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Unfolding Generation Z Pre-Service Elementary Teachers Positive Attitude Toward Artificial Intelligence: Rasch Model Analysis

Eli Meivawati[*1], Dyah Puspitasari Ningthias[2], Eka Pravitasari Putri[3], Suci Rizkina Tari[4], Hilman Qudratudarsi[5], Meili Yanti[5]
[1]*Elementary School Teacher Education, Faculty of Teacher Training and Education, Universitas Sulawesi Barat, Indonesia*
[2]*Chemistry Education, Faculty of Teacher Training and Education, Universitas Mataram, Indonesia*
[3]*Physics Education, Faculty of Teacher Training and Education, Universitas Syiah Kuala, Indonesia*
[4]*Economic department, Sekolah Tinggi Ilmu Ekonomi Port Numbay, Indonesia*
[5]*Science Education, Faculty of Teacher Training and Education, Universitas Sulawesi Barat, Indonesia*
Email: eli.meivawati@unsulbar.ac.id

Abstrak
This study investigates the attitudes of pre-service elementary teachers in Indonesia toward artificial intelligence (AI) using Rasch model analysis. As future educators, their perceptions of AI are crucial for the successful integration of technology in educational practices. The research involved 244 participants from the Elementary Teacher Education program in West Sulawesi, Indonesia, selected based on inclusion criteria such as year of study and experience with AI applications in learning. The instrument, adapted with 12 items measuring positive attitudes toward AI, was validated through checks for reliability, item separation, fit statistics, and unidimensionality. Data were analyzed using WINSTEPS software to generate Wright maps and conduct Differential Item Functioning (DIF) analysis. Findings reveal that pre-service teachers generally demonstrate a moderate to high positive attitude toward AI, with higher-year students and those with more frequent AI usage exhibiting stronger positive attitudes. DIF analysis shows significant differences in item endorsement based on year of study and supported by one-way ANOVA results. These results suggest that greater exposure to AI correlates with more favorable attitudes. The study implies the need for structured AI integration in teacher education curricula to foster readiness and acceptance of AI in future teaching practices.
Keyword: *Generation Z, Pre-service Teacher, Rasch Model, Artificial Intelligence, Differential Item Functioning (DIF)*

INTRODUCTION

The integration of Artificial Intelligence (AI) into academic environments has brought about numerous benefits, transforming the ways in which knowledge is acquired, shared, and applied. The primary objectives of incorporating AI in academia include streamlining educational processes, enhancing research capabilities, and fostering innovation (Wang & Huang, 2025; Khatimah, Mustadi, Meivawati, & Anas, 2024). One of the key advantages of AI in education is its ability to personalize learning experiences. AI-powered adaptive learning systems can analyze student performance data and tailor instructional content to meet individual needs, ensuring more effective knowledge acquisition. Additionally, AI-based virtual assistants can offer round-the-clock academic support, providing answers to student queries and guiding them through complex concepts (Cukurova, 2025).

In recent years, the development of AI has significantly reshaped the educational landscape. As a rapidly advancing technology, AI has the potential to transform teaching and learning processes across all levels of education, including at the elementary school level (Kong, et. al., 2025). Recent surveys indicate a substantial increase in AI usage among educators and students. For instance, Richardson et al. (2024) reported that 68% of educators have used ChatGPT for lesson planning, while 45% have utilized GitHub Copilot for creating programming-related instructional materials. Similarly, Habibi et al., (2024) showed that most university students including pre-service teachers utilizing ChatGPT for their academic purposes.

However, the successful integration of AI into educational settings greatly depends on the attitudes and acceptance of educators toward these technologies (Al Darayseh, 2023; Dewi, Qudratuddarsi, Ningthias & Cinthami, 2024). Pre-service elementary school teachers, as the next generation of educators, play a critical role in determining the effectiveness of AI implementation in classrooms. Their attitudes toward AI will influence how they integrate the technology into their future teaching practices (Qudratuddarsi, Fauziah, Agung & Yanti, 2025; Sun, Tian, Sun, Fan & Yang, 2024). Despite its importance, research on pre-service elementary teachers' attitudes toward AI remains limited, especially in the Indonesian context . Elementary teachers are vital in shaping children's foundational knowledge and motivation, and their success impacts broader educational agendas such as the promotion of STEM education (Soeharto, Singh & Afriyanti, 2024).

A systematic review by Salas-Pilco et al. (2022) highlights the importance of nurturing digital competence and self-efficacy among pre-service teachers, suggesting that professional development initiatives should prioritize AI integration alongside ethical considerations. This aligns with the findings of Zhang et al. (2023), who observed that while pre-service teachers may have positive attitudes toward technology, their practical integration of AI often remains limited to teacher-centered practices. Addressing this gap requires targeted training that emphasizes student-centered approaches and the effective use of AI to support active learning. Ultimately, comparative studies such as this not only shed light on the factors influencing teacher attitudes toward AI but also inform the design of teacher education programs that empower future educators to embrace AI as a valuable tool for enhancing teaching and learning in primary education. Future research should consider longitudinal studies to track changes in attitudes as pre-service teachers engage with AI tools throughout their training and examine the impact of specific pedagogical interventions in cultivating positive attitudes toward AI.

This study adopts the Rasch model, distinguishing it from previous research that primarily used Classical Test Theory for instrument validation and analysis. The Rasch model has been proven to yield more accurate and in-depth insights when analyzing attitudes toward technology (Bond & Fox, 2021; Qudratuddarsi, Ramadhana, Indriyanti & Ismail, 2024). It enables researchers to identify various dimensions of attitudes while simultaneously measuring item difficulty and respondent ability on a common metric (Sumintono & Widhiarso, 2022).

Accordingly, this research aims to analyze the attitudes of pre-service elementary school teachers toward AI using the Rasch model, with a particular focus on promoting positive attitudes that support AI integration in teaching. The findings are expected to contribute significantly to the development of teacher education programs that prepare future educators for the digital era. The study is guided by two research questions: (1) What is the level of pre-service elementary teachers' positive attitude toward Artificial Intelligence at a university in Sulawesi? (2) Is there any influence of year of study and usage frequency on pre-service elementary teachers' positive attitude toward Artificial Intelligence at a university in Sulawesi?

METHODS

Research Design

This study employs a quantitative approach with a survey design. In this methodology, the primary focus is on gathering data in numerical form, allowing for objective measurement and statistical analysis. Unlike experimental designs, where researchers manipulate variables to observe their effects, this study maintains the natural conditions of the sample, ensuring that data reflect real-world situations without external influence (Qudratuddarsi, Sathasivam, & Hutkemri, 2019). The survey design is chosen due to its suitability for addressing the research objectives to unfold Pre-service Elementary Teachers Positive Attitude Toward Artificial Intelligence. It allows the collection of data from a large group of participants efficiently, providing a broader perspective on the phenomenon being studied. This approach is particularly valuable for identifying patterns, relationships, and trends within the data, which can then be generalized to the larger population as this study (Wagner, Mendez, Felderer, Graziotin & Kalinowski, 2020).

Subject of the study

The study involved 244 participants categorized based on gender, year of study, and usage frequency. The sample was chosen using convenience sampling because it allowed for quick and easy data collection by selecting participants who were readily accessible to the researcher. This method is considered due to there are constraints related to time, cost, or resources. The majority were female (83.61%), while males comprised 16.39% of the sample. Regarding the year of study, most participants were in their second year (56.56%), followed by third-year students (31.19%) and first-year students (14.75%). In terms of usage frequency, 65.57% were intermittent users, while 34.42% were frequent users. These demographics provide insight into the composition of the study subjects and their engagement levels.

Table 1. Subject of the study

Category	N	%
Gender		
Male	40	16.39%
Female	204	83.61%
Year of study		
First year	36	14.75%
Second year	138	56.56%

Category	N	%
Third year	70	31.19%
Usage Frequency		
Frequent user	84	34.42%
Intermittent user	160	65.57%
Total	244	100%

Instrument

The instrument used in this study was adapted from the work of Schepman and Rodway (2020), who developed a scale to measure general attitudes toward Artificial Intelligence (AI). To better align with the specific context of this research, several of the original statements were modified to reflect a focus on positive attitudes toward AI in the educational setting. These adapted items were reviewed and validated by three subject matter experts in the fields of educational technology and psychometrics. Their feedback was used to refine the wording, clarity, and contextual relevance of the statements, thereby enhancing the instrument's content validity.

Reliability and Separation

Reliability refers to the consistency and stability of the data collected using an instrument. In this study, three types of reliability were reported: Cronbach's alpha (0.94), item reliability (0.95), and person reliability (0.91). These values are considered high and indicate that the instrument produces consistent results across items and participants. Additionally, the instrument showed good item separation (4.43) and person separation (3.09), which means it can effectively distinguish between items of varying difficulty and individuals with different ability levels. These results suggest that the instrument is both reliable and capable of accurately measuring what it intends to a

Table 2. Reliability and Separation of PATAI

Indicator	Value
Person Reliability	0.91
Item Reliability	0.95
Cronbach Alpha	0.94
Person Separation	3.09
Item Separation	4.43
Chi-square	5261.11^{**} (d.f. 2593)

Item Fit Statistics

There are three considered indices to measure how well PATAI fit the Rasch midel framework. They are MNSQ measures the degree to which the data conforms to the Rasch model expectations. It quantifies the size of the difference (residual) between observed and expected responses. ZSTD is a standardized transformation of MNSQ into a z-score, showing how significant the misfit is relative to the sample size. Point Masure correlation is the correlation between an item's score and the overall ability measure of individuals. It reflects whether an item is aligned with the construct being measured. Accepted score for MNSQ is. All items from PATAI are accepted to be used to measure pre-service teacher attitude toward artificial intelligence.

Table 3. Item Fit Statistics of PATAI

Item	MNSQ		ZSTD		Pt Mea Corr
	Infit	Outfit	Infit	Oufit	
PATAI1	0.87	0.86	-1.4	-1.5	0.76
PATAI2	1.06	1.08	0.7	0.8	0.68
PATAI3	0.97	0.97	-0.3	-0.4	0.75
PATAI4	1.01	1.01	0.2	-0.1	0.75
PATAI5	0.73	0.73	-3.2*	-3.4*	0.81
PATAI6	1.48	1.48	4.6*	4.9*	0.71
PATAI7	1.12	1.12	1.3	0.8	0.70
PATAI8	0.72	0.72	-3.4*	-3.0*	0.80
PATAI9	0.84	0.84	-1.8	-1.7	0.77
PATAI10	0.97	0.97	-0.3	0.0	0.77
PATAI11	0.99	0.99	0.0	0.0	0.74
PATAI12	1.09	1.09	0.9	0.8	0.74

Unidimensionality

The PATAI (Positive Attitude Toward Artificial Intelligence) instrument satisfies the unidimensionality assumption of the Rasch model. The raw variance explained by measures is 57.3%, with 38.9% attributed to persons and 18.4% to items, indicating that the items collectively reflect the intended construct. The eigenvalue of the first contrast is 2.1, below the threshold of 3, and the unexplained variance in the residuals is 7.5%, well under the critical 15%. These results confirm that the PATAI instrument measures a single latent trait, and no further investigation of secondary dimensions is necessary.

Table 4. Unidimensionality of PATAI

	Value
Raw variance explained by persons	38.9%
Raw variance explained by items	18.4%
Raw variance explained by measures	57.3%
Unexplained variance in 1st contrast (eigenvalue)	2.1
Unexplained variance in 1st contrast (percentage)	7.5%

Data Collection

To collect the data, the researcher met participants directly through a door-to-door approach. This method ensured that participants clearly understood the purpose of the questionnaire and provided an opportunity to ask questions if they found any items confusing. Before completing the questionnaire, the researcher explained its purpose and emphasized that participation was entirely voluntary and would not affect the participants' grades. The questionnaire was administered using Google Forms to promote environmental sustainability by reducing paper usage compared to traditional paper-based surveys. Additionally, this method allowed for easier data management and analysis, as digital responses could be automatically recorded and organized. It also ensured better accuracy in data entry and minimized the risk of losing responses.

Data Analysis

The collected data were compiled into an Excel (.xls) file format to facilitate further analysis. The data were then processed using WINSTEPS, a software program designed for Rasch model measurement analysis. WINSTEPS allows for detailed and reliable examination of item and person performance based on Rasch principles. In this study, several key outputs from WINSTEPS were considered. First, the Wright Map was used to visualize the distribution of person abilities and item difficulties on the same scale, offering insight into the instrument's effectiveness. Second, a Differential Item Functioning (DIF) analysis was conducted based on participants' year of study, followed by a one-way ANOVA to determine whether there were statistically significant differences across groups. Third, a separate DIF analysis was carried out based on the frequency of questionnaire usage, and this was followed by an independent samples t-test to examine differences between high and low frequency users (Rahayu, Meiliyanti & Rabbani, 2024). These analyses enhanced the interpretation of the instrument's fairness and precision.

RESULTS AND DISCUSSION

Table 5 presents the distribution of responses to 12 items measuring Positive Attitude Toward Artificial Intelligence (PATAI) among future educators. Each item reflects different aspects of how AI is perceived in the context of teaching and learning. Responses are categorized using a five-point Likert scale ranging from "Very Disagree" to "Very Agree".

Table 5. Respondent Answer to Each Item

No	Item	Likert Scale									
		Very Disagree		Disagree		Neutral		Agree		Very Agree	
		N	%	N	%	N	%	N	%	N	%
1	PATAI 1	4	1.2%	41	12.7%	86	86	150	46.3%	43	13.3%
2	PATAI 2	3	1.0%	23	7.7%	69	69	155	51.7%	50	16.7%
3	PATAI 3	6	1.9%	40	12.9%	85	85	126	40.6%	53	17.1%
4	PATAI 4	1	0.3%	51	15.6%	91	91	126	38.5%	58	17.7%
5	PATAI 5	13	4.3%	49	16.3%	94	94	107	35.7%	37	12.3%
6	PATAI 6	20	6.7%	69	23.0%	95	95	83	27.7%	33	11.0%
7	PATAI 7	5	2.0%	27	11.1%	70	70	106	43.4%	36	14.8%
8	PATAI 8	5	2.0%	31	12.4%	86	86	100	40.0%	28	11.2%
9	PATAI 9	5	2.0%	32	13.1%	74	74	106	43.4%	27	11.1%
10	PATAI 10	13	5.3%	51	20.9%	75	75	84	34.4%	21	8.6%
11	PATAI 11	7	2.9%	24	9.8%	77	77	101	41.4%	35	14.3%
12	PATAI 12	13	5.3%	35	14.3%	80	80	90	36.9%	26	10.7%

The data in the Table 5 illustrates a generally favorable perception toward Artificial Intelligence (AI) among prospective teachers, as measured through 12 items representing Positive Attitude Toward AI (PATAI). Most participants expressed agreement or strong agreement with the majority of the statements, indicating a high level of acceptance and enthusiasm for the integration of AI into educational practices. Items such as PATAI 1 ["I am interested in using AI in everyday life if I work as a teacher"] and PATAI 2 ["AI has many benefits in teaching and learning"] show strong positive responses, suggesting that respondents are open to embracing AI in their future teaching roles. PATAI 4 ["AI can offer new opportunities for improving education in Indonesia"] and PATAI 11 ["Students and teachers will benefit from the increased use of AI in future teaching and learning"] also reflect widespread optimism about AI's transformative potential.

Meanwhile, PATAI 5 ["I will use AI when I work as a teacher"] and PATAI 10 ["Learning assisted by AI will be better than learning without AI"] show slightly lower agreement levels, indicating that while there is general positivity, there may be some hesitation or a need for more exposure and training to increase confidence in practical implementation. Items like PATAI 6 ["Teachers who use AI are better than those who do not use AI in the teaching and learning process"] reveal a more cautious or divided view, possibly due to ethical considerations or uncertainties about over-reliance on technology.

Wright Map

The Figure 1 presents a Wright Map (Item-Person Map) generated through Rasch analysis, illustrating the relationship between instrument items (left side) and respondents (right side) along a shared latent trait continuum—specifically, participants' attitudes toward Artificial Intelligence (AI) in education. The map aligns items and persons based on their respective logit scores on the vertical axis, which quantifies the level of agreement or endorsement (for items) and the tendency to agree (for participants). Each item, labeled PATAI1 to PATAI12, corresponds to statements regarding participants' perceptions of AI in teaching and learning. For example, PATAI1 reflects interest in using AI in daily life as a future teacher, while PATAI12 captures a preference for AI-assisted learning over traditional methods. Higher positions indicate items that require stronger agreement to endorse and participants with a more positive or accepting attitude toward AI.

From figure 1, we observe that some items such as PATAI6 ("Teachers who use AI are better...") and PATAI12 ("I prefer AI-assisted learning") appear higher on the logit scale, suggesting these items were more difficult to endorse—likely due to their evaluative or preference-based nature. Conversely, items like PATAI2 and PATAI4, which highlight general benefits of AI, are located lower, indicating broader agreement among respondents. Participants are scattered across the scale, suggesting a diverse range of attitudes toward AI. Clustering of respondents in the mid-to-high logit range implies an overall favorable disposition, though some items challenge this alignment. This map thus offers valuable diagnostic insight into how specific beliefs align with varying levels of acceptance, guiding targeted educational interventions or instrument refinement.

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                           Item - MAP - Person
                                  <rare>|<more>
7                                 +  11521  11721  19022  20821  23921  24021
                                  |  14921
6                                 +
                                  |  12521
5                                 +  06032  14722  16021
                                  |  02032
                                  |T
4                                 +  02432  03332  06831  14222  22021  23121
                                  |  00722  05531  05632  13321  21821
                                  |  00631  02531  03532  03832  04032  04232  05432  07831  08311
                                     17022  19321
                                  |  02231  02831  04132  17422
3                                 +
                                  |  01432  05832  06531  11211  21721  22921
                          PATAI3  |S 01131  14621  18321
                                  |  03032  03432  03732  05132  05932  06131  08611  11622  12021
                                     12322  13221  13521  14521  15022  15222  15321  16221  16621
                                     16721  17521  18221  18621  20721  21321  22521  22621  23822
                                     24321  24421
2                         PATAI2  +  00222  02932  04532  05232  05332  13721  14321  18521  20222
                                     23621  24121
                                  |  05732  06732  12821  17222  18121  22121
                                  |  07911  08012  12621  12921  15721  21421  22422
                                  |  09712  10011  11821  14421  23321  24222
1                         PATAI6  T+ 00531  04731  17321  17621  19521  22221  24922
                                  |M 02631  02732  06931  07131  08112  08812  09011  09511  09811
                                     10512  15421  15521  19422  21021
                      PATAI10     |  03232  03932  06231  07031  09411  16921  19222  23422
                      PATAI12    S|  01032  01222  01931  06431  09111  13621  20522  22721  22821
                      PATAI5      |  05031  06331  09911  19821  19921  23522
0    PATAI1 PATAI8 PATAI9        M+  01531  01632  03131  04631  12222  15821  21122  21222
       PATAI4 PATAI7 PATAI11       |  01332  01732  08911  11311  13921  14121  16121  16321  18822
                                      19721  23021
                      PATAI3      S|  00122  00822  01821  02331  04831  07631  08512  08711  09611
                                      11111  12122  12722  13021  13421  13821  14822  16422  16822
                                      17121  17722  17821  18421  18921  20021  22321  23721
                                   |  09212  10211  17921  20122  21522  21921
                                   |  12421  14021  19921  20421
 -1                   PATAI2      T+S 00921  02132  06631  13121  20321
                                   |  00332  00421  04332  07531  08211  10312  10712  10811  11411
                                      15121  15621  18021  18721  19621
                                   |  07331  10111  10611  11011  11911
                                   |  09311
                                   |  03631
 -2                                +  04431  07431  10412
                                   |  07731  08411  20622  23221
                                   |  15921  21621
                                   |T
 -3                                +  07231
                                   |  16521  19122
 -4                                +
 -5                                +  04931
                              <frequ>|<less>
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Figure 1. Wright Map

DIF analysis based on year of study

The chart above represents the results of a Differential Item Functioning (DIF) analysis within the Rasch model, comparing how different groups of respondents perceive and respond to the 12 items related to attitudes toward AI in education. Each item is plotted along the x-axis, and the DIF measure (in logits) is on the y-axis, indicating how much more or less difficult an item is for one group compared to another. Lines 1, 2, and 3 represent three different respondent groups: group 1 (first year students), group 2 (secind year student) and group 3 (third year student).

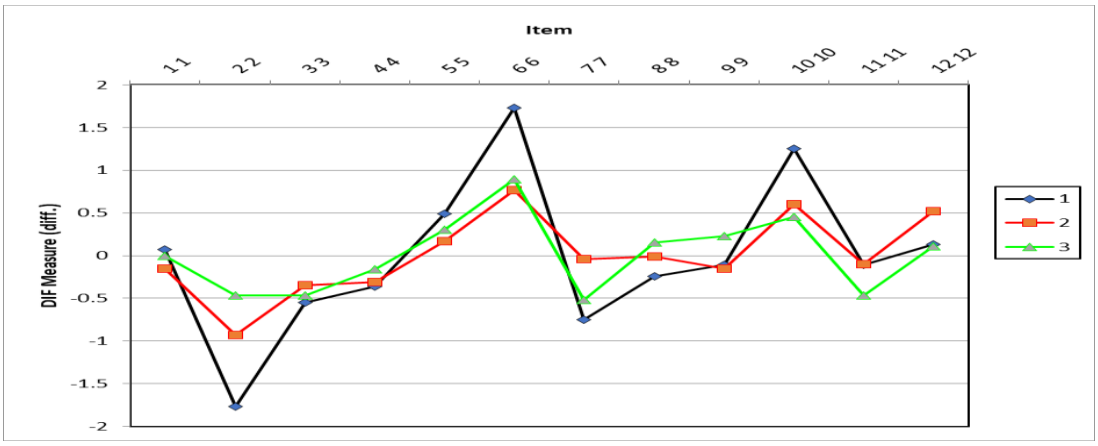

Figure 2. DIF based on year of study

The Differential Item Functioning (DIF) analysis reveals notable variations in how different respondent groups perceive certain statements about AI in education. Item 2, which states *"AI has many benefits in teaching and learning,"* shows significant DIF between Group 1 and Group 2, as well as between Group 2 and Group 3. This suggests that perceptions of AI's benefits vary across groups, possibly due to differences in exposure to AI tools or levels of confidence in using technology. Item 6, which asserts that *"Teachers who use AI are better than those who don't,"* exhibits marked DIF between Group 1 and Group 2 and also between Group 1 and Group 3. Group 1 appears to find this item more difficult to endorse, indicating a more skeptical or critical stance toward the assumption that AI use automatically enhances teaching quality. In Item 7, which expresses amazement at AI's capabilities in teaching and learning, a DIF is seen between Group 1 and Group 2. This implies that one group is more impressed or inspired by AI's potential, possibly reflecting differences in familiarity or enthusiasm toward emerging technologies. Item 10, which claims that *"AI-assisted learning is better than without AI,"* also shows DIF for both the Group 1–2 and Group 1–3 comparisons. Here again, Group 1 appears less convinced of the advantages of AI-enhanced learning, potentially signaling more traditional views or limited hands-on experience with AI in education. Overall, Group 1 consistently exhibits more extreme DIF values, especially for Items 6 and 10, suggesting this group may be less aligned with pro-AI sentiments. Items with high DIF measures (above +1.0 or below -1.0) highlight potential biases or differential interpretations, indicating that these items may advantage or disadvantage certain groups, even when their underlying abilities or attitudes are comparable.

To confirm the findings, A one-way ANOVA was conducted to examine whether students' responses on positive attitude toward AI differed significantly based on their year of study (first year, second year, third year). The ANOVA results revealed a statistically significant difference between the groups, $F(2, 241) = 5.735$, $p = .004$, indicating that at least one group mean was significantly different from the others. To further investigate where these differences occurred, post-hoc comparisons using the Least Significant Difference (LSD) test were performed.

Table 6. One Way ANOVA result

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.150	2	3.075	5.735	.004
Within Groups	129.199	241	.536		
Total	135.349	243			

The LSD results showed that first-year students scored significantly lower than both second-year (mean difference = -0.434, p = .002) and third-year students (mean difference = -0.469, p = .002), with 95% confidence intervals clearly not crossing zero. This suggests that students in their first year had notably different (and lower) mean responses on datay compared to those in later years. However, there was no significant difference between second-year and third-year students (mean difference = -0.035, p = .742), indicating a relatively similar perspective or experience between these two cohorts.

Table 7. Least Significant Difference (LSD) test result

		Mean			95% Confidence Interval	
(I) yearofstudy	(J) yearofstudy	Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
First year	Second year	-.43357*	.13703	.002	-.7035	-.1637
	Third year	-.46905*	.15017	.002	-.7649	-.1732
Second year	First year	.43357*	.13703	.002	.1637	.7035
	Third year	-.03547	.10744	.742	-.2471	.1762
Third year	First year	.46905*	.15017	.002	.1732	.7649
	Second year	.03547	.10744	.742	-.1762	.2471

*. The mean difference is significant at the 0.05 level.

DIF based on Usage Frequency

The second DIF graph compares responses between two groups (Group 1 and Group 2) across 12 items measuring attitudes toward the use of Artificial Intelligence (AI) in education. Overall, the DIF values are mostly within a moderate range, but certain items exhibit noteworthy differences that warrant attention. Item 2 (*"AI has many benefits in teaching and learning"*) shows clear DIF between the groups, with Group 2 exhibiting more difficulty agreeing with this statement than Group 1. This suggests that Group 2 may be less convinced about the benefits of AI in educational contexts—potentially due to limited exposure or lower perceived relevance.

Item 6 (*"Teachers who use AI are better than those who don't"*) demonstrates a high DIF value, especially for Group 2, which scores significantly higher. This indicates stronger agreement from Group 2, suggesting they may hold more favorable perceptions of AI-using teachers. In contrast, Group 1 appears more hesitant or critical of this notion. Item 10 (*"AI-assisted learning is better than without AI"*) also stands out, with Group 2 showing a notably higher DIF measure. This implies that Group 2 more readily agrees with the superiority of AI-assisted learning. Group 1, while not completely opposed, appears more conservative in endorsing this idea. Across the chart, Items 6 and 10 consistently demonstrate the highest DIF measures, implying potential bias or differential interpretation. While most other items show relatively small DIF differences (below ±0.5), the presence of these peaks highlights the need for caution. These discrepancies suggest that group membership affects item responses in ways not solely tied to overall attitude toward AI.

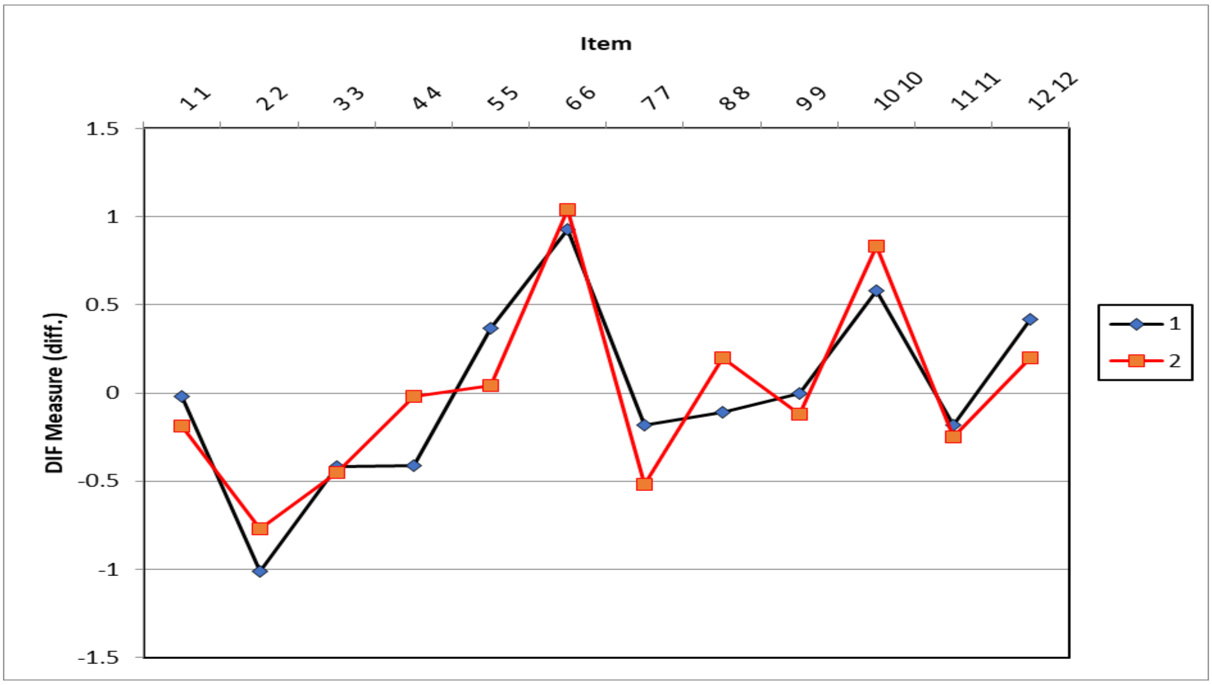

Figure 3. DIF based on Usage Frequency

An independent samples t-test was conducted to examine whether there is a significant difference in the mean scores of two independent groups on the variable positive attitude toward artificial intelligence (Rahmadhani & Yanti, 2024). Prior to interpreting the t-test results, Levene's test for equality of variances was performed and indicated no significant difference in variances between the groups ($F = 1.134$, $p = 0.288$), meaning the assumption of equal variances was met. Based on this, the results from the row assuming equal variances were used. The t-test revealed a t-value of -1.892 with 242 degrees of freedom and a p-value of 0.060, which is slightly above the conventional significance threshold of 0.05. The mean difference between the two groups was -0.18980, with a 95% confidence interval ranging from -0.38741 to 0.00780. Although the result is not statistically significant at the 0.05 level, it does indicate a potential trend toward a difference, as the p-value is marginally non-significant. The alternative analysis without assuming equal variances (Welch's t-test) produced a slightly more significant result ($p = 0.051$), though still not below the 0.05 threshold. Overall, the findings suggest that while there may be a tendency for the groups to differ in their datay scores, the evidence is not strong enough to confirm a statistically significant difference. Further research with larger samples or in different contexts may help clarify this trend.

Table 8. Independent t-test

		t-test for Equality of Means						
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% CI Lower	95% CI Upper
Datay	Equal variances assumed	-1.892	242	.060	-.18980	.10032	-.38741	.00780
	Equal variances not assumed	-1.962	183.187	.051	-.18980	.09673	-.38065	.00105

Based on the findings of this study, the Technology Acceptance Model (TAM) provides a strong theoretical foundation to explain Generation Z pre-service elementary teachers' positive attitudes toward Artificial Intelligence (AI) in education. According to TAM, two key factors—Perceived Usefulness (PU) and Perceived Ease of Use (PEOU)—influence an individual's intention to adopt a new technology. In this study, items like "*AI has many benefits in teaching and learning*" and "*AI can offer new opportunities for improving education in Indonesia*" reflect strong PU, with high levels of agreement suggesting that participants recognize AI's value in enhancing educational outcomes. Meanwhile, items showing less agreement, such as "*Teachers who use AI are better...*" or "*Learning with AI is better than without AI,*" indicate areas where PEOU or confidence in implementation may be lower. The differences observed across years of study and groups in the DIF analysis support this, suggesting that more experienced or exposed students perceive AI as more useful and easier to use. Hence, TAM effectively explains the pattern of acceptance and hesitation found in this study.

Despite providing valuable insights into pre-service elementary teachers' positive attitudes toward artificial intelligence, this study has several limitations. First, the use of a convenience sampling technique limits the generalizability of the findings, as the sample may not represent the broader population of pre-service teachers in other institutions or regions. Second, the cross-sectional survey design captures responses at a single point in time, which prevents analysis of how attitudes might change over time or with increased exposure to AI in educational settings. Third, while the instrument demonstrated strong reliability and unidimensionality, some items showed notable Differential Item Functioning (DIF) across subgroups, particularly by year of study, suggesting that certain items may have been interpreted differently depending on participants' experience levels. Furthermore, the overrepresentation of female participants (83.61%) and second-year students (56.56%) may have introduced bias, skewing the results toward the dominant subgroup's perspectives. Lastly, the reliance on self-reported data through questionnaires, though efficient, may have introduced social desirability bias, where participants provide answers they believe are expected rather than those that truly reflect their beliefs.

CONCLUSION

Based on the findings of this study, it can be concluded that pre-service elementary teachers from a university in Sulawesi generally hold a moderately positive attitude toward Artificial Intelligence (AI). This reflects a growing awareness of the relevance and potential benefits of AI in the field of education, although it also suggests that their level of confidence and readiness to integrate AI into their future teaching practices is not yet optimal. The results further indicate that both the year of study and the frequency of AI usage significantly influence students' attitudes. Pre-service teachers in higher academic years tend to have a more positive attitude toward AI, likely due to increased exposure to educational technology and a more developed understanding of pedagogical approaches. Likewise, those who reported using AI more frequently exhibited more favorable attitudes, emphasizing the importance of practical experience and regular engagement with AI tools in shaping perceptions.

These findings carry important implications for teacher education programs and educational policymakers. First, the curriculum for pre-service teachers should be enhanced by incorporating AI-related content and training at earlier stages of study. Early exposure to AI concepts and tools can help foster a more positive and confident attitude among students from the beginning of their academic journey. In addition, teacher training institutions should facilitate more frequent and hands-on interactions with AI through practical activities such as workshops, classroom simulations, lesson planning using AI tools, and integration of AI-supported applications in teaching strategies. Such approaches can build familiarity and reduce apprehension toward AI, thereby encouraging future teachers to embrace and effectively utilize these technologies.

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