BEYOND AVERAGES : DISTRIBUTIONAL INSIGHTS INTO STUDENTS' DIGITAL LITERACY IN AI AND BEHAVIORAL INTENTION TO USE AI

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ABSTRACT

The rapid integration of artificial intelligence (AI) in higher education has increased the importance of students' digital literacy and intention to use AI technologies. This study examines students' Digital Literacy in AI (DLAI) and Behavioral Intention to Use AI (BIAI) using a descriptive approach. A total of 121 undergraduate students from three faculties at Universitas Negeri Padang participated in the study. Data were collected through a questionnaire consisting of seven DLAI items and six BIAI items adapted from validated instruments. Descriptive statistical analyses were employed to examine central tendency, variability, and distribution patterns. The findings show that students generally possess high levels of digital literacy in AI, with comparable mean scores across gender groups. However, male students demonstrate greater variability, while female students exhibit more consistent patterns. Behavioral intention to use AI is consistently high across all groups, indicating strong readiness to adopt AI technologies in learning. The results further reveal that differences in AI-related competencies are more visible in distribution characteristics than in mean comparisons. Moreover, students maintain a high intention to use AI despite variations in digital literacy levels. These findings emphasize the need for educational strategies that strengthen AI competencies and promote effective and ethical AI use in higher education.

Keywords : *Digital Literacy in AI; Behavioral Intention; AI in Education*

INTRODUCTION

The rapid advancement of artificial intelligence (AI) has significantly transformed the landscape of education, particularly in higher education settings. AI technologies, including intelligent tutoring systems, automated feedback tools, and generative AI applications, are increasingly integrated into teaching and learning processes, reshaping how students access, process, and apply knowledge (Holmes et al., 2019; Zawacki-Richter et al., 2019). As AI becomes more embedded in educational environments, students are expected not only to use these technologies but also to develop the necessary competencies to engage with them effectively.

In this context, digital literacy in AI has emerged as a critical skill for students. Digital literacy extends beyond basic technical skills and encompasses the ability to critically evaluate, create, and communicate information using digital technologies (Ng, 2012; van Laar et al., 2017). When applied to AI, this concept includes understanding how AI systems function, recognizing their limitations, and using them responsibly and ethically. Previous studies have emphasized that digital literacy plays a key role in determining how effectively students can utilize emerging technologies in learning environments (Falloon, 2020; Siddiq et al., 2016).

Alongside competence, students' behavioral intention to use AI is another crucial factor influencing the successful adoption of AI technologies in education. Drawing on the Technology Acceptance Model (TAM), behavioral intention is considered a strong predictor of actual technology use and is primarily influenced by perceived usefulness and perceived ease of use (Davis, 1989; Venkatesh et al., 2003). Recent studies have shown that students generally exhibit positive attitudes and strong intentions toward using AI tools in their academic activities, driven by perceived benefits such as efficiency, personalization, and accessibility (Chiu et al., 2022; Dwivedi et al., 2021).

Despite the growing body of research on AI in education, most studies tend to focus on either technological adoption or learning outcomes, often using inferential approaches to examine relationships between variables. However, limited attention has been given to understanding how students' competencies and intentions are distributed within populations, particularly from a descriptive perspective. In addition, while gender has been widely examined in digital literacy research, findings remain inconclusive, with some studies reporting differences and others indicating minimal or no significant gaps (N. Li & Kirkup, 2007; van Deursen & van Dijk, 2014). This suggests the need for a more nuanced analysis that goes beyond mean comparisons to explore variability and distribution patterns within groups.

Addressing this gap, the present study aims to descriptively examine students' Digital Literacy in AI and Behavioral Intention to Use AI, with particular attention to their distributional characteristics across gender groups. Rather than focusing on causal relationships, this study emphasizes how competencies and intentions are structured within the sample, including patterns of variability, consistency, and potential disparities. By doing so, this study contributes to the existing literature by highlighting that differences in AI-related competencies may not always be reflected in average scores, and that high intention to use AI can coexist with varying levels of digital literacy.

METHOD

This study employed a quantitative descriptive research design to examine students' Digital Literacy in AI (DLAI) and Behavioral Intention to Use AI (BIAI). The study did not aim to test causal relationships but focused on describing the distribution, central tendency, and variability of the two variables. A descriptive approach was considered appropriate to provide a comprehensive understanding of how students' competencies and intentions toward AI are structured within the sample.

The participants were undergraduate students from Universitas Negeri Padang, representing three faculties, namely the Faculty of Tourism and Hospitality, the Faculty of Engineering, and the Faculty of Education. These faculties were selected to capture variation in academic backgrounds and levels of exposure to technology. The sampling technique used was purposive sampling, targeting students who have experience with digital learning environments and are familiar with AI-based tools in their academic activities. A total of 121 students participated in this study, consisting of 66 male and 55 female students.

Data were collected using a structured questionnaire consisting of two main constructs. Digital Literacy in AI was measured using seven items adapted from Hwang et al. (2023), which assess students' abilities to understand, evaluate, and effectively use AI technologies in learning contexts. Behavioral Intention to Use AI was measured using six items adapted from Wang et al. (2024), which evaluate students' willingness and readiness to adopt AI technologies by integrating the Theory of Planned Behavior and AI literacy. All items were measured using a Likert scale ranging from strongly disagree to strongly agree, and were adapted to fit the context of AI use in higher education while maintaining their original conceptual structure.

The data were analyzed using descriptive statistical techniques, including mean, median, mode, standard deviation, variance, and range to examine central tendency and variability. In addition, skewness and kurtosis were used to assess distributional characteristics, while visualizations such as bar charts with confidence intervals, histograms with density curves, and violin plots combined with boxplots were employed to support a more comprehensive interpretation. The analysis emphasized identifying patterns of distribution, consistency, and variability across gender groups to better understand how students' AI-related competencies and intentions are manifested within the sample.

RESULTS AND DISCUSSIONS

This section presents and discusses the findings on students' Digital Literacy in AI and Behavioral Intention to Use AI based on descriptive statistical analysis. The results are examined through measures of central tendency, variability, and distribution patterns, supported by tabular data (Table 1) and visual representations (Figure 1 and Figure 2) for deeper interpretation. Each result is immediately followed by its discussion by connecting empirical findings with relevant theories and prior research. The analysis begins with Digital Literacy in AI, followed by Behavioral Intention to Use AI, and concludes with an integrated interpretation of both variables.

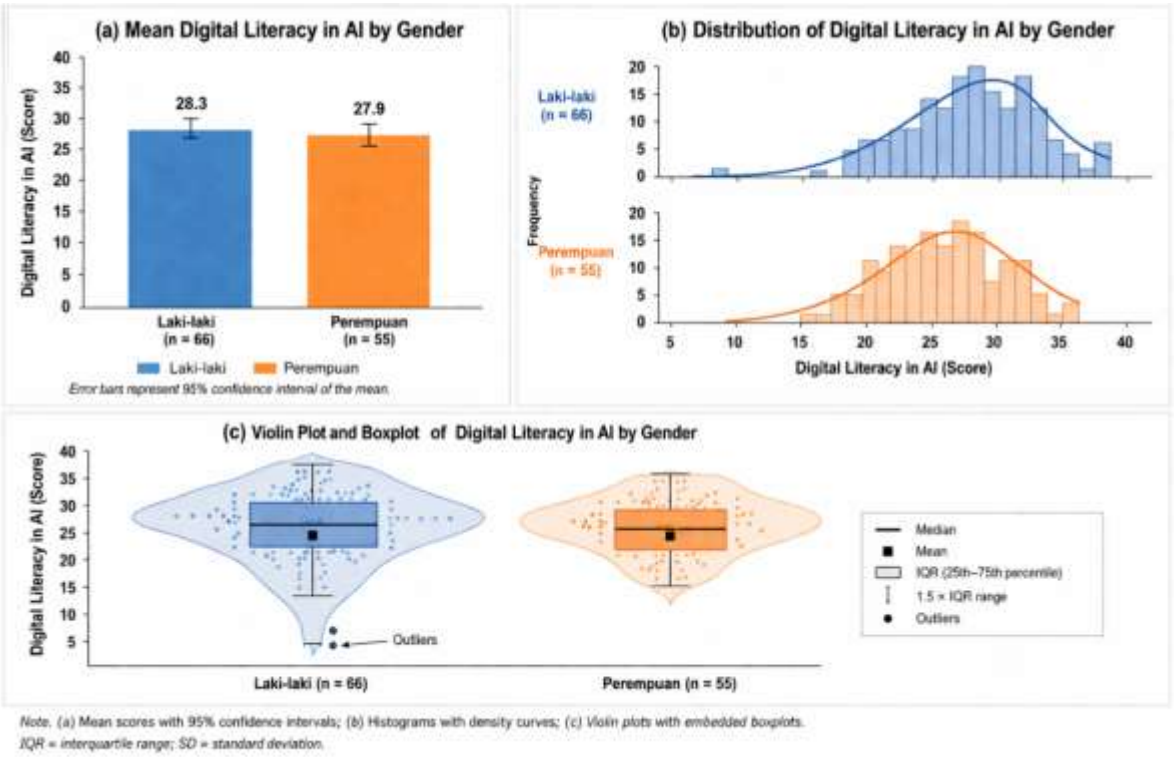
Table 1. Summary of Descriptive Statistics for Digital Literacy in AI and Behavioral Intention to Use AI Across Gender Groups.

	Gender	Digital Literacy in AI	Behavioral Intention to Use AI
N	Male Students	66	66
	Female Students	55	55
Missing	Male Students	0	0
	Female Students	0	0
Mean	Male Students	28.3	15.7
	Female Students	27.9	15.7
Std. error mean	Male Students	0.584	0.345
	Female Students	0.542	0.398
95% CI mean lower bound	Male Students	27.1	15.0
	Female Students	26.8	14.9
95% CI mean upper bound	Male Students	29.5	16.3
	Female Students	29.0	16.5
Median	Male Students	29.0	16.0
	Female Students	28	16
Mode	Male Students	30.0	16.0
	Female Students	28.0	16.0
Sum	Male Students	1868	1033
	Female Students	1534	861
Standard deviation	Male Students	4.74	2.80
	Female Students	4.02	2.95
Variance	Male Students	22.5	7.86
	Female Students	16.1	8.71
Range	Male Students	27	11
	Female Students	14	12
Minimum	Male Students	8	9
	Female Students	21	8
Maximum	Male Students	35	20
	Female Students	35	20
Skewness	Male Students	-1.49	-0.217
	Female Students	0.298	-0.271
Std. error skewness	Male Students	0.295	0.295
	Female Students	0.322	0.322
Kurtosis	Male Students	4.09	-0.270
	Female Students	-0.680	-0.501
Std. error kurtosis	Male Students	0.582	0.582
	Female Students	0.634	0.634
25th percentile	Male Students	26.0	14.0
	Female Students	25.0	13.5
50th percentile	Male Students	29.0	16.0

	Female Students	28.0	16.0
75th percentile	Male Students	31.8	17.8
	Female Students	30.0	18.0

Digital Literacy in AI

The descriptive analysis of students' Digital Literacy in AI reveals nuanced patterns in terms of central tendency, variability, and distribution across gender groups. These patterns provide a more comprehensive understanding of how students' competencies in AI are distributed beyond simple average comparisons. The findings are further supported by statistical summaries in Table 1 and visual representations in Figure 1, which together offer deeper insights into the structure and characteristics of the data.



Note. (a) Mean scores with 95% confidence intervals; (b) Histograms with density curves; (c) Violin plots with embedded boxplots. IQR = interquartile range; SD = standard deviation.

Figure 1. Descriptive Statistics and Distribution of Digital Literacy in AI by Gender

a. Central Tendency and Overall Performance

The mean score of Digital Literacy in AI for male students is 28.3 (SE = 0.584), slightly higher than that of female students, which is 27.9 (SE = 0.542). The difference between the two groups is minimal, indicating that, at an aggregate level, both male and female students demonstrate relatively comparable levels of AI-related digital literacy. This observation is further supported by the median values, where male students have a median score of 29.0, while female students have a median of 28.0. The proximity between mean and median values in both groups suggests that the central distribution of scores is relatively stable, although subtle differences in distribution shape are observed.

The mode values also provide additional insight, with male students showing a mode of 30.0, whereas female students have a mode of 28.0, indicating that the most frequently occurring score among male students is slightly higher. From a descriptive standpoint, these findings suggest

that students, regardless of gender, have reached a relatively high level of familiarity and competence in engaging with AI-related technologies. This aligns with recent developments in AI integration within educational contexts, where students are increasingly exposed to AI-driven tools for learning, assessment, and content generation.

b. Variability and Score Dispersion

Despite similar mean scores, a more detailed examination reveals differences in variability between the two groups. Male students exhibit a higher standard deviation (SD = 4.74) compared to female students (SD = 4.02), indicating a wider spread of scores. This pattern is further confirmed by the variance values, where male students show a higher variance (22.5) than female students (16.1), suggesting that the distribution of Digital Literacy in AI among male students is more dispersed.

Additionally, the range of scores among male students is substantially wider (Range = 27, Min = 8, Max = 35) compared to female students (Range = 14, Min = 21, Max = 35). This suggests that male students include both high-performing individuals and those with relatively low levels of AI literacy, whereas female students tend to cluster within a narrower performance band. From an educational perspective, this pattern indicates that while average competence appears similar, the distribution of competence is less uniform among male students, pointing to a higher degree of heterogeneity. This finding resonates with prior studies on digital literacy, which suggest that variability within groups can be influenced by differences in prior exposure, access to technology, and self-directed learning behaviors rather than demographic factors alone.

c. Distribution Shape: Skewness and Kurtosis

A deeper understanding of the data emerges from examining skewness and kurtosis values. For male students, the skewness value is −1.49 and kurtosis is 4.09, while for female students, the skewness is 0.298 and kurtosis is −0.680. The negative skewness observed among male students indicates a left-skewed distribution, meaning that a large proportion of students achieved higher scores, with a small number of low-scoring outliers extending the distribution tail to the left. The relatively high kurtosis value further suggests a leptokurtic distribution, characterized by a sharper peak and heavier tails, indicating the presence of extreme values.

In contrast, the distribution for female students is relatively symmetrical and platykurtic, reflecting a flatter distribution with fewer extreme values and a more even spread of scores around the mean. These distributional differences are visually reinforced in Figure 1, where male students display a concentration of high scores alongside a few extreme low values, while female students show a more balanced and consistent distribution.

d. Visual Interpretation

The graphical representation provides strong support for the statistical findings. As presented in Figure 1, which integrates a bar chart with confidence intervals, histogram with density curves, and a violin plot combined with a boxplot, the mean differences between male and female students appear minimal, as indicated by overlapping confidence intervals. The histogram and density plots further show a negatively skewed distribution for male students and a more symmetrical distribution for female students. In addition, the violin plot and boxplot reveal a wider dispersion and the presence of low value outliers among male students, whereas female students display a more compact and consistent distribution. Overall, these visual insights confirm that the key distinction between the groups lies not in average performance, but in their distributional characteristics and variability.

e. Discussion and Theoretical Interpretation

The findings of this study suggest that Digital Literacy in AI among students is generally high and relatively balanced across gender. This aligns with contemporary perspectives on digital literacy, which emphasize that access to technology and exposure to digital tools are increasingly democratized in modern educational environments (Kalyani, 2024; Rahimi & Oh, 2024). However, the greater variability observed among male students indicates that individual differences within groups remain significant. This supports the argument that digital literacy is not merely a function of demographic variables such as gender, but is also shaped by factors such as self-regulated learning, prior experience with technology, frequency of AI tool usage, and intrinsic motivation (Bembenutty et al., 2024; Huang & Derakhshan, 2025). These factors play a crucial role in determining how effectively students engage with and develop competencies in AI-related technologies.

From the perspective of digital literacy theory, this finding highlights the importance of moving beyond average scores and focusing on distributional equity. In other words, ensuring that all students reach a minimum level of competence is more critical than simply increasing overall averages (Mirazchiyski & Černe, 2020). This perspective emphasizes the need to address inequalities in digital skills within groups rather than between groups. Furthermore, the presence of high-performing individuals alongside low-performing outliers among male students suggests a polarization effect, where some students benefit significantly from AI exposure while others lag behind. This phenomenon has been widely discussed in technology adoption research, where early adopters rapidly develop advanced competencies, while others struggle due to limited guidance, access, or support (Howaldt et al., 2025; Mbatha, 2024). Interestingly, the more consistent distribution among female students may indicate a more uniform learning pattern, potentially reflecting differences in learning strategies, engagement, or collaborative behaviors (Gomes et al., 2023; Shi et al., 2024).

f. Key Insight of Digital Literacy

The most important contribution of this finding is that the primary difference in Digital Literacy in AI is not reflected in mean scores, but rather in the variability and distribution of competencies within groups. This implies that educational interventions should not only aim to improve overall literacy levels, but also focus on reducing disparities among students, supporting low-performing individuals, and promoting equitable access to AI learning opportunities.

1. Behavioral Intention to Use AI

The descriptive analysis of students' Behavioral Intention to Use AI provides important insights into their readiness and willingness to adopt AI technologies in learning contexts. Similar to Digital Literacy in AI, the analysis is examined through central tendency, variability, distributional characteristics, and theoretical interpretation. The results are reinforced by the statistical summaries presented in Table 1 and the visualizations in Figure 2, which collectively provide a more detailed understanding of the data's structure and underlying characteristics.

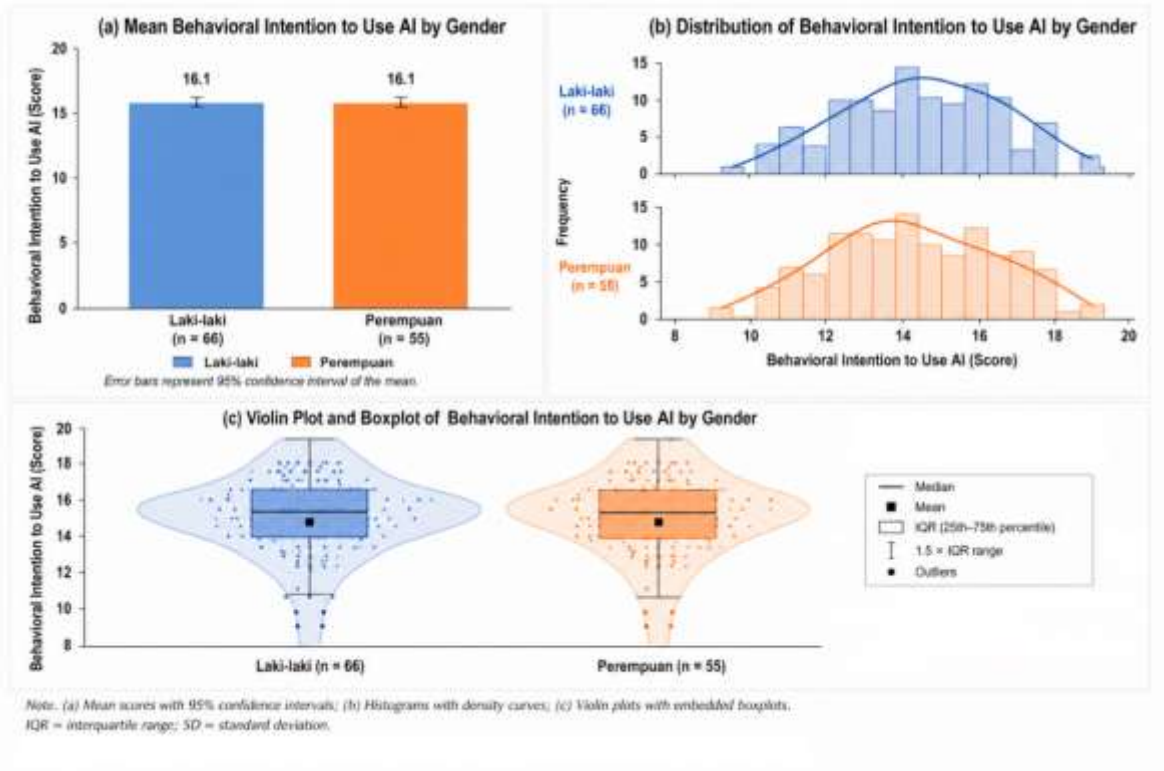


Figure 2. Descriptive Statistics and Distribution of Behavioral Intention to Use AI by Gender

a. Central Tendency and Overall Intention Level

The results show that the mean score of Behavioral Intention to Use AI is identical for both male and female students, with a value of 15.7. This indicates that, at an aggregate level, students demonstrate a consistently high intention to use AI technologies regardless of gender. The median values further reinforce this finding, with both groups recording a median of 16.0, suggesting that the central tendency of the data is highly stable and symmetrical across groups. Similarly, the mode value for both male and female students is 16.0, indicating that the most frequently occurring level of intention is exactly the same.

The closeness of mean, median, and mode values across both groups suggests a high level of consistency and central concentration, indicating that students' intention to use AI is not only high but also uniformly distributed around a central value. From a practical perspective, this reflects a strong acceptance of AI technologies among students, likely influenced by the increasing integration of AI tools such as generative AI, automated feedback systems, and intelligent tutoring systems in educational environments.

b. Variability and Score Dispersion

In contrast to Digital Literacy in AI, the variability in Behavioral Intention to Use AI is relatively low and consistent across groups. The standard deviation for male students is 2.80, while for female students is slightly higher at 2.95, indicating only minor differences in score dispersion. This pattern is further supported by the variance values, which are comparable between male students (7.86) and female students (8.71).

Similarly, the range of scores is also relatively close, with male students having a range of 11 (Min = 9; Max = 20) and female students a range of 12 (Min = 8; Max = 20). These findings suggest that students' intention to use AI is not only high but also relatively homogeneous, with most students clustering within a narrow band of scores. Unlike Digital Literacy in AI, where substantial variability was observed, particularly among male students, Behavioral Intention appears to be more stable and evenly distributed, indicating that students share a broadly similar level of willingness to engage with AI technologies.

c. Distribution Shape: Skewness and Kurtosis

Further insights into the distribution shape can be drawn from the skewness and kurtosis values. For male students, the skewness is −0.217 and kurtosis is −0.270, while for female students, the skewness is −0.271 and kurtosis is −0.501. The negative skewness values in both groups indicate a slight left-skewed distribution, meaning that a larger proportion of students tend to have higher intention scores, with fewer students reporting low intention levels. However, since the skewness values are relatively close to zero, the distributions can be considered approximately symmetrical. In addition, the slightly negative kurtosis values suggest a platykurtic distribution, indicating that the data are relatively flat and lack extreme peaks or heavy tails. Overall, this pattern implies that the distribution of Behavioral Intention to Use AI is well balanced and free from extreme outliers, reinforcing the idea that students' intention levels are consistently distributed across the sample.

d. Visual Interpretation

The graphical representation further supports the statistical findings. As presented in Figure 2, which integrates multiple visual components including a bar chart with confidence intervals, histogram with density curves, and a violin plot combined with a boxplot, both male and female students show distributions that are slightly skewed toward higher scores, indicating a general tendency toward strong intention to use AI. The histogram and density plots illustrate that most students cluster in the upper range of scores, while the violin plot and boxplot reveal a relatively compact spread with minimal presence of extreme outliers. Compared to Digital Literacy in AI, the Behavioral Intention variable demonstrates lower variability, a more symmetrical distribution, and greater consistency across individuals. Overall, these visual patterns confirm that students' intention to use AI is not only high but also uniformly shared across the population.

e. Discussion and Theoretical Interpretation

The findings suggest that Behavioral Intention to Use AI among students is consistently high and relatively homogeneous across gender groups. This pattern aligns with established models of technology adoption, particularly the Technology Acceptance Model (TAM), which posits that behavioral intention is a key determinant of actual technology use and is primarily influenced by perceived usefulness and perceived ease of use (Davis, 1989; Venkatesh et al., 2003). The high and consistent intention observed in this study indicates that students likely perceive AI technologies as beneficial for their learning activities, easy to access and use, and relevant to their academic needs (Alqahtani et al., 2022; M. Li et al., 2025).

When compared with the findings on Digital Literacy in AI, an important pattern emerges. While Digital Literacy shows variability and differences in distribution, Behavioral Intention remains stable and consistently high across all groups. This suggests that students' intention to use AI is not strictly dependent on their level of digital literacy. Such a finding is particularly significant, as it indicates that even students with varying levels of competence still demonstrate a strong willingness to adopt AI technologies. This phenomenon may be explained by the intuitive

design of modern AI tools, widespread exposure to AI applications, as well as peer influence and academic demands (Dwivedi et al., 2021; Strzelecki, 2024).

From the perspective of educational technology, this reflects a shift from competence-driven adoption to necessity-driven adoption, where students engage with AI not only because they possess the required skills, but also because AI has become an integral part of the contemporary learning ecosystem (Farias-Gaytan et al., 2023; Zawacki-Richter et al., 2019).

f. Key Insight of Behavioral Intention to Use AI

The most important takeaway from this finding is that Behavioral Intention to Use AI represents a stable and uniformly high construct, indicating that AI adoption among students has reached a normative stage in which intention is no longer a differentiating factor but a common baseline. This suggests that future educational strategies should focus less on increasing intention and more on improving actual competence in terms of digital literacy, ensuring the effective and ethical use of AI, and providing targeted support for students who lag behind in skills despite demonstrating high levels of intention.

2. Comparative Insight of Digital Literacy in AI and Behavioral Intention to Use AI

A key contribution of this study emerges when comparing Behavioral Intention with Digital Literacy in AI. Digital Literacy demonstrates noticeable variability, includes outliers, and reflects an unequal distribution of competencies among students. In contrast, Behavioral Intention appears more stable, consistent, and widely shared across the sample. This contrast highlights an important implication, namely that the gap in AI competence does not translate into a gap in AI adoption intention. In other words, although students differ in how well they understand or use AI, they do not differ significantly in their willingness to adopt it.

CONCLUSIONS

This study found that students' Digital Literacy in AI is generally high and comparable across gender in terms of mean scores, but differs in distribution, with male students showing greater variability and female students displaying more consistent patterns. In contrast, Behavioral Intention to Use AI is uniformly high and stable across all groups, indicating a shared readiness to adopt AI technologies. The key contribution of this study is the identification that differences lie not in average performance but in the variability of competencies, while intention remains consistently strong regardless of literacy levels. These findings imply that educational efforts should focus on improving actual AI competence, reducing disparities among students, and promoting effective and ethical use of AI. Future research is recommended to explore the relationship between digital literacy and behavioral intention using inferential approaches, incorporate additional influencing factors, and expand the scope of study to enhance generalizability and depth of understanding.

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