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The Influence of Artificial Intelligence Technology Usage on Generation Z's Learning Styles in German Language Learning in Malang City

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Abstract: This study aims to examine the impact of Artificial Intelligence (AI) technology utilization on the learning styles of Generation Z students in German language learning in Malang City. The study employs a quantitative approach using an explanatory survey method. The sample consists of 100 respondents selected via purposive sampling. Data collection was conducted using a Likert-scale questionnaire, and the data were analyzed using SPSS software. The results indicate that the research instrument is valid and reliable, and satisfies classical assumption tests regarding normality, multicollinearity, and heteroscedasticity. Multiple linear regression analysis reveals that both AI utilization and the intensity of AI usage positively influence Generation Z's learning styles. The t-test results show that both variables have a significant partial effect, while the F-test results demonstrate a simultaneous influence on Generation Z's learning styles. An Adjusted R-Square value of 0.653 indicates that AI utilization and usage intensity explain 65.3% of the variation in Generation Z's learning styles. Thus, the presence of AI technology plays a positive role in supporting German language learning for Generation Z.

Keywords: Artificial Intelligence; German Language; Generation Z; Learning Styles; Learning Technology

Introduction

Rapid developments in digital technology services have brought significant changes across various fields, including education. One rapidly advancing technological innovation is Artificial Intelligence (AI) or artificial intelligence. AI refers to technology capable of enhancing human cognitive capacities through computer systems, thereby assisting diverse activities such as learning by providing instant feedback, personalizing instructional materials, and offering flexible, interactive learning experiences. Several AI-based platforms, particularly ChatGPT, Duolingo, DeepL, Grammarly, and Google Translate, have been utilized by students to help acquire understanding in vocabulary, grammar, pronunciation, and to reinforce communication skills in foreign languages. Technology empowers students to access expanded knowledge without temporal or spatial restrictions, enabling them to integrate lessons more efficiently.

Generation Z comprises the cohort born between 1997 and 2012, growing up amid rapid technological evolution, which fosters distinct characteristics marked by close proximity to digital technology. Consequently, their learning styles differ significantly from previous generations. Generation Z exhibits preferences for visual, interactive, and flexible learning, while actively leveraging digital devices for daily educational activities. Therefore, AI technology utilization is considered highly congruent with Generation Z's learning characteristics, enabling them to explore structured learning experiences that are engaging, transparent, and aligned with their learning needs. In the context of German language acquisition, AI utilization assists students in comprehending various instructional aspects, such as automated translation features, grammar

assistance, conversation exercises, and personalized learning recommendations tailored to user capacity. Several prior studies suggest that AI utilization enhances language skills, teaching efficiency, and student learning engagement.

However, AI utilization also introduces several challenges, such as technological dependency and diminished teacher-student interactions. Although several studies have examined AI implementation in education, specific empirical investigations concerning the impact of AI technology utilization on Generation Z's learning styles in Malang City remain limited. Malang City, recognized as a prominent educational hub with a substantial population of pupils and university students actively utilizing digital products, urgently requires empirical research to thoroughly examine the influence of AI technology utilization on Generation Z's learning styles in German language acquisition. The findings are expected to serve as an evaluation of AI technology utilization in German language learning and unlock further educational potential in Malang City. Furthermore, this study aims to contribute to developing contemporary instructional models through effective digital technology integration to enhance learning quality.

Literature Review

Artificial Intelligence (AI) is increasingly adopted as a supporting tool in instructional activities. This technology assists students in obtaining information, receiving feedback, and engaging in flexible learning. In language acquisition, applications such as ChatGPT, Duolingo, DeepL, Grammarly, and Google Translate aid in understanding vocabulary, grammar, translation, and communication practice. Generation Z has grown alongside digital technology development, making technology an integral component of daily routines, including learning. This condition renders AI usage highly relevant for Generation Z, offering convenient material access and supporting independent, interactive learning processes.

Based on these premises, AI usage both in terms of utilization and usage intensity is anticipated to correlate directly with Generation Z's learning styles. Consequently, this study was conducted to determine the influence of Artificial Intelligence Utilization (X1) and Artificial Intelligence Usage Intensity (X2) on Generation Z's Learning Styles (Y) in German language learning in Malang City.

Research Method

This study adopted a quantitative approach with an explanatory survey design to analyze the impact of Artificial Intelligence (AI) technology usage on Generation Z's learning styles in German language acquisition in Malang City. The study population comprised Generation Z individuals aged 17–25 years who were currently or had previously studied the German language in Malang City. The research sample consisted of 100 respondents selected using a purposive sampling technique based on specific criteria: born between 1997 and 2012, had utilized AI applications such as ChatGPT, Duolingo, DeepL, or similar platforms in German language learning within the past three months, and resided in Malang City.

Data collection was executed through an online questionnaire distributed via Google Forms using a Likert scale. To ensure data quality, research instruments underwent validity and reliability testing prior to implementation. Data analysis was performed using SPSS software, encompassing descriptive statistical analysis, prerequisite testing (normality, multicollinearity, and heteroscedasticity tests), and multiple linear regression analysis to evaluate the influence of AI usage on Generation Z's learning styles. Additionally, a coefficient of determination (R^2) test was conducted to measure the contribution of AI usage variables to Generation Z's learning styles in German language acquisition.

Results and Discussion

Descriptive Statistical Analysis

Table 1. Classification Based on Gender

No.	Gender	Total Respondents	Percentage (%)
1.	Male	42	42%
2.	Female	58	58%
Total	Overall Sample	100	100%

Source: Primary Data Processing, 2026

Based on Table 1, out of 100 respondents studied, 42 respondents (42%) were male and 58 respondents (58%) were female. The results indicate that female respondents outnumbered male respondents in this study.

Table 2. Classification Based on Age

No.	Age Range (Years)	Total Respondents	Percentage (%)
1.	14–19 years	5	5%
2.	20–24 years	76	76%
3.	25–29 years	19	19%
Total	Overall Sample	100	100%

Source: Primary Data Processing, 2026

According to Table 2, the majority of respondents were aged 20–24 years (76%), followed by those aged 25–29 years (19%), and those aged 14–19 years (5%). This demonstrates that most respondents represent young adult Generation Z learners currently or previously engaged in German language acquisition.

Table 3. Classification Based on German Language Learning Institution

No.	Learning Institution	Total Respondents	Percentage (%)
1.	Higher Education (University)	42	42%
2.	Course / Private Institute	24	24%
3.	Independent (Self-Study)	34	34%
Total	Overall Sample	100	100%

Source: Primary Data Processing, 2026

Based on Table 3, the majority of respondents studied German through higher education institutions (42 respondents / 42%). Furthermore, 34 respondents (34%) engaged in self-study, while 24 respondents (24%) attended courses or private tutoring institutes. This indicates that higher education is the most prevalent setting chosen by respondents to learn German.

Table 4. Classification Based on Duration of German Language Learning

No.	Duration of Learning	Total Respondents	Percentage (%)
1.	Less than 6 months	35	35%
2.	6 months – 1 year	21	21%
3.	More than 1 year	44	44%
Total	Overall Sample	100	100%

Source: Primary Data Processing, 2026

According to Table 4, the largest proportion of respondents had studied German for more than one year (44 respondents / 44%), followed by less than 6 months (35 respondents / 35%), and 6 months to 1 year (21 respondents / 21%). These results confirm that a substantial portion of respondents possessed a relatively extended duration of German language learning experience.

Instrument Testing: Validity and Reliability

Table 5. Validity Test Results

Research Variable	Statement Item	Calculated R (r-count)	Table R (r-table)	Status
AI Utilization (X1)	X1 (1)	0.721	0.1966	Valid
	X1 (2)	0.684	0.1966	Valid
	X1 (3)	0.756	0.1966	Valid
	X1 (4)	0.638	0.1966	Valid
	X1 (5)	0.709	0.1966	Valid
AI Usage Intensity (X2)	X2 (1)	0.667	0.1966	Valid
	X2 (2)	0.714	0.1966	Valid
	X2 (3)	0.781	0.1966	Valid
	X2 (4)	0.693	0.1966	Valid
	X2 (5)	0.748	0.1966	Valid
Gen Z Learning Styles (Y)	Y1	0.689	0.1966	Valid
	Y2	0.724	0.1966	Valid
	Y3	0.776	0.1966	Valid
	Y4	0.708	0.1966	Valid
	Y5	0.739	0.1966	Valid
	Y6	0.751	0.1966	Valid
	Y7	0.703	0.1966	Valid
	Y8	0.728	0.1966	Valid
	Y9	0.681	0.1966	Valid
	Y10	0.745	0.1966	Valid

Source: Primary Data Processing, 2026

Validity testing was conducted to determine the degree to which questionnaire statement items measured the intended research variables. Calculated r values (r-count) were compared against the r table value at a 5% significance level ($\alpha = 0.05$). For $N = 100$ respondents, the r table value is 0.1966. Test results indicate that all statement items for AI Utilization (X1) yielded r-count values between 0.638–0.756, AI Usage Intensity (X2) yielded r-count values between 0.667–0.781, and Generation Z Learning Styles (Y) yielded r-count values between 0.681–0.776. Because all calculated r values exceeded the r table threshold (0.1966), all statement items across X1, X2, and Y were declared valid.

Table 6. Reliability Test Results

Research Variable	Cronbach's Alpha	Status
AI Utilization (X1)	0.847	Reliable
AI Usage Intensity (X2)	0.861	Reliable
Generation Z Learning Styles (Y)	0.912	Reliable

Source: Primary Data Processing, 2026

Reliability testing was performed to evaluate the internal consistency of research instruments. The findings demonstrate that AI Utilization (X1) achieved a Cronbach's Alpha of 0.847, AI Usage Intensity (X2) achieved 0.861, and Generation Z Learning Styles (Y) achieved 0.912. Since each Cronbach's Alpha value exceeded the 0.70 benchmark, all research variables demonstrated strong reliability.

Classical Assumption Tests

Table 7. One-Sample Kolmogorov-Smirnov Normality Test

Variable	Asymptotic Significance (Sig. 2-tailed)
Unstandardized Residual	0.200

Source: Primary Data Processing, 2026

Normality testing was conducted using the One-Sample Kolmogorov-Smirnov method. Results revealed an asymptotic significance value (Sig.) of 0.200, which exceeds 0.05. Consequently, the research data follow a normal distribution, satisfying the normality assumption.

Table 8. Multicollinearity Test Results

Independent Variable	Tolerance Value	Variance Inflation Factor (VIF)
AI Utilization (X1)	0.684	1.462
AI Usage Intensity (X2)	0.684	1.462

Source: Primary Data Processing, 2026

Multicollinearity testing was performed to ensure the absence of strong inter-correlations among independent variables in the regression model. Test outputs indicate that both AI Utilization (X1) and AI Usage Intensity (X2) yielded Tolerance values of 0.684 (> 0.10) and VIF values of 1.462 (< 10.0). Therefore, no multicollinearity exists between independent variables.

Table 9. Glejser Heteroscedasticity Test Results

Independent Variable	Significance Value (Sig.)
AI Utilization (X1)	0.483
AI Usage Intensity (X2)	0.592

Source: Primary Data Processing, 2026

Heteroscedasticity testing was executed using Glejser's method to examine residual variance consistency. Results show that AI Utilization (X1) yielded a significance value of 0.483 and AI Usage Intensity (X2) yielded 0.592, both exceeding 0.05. Thus, no heteroscedasticity pattern was detected.

Multiple Linear Regression Analysis

$$Y = 8.245 + 0.432 X_1 + 0.518 X_2$$

Source: Primary Data Processing, 2026

Multiple linear regression analysis yielded the regression equation $Y = 8.245 + 0.432 X_1 + 0.518 X_2$. The constant value of 8.245 indicates that if AI Utilization (X1) and AI Usage Intensity (X2) remain constant at zero, Generation Z Learning Styles (Y) holds a baseline score of 8.245. The regression coefficients of 0.432 for X1 and 0.518 for X2 demonstrate that a one-unit increase in AI utilization and AI usage intensity corresponds to a 0.432 and 0.518 unit increase in Generation Z learning style effectiveness, respectively.

Hypothesis Testing

Table 10. Coefficient of Determination Test (Model Summary)

Correlation (R)	Coefficient of Determination (R Square)	Adjusted R Square
0.812	0.660	0.653

Source: Primary Data Processing, 2026

The coefficient of determination test yielded an Adjusted R Square value of 0.653. This indicates that AI Utilization (X1) and AI Usage Intensity (X2) account for 65.3% of the variance in Generation Z Learning Styles (Y), while the remaining 34.7% is influenced by other extraneous factors not included in the research model.

Table 11. Partial Effect Test (t-Test)

Variable	Calculated t (t-count)	Significance (Sig.)
AI Utilization (X1)	4.872	0.000
AI Usage Intensity (X2)	6.214	0.000

Source: Primary Data Processing, 2026

The t-test results revealed that AI Utilization (X1) obtained a t-count of 4.872 and AI Usage Intensity (X2) obtained 6.214, both exceeding the t-table threshold of 1.984 with significance values of 0.000 (< 0.05). Consequently, H1 and H2 are accepted, confirming that AI utilization and usage intensity each exert a statistically significant partial positive effect on Generation Z's learning styles.

Table 12. Simultaneous Effect Test (F-Test)

Calculated F (F-count)	Table F (F-table)	Significance (Sig.)
94.126	3.09	0.000

Source: Primary Data Processing, 2026

The F-test results demonstrated a calculated F-count of 94.126, substantially exceeding the F-table value of 3.09 at a significance level of 0.000 (< 0.05). Thus, AI Utilization (X1) and AI Usage Intensity (X2) simultaneously exert a significant positive effect on Generation Z's learning styles in German language acquisition.

Conclusion and Recommendations

Based on the empirical findings, it is concluded that Artificial Intelligence (AI) technology utilization and usage intensity exert a statistically significant positive effect both partially and simultaneously on Generation Z's learning styles in German language acquisition in Malang City. The F-test confirms simultaneous influence (F-count = 94.126, $p < 0.05$), while t-tests confirm significant partial contributions from both AI utilization ($t = 4.872$) and usage intensity ($t = 6.214$). The Adjusted R Square value of 0.653 indicates that 65.3% of the variance in Generation Z's learning styles is explained by AI utilization and usage intensity, whereas the remaining 34.7% is influenced by unmodeled external factors.

It is recommended that students utilize AI technology wisely as an auxiliary learning tool to foster autonomous and effective learning habits. Furthermore, educators and educational institutions are encouraged to integrate AI technology into instructional practices to create interactive, innovative, and tailored learning environments suited to Generation Z in the digital era.

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Conflict of Interest Statement

The authors declare that there is no conflict of interest regarding the research, authorship, and/or publication of this article.

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