not only teachers' technological competencies but also their readiness for AI-supported instructional design have become decisive for the success of contemporary education systems. The concept of readiness is considered as a reflection of teachers' and pre-service teachers' knowledge, skills and attitudes towards technology integration (Yıldız & Arslan, 2022). Especially in environments that require complex cognitive processes such as artificial intelligence-supported instructional design, individuals' cognitive, affective and psychomotor readiness levels directly affect the quality of the teaching process (Süral, 2025). The high level of readiness of pre-service teachers enables them to use artificial intelligence tools in line with pedagogical goals and to develop creative teaching plans (Göksün, 2025). In this context, today, the processes of preparing and planning AI-supported instructional design are not only a technological innovation but also a skill area that redefines the professional standards of the teaching profession (Li, Wang & Gao, 2021). AI-assisted instructional design is the process of personalizing and data-driven instructional design by integrating artificial intelligence tools into lesson planning and instructional processes.

In the international literature, teachers' capacity to design AI-supported instructional design is recognized as one of the key components of 21st-century teacher competencies (Zawacki-Richter, Olaf, Marin, Victoria I., Bond, Melissa, & Gouverneur, Frank, 2019). However, research conducted at the national level also reveals that pre-service teachers' readiness in AI-supported planning processes directly affects the quality of instructional design. Süral (2025) showed that pre-service teachers' cognitive flexibility and affective awareness levels are strongly related to their planning competencies while preparing AI-supported instructional design. Similarly, Göksün (2025) emphasized that pre-service teachers' technological awareness levels determine their pedagogical decision-making competencies in the AI-supported instructional planning process. Temur (2025), on the other hand, states that although pre-service teachers' practical competencies have increased in artificial intelligence-based teaching research in Turkey, there are still areas for improvement in the planning dimension. In their study, Yılmaz and Mutlu-Bayraktar (2021) revealed that pre-service teachers created original teaching scenarios with the interaction of cognitive, affective and social factors in artificial intelligence-supported design processes; this situation strengthened their creative thinking and critical thinking skills in the planning process. In addition, the studies

conducted by Amanvermez İncirkuş (2025) and Ulaş and Ayhan (2023) show that there is a significant relationship between pre-service teachers' metacognitive awareness levels and their AI-based planning skills. In this context, both national and international literature reveal that preparing and planning AI-supported instructional design is no longer only a technical competence, but a holistic process shaped by cognitive, affective and metacognitive components together.

The effective use of AI-based instructional environments requires a multidimensional competence that blends teachers' pedagogical, technological and content knowledge (Göksün, 2025). In this context, the TPACK (Technological Pedagogical Content Knowledge) model developed by Mishra and Koehler (2006) provides an important theoretical framework to explain teachers' holistic competencies regarding technology integration. However, the classical TPACK model is insufficient to fully explain the dynamics brought by artificial intelligence to learning environments; therefore, researchers have emphasized on artificial intelligence-based TPACK extensions in recent years (Toprakçı & Yücel, 2023). Pre-service teachers' capacity to transfer AI technologies to pedagogical context is critical in terms of showing how these competencies are reflected in new generation instructional designs (Yılmaz & Mutlu-Bayraktar, 2021). Recently, the potential of pre-service teachers to utilize generative AI-based content creation tools while preparing lesson plans has been seen as a practical reflection of AI-supported instructional design.

Research on AI-supported instructional practices in Turkey points to a promising but unbalanced picture in pre-service teachers' perceptions of these technologies. Temur (2025), in his trend analysis between 2000 and 2024, stated that artificial intelligence-based educational research has gained momentum in the last five years; however, the competencies of pre-service teachers at the application level are not yet at the desired level. Ulaş and Ayhan (2023) also revealed that pre-service teachers' perceptions of artificial intelligence are largely influenced by affective factors, and their awareness of the role of artificial intelligence in instructional design is limited. This situation indicates that artificial intelligence literacy and design-based thinking should be integrated in teacher training programs (Amanvermez İncirkuş, 2025).

The readiness levels of pre-service teachers for AI-supported instructional design are not only related to technical knowledge but also to cognitive and metacognitive processes. Amanvermez İncirkuş (2025), who examined the effect of metacognitive teaching approaches on pre-service teachers' awareness development, showed that the cognitive flexibility of pre-service teachers in the planning and evaluation stages directly contributed to their lesson planning competencies. These finding positions lesson planning competence as not only a pedagogical skill but also a cognitive construct (Gülbahar, 2016). Süral (2019) also emphasized that pre-service teachers' lesson planning competencies are closely related to cognitive processes related to structuring instructional goals and measuring learning outcomes.

In recent years, the concept of artificial intelligence-supported instructional design has become a new focus area in the development of pre-service teachers' technology-

based planning skills. The "Readiness Scale for Artificial Intelligence Supported Instructional Design" developed by Süral (2025) stands out as an important tool in measuring the readiness levels of pre-service teachers in this field. However, lesson planning is a skill that is at the center of the teaching profession and requires holistic structuring of the processes of determining teaching objectives, content selection, organizing learning activities and evaluation. Gülbahar (2016) defines lesson planning as a cognitive process that guides teachers' pedagogical decisions, while Süral (2019) emphasizes that this process is related to pre-service teachers' instructional design competencies. In addition, the "Lesson Planning Competencies Scale" developed by Süral (2019) measures pre-service teachers' cognitive, affective and practical skills in the planning process; this scale is widely used to assess their self-efficacy perceptions towards lesson planning.

AI-supported instructional design reshapes pre-service teachers' planning competencies by introducing new components such as data-driven analysis, individualization and dynamic adaptation to the traditional planning process. Therefore, the importance of the study can be evaluated on two main axes: first, determining the readiness levels of pre-service teachers towards AI-supported instructional design; and second, determining the extent to which this readiness predicts their lesson planning competencies. In this context, the aim of the study is to examine in depth the theoretical and practical contributions of course planning processes integrated with AI-supported instructional design in the field of teacher training. The scale evaluates pre-service teachers' perceptions, attitudes and application competencies towards artificial intelligence under two dimensions: cognitive and affective. Thus, the main variables that support pre-service teachers' participation in AI-based instructional design processes can be empirically analyzed.

Yıldız and Arslan (2022) found that pre-service teachers' readiness levels significantly predicted their learning outcomes; therefore, readiness is an important determinant in instructional design. In this context, the relationship between pre-service teachers' readiness levels for AI-supported instructional design and their lesson planning competencies is at the center of today's teacher training paradigms. At this point, the main purpose of this study is to reveal the extent to which pre-service teachers' readiness levels for AI-supported instructional design predict their lesson planning competencies.

2. Problem Statement

- Do pre-service teachers' readiness levels for AI-supported instructional design significantly predict their lesson planning competencies?

2.1 Sub-problem Statements

- What is the level of pre-service teachers' readiness for artificial intelligence-supported instructional design?
- What is the level of pre-service teachers' lesson planning competencies?

- Is there a meaningful relationship between pre-service teachers' readiness levels for artificial intelligence-supported instructional design and their lesson planning competencies?
- Do pre-service teachers' readiness levels for AI-supported instructional design significantly predict their lesson planning competencies?

3. Method

3.1 Research Model

This research is a quantitative study conducted to examine the relationship between pre-service teachers' readiness levels for artificial intelligence-supported instructional design and their lesson planning competencies. A relational survey design was used in the study. Relational survey design is a research approach to determine the relationship between two or more variables and to reveal the direction of this relationship (Karasar, 2012). This design provides the opportunity to evaluate the predictive relationships between variables and to reach inferences supported by descriptive statistics (Büyüköztürk, 2006). For this reason, it was preferred as the most appropriate design to examine the predictive effect of pre-service teachers' readiness levels towards artificial intelligence-supported instructional design on their lesson planning competencies.

3.2 Population and Sample

The population of the study consisted of a total of 677 pre-service teachers studying at Pamukkale University Faculty of Education. From this population, 412 pre-service teachers were reached by using simple random sampling methods. The simple random sampling method is an approach in which everyone in the population has an equal probability of being selected for sampling, and it was preferred because it increases the representativeness (Büyüköztürk, 2006).

Of the pre-service teachers participating in the study, 278 were female, and 134 were male. 289 of the participants were 3rd grade, and 123 of them were 4th grade students. The participants were from the departments of Classroom Teaching, Preschool Teaching, Science Teaching, Elementary Mathematics Teaching, Turkish Language Teaching, Social Studies Teaching and English Language Teaching. In addition, 399 of 412 participants answered "Yes" (96.8%), and 13 of them answered "No" (3.2%) to the question "Have you prepared a lesson plan?" in the scale form. This distribution shows that most pre-service teachers have experience in preparing lesson plans. The pre-service teachers in the study vary in terms of gender, age, department and grade level. This situation allows the findings to be evaluated comparatively on different groups of pre-service teachers.

Table 1: Distribution of the Study Group According to Demographic Characteristics

Variable	Category	f	%
Gender	Female	278	67,5
	Male	134	32,5
Class Level	Grade 3	289	70,1
	Grade 4	123	29,9
	Classroom Teaching	74	18,0
	Preschool Education	60	14,6
Department	Science Teacher Education	55	13,3
	Elementary Mathematics Teacher Education	58	14,1
	Turkish Language Teaching	55	13,3
	Social Studies Teacher Education	54	13,1
	English Language Teaching	56	13,6
Lesson Plan Preparation Status	Yes	399	96,8
	No	13	3,2
Total		**412**	**100**

3.3 Data Collection Tools

Two basic scales were used in the study. The first one is the "Readiness Scale for Artificial Intelligence Supported Instructional Design" developed by Süral (2025). The scale aims to measure pre-service teachers' cognitive and affective readiness for artificial intelligence-based instructional design. As a result of the scale development study, a two-dimensional structure was obtained, and Cronbach's alpha coefficient was reported as .88 because of validity and reliability analysis. The scale measures pre-service teachers' levels of technology integration, self-efficacy for learning, openness to innovation and adaptation to artificial intelligence-based teaching processes.

The second data collection tool is the "Lesson Planning Competencies Scale" developed by Süral (2019). This scale evaluates the cognitive, effective and practical competencies of pre-service teachers towards the lesson plan preparation process. The scale consists of three dimensions, and the total Cronbach's alpha reliability coefficient was reported as .89, and for the sub-dimensions, cognitive .83, affective .81, and practical .85. The items in the scale measure the skills of pre-service teachers in determining teaching objectives, organizing learning activities, planning the assessment and evaluation process, and applying teaching strategies. Both scales are highly valid and reliable instruments. These scales enable a holistic assessment of pre-service teachers' AI-supported instructional design readiness and lesson planning competencies.

3.3.1 Reliability Analysis

The reliability of the scales used in the study was evaluated with Cronbach's alpha coefficients. Cronbach's alpha coefficient is an indicator that measures the internal consistency of the scale, and values above 0.70 generally indicate an acceptable level of reliability (Tavşancıl, 2006; Şencan, 2005). These results show that the scales used have high internal consistency and are reliable measurement tools.

Table 2: Cronbach's Alpha Reliability Coefficients of the Scales

Scale	Size	Number of Articles	Cronbach α
Artificial Intelligence Supported Instructional Design Readiness Scale	Cognitive readiness	8	.87
	Affective readiness	8	.86
	Technological integration of	8	.81
	Perceptual trust	8	.85
	Total	**32**	**.88**
Lesson Planning Competencies Scale	Theoretical	11	.83
	Application	12	.85
	Total	**23**	**.89**

3.4 Data Analysis

During the data analysis process, various statistical analyses were performed to achieve the purpose of the study and to evaluate the sub-problems. In the first and second sub-problems, descriptive statistics were used to determine the mean and standard deviation values of pre-service teachers' readiness levels for artificial intelligence-supported instructional design and lesson planning competencies. In the third sub-problem, Pearson correlation analysis was used to determine the relationship between the variables, and in the fourth sub-problem, hierarchical (multiple) regression analysis was applied to evaluate the predictive power of artificial intelligence-supported instructional design readiness levels on lesson planning competencies. All analyses were conducted using the SPSS 26.0 package program. The findings were supported by tables to reveal the direction and strength of the relationships between the variables.

4. Findings

Four sub-problems were identified in this study. The findings were organized in accordance with these sub-problems. The data obtained in the study were first analyzed in terms of demographic characteristics and then in terms of the relationships between variables. Demographic variables (gender, grade level, department and lesson plan preparation status) were analyzed with descriptive statistics and contributed to comparative evaluations in interpreting the findings. Accordingly, in the findings section, demographic characteristics are presented as the first table, and then the analysis of the sub-problems related to the main variables is presented.

4.1 Level of Readiness for Artificial Intelligence Supported Instructional Design and Demographic Differences

In this section, pre-service teachers' readiness levels for artificial intelligence-supported instructional design and whether these levels differ according to demographic variables were examined. First, the normality of the data was examined with the Kolmogorov-Smirnov test, skewness and kurtosis values.

Table 3: Normality Test, Skewness and Kurtosis Values

Size	Kolmogorov-Smirnov p	Skewness	Kurtosis	Distribution
Cognitive readiness	.087	-0.41	-0.27	Normal
Affective readiness	.104	-0.36	-0.44	Normal
Technological integration	.094	-0.40	-0.32	Normal
Perceptual trust	.089	-0.39	-0.40	Normal

The results show that the data meet the parametric test assumptions since p>0.05 for all variables, and the skewness and kurtosis values are within the range of ±1. In addition, the fact that the p-value obtained from the Kolmogorov-Smirnov tests is greater than .05 confirms that the data are normally distributed, and the results of the Levene test are p>.05 confirms that the group variances are homogeneous. The fact that the skewness and kurtosis values are between -1 and +1, respectively (George & Mallery, 2010) indicates that the distribution is symmetric and close to the bell curve form. Based on these results, it was found statistically appropriate to apply parametric tests (t-test and ANOVA) in the analysis; thus, it was reliably evaluated whether the differences between the averages were due to real variance.

Table 4: Preservice Teachers' Level of Readiness for Artificial Intelligence Supported Instructional Design

Size	$\bar{X}$	SS	Level
Cognitive readiness	4.23	0.57	High
Affective readiness	4.09	0.59	High
Technological integration of	4.19	0.64	High
Perceptual trust	4.11	0.51	High
Total	**4.16**	**0.56**	**High**

It is seen that the readiness levels of pre-service teachers are high. Although there is no statistically significant difference between the high mean of the cognitive readiness sub-dimension ($\bar{X}$=4.23, SD=0.57) and the mean of the affective readiness sub-dimension ($\bar{X}$=4.09, SD=0.59) (t(411)=1.92, p>.05), the high mean of the cognitive dimension shows that the pre-service teachers' knowledge, perception and self-efficacy levels about artificial intelligence-supported instructional design are more developed. In addition, the fact that the total scale score is 4.16 shows that most of the participants are in the high-level range of the scale (3.41-5.00), and the distribution shows a homogeneous tendency. This indicates that there is a strong awareness and cognitive readiness for AI-based instructional design processes in the sample. It shows that the knowledge level of the prospective teachers about AI-based instructional design is strong.

In the demographic variables, an independent samples t-test was applied for binary groups (gender and lesson plan preparation status), and one-way ANOVA was applied for the variable with three or more groups (department). In addition, since the grade level had two categories, it was evaluated within the scope of the t-test. In each analysis, variance homogeneity was checked with the Tukey test (p>.05). In line with the SPSS analysis outputs, t-test and ANOVA results are given in detail in the table below.

Table 5: T-Test and ANOVA Results of Readiness Levels According to Demographic Variables

Variable	Group	N	$\bar{X}$	SS	t/F	sd	p	Post Hoc
Gender	Female	278	4.18	0.55	1.52	410	.129	Classroom Teaching > Social Studies and English Language Teaching
	Male	134	4.11	0.59				
Class Level	Grade 3	289	4.21	0.56	2.26	410	.024*	
	Grade 4	123	4.09	0.58				
Department (ANOVA)	Group 7	-	-	-	6.01	6,405	.000*	
Lesson Plan Preparation Status	Yes	399	4.17	0.56	2.94	410	.004*	
	No	13	3.82	0.61				

*p<.05

According to the t-test results, the difference regarding the gender variable is not statistically significant (t (410) =1.52, p>.05). However, in the grade level variable, the averages of 3rd grade students are significantly higher than 4th grade students (t (410) =2.26, p<.05). In the variable of lesson plan preparation status, the readiness scores of the participants who answered "Yes" were significantly higher (t (410) =2.94, p<.01). ANOVA results for the department variable show a significant difference (F (6,405) =6.01, p<.001). As a result of the Tukey post hoc test, it was determined that the difference was in favor of the students of the Department of Classroom Teaching. These analyses reveal that readiness levels for AI-supported instructional design differ significantly according to certain demographic variables. This approach provided a statistically more reliable evaluation of the within-group and between-group differences in the data.

4.2 Level of Readiness for Lesson Planning Competency and Demographic Differences

In this section, the lesson planning efficacy levels of pre-service teachers and the differentiation of these levels according to demographic variables were examined in detail. First, the normality of the data was analyzed with the Kolmogorov-Smirnov test; then, the skewness and kurtosis values were evaluated. Since p>.05 in all dimensions and skewness and kurtosis values were within the range of ±1 in the Kolmogorov-Smirnov test, it was concluded that the distribution was normal. Homogeneity of variance was confirmed by Levene's test (p>.05). These findings make the use of parametric tests statistically appropriate.

Table 6: Normality Test, Skewness and Kurtosis Values

Size	Kolmogorov-Smirnov p	Skewness	Kurtosis	Distribution
Theoretical	.095	-0.28	-0.18	Normal
Application	.112	-0.31	-0.36	Normal

According to these findings, the data were normally distributed, and homogeneity of variance was ensured. Therefore, independent samples t-test (gender, grade level, lesson plan preparation status) and one-way ANOVA (department) were used in the analysis.

Table 7: Lesson Planning Competency Levels of Prospective Teachers

Size	$\bar{X}$	SS	Level
Theoretical	4.12	0.61	High
Application	4.04	0.65	High
Total	**4.12**	**0.57**	**High**

It was determined that pre-service teachers' lesson planning efficacy levels were generally high, especially the theoretical dimension mean ($\bar{X}$=4.12), which was higher than the other dimensions. This finding shows that pre-service teachers have a strong command of theoretical knowledge while creating lesson plans.

Table 8: T-Test and ANOVA Results of Lesson Planning Competencies According to Demographic Variables

Variable	Group	N	$\bar{X}$	SS	t/F	sd	p	Post Hoc
Gender	Female	278	4.15	0.56	1.78	410	.075	Classroom Teaching > English Language Teaching, Social Studies
	Male	134	4.07	0.58				
Class Level	Grade 3	289	4.08	0.59	2.35	410	.020*	
	Grade 4	123	4.21	0.55				
Department (ANOVA)	Group 7	-	-	-	7.24	6,405	.000*	
Lesson Plan Preparation Status	Yes	399	4.14	0.56	3.02	410	.003*	
	No	13	3.77	0.60				

*p<.05

According to the results of the analysis, the difference in the gender variable is not significant (t (410) =1.78, p>.05). However, according to the grade level, the averages of 4th grade students are significantly higher than 3rd grade students (t (410) =2.35, p<.05). In the variable of lesson plan preparation status, the competence scores of pre-service teachers who answered "Yes" were significantly higher (t (410) =3.02, p<.01). ANOVA results obtained in the department variable show a significant difference (F (6,405) =7.24, p<.001). Since Levene's test result was p>.05, the variances were homogeneous and therefore the Tukey HSD post hoc test was applied. According to the results of the analysis, it was determined that the difference was in favor of the students of the Department of Classroom Teaching. These findings reveal that lesson planning competencies differ significantly in terms of certain demographic variables and that candidates' implementation experience and academic level strengthen their perceptions of competencies.

4.3 The Relationship between Artificial Intelligence Supported Instructional Design Readiness and Lesson Planning Competencies

This sub-problem aims to reveal the relationship between pre-service teachers' readiness levels for AI- AI-supported instructional design and their lesson planning competencies. This part of the study makes a holistic contribution to the general purpose of the study by determining how the candidates' awareness of artificial intelligence and their tendency to use instructional technologies are related to their planning competencies.

Determining the extent to which the level of readiness is reflected in lesson planning processes is important both for the development of teacher education programs and for understanding the effectiveness of artificial intelligence-based teaching practices.

Normality of the variables was confirmed by the Kolmogorov-Smirnov test ($p>0.05$). It is important to ensure parametric assumptions in Pearson correlation analysis because this analysis gives the most accurate results when the variables are normally distributed and show a linear relationship. The normality test ensures the reliability of the Pearson coefficient by determining whether the data are symmetrically distributed. Thus, both the direction and strength of the correlation coefficients (r) obtained become statistically significant and interpretable. The values obtained from the Pearson correlation analysis are presented below.

Correlation coefficients were calculated by Pearson product-moment correlation analysis. In the interpretation of the correlation coefficients, the classifications suggested in current research were taken into consideration. According to the large-scale meta-analysis study conducted by Gignac and Szodorai (2016), $r \approx .10$ indicates a low-level relationship, $r \approx .20$ indicates a medium-level relationship, and $r \approx .30$ and above indicates a high-level relationship.

Table 9: Correlation Analysis Results between Artificial Intelligence Supported Instructional Design Readiness and Lesson Planning Competencies

Variables	**1**	**2**	**3**	**4**	**5**	**6**	$\bar{X}$	**SS**
1. Cognitive Readiness	-						4.23	0.57
2. Affective Readiness	.72**	-					4.09	0.59
3. Technological Integration	.64**	.60**	-				4.19	0.59
4. Perceptual Trust	.58**	.61**	.66**	-			4.13	0.62
5. Theoretical	.59**	.63**	.74**	.63**	-		4.12	0.61
6. Application	.54**	.57**	.69**	.71**	.65**	-	4.04	0.65

**p<.01

According to the results of the analysis, the correlation coefficients between the variables are in the range of r=.54-.74 and show a moderate to high level positive relationship. This finding reveals that as pre-service teachers' readiness levels for AI-supported instructional design increase, their lesson planning competencies increase in parallel. The strongest relationship was observed between cognitive readiness and theoretical competence (r=.64**, p<.01). This result shows that the increase in candidates' cognitive awareness of AI-based teaching processes directly supports their planning and implementation skills. The findings confirm that the contribution of artificial intelligence integration to pre-service teachers' pedagogical planning processes is statistically significant and strong.

4.4 Predictive Power of Readiness for Artificial Intelligence Supported Instructional Design on Lesson Planning Competencies

Within the scope of this sub-problem, the predictive power of pre-service teachers' readiness levels for AI-supported instructional design (cognitive, affective, technological integration competence, and perceived self-efficacy) on the sub-dimensions of lesson planning competencies—namely, theoretical and practical dimensions—was examined using multiple regression analysis. This analysis aimed to determine the extent to which multidimensional readiness for AI explains pre-service teachers' competencies related to lesson planning.

For each sub-dimension of lesson planning, four models were constructed. In the first model, only the cognitive readiness variable was included. The second model added the affective dimension. The third model incorporated technological integration competence, and in the fourth model, perceived self-efficacy was added to complete the analysis. Below are the regression outputs for these four models presented in tabular form for both the "Theoretical Dimension" and the "Practical Dimension".

Table 10: Regression Analysis Results on the Predictive Power of AI-Supported Instructional Design Readiness Dimensions for Sub-Dimensions of Lesson Planning Competencies

Model	Dependent Variable	Independent Variables	B	β	t	p	R^2	ΔR^2	f^2	CI (95%)
1	Theoretical Dim.	Cognitive Readiness	.33	.29	5.21	.000	.084	—	.092	[.20, .46]
2	Theoretical Dim.	+ Affective Readiness	.28	.24	4.39	.000	.132	.048	.152	[.16, .40]
3	Theoretical Dim.	+ Tech. Integration Comp.	.25	.21	4.03	.000	.186	.054	.228	[.14, .36]
4	Theoretical Dim.	+ Perceived Self-Efficacy	.22	.19	3.72	.000	.228	.042	.295	[.11, .33]
1	Practical Dim.	Cognitive Readiness	.31	.27	5.06	.000	.073	—	.079	[.18, .44]
2	Practical Dim.	+ Affective Readiness	.26	.23	4.27	.000	.117	.044	.133	[.15, .37]
3	Practical Dim.	+ Tech. Integration Comp.	.23	.20	3.84	.000	.165	.048	.198	[.13, .33]
4	Practical Dim.	+ Perceived Self-Efficacy	.21	.19	3.58	.000	.211	.046	.266	[.10, .31]

Note: Readiness = Readiness; Tech. = Technological; CI = Confidence Interval; ΔR^2 = Incremental Variance Explained; f^2 = Effect Size.

According to the regression analysis results above, the readiness dimensions of pre-service teachers for AI-supported instructional design (cognitive, affective, technological integration competence, and perceived self-efficacy) exhibit significant and positive predictive effects on both the theoretical and practical sub-dimensions of lesson planning competencies ($p < .05$). The first model includes only cognitive readiness, which shows a significant effect on both sub-dimensions. With the addition of affective readiness in the second model, there is a notable increase in the explained variance (R^2), indicating its contribution. The third model further improves explanatory power by including technological integration competence. Finally, in the fourth model, the inclusion of perceived self-efficacy results in approximately 23% of the total variance in both sub-dimensions being explained. The consistently positive and significant ΔR^2 values across models demonstrate the contribution of each dimension to the model.

R^2 values exceeding .20 indicate that readiness dimensions serve as strong predictors of lesson planning competencies. Furthermore, f^2 values of .15 and above

support the establishment of moderately effective models (Cohen, 1988). These findings highlight that not only knowledge levels but also technology use, self-confidence, and affective tendencies of pre-service teachers directly influence their lesson planning processes. This emphasizes the importance of multidimensional readiness in instructional design processes.

In conclusion, the findings show that pre-service teachers' readiness levels for AI-supported instructional design and lesson planning competencies are high, there are positive, strong and significant relationships between these two variables, and readiness significantly predicts lesson planning competencies. The findings point to the necessity of systematically incorporating artificial intelligence integration into teacher training processes.

5. Discussion, Conclusion and Recommendations

The findings of the study show that pre-service teachers' readiness levels and lesson planning competencies for artificial intelligence-supported instructional design are generally high. This result reveals that pre-service teachers have a positive tendency to adapt to technological innovations, perceive artificial intelligence-based instructional processes and integrate them into instructional design. The fact that Classroom Teaching students exhibit higher planning competence can be interpreted as indicating that instructional design training given in this program can be more applied. The findings are supported by the high percentages obtained, especially in cognitive and affective dimensions. This situation indicates that artificial intelligence integration increases the level of awareness in teacher education programs and that pre-service teachers are ready for technology-based pedagogical transformation. Similarly, it is stated in the literature that AI-supported learning environments increase preservice teachers' digital competencies and awareness of pedagogical transformation (Zawacki-Richter, Marín, Bond, & Gouverneur, 2019; Holmes, Bialik, & Fadel, 2019; Luckin, 2018). This finding is in line with the results of Uerz, Volman, and Kral (2018) in the literature. In the study, it was stated that pre-service teachers' ability to integrate digital technologies into the teaching process developed through technology-based practices and guided experiences in the curriculum. In this study conducted in Turkey, the high readiness level of pre-service teachers in the sample of Pamukkale University Faculty of Education may be related to the inclusion of applied content for technology literacy and activities that increase artificial intelligence awareness in teacher training programs.

The high level of readiness for artificial intelligence-supported instructional design indicates that pre-service teachers cognitively comprehend the potential of this technology in teaching processes. This finding emphasizes the need for teachers to assume active roles in the ever-evolving digital ecosystem (Luckin, 2018). The positive results obtained in the affective readiness dimension show that pre-service teachers developed positive attitudes towards the contribution of artificial intelligence to teaching processes. This result is in line with the literature, indicating that teachers' tendency to

adopt technology and their openness to innovative approaches are decisive for professional development (Teo, 2019; Ertmer & Ottenbreit-Leftwich, 2020). In addition, it was also revealed that increasing AI literacy strengthens pre-service teachers' self-efficacy perceptions and supports their technology-based planning skills (Chan & Hu, 2023).

Another finding of the study shows that pre-service teachers' lesson planning competencies are also at a high level. This finding was supported by the high averages observed, especially in the cognitive dimension. The cognitive maturity of pre-service teachers in the lesson planning process reflects their ability to set goals, write objectives, assessments and evaluations, and integrate technology effectively. This coincides with studies in the teacher education literature that emphasize the importance of the simultaneous development of curriculum literacy, instructional design and planning skills (Süral, 2019; Korkmaz & Kaya, 2021). In fact, the high averages obtained in the effective and practical dimensions of lesson planning competencies show that pre-service teachers not only have knowledge but also can transform this knowledge into practice.

The findings obtained from correlation and regression analyses showed that AI-supported instructional design readiness significantly and strongly predicted lesson planning competencies. The effect of cognitive and affective readiness variables on lesson planning competencies indicates that AI-based instructional design will be the main determinant of future teacher competencies. This finding is in line with the studies in the international literature that reveal that teachers' competencies in planning and implementing AI-supported environments are decisive for teaching quality (Mouza, Yang, Pan, Ozden, & Pollock, 2021; Luckin, Holmes, Griffiths, & Forcier, 2022). This clearly shows the necessity of developing AI literacy in teacher education policies and restructuring teacher education programs in this direction.

The findings of this study emphasize the necessity of integrating AI-based instructional design approaches in teacher education. The findings indicate that there is a significant relationship between the readiness and planning competencies of pre-service teachers, suggesting that these two competencies should be developed simultaneously. As a result, it is recommended that courses on AI-supported instructional design, project-based practices and microlearning activities should be increased in teacher education programs. Therefore, teacher education programs should include more integration of AI literacy and instructional design. Moreover, increasing opportunities to develop AI literacy will deepen pre-service teachers' technological pedagogy skills.

In conclusion, this study scientifically revealed that pre-service teachers' readiness levels towards AI-supported instructional design significantly predicted their lesson planning competencies. However, experimental studies are needed to determine whether this relationship is a causal link. This finding points to the necessity of including artificial intelligence as a pedagogical component in teacher education policies. The findings are limited to the Pamukkale University sample; further studies in different universities and departments will increase the generalizability of the results. Supporting pre-service

teachers technologically, cognitively and emotionally will enable them to grow as effective, creative and ethically responsible individuals in the future educational ecosystem. To summarize, this study revealed that increasing pre-service teachers' readiness for AI-supported instructional design will also improve their lesson planning skills.

Conflict of Interest Statement
The author declares no conflicts of interest related to this study.

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