

## AI Readiness for Personalized Learning: A Comparative Study Between Millennials and Gen Z Contents

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### Abstract

This research examines the impact of Artificial Intelligence (AI) on personalized learning across two generational cohorts, Generation Z (Gen Z) and Millennials, with a focus on three key variables: engagement with AI in education, perceptions of AI in education, and technological fluency and interaction with AI. Using a 30-item AI Readiness Scale (Cronbach's  $\alpha = .96$ ), data were collected from 123 participants, including 78 Gen Z and 45 Millennial learners (84 females and 39 males). Independent samples t-tests revealed that Gen Z learners scored significantly higher than Millennials in overall AI readiness  $t(54.48) = 4.75, p < .001$ , with large effect sizes for engagement ( $d = 1.23$ ) and technological fluency ( $d = 1.00$ ), and a moderate effect for perceptions ( $d = 0.61$ ). A significant association was found between generational group and AI readiness level,  $\chi^2(2, N = 123) = 20.02, p < .001$ . Gender-based chi-square analyses showed similar trends. Among females, Gen Z participants were significantly more likely to be in the high readiness category (33.9%) than Millennial females (10.7%),  $\chi^2(2, N = 84) = 12.52, p = .002$ . Among males, Gen Z learners also outperformed their Millennial peers, with significant differences observed,  $\chi^2(2, N = 39) = 7.43, p = .024$ . These findings support that Gen Z exhibits higher AI readiness and highlight the need for differentiated AI integration strategies in educational settings. Institutions should leverage Gen Z's advanced digital fluency while providing targeted support to bridge readiness gaps among millennial learners. The results offer critical insights into generational dynamics in the adoption of AI for personalized learning.

**Keywords:** Artificial Intelligence; Millennials; Generation Z; AI Readiness

### Introduction

#### Background of the Study

Artificial Intelligence (AI) has become more integrated into educational environments, creating new opportunities for personalized and adaptable learning. Learners can receive content that is customized to their needs, pace, and preferences thanks to AI systems in education, which also provide differentiated training, real-time feedback, intelligent coaching, and data-driven insights (Zawacki-Richter et al., 2019).

Understanding students' readiness—or AI readiness—to engage with these systems is crucial as personalized learning emerges as a key trend in 21st-century education.

According to Luckin et al. (2016), a learner's engagement with AI tools, opinions regarding the usefulness of AI in education, and proficiency with intelligent technology are all components of AI readiness in education.

Generational disparities are becoming more significant in this environment. The largest percentage of students at higher education institutions and professional development settings are Millennials (born 1981–1996) and Generation Z (born 1997–2012). Despite having digital connections, the two groups' expectations and experiences with educational technology are very different (Seemiller & Grace, 2017). While Gen Z grew up surrounded by smart devices, social media, and algorithm-driven platforms, Millennials made the shift from analogue to digital surroundings. As a result, they may be more receptive to AI-enhanced learning methods (Twenge, 2017).

In the wake of recent studies, Gen Z students' extended exposure to recommendation engines, chatbots, and digital learning platforms may have made them more accustomed to automation and AI-enabled decision-making in the classroom (Zhang et al., 2021). On the other hand, because of their prior experiences with swift technical advancements and privacy issues, Millennials might be more cautious and skeptical when using AI technologies (Baig et al., 2021). This discrepancy is further emphasized by studies showing that Gen Z values efficiency and personalization more, which is consistent with what AI-driven learning environments can offer (Ahmad & Lee, 2023). Moreover, as AI is incorporated into assessment programs, learning management systems, and institutional regulations, all students must be prepared to be AI-ready, as highlighted by worldwide educational trends (Holmes et al., 2019).

Researchers are now investigating digital readiness and fair access to technology because of the COVID-19 pandemic, which further expedited the use of AI-based educational technologies (Sá & Serpa, 2020). Generational cohorts may react differently to AI integration in this changing environment, depending on their preferred methods of learning, level of technological exposure, and level of digital confidence.

Even though AI is becoming increasingly important in education, there is still a lack of empirical study assessing the preparedness of different generations for AI. Most of the current research emphasizes technology infrastructure or faculty preparedness rather than learner-centric viewpoints. To bridge that gap, this study examines AI readiness from the perspectives of Gen Z and Millennials, paying particular attention to their use of AI technologies, perceptions of its value in education, and digital fluency.

By identifying generational gaps in AI preparedness, the study hopes to enlighten educational designers, policymakers, and technology developers on how to create AI-enhanced learning environments that are inclusive, successful, and responsive to learners' needs.

### **Research Objectives**

1. To compare the AI readiness of Millennials and Generation Z in the context of personalized learning.
2. To compare the level of engagement with AI in education between Millennial and Gen Z learners.
3. To analyze the differences in perceptions of AI in education between Millennial and Gen Z learners.
4. To assess the variations in technological fluency and interaction with AI tools for

personalized learning between Millennial and Gen Z learners.

### **Hypotheses:**

#### **Hypothesis 1**

H<sub>0</sub>: There is no significant difference between Millennials and Gen Z in their AI readiness for personalized learning.

H<sub>1</sub>: There is a significant difference between Millennials and Gen Z in their AI readiness for personalized learning.

#### **Hypothesis 2**

H<sub>0</sub>: There is no significant difference between Millennials and Gen Z in their engagement with AI in education.

H<sub>1</sub>: There is a significant difference between Millennials and Gen Z in their engagement with AI in education.

#### **Hypothesis 3**

H<sub>0</sub>: There is no significant difference between Millennials and Gen Z in their perceptions of AI in education.

H<sub>1</sub>: There is a significant difference between Millennials and Gen Z in their perceptions of AI in education.

#### **Hypothesis 4**

H<sub>0</sub>: There is no significant difference between Millennials and Gen Z in their technological fluency and interaction with AI learning tools.

H<sub>1</sub>: There is a significant difference between Millennials and Gen Z in their technological fluency and interaction with AI learning tools.

## **Methodology**

### **Research Design**

This study employed a quantitative, cross-sectional survey design to explore generational differences in AI readiness across three dimensions: Engagement with AI (EAI), Perceptions of AI (PAI), and Technological Fluency and Interaction with AI (TFAI). The design was selected to systematically collect and analyze data from a defined population at a single point in time. It enabled the researchers to identify patterns, make comparisons between Generation Z and Millennial learners, and assess the overall levels of AI readiness. This design is particularly suitable for studies aiming to examine psychological constructs and technology usage behaviors in educational contexts.

### **Participants**

A total of 123 participants were surveyed, comprising 78 Generation Z and 45 Millennial learners. The sample included 84 females and 39 males, representing a diverse group of learners in terms of age and gender. Participants were selected using the convenience sampling technique, chosen for its cost-effectiveness, ease of access, and time-efficiency. While this non-probability sampling method may limit the generalizability of findings, it provided a practical means to reach the targeted age groups within educational institutions and online learning platforms.

### **Instrument**

Data was collected using a structured questionnaire, designed to assess participants' readiness to engage with AI tools for personalized learning. The instrument consisted of two sections:

- **Section I** captured demographic details, including age, gender, educational background, and generational category.
- **Section II** contained the **AI Readiness Scale**, developed specifically for this study, comprising **30 items** divided equally into three dimensions:
  - a. **Engagement with AI (EAI)**
  - b. **Perceptions of AI (PAI)**
  - c. **Technological Fluency and Interaction with AI (TFAI)**

Each item was measured on a five-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). The internal consistency of the full scale was excellent (Cronbach's Alpha = .959), indicating high reliability. The questionnaire explored learners' frequency of AI use, their attitudes toward AI in education, and their competency in interacting with AI-based tools.

Each respondent's AI readiness was categorized into one of three levels based on their total score (ranging from 30 to 150):

- **High AI Readiness (120–150):** Indicates strong engagement and integration of AI tools in learning.
- **Moderate AI Readiness (90–119):** Suggests occasional or functional use of AI with partial reliance on traditional methods.
- **Low AI Readiness (60–89):** Reflects limited or reluctant use of AI in education.

The three subscales (EAI, PAI, TFAI) were further interpreted based on three-tiered frameworks that defined learners' levels of engagement, perception, and technological fluency:

#### **Engagement with AI (EAI)**

This subscale measured the frequency and depth of learners' use of AI tools in their educational experiences. It included 10 items that assessed participants' behavioral involvement with AI technologies, such as adaptive learning platforms, AI tutors, or generative tools like ChatGPT. Engagement levels were categorized into three tiers:

##### **Level 1: Passive Engagement / Minimal Adoption (Scores 10–15)**

Learners in this category demonstrate limited or hesitant use of AI tools and tend to rely on conventional learning methods. They often find AI platforms confusing, unintuitive, or not particularly helpful in improving academic performance.

**Level 2: Functional Engagement / Moderate Adoption (Scores 16–30)** Learners at this level make regular use of AI for specific tasks (e.g., practice quizzes, summarization tools) and find them moderately helpful. They integrate AI with traditional approaches but do not rely on it exclusively.

##### **Level 3: Active Engagement / High Adoption (Scores 31–50)**

These learners actively use AI as a central part of their learning. They demonstrate a preference for AI over traditional methods, trust AI platforms to deliver personalized instruction, and feel motivated by AI features like adaptability, feedback, and interactivity.

#### **Perceptions of AI (PAI)**

The PAI subscale captured participants' cognitive and affective attitudes toward the role of AI in education. The 10 items in this subscale explored learners' beliefs, trust, curiosity, and concerns related to AI-powered tools and their potential for personalized learning. Perception levels were also defined across three tiers:

**Level 1: Awareness & Curiosity (Introductory Perception) (Scores 10–15)** Participants in this group have basic knowledge of AI, often from informal sources. They may be skeptical or

cautious due to limited exposure or misconceptions about AI capabilities.

**Level 2: Acceptance & Experimentation (Functional Perception) (Scores 16–30)**

Learners at this level view AI as a helpful tool and engage with it selectively for tasks like writing support or language learning. They show moderate understanding of its capabilities and express interest in its ethical implications.

**Level 3: Trust & Integration (Transformative Perception) (Scores 31–50)** These individuals demonstrate deep understanding of AI applications and trust them for core learning activities. They view AI as a collaborative agent and engage critically with ethical and data privacy concerns.

**Technological Fluency and Interaction with AI (TFAI)**

This subscale evaluated the participants' technological competence and their ability to interact effectively with AI-based systems. It assessed both the confidence in using AI tools and the ability to personalize their learning experience through such tools. The 10 items in this subscale were also classified into three levels:

**Level 1: Basic Exposure & Low Confidence (Introductory Technological Fluency) (Scores 10–15)**

Learners in this category have minimal experience with AI tools and report low confidence in using them effectively. They may perceive AI systems as difficult to navigate or irrelevant to their learning style.

**Level 2: Functional Use & Growing Trust (Intermediate Technological Fluency) (Scores 16–30)**

These learners use AI more regularly and recognize its usefulness in tasks such as homework assistance or revision. While still relying on human instructors, they begin to see value in AI's feedback and personalization features.

**Level 3: Integrated Use & High Trust (Advanced Technological Fluency) (Scores 31–50)**

Learners at this level are highly fluent in using multiple AI tools and trust them for real-time, personalized learning. They prefer AI tools over delayed human responses and are willing to share data for improved recommendations and learning pathways.

Each of the three subscales provided a nuanced understanding of the learners' readiness to engage with AI-driven educational platforms and applications. These classifications are consistent with contemporary models of technology adoption such as the **Technology Acceptance Model (TAM)** (Davis, 1989) and the **SAMR model** (Puentedura, 2014), thereby providing both conceptual and practical relevance for the analysis and interpretation of results.

**Data Collection**

The data collection was conducted using an online survey administered via Google Forms. Participants were invited through email and social media platforms with a brief description of the study's purpose. Informed consent was obtained digitally before participants proceeded to the questionnaire. Respondents were assured of the confidentiality and anonymity of their responses, and participation was entirely voluntary. The survey remained open for a period of four weeks.

**Data Analysis**

Data were analyzed using IBM SPSS Statistics version 27. Descriptive statistics (means, standard deviations, frequencies, and percentages) were computed to summarize demographic data and AI readiness scores. The total readiness scores were computed by summing all 30 items, with subscale scores calculated for each of the three dimensions.

To examine generational differences, independent samples t-tests were conducted for mean comparisons between Generation Z and Millennial groups. Where appropriate, one-tailed t-tests were applied based on directional hypotheses. Chi-square tests were used to analyze categorical variables such as levels of readiness across groups. Additionally, effect sizes (Cohen's *d*) were calculated to assess the practical significance of observed differences. All statistical tests were conducted at a significance level of  $p < .05$ .

### Results and Findings

This section outlines the empirical findings of the study, starting with respondents' demographic characteristics, followed by descriptive statistics, reliability analysis and inferential tests examining generational differences in AI readiness between Millennials and Gen Z.

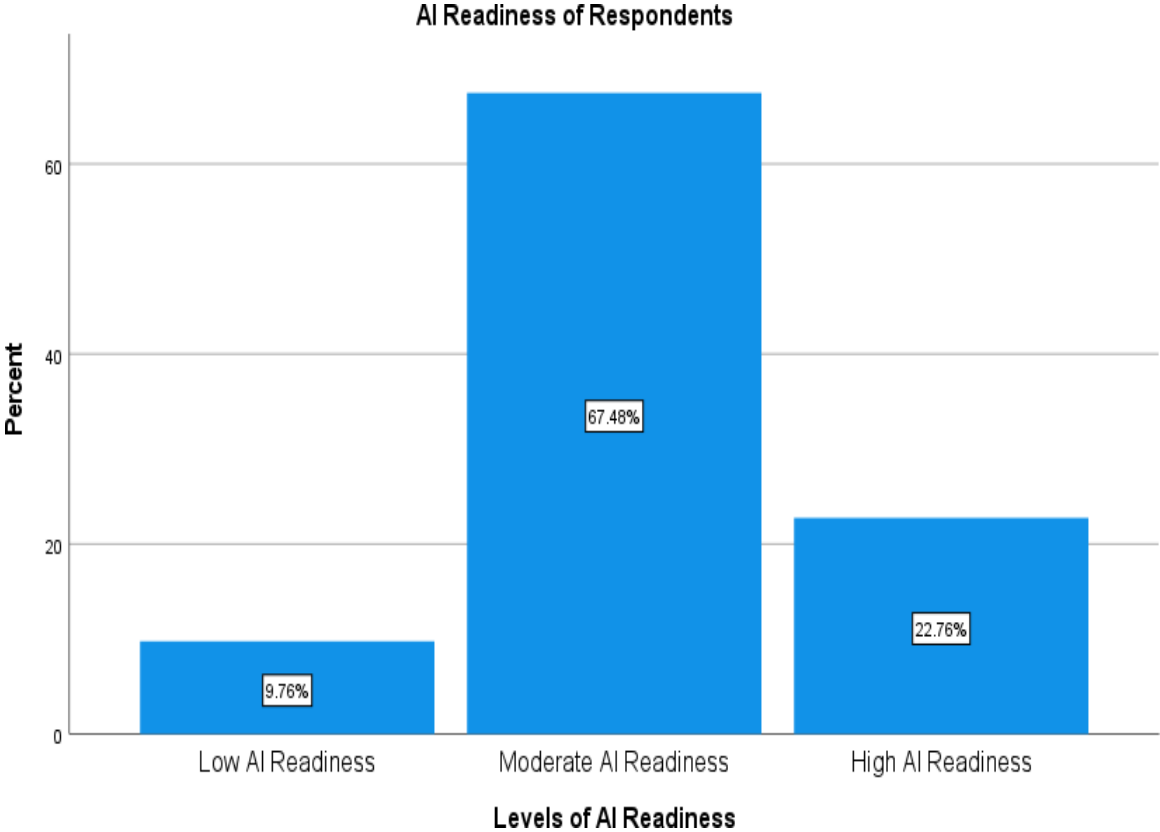
#### Demographic Characteristics of Respondents

To contextualize the findings, the demographic characteristics of the respondents (N=123) are presented first. These characteristics provide an overview of the sample composition in terms of gender, age, generational cohort, employment status, and marital status.

*Table 3.1: Demographic Characteristics of Respondents*

<i>Demographic Variable</i>	<i>Category</i>	<i>Count (n)</i>	<i>Percent (%)</i>
<i>Gender</i>	Female	84	68.3
	Male	39	31.7
<i>Generation</i>	Millennials	45	36.6
	Gen Z	78	63.4
<i>Age (years)</i>	11–17	19	15.4
	18–25	54	43.9
	26–35	25	20.3
	36–45	25	20.3
<i>Employment Status</i>	Government sector	32	26.0
	Private sector	17	13.8
	Part-time employment	1	0.8
	Self-employed	2	1.6
	Unemployed	71	57.7
<i>Marital Status</i>	Married with children	31	25.2
	Married without children	12	9.8

Single, never married	77	62.6
Other	3	2.4



As shown in the Table 3.1, the sample predominantly comprised females and Gen Z participants.

AI Readiness Levels

Figure 3.1, illustrates that the majority of respondents (67.5%) demonstrated a moderate level of AI readiness.

Comparison of AI readiness between Gen Z and Millennials

Figure 3.1: Comparison of AI readiness between Gen Z and Millennials

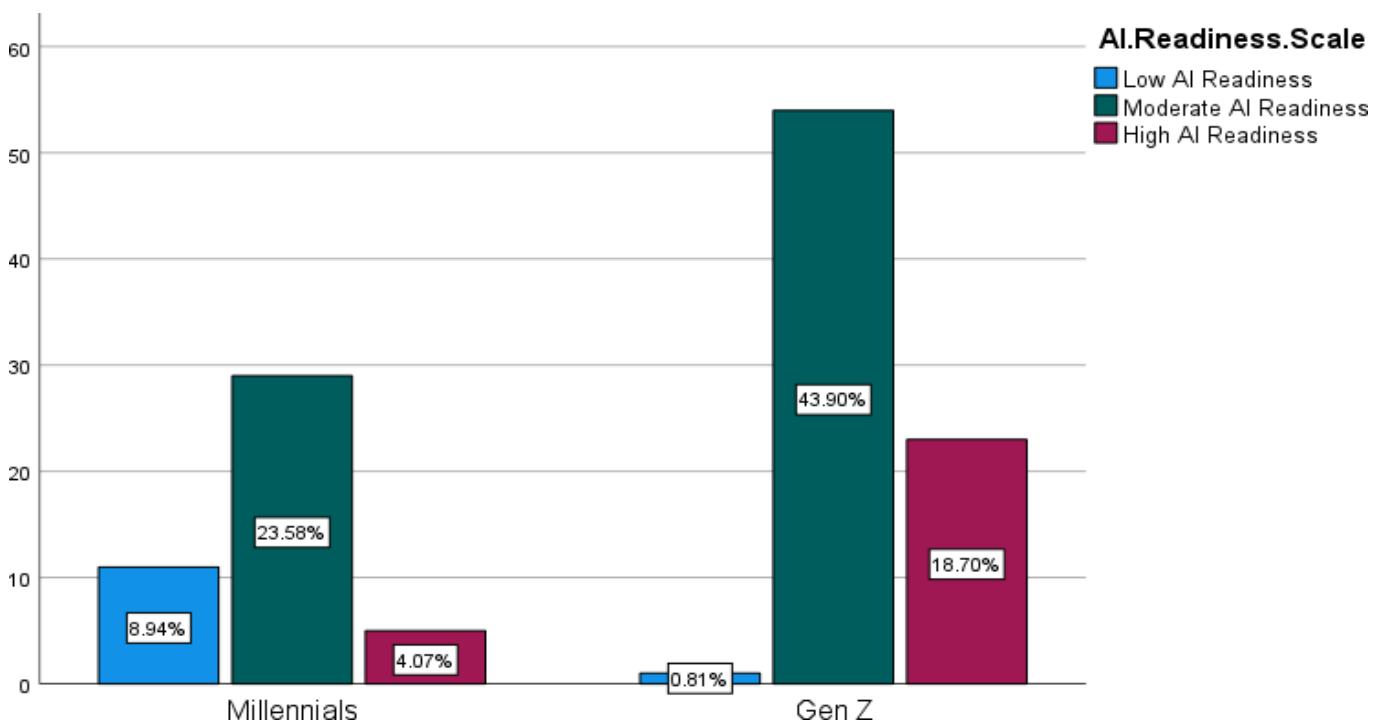


Figure 3.2 shows that generational differences in AI readiness, with Gen Z consistently scoring higher than Millennials across all readiness levels.

### Reliability Analysis

The internal consistency of the AI Readiness Scale, consisting of 30 items, was assessed using Cronbach's alpha. The scale demonstrated excellent reliability, Cronbach's Alpha = 0.959 (30 items), indicating that the items consistently measure the construct of AI readiness.

### Group Differences in AI Readiness Between Generations

To examine whether Gen Z and Millennial learners differ in their AI readiness, an independent samples t-test was conducted on the overall AI Readiness composite score and its three subdomains: Engagement with AI in Education (EAI), Perceptions of AI in Education (PAI), and Technological Fluency and Interaction with AI (TFAI).

### Levene's Test for Equality of Variances

Levene's test indicated a violation of homogeneity of variances for AI Readiness, EAI, and PAI ( $p < .001$ ); hence, equal variances were not assumed for these variables in the t-test interpretation.

Table 3.2: Independent samples t-test results for generational differences in AI readiness

<i>Variable</i>	<i>t-value</i>	<i>Sig. (2-tailed)</i>	<i>Mean Difference</i>	<i>Equal Variance Assumption</i>	<i>Interpretation</i>
<i>AI Readiness</i>	5.696	< .001	18.03	Not assumed	Significant difference: Gen Z scored significantly higher than Millennials ( $p < .001$ ).
<i>Engagement with AI in Education</i>	6.590	< .001	7.78	Not assumed	Significant difference: Gen Z > Millennials ( $p < .001$ ).
<i>Perception of AI in Education</i>	3.231	.002	3.92	Not assumed	Significant difference: Gen Z > Millennials ( $p = .002$ ).

There is a significant difference between Gen Z and Millennials across all domains of AI readiness. Gen Z consistently scores higher.

Table 3.3: Effect sizes (Cohen's *d*) for generational differences in AI readiness

<i>Variable</i>	<i>Cohen's d</i>	<i>Effect Size Magnitude</i>	<i>Interpretation</i>
<i>AI Readiness</i>	1.066	Large	Gen Z scores very substantially higher than Millennials.
<i>Engagement with AI in Education</i>	1.234	Large	Large difference in AI engagement between Gen Z and Millennials.
<i>Perception of AI in Education</i>	0.605	Medium	Moderate difference in perceptions of AI in education.

<i>Technological Fluency and Interaction with AI in Education</i>	0.998	Large	Large difference in technological fluency and interaction.
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A statistically significant difference was found between Gen Z and Millennials in overall AI readiness,  $t(54.48) = 4.75$ ,  $p < .001$ , with Gen Z ( $M =$  higher) scoring significantly higher than Millennials. The effect size was large, Cohen's  $d = 1.07$ , suggesting a substantial practical difference.

#### **Engagement with AI in Education (EAI)**

Gen Z participants reported significantly greater engagement with AI tools compared to Millennials,  $t(52.75) = 5.42$ ,  $p < .001$ . This difference was large in magnitude, Cohen's  $d = 1.23$ .

#### **Perceptions of AI in Education (PAI)**

There was a statistically significant difference in perceptions of AI in education between Gen Z and Millennials,  $t(55.69) = 2.72$ ,  $p = .009$ , with Gen Z reporting more favorable perceptions. The effect size was moderate, Cohen's  $d = 0.61$ .

#### **Technological Fluency and Interaction with AI (TFAI)**

Gen Z also demonstrated significantly higher technological fluency and interaction with AI learning tools compared to Millennials,  $t(121) = 5.33$ ,  $p < .001$ . The effect size was large, Cohen's  $d = 1.00$ .

#### **Chi-Square Analysis of AI Readiness Levels by Generation**

To further explore the association between generational group and AI readiness level (low, moderate, high), a chi-square test of independence was conducted. A statistically significant association was found,  $\chi^2(2, N = 123) = 20.02$ ,  $p < .001$ . The majority of Gen Z participants (82.1%) fell into the "high AI readiness" category, while the majority of Millennials (64.4%) were in the "moderate AI readiness" category. Only 1.3% of Gen Z participants were categorized as having low AI readiness, compared to 24.4% of Millennials..

### **Discussion and Analysis**

The present study aimed to examine generational differences in AI readiness between Millennials and Gen Z learners, focusing on three key domains: Engagement with AI in Education (EAI), Perceptions of AI in Education (PAI), and Technological Fluency and Interaction with AI (TFAI). The results strongly support the directional hypothesis ( $H_{14}$ ), which posited that Gen Z learners would exhibit significantly higher AI readiness than their Millennial counterparts.

Across all three domains, Gen Z consistently outperformed Millennials, with statistically significant differences observed in engagement, perception, and technological fluency scores. Specifically, Gen Z learners reported higher levels of engagement with AI tools, more positive perceptions of AI in education, and greater technological fluency and interaction with AI-driven platforms. The effect sizes for these differences were notably large for EAI ( $d = 1.23$ ) and TFAI ( $d = 1.00$ ), and moderate for PAI ( $d = 0.61$ ), underscoring both the statistical and practical significance of the findings.

These results are consistent with existing literature suggesting that Gen Z, often referred to as

digital natives, have grown up with greater exposure to technology, including AI-enabled systems, which may contribute to their comfort, adaptability, and enthusiasm toward educational innovations (Prensky, 2001; Seemiller & Grace, 2016). Conversely, Millennials, while technologically competent, may not have experienced the same early and ubiquitous integration of AI into their academic and social environments.

The chi-square analysis further corroborated these findings by showing that a significantly greater proportion of Gen Z learners (82.1%) fell into the high AI readiness category, while the majority of Millennials (64.4%) were in the moderate AI readiness group. This reinforces the idea that Gen Z learners are more equipped and more open to adopting personalized learning environments powered by AI technologies.

### **Conclusion**

In conclusion, this study provides strong empirical support for the assertion that Gen Z learners demonstrate significantly higher AI readiness than Millennials in educational contexts. These differences span across engagement, perception, and technological fluency, suggesting the need for differentiated instructional strategies and AI training programs. As educational systems become increasingly driven by AI technologies, understanding generational readiness will be critical to ensuring effective and inclusive.

### **Implications for Educational Practice**

These findings have important implications for educators, instructional designers, and policy makers. Educational institutions should consider tailoring AI-integrated learning environments to accommodate generational readiness gaps. For Millennials, targeted training and scaffolding may be necessary to enhance their comfort and competence with AI tools. Meanwhile, for Gen Z, institutions can leverage their existing fluency to design more advanced, interactive, and autonomous AI-enhanced learning systems.

Furthermore, the significant differences suggest that a one-size-fits-all approach to AI integration in education may be ineffective. Instead, age-specific digital pedagogies and support mechanisms could foster more inclusive and equitable adoption of AI-enhanced personalized learning experiences.

### **Limitations and Future Research**

While the findings are robust, the study has a few limitations. First, the sample size, although adequate for t-tests and chi-square analysis, may not be representative of the broader population of Millennial and Gen Z learners across diverse educational contexts and cultural backgrounds. Second, the study relies on self-reported data, which may be subject to biases such as social desirability or over/underestimation of one's technological competence. Future research could explore longitudinal patterns in AI readiness, examine the influence of other demographic factors (e.g., gender, discipline, socio-economic status), and conduct qualitative investigations to understand the motivations and experiences underlying generational differences in AI adoption.

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