

The Effect of Artificial Intelligence Knowledge on the GPA of Statistics Students in Ankara

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ABSTRACT: *This study analyzes the effect of Artificial Intelligence (AI) and automation knowledge on the academic performance of statistics students in Ankara. As AI literacy becomes an increasingly important competency for students in the digital era, previous research has produced inconsistent findings regarding its relationship with academic achievement. Using secondary data from the “AI Impact on Statistics Students in Ankara” dataset, this study examined undergraduate statistics students from Ankara University, Gazi University, Middle East Technical University, and Hacettepe University. AI and Automation Knowledge Level served as the independent variable, while GPA Midpoint served as the dependent variable. Data were analyzed using descriptive statistics and simple linear regression, supported by Spearman correlation and Kruskal-Wallis tests to strengthen the validity of the findings. The regression analysis produced the equation $\hat{Y} = 2.715 - 0.042X$, with an R^2 of 0.006 and a p -value of 0.285, indicating that AI knowledge level did not significantly affect students’ GPA. Additional statistical tests confirmed the absence of a significant relationship between AI knowledge and academic performance. These findings suggest that AI literacy alone is insufficient to predict academic achievement among statistics students. Nevertheless, AI literacy remains essential for preparing students to adapt to technological change and future workforce demands. Higher education institutions are therefore encouraged to integrate AI literacy, critical thinking, and ethical AI usage into their learning systems and curricula.*

Keywords: *Artificial Intelligence; AI Literacy; Academic Performance; GPA; Statistics Students*

ABSTRAK: Penelitian ini bertujuan untuk menganalisis pengaruh tingkat pengetahuan Artificial Intelligence (AI) dan otomatisasi terhadap performa akademik mahasiswa statistika di Ankara. Perkembangan pesat teknologi AI dalam pendidikan tinggi mendorong meningkatnya pentingnya literasi AI sebagai kompetensi yang perlu dimiliki mahasiswa di era digital. Namun, penelitian sebelumnya menunjukkan hasil yang tidak konsisten mengenai hubungan antara literasi AI dan pencapaian akademik. Penelitian ini menggunakan pendekatan kuantitatif dengan memanfaatkan data sekunder dari dataset “AI Impact on Statistics Students in Ankara” yang melibatkan mahasiswa program studi statistika dari Ankara University, Gazi University, Middle East Technical University, dan Hacettepe University. Variabel independen dalam penelitian ini adalah AI and Automation Knowledge Level, sedangkan GPA Midpoint digunakan sebagai variabel dependen. Analisis data dilakukan menggunakan statistik deskriptif dan regresi linear sederhana, kemudian diperkuat dengan uji korelasi Spearman dan Kruskal-Wallis untuk meningkatkan validitas temuan. Hasil analisis regresi

menghasilkan persamaan $\hat{Y} = 2,715 - 0,042X$ dengan nilai R^2 sebesar 0,006 dan p-value sebesar 0,285 yang menunjukkan bahwa tingkat pengetahuan AI tidak berpengaruh signifikan terhadap GPA mahasiswa. Uji statistik tambahan juga menunjukkan hasil yang konsisten bahwa tidak terdapat hubungan signifikan antara pengetahuan AI dan performa akademik mahasiswa. Temuan penelitian menunjukkan bahwa literasi AI saja belum cukup untuk memprediksi pencapaian akademik mahasiswa statistika. Meskipun demikian, literasi AI tetap penting dalam mempersiapkan mahasiswa menghadapi transformasi teknologi dan tuntutan dunia kerja di masa depan. Oleh karena itu, perguruan tinggi perlu mengintegrasikan literasi AI, kemampuan berpikir kritis, dan penggunaan AI secara etis dalam sistem pembelajaran dan pengembangan kurikulum.

Keywords: *Artificial Intelligence; AI Literacy; Academic Performance; GPA; Statistics Students*

I. INTRODUCTION

Artificial Intelligence (AI) has become one of the most influential technologies in higher education, as it is capable of significantly transforming learning systems, academic activities, and student learning experiences. The rapid development of generative AI technologies such as ChatGPT, Gemini, and Claude has changed the way students access information, complete assignments, conduct data analysis, and develop academic skills. In the educational context, AI is used to support personalized learning, improve the efficiency of the learning process, and expand access to digital knowledge resources. The integration of AI in higher education also drives the transformation of learning models toward being more adaptive, interactive, and digitally based. Recent studies have shown that the use of AI in educational environments can enhance student learning engagement, learning effectiveness, and the ability to adapt to digital technological developments (Bećirović et al., 2025; Chan & Hu, 2023; Sallu & Hendriadi, 2025). Meta-analytic evidence further indicates that generative AI tools such as ChatGPT can have a positive effect on college students' academic achievement across disciplines (Sun & Zhou, 2024), including in professional fields such as medical education (Boscardin et al., 2024). In addition, AI literacy is now considered an essential competency that students must possess to face the challenges of the Society 5.0 era and the automation-based industrial revolution (Ng et al., 2024).

Previous studies have examined the relationship between AI literacy, digital literacy, and students' academic performance in higher education. Bećirović et al. (2025) found that students with higher levels of AI literacy tend to have better self-efficacy, higher-quality academic outcomes, and more optimal learning performance. Chan and Hu's (2023) study also showed that students view AI as a technology that helps learning effectiveness, improves access to information, and supports the completion of academic tasks more efficiently. On the other hand, Sallu and Hendriadi (2025) explained that the use of generative AI in learning can improve learning effectiveness and students' digital skills in Indonesian higher education institutions. Other studies further confirm that the integration of AI in education contributes to improvements in critical thinking ability, self-regulated learning, and student readiness to face the digital work environment (Kasneci et al., 2023; Tlili et al., 2023). In addition, higher education institutions have begun redesigning their curricula to integrate AI competencies and digital literacy as an important part of 21st-century learning (Crompton & Burke, 2023). Beyond perception-based studies, several researchers have also developed and validated instruments to directly measure students' AI literacy. Hornberger et

al. (2023) developed and validated an AI literacy test assessing university students' factual knowledge of AI concepts, while Mansoor et al. (2024) conducted a large-scale transnational survey showing that AI literacy levels differ significantly by country, academic discipline, and academic performance category. Gokce et al. (2024) further examined the demographic and academic factors associated with AI literacy using decision-tree analysis, and Kong et al. (2021) demonstrated that structured AI literacy courses can improve university students' conceptual understanding of AI regardless of their prior programming background.

Although research on AI in education continues to grow, studies that specifically analyze the relationship between AI knowledge and the academic performance of statistics students remain relatively limited. Most previous studies have focused more on perceptions of AI use, the implementation of AI in learning, or the effect of AI on students' learning experiences in general, without directly linking it to academic achievement indicators such as Grade Point Average (GPA). In addition, previous research findings still show inconsistencies. Some studies report that AI literacy has a positive effect on students' academic performance because it can improve learning efficiency and access to knowledge (Bećirović et al., 2025). However, other studies indicate that excessive reliance on AI can reduce students' independent thinking, creativity, and analytical ability (Kasneci et al., 2023). This inconsistency is also evident in studies that directly examine the relationship between digital or AI literacy and GPA. Abbas et al. (2019) found that digital literacy had a significant positive effect on the academic performance of university students in Pakistan, whereas Asio (2024) reported only a weak correlation between AI literacy and academic performance among tertiary-level students. Similarly, Widowati et al. (2023) found that digital literacy did not have a direct effect on students' academic performance, while Singh et al. (2024) demonstrated a significant positive relationship between AI literacy and the academic performance of Generation Z students in northern India. This inconsistency indicates a research gap regarding how AI knowledge levels actually affect students' academic performance, particularly among statistics students, whose field of study is closely related to data analysis, machine learning, and computational technology.

Statistics students represent an academic group with a close connection to the development of AI, as their field of study is directly related to data science, machine learning, and computational analytics. Therefore, understanding the relationship between AI knowledge levels and the academic achievement of statistics students is becoming increasingly important within the context of digital education transformation. This study uses the "AI Impact on Statistics Students in Ankara" dataset, which involves statistics students from Ankara University, Gazi University, Middle East Technical University, and Hacettepe University. The dataset contains various variables related to AI and Automation Knowledge Level, GPA midpoint, AI awareness, internship experience, and student anxiety toward job automation. These variables provide an opportunity to analyze the relationship between AI literacy and students' academic performance in a more specific and contextual manner.

This study aims to analyze the effect of Artificial Intelligence and automation knowledge levels on the academic performance of statistics students in Ankara. The study uses a quantitative approach with linear regression analysis to examine the relationship between AI Knowledge Level and

students' GPA midpoint. In addition, this study also employs supplementary analyses, namely Spearman correlation and the Kruskal-Wallis test, to strengthen the validity of the results given the discrete nature of the GPA data. The findings of this study are expected to contribute to the development of AI-based learning strategies, the enhancement of students' digital literacy, and the development of higher education curricula that are more adaptive to advances in AI technology. This article is organized into several main sections: introduction, research method, results and discussion, and conclusion.

II. METHOD

This study employs a quantitative approach to analyze the relationship between Artificial Intelligence (AI) knowledge and the academic performance of statistics students in Ankara. The study makes use of secondary data obtained from the dataset entitled "AI Impact on Statistics Students in Ankara," which is publicly available on Kaggle and was collected by Yigit Kandemir as part of the IST470 Categorical Data Analysis course at Hacettepe University. The dataset involves statistics students from several public universities in Ankara, namely Ankara University, Gazi University, Middle East Technical University, and Hacettepe University. Data collection was conducted through a voluntary and anonymous survey, allowing respondents to freely share their perceptions and experiences regarding AI and automation.

The variables analyzed in this study consist of AI and Automation Knowledge Level as the independent variable and GPA Midpoint as the dependent variable. The AI knowledge level variable is categorized into four levels: No Knowledge, Little Knowledge, Moderate Knowledge, and High Knowledge. For statistical analysis purposes, these categories were transformed into numerical codes ranging from 0 to 3. Meanwhile, GPA Midpoint was used as an indicator of students' academic performance and consists of four discrete values. Other supporting variables in the dataset include AI awareness, internship experience, anxiety toward automation, and perceptions of the impact of AI on students' future careers.

Data analysis was conducted using descriptive and inferential statistics. Descriptive statistics were used to describe data characteristics such as the mean, median, standard deviation, and the distribution pattern of the study variables. Subsequently, inferential analysis employed simple linear regression to identify the effect of AI Knowledge Level on GPA Midpoint. The regression model used in this study is as follows:

$$\hat{Y} = 2.715 - 0.042X$$

Note:

$\hat{Y}$ = GPA Midpoint

X = AI and Automation Knowledge Level

To test the significance of the relationship between the variables, a t-test and coefficient of determination (R^2) were conducted. However, the results of the initial assumption testing indicated that the residual data were not normally distributed, based on the Shapiro–Wilk test ($p < 0.001$), and the GPA variable had only four discrete values. This condition caused the assumptions of Ordinary Least Squares (OLS) to be not fully satisfied. Therefore, additional

analyses using Spearman correlation and the Kruskal-Wallis test were conducted to strengthen the validity of the study's results. All analyses were interpreted using a significance level of $\alpha = 0.05$.

III. RESULT AND DISCUSSION

RESULT

The study dataset consists of statistics students from several public universities in Ankara who voluntarily participated in a survey on AI and automation. The descriptive analysis results show that students possess varying levels of AI knowledge, ranging from no knowledge to high knowledge of AI. Students' GPA Midpoint values are distributed across four discrete categories, namely 2.25, 2.55, 3.25, and 3.55, indicating variation in students' academic performance.

Table 1. Descriptive Statistics Results

No	Descriptive	Score
1.	Mean	2.715
2.	Median	2.550
3.	Standard Deviation	0.042
4.	Minimum GPA Value	2.25
5.	Maximum GPA Value	3.55

The descriptive statistics results show that most students fall into the moderate AI knowledge category (Moderate Knowledge), while a smaller proportion fall into the no-knowledge or high-knowledge categories regarding AI and automation. In terms of academic performance, the average GPA indicates that students generally achieve moderate to high academic performance. However, the limited number of GPA categories indicates that the academic performance variable does not fully satisfy the assumptions of continuous parametric analysis.

Linear Regression Analysis

The main analysis in this study uses simple linear regression to examine the effect of AI and Automation Knowledge Level on GPA Midpoint. The resulting regression equation is:

$$\hat{Y} = 2.715 - 0.042X$$

The regression coefficient indicates a negative relationship between AI knowledge level and GPA Midpoint. This means that each one-level increase in AI knowledge is associated with a decrease in GPA of approximately 0.042 points. However, this relationship is not statistically significant.

Table 2. Linear Regression Analysis Results

Statistic	Value	Interpretation
Slope (b_1)	-0.042	For each 1-level increase in AI Knowledge, GPA decreases by approximately 0.04
R^2	0.006	Only 0.6% of GPA variation is explained by AI Knowledge
t-statistic	-1.072	Very weak relationship
p-value	0.285	Not significant ($\alpha = 0.05$)
95% Confidence Interval	[-0.118, 0.035]	Includes zero

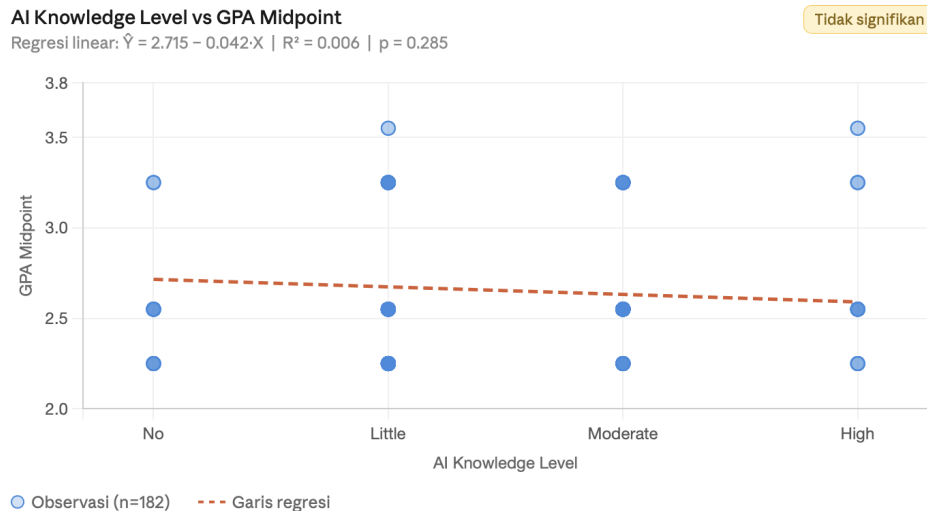


Figure 1. Relationship between AI Knowledge Level and GPA Midpoint

Based on Figure 1, the regression line shows a very weak negative trend between AI knowledge level and students' GPA. The distribution of observation points does not form a strong linear pattern, indicating that increases in AI knowledge are not consistently followed by increases in GPA. The coefficient of determination ($R^2 = 0.006$) also indicates that the AI Knowledge Level variable is only able to explain about 0.6% of the variation in students' GPA.

Furthermore, the p-value of 0.285 is greater than the significance level of 0.05, so the relationship between the two variables is statistically not significant. Thus, the hypothesis stating a significant effect of AI knowledge level on the academic performance of statistics students in Ankara cannot be accepted.

Discussion

The results of this study show that the level of Artificial Intelligence and automation knowledge does not have a significant effect on the academic performance of statistics students in Ankara. Although the regression model shows a weak negative relationship between AI knowledge and GPA Midpoint, this relationship is not statistically significant. This finding indicates that students' understanding of AI and automation technology does not directly affect their academic achievement as measured by GPA.

This finding is consistent with several previous studies stating that AI literacy does not automatically guarantee an improvement in students' academic performance. Kasneci et al. (2023) explained that although AI technology provides benefits in the form of efficiency and ease of access to information, excessive reliance on AI can reduce students' independent thinking and analytical reasoning ability. Chan and Hu's (2023) study also found that students view AI as an effective academic tool, yet concerns remain regarding the reduced cognitive engagement resulting from overly intensive AI use. This finding is further supported by Asio (2024), who similarly reported only a weak correlation between AI literacy and academic performance among tertiary-level students, and by Widowati et al. (2023), who found no direct effect of digital literacy on students' academic performance.

On the other hand, this finding differs from the study by Bećirović et al. (2025) and Singh et al. (2024), which found a positive relationship between AI literacy, self-efficacy, and students' academic performance. This difference in results may be due to differences in research context, measurement instruments, and respondent characteristics. In this study, the GPA variable has only four discrete values, which limits the sensitivity of the statistical analysis in detecting academic differences among students. In addition, academic performance is also influenced by many other factors, such as learning motivation, learning strategies, socioeconomic background, and the learning environment.

Additional analyses using Spearman correlation and the Kruskal-Wallis test also show consistent results, indicating no significant relationship between AI knowledge level and students' GPA Midpoint. This finding reinforces the conclusion that AI knowledge alone is not yet sufficient to predict the academic performance of statistics students. Nevertheless, AI literacy remains an important competency in preparing students to face technological change and future workforce demands. Therefore, higher education institutions need not only to improve students' technical understanding of AI, but also to develop critical thinking ability, ethical awareness, and responsible AI use in academic contexts.

Overall, this study contributes to the discussion on AI literacy in higher education by providing empirical evidence from statistics students in Ankara. The results show that although AI knowledge is important for students' digital readiness, its direct relationship with GPA performance remains very weak and statistically not significant. Future research is recommended to use a larger dataset, more continuous academic performance indicators, and more comprehensive analytical models such as ordinal regression or structural equation modeling, so that the relationship between AI literacy and academic performance can be understood more thoroughly.

IV. CONCLUSION

Based on the results of this study, the level of Artificial Intelligence (AI) and automation knowledge does not have a significant effect on the academic performance of statistics students in Ankara. The linear regression analysis results show a very weak negative relationship between AI Knowledge Level and GPA Midpoint, with a coefficient of determination of 0.006 and a p-value of 0.285. These findings indicate that AI knowledge level explains only a small portion of the variation in students' GPA and is not strong enough to significantly predict academic performance.

The results of additional analyses using Spearman correlation and the Kruskal-Wallis test also show consistent results, indicating no significant relationship between AI knowledge level and students' GPA. This finding suggests that students' academic performance is influenced not only by AI literacy, but also by various other factors, such as learning motivation, learning strategies, the academic environment, and students' critical thinking ability.

Although no significant effect on GPA was found, AI literacy remains an important competency in facing the development of digital technology and automation in the modern education era. Therefore, higher education institutions need to develop learning strategies that focus not only

on mastering AI technology, but also on strengthening analytical ability, critical thinking, and the ethical and responsible use of AI.

This study has limitations related to the discrete nature of the GPA data and the limited number of value variations, which affect the sensitivity of the statistical analysis. Therefore, future research is recommended to use a dataset with a larger sample size, more diverse academic variables, and more complex analytical models, such as ordinal regression or structural equation modeling, so that the relationship between AI literacy and academic performance can be analyzed more thoroughly.

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In the process of preparing this article, Artificial Intelligence (AI) technology was also used as a supporting tool for statistical analysis, assisting in data processing and interpretation, and improving the writing and academic structure of the article.

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