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Comparative Study: Millennials' and Gen Z's Perceptions of Using DeepL for Arabic Learning

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Abstract

While AI-assisted tools like DeepL are becoming more popular in Islamic universities, there is limited research on generational differences in how these tools support Arabic language learning. This study asks: *How do Millennials and Generation Z perceive and use DeepL for Arabic language learning?* Using a qualitative phenomenological design, data were gathered through in-depth interviews, with validity ensured via triangulation of sources, techniques, and time. Analysis followed the Miles and Huberman model. The findings show that Millennials mainly use DeepL as a supplementary translation tool and prefer traditional support from lecturers and classical texts to improve their phonology, morphology, and syntax. In contrast, Gen Z integrates DeepL with additional tools like Arabic morphology analyzers and online forums to deepen their understanding. They are also more cautious about DeepL's accuracy and often seek alternative digital resources. This study supports Prensky's digital native theory (2001), Piaget's constructivism (1972), and Bandura's social learning theory (1986) in AI-assisted language learning. However, this research is limited to UIN Walisongo Semarang; future studies at other Islamic universities are recommended to gain a broader perspective.

Keywords: *DeepL, Millennial and Gen Z, Perceptions, Arabic Learning*

Introduction

In the digital age, artificial intelligence (AI) has become an integral part of education, including Arabic language learning at Islamic universities. AI-powered translators such as DeepL, equipped with Neural Machine Translation (NMT), have transformed the way students access Arabic texts by offering more accurate and context-sensitive translations. The adoption of AI in Indonesia is rapidly growing, with users projected to reach 3.33 million by 2030. According to the We Are Social (2022) report, Indonesia ranks fourth globally in translation app usage, with nearly half of internet users reportedly relying on DeepL. This trend reflects the growing role of AI in educational settings, particularly within Islamic universities. Yet, perceptions of DeepL differ between generational cohorts. Millennials, who experienced the technological transition era, are more cautious in their use of AI; they often verify translations using printed dictionaries or seek clarification from lecturers, especially when interpreting religious or culturally nuanced texts. In contrast, Generation Z digital natives born into a technology-saturated world are more receptive to AI, using it as a primary tool for learning Arabic. A 2024 survey by Tirto and Jakpat shows that 86.21% of Indonesian students aged 15–21 use AI to complete assignments, illustrating their strong acceptance of technology. This generational contrast signifies a shift in language learning approaches, emphasizing the importance of exploring how these differences influence students' interaction with AI tools.

Despite the growing reliance on AI translators like DeepL, limited research has examined the generational dynamics shaping its use in Arabic language learning. While prior studies (Rahma, 2025; Nanda, 2024; Abdekhoda & Dehnad, 2024) affirm that Generation Z are frequent users of

AI-based applications, there is still a notable gap in understanding how Millennials differ in their engagement and trust toward such tools. Helaludin (2019) also notes that Gen Z increasingly utilizes apps and digital platforms in language acquisition, suggesting a dependency that shapes their learning behavior. However, few studies have specifically compared how both groups use AI to master core linguistic elements of Arabic namely phonology (pronunciation and tajweed), morphology (sharf and derivational patterns), and syntax (nahwu and i'rab structure). Moreover, data from Google Workspace reveals that 93% of Gen Z respondents use at least two AI apps weekly, compared to 79% of Millennials, indicating varying degrees of digital integration. This research, conducted at UIN Walisongo Semarang a prominent Islamic university known for combining digital innovation with religious education aims to fill that gap. By analyzing the perceptions and usage patterns of DeepL among both generations, this study seeks to contribute to the design of more adaptive, generation-responsive learning methodologies in AI-assisted Arabic education within Islamic higher education contexts.

Method

In general, this section describes how the study was conducted. The subject matter of this sections are: (1) the study design; (2) the sample population or subject of the research; (3) data collection techniques and instrument development; (4) and data analysis techniques. Please use descriptive paragraphs.

You can use these questions as a guideline to write the method: 1) Is the design suitable for answering the question posed? 2) Is there sufficient information present for you to replicate the research? 3) Does the article identify the procedures followed? 4) Are these ordered in a meaningful way? 5) If the methods are new, are they explained in detail? 6) Was the sampling appropriate? 7) Have the equipment and materials been adequately described? 8) Does it clear what type of data was recorded? 9) Have you been precise in describing measurements?

It is important to note that you do not need to use too many formulas or tables unless it is absolutely necessary to be displayed.

Results

This study employs a qualitative approach using a phenomenological method to explore how Millennials and Generation Z perceive the use of DeepL in Arabic language learning at Islamic universities. A total of ten participants were selected through purposive sampling: five Millennial students and five Generation Z students from the Arabic Language Education Study Program at UIN Walisongo Semarang. This participant composition ensures a balanced generational perspective within the same academic environment, aligning with studies that emphasize the importance of diversity in educational research (Nor & Sihes, 2022). The phenomenological method was chosen to examine students' subjective experiences with DeepL, revealing how each generation interacts with emerging technologies in educational contexts (Hanandeh et al., 2024). Data were collected through in-depth interviews, questionnaires, and document analysis. Interviews provided rich qualitative insights into students' learning behaviors and perceptions. Questionnaires supported these findings with quantitative data on usage frequency and trust levels. Document analysis further contextualized the use of AI in Arabic language education by reviewing related institutional policies and scholarly literature (Nurdianto et al., 2021). This combination of instruments follows a mixed-method approach recommended in recent educational technology studies (Alwi et al., 2024).

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Table 1: Informant Profile

No.	Initials	Age	Position
1.	Z1	20	Gen-z students
2.	Z2	22	Gen-z students
3.	Z3	21	Gen-z students
4.	M1	30	Gen-millennial students
5.	M2	32	Gen-millennial students
6.	Z4	20	Gen-z students
7.	M3	35	Gen-millennial students
8.	Z5	22	Gen-z students
9.	M4	31	Gen-millennial students
10.	M5	30	Gen-millennial students

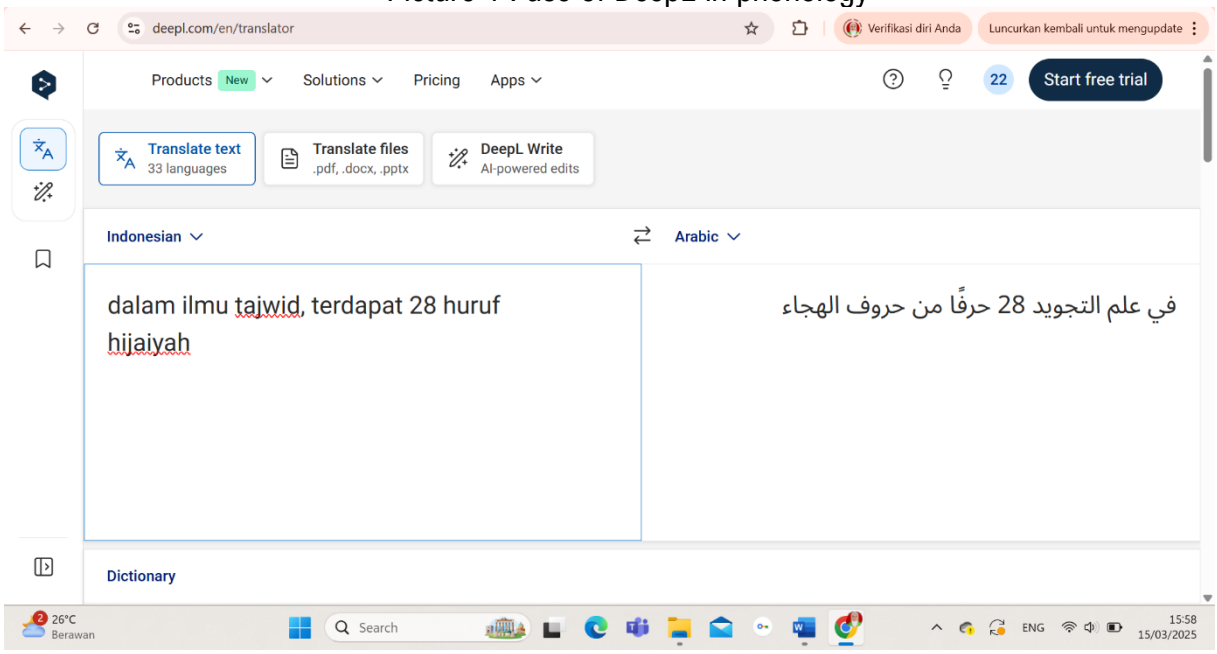
To ensure validity, this research used source, technique, and time triangulation, which collectively strengthened the credibility of the data (Natalia et al., 2023; Donkoh, 2023; Suhaeb & Kaseng, 2023). Data analysis followed the Miles and Huberman model, which includes data reduction, data display, and conclusion drawing (Muadin et al., 2022; Azzahra, 2023). This framework allowed the researchers to synthesize findings systematically and identify generational patterns in DeepL utilization for Arabic language learning.

Results

A Comparison of Millennials' and Gen-Z's Perceptions of Using DeepL to Improve Phonology Skills

This study shows that there is a difference in perception between Millennials and Generation Z in using DeepL to improve phonology skills in learning Arabic at UIN Walisongo Semarang. Millennials tend to use DeepL as a tool to understand text and vocabulary, but are aware of its limitations in pronunciation. They prefer conventional methods such as lecturer guidance, formal classes, or audio-visual media to train phonological aspects such as makharijul letters and tajweed. Meanwhile, Generation Z is more open to technology and considers DeepL to be quite helpful for the early stages of reading Arabic because the sentence structure is light and easy to understand. However, they also highlight the absence of audio features, which make it difficult to recognize the final meaning and practice pronunciation. DeepL is considered accurate in text translation, but it is not effective for phonology skills. Most Gen Z respondents suggested the use of additional apps such as audio, video, or tajweed-specific platforms as a complement. Thus, although both generations used DeepL in the learning process, both agreed that phonology skills require a different approach that cannot be met with text-based translators like DeepL alone.

Picture 1 : use of DeepL in phonology



Generation Z shows appreciation for DeepL as an early tool in reading Arabic texts. Z1 states, *"It's approved, because in the DeepL we know that there is no hope but the sentence is light so it's suitable for beginners."*

This is also strengthened by Z2 who said, "I am also in the process of completing a thesis on maharah qira'ah and am very helped by the existence of DeepL, especially in terms of translating." Z3 added that DeepL is quite beginner-friendly because the sentences feel familiar. For them, the light sentence structure helps to understand the context quickly, even if it doesn't include a harakat sign. However, they realized that this feature wasn't enough to form deep phonology skills. Generation Z considers DeepL to be a paving road, not a refiner, in understanding the phonetic aspects of Arabic. The use of DeepL is more directed at translating texts, not pronunciation training or letter makharijul. Therefore, although DeepL is considered efficient and practical for understanding the meaning of words or sentences, its limitations in phonological aspects are of major concern.

While Gen Z recognizes DeepL's superiority in terms of translation accuracy, they're also quite critical of its limitations. Z3 said, "I think it's because DeepL doesn't provide audio like Google Translate and Microsoft Bing, so it's a bit difficult to figure out the final letter." In line with that, Z4 stated,

"DeepL is less effective, it's a text translator, not a pronunciation trainer. For phonology, you need audio tools or native speakers."

Z5 adds, "DeepL focuses more on text translation and does not provide pronunciation or letter sound analysis features." This criticism suggests that while DeepL excels syntactically and semantically, it is not designed to assist users in phonology training that requires sound and phonetic contextualization. This is an obstacle, especially in practicing the correct reading skills according to tajweed and makharijul letters. Most informants from Gen Z suggest the need for the support of specialized pronunciation applications, or the use of audio-visual based media to complement DeepL in the process of learning Arabic thoroughly, especially on phonology skills that are in dire need of voice practice and direct pronunciation.

In contrast to Gen Z, Millennials view DeepL as an additional tool, not a primary tool. M1 stated, "I use DeepL only to translate text, but for pronunciation I still rely more on native speaker

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recordings." Meanwhile, M2 emphasized, "DeepL cannot replace conventional learning methods such as guidance from lecturers, especially for phonology aspects that require direct assistance." M3 also argues,

> *"For tajweed and makharijul letters, DeepL is unreliable. I still learn through videos from ustaz or online classes."*

All three emphasize that phonology skills require direct interaction or at least a valid audio source. DeepL is considered to focus too much on the written aspect without paying attention to phonetic elements. Millennials rely more on formal methods or traditional learning media that they have known since the beginning. They also show caution in trusting the results of translations, especially when it comes to complex religious texts that require precision in interpretation and pronunciation.

The Millennial generation seems to have a special strategy in overcoming the limitations of DeepL for phonology. M4 explains, "I usually combine DeepL with a digital Arabic dictionary, and then listen to audio from YouTube to learn how to read it." M5 added,

> *"Correct pronunciation is important, so I am still diligent in participating in online studies that have reading practice."*

M2 again emphasized that "DeepL helps me understand the meaning of words, but for tajweed I still need direct guidance from the lecturer." This shows that Millennials have a hybrid approach: using technology to speed up the understanding of texts, but still relying on traditional methods to train phonological aspects. They also seem to be more selective in choosing supporting applications, not only based on practicality but also the credibility of the source. DeepL is not rejected, but it is not enough to be considered the main tool in learning phonology. This reflects the desire of this generation to maintain accuracy and comprehensive understanding in learning Arabic, especially in aspects that are not only written but also oral and phonetic.

Despite having different approaches, both Gen Z and Millennials agree that DeepL cannot stand alone in helping to improve Arabic phonology. Z2 says,

> *"DeepL is very helpful for understanding the meaning of text, but it still needs a pronunciation app as well."*

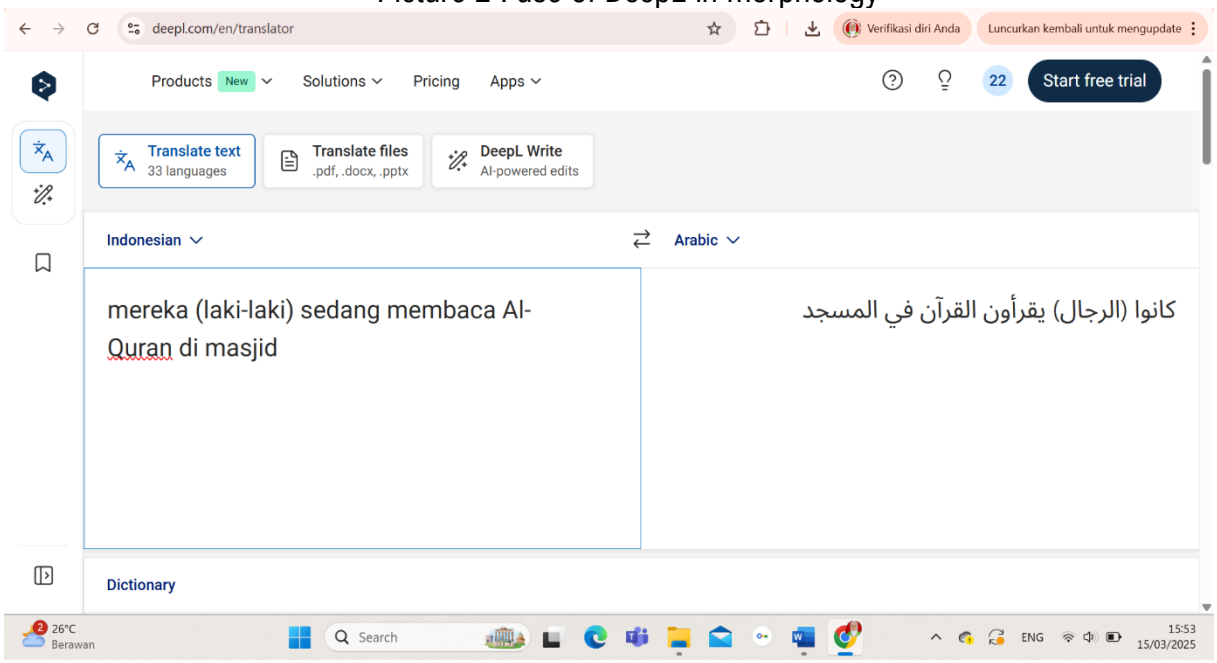
M5 agreed, "Phonology is about sound, so DeepL alone is not enough, you have to use audio media as well." Z4 also stated, "If I study phonology, I still look for videos of ustaz who teach makharijul letters." These three quotes show the awareness of both generations of the need for a more comprehensive approach to learning Arabic. DeepL is very useful in understanding the meaning and structure of sentences, but aspects of pronunciation, letter meaning, and tajweed still require other tools. Both Gen Z and Millennials explicitly recognize the importance of companion technology in the form of audio, video, or educational platforms that are more specific to phonology. Thus, even though their characteristics and learning styles are different, the need for pronunciation support media is a common point in this AI-based Arabic learning process.

A Comparison of Millennial and Gen-Z Perceptions of Using DeepL to Improve Morphology Skills

This study shows that there is a difference in perception between Millennials and Generation Z in using DeepL to improve Arabic morphology skills at UIN Walisongo Semarang. Millennials use DeepL to understand the meaning of vocabulary and basic sentence structure, but consider that this application lacks depth in analyzing changes in word form (tashrif) and does not provide a systematic explanation of Arabic grammar. Therefore, they prefer other sources such as classics, grammar books, or lecturers' directions to deepen their morphological understanding. In contrast, Generation Z shows a higher acceptance of DeepL. They assessed

that the sentence structure presented by DeepL was generally in accordance with the rules of the Arabic language and helped in recognizing morphological patterns. The translation variation feature is considered useful for enriching mufradat and understanding the context of word form changes, although it still requires additional analysis. Although not a specific tool for morphological analysis, Gen Z considers DeepL to be quite effective as a practical support in understanding word formation. These findings reflect that the two-generational approach to translation technology is influenced by their respective learning preferences, where Millennials tend to rely on traditional methods, while Gen Z is more open to the integration of technology in Arabic learning.

Picture 2 : use of DeepL in morphology



The Millennial Generation at UIN Walisongo Semarang views DeepL as a useful tool in translating vocabulary and understanding the basic sentence structure of Arabic. However, they consider that this application lacks depth in presenting changes in the form of words (tashrif) and does not provide a systematic grammatical explanation. M1 states,

> "A lot of people can help me find meaning in a quick fix, but when it comes to Shirley, I'm still open to it."

M2 adds, "I usually use DeepL for the initial translation, but to understand the root of the word, I need to look at an Arabic grammar book." M4 emphasizes its limitations: "Sometimes the translations are too free, not in accordance with the correct Arabic grammatical arrangement." This reflects the tendency of Millennials to still rely on morphological understanding on conventional sources such as books, nahwu-sharaf books, and lecturers' explanations, because they feel that DeepL does not provide comprehensive morphological learning.

Most Millennial informants highlight that DeepL has not been able to distinguish the meaning of words based on changes in the form of tashrif. They see the absence of grammar learning as the main weakness in learning morphology. M3 stated, "The sentence structure of DeepL is sometimes good, but it does not explain why the form of the word has changed so much. So I refer to the lecturer." M5 added,

> "DeepL cannot distinguish the meaning of words with similar shapes, even though in morphology, one change in meaning can change the meaning completely."

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M4 reinforces, "For lessons like morphology, it takes a systematic approach, and I didn't find that in DeepL." In other words, even though Millennials use DeepL for quick translation purposes, they still feel the need to seek further clarification through traditional methods in order to fully and correctly understand the formation and change of words in Arabic.

Different from Millennials, Generation Z shows a more positive acceptance of DeepL in learning Arabic morphology. They assessed that the sentence structure displayed by DeepL was generally in accordance with the rules of the Arabic language, although it still required re-observation. Z1 revealed,

> *"It's approved, because in the DeepL we know that there is no harokat but the sentence is light, so it is suitable for beginners."*

Z4 added, "Good, because the presentation is in accordance with Arabic rules, but sometimes it is necessary to re-examine the sentence structure several times." Z3 also stated, "DeepL is quite helpful. When translating, DeepL often forms the word correctly, so you can see the pattern." This attitude reflects that Gen Z is quite confident in the quality of DeepL's structure as an initial tool to understand changes in word forms, while still conducting independent analysis of the translation results.

Gen Z informants also rated the translation variation feature on DeepL as a resource that helps expand vocabulary and understand morphological patterns. Z2 explains, "I think it's helpful to improve morphology because DeepL provides another mufradat or other arrangement for alternatives if the translated shown doesn't match." Z5 revealed, "I like to use DeepL to check word variations, from there I learn other forms of one word." Z4 adds,

> *"DeepL can be a fairly effective tool in learning morphology, especially for enriching vocabulary and understanding the context of changing the shape of words."*

These findings suggest that Gen Z is more adaptive to learning technologies, taking advantage of available features even though the app is not directly designed for morphological analysis.

While DeepL is useful, Gen Z also realizes that it doesn't provide an explanation of grammatical rules or hands-on training on tashrif. Z3 asserts, "DeepL doesn't explain the rules, we have to add our own analysis to make it more accurate." Z4 also says,

> *"Although not specifically designed for morphological analysis, DeepL is able to show translational variations that reflect the shape of tashrif."*

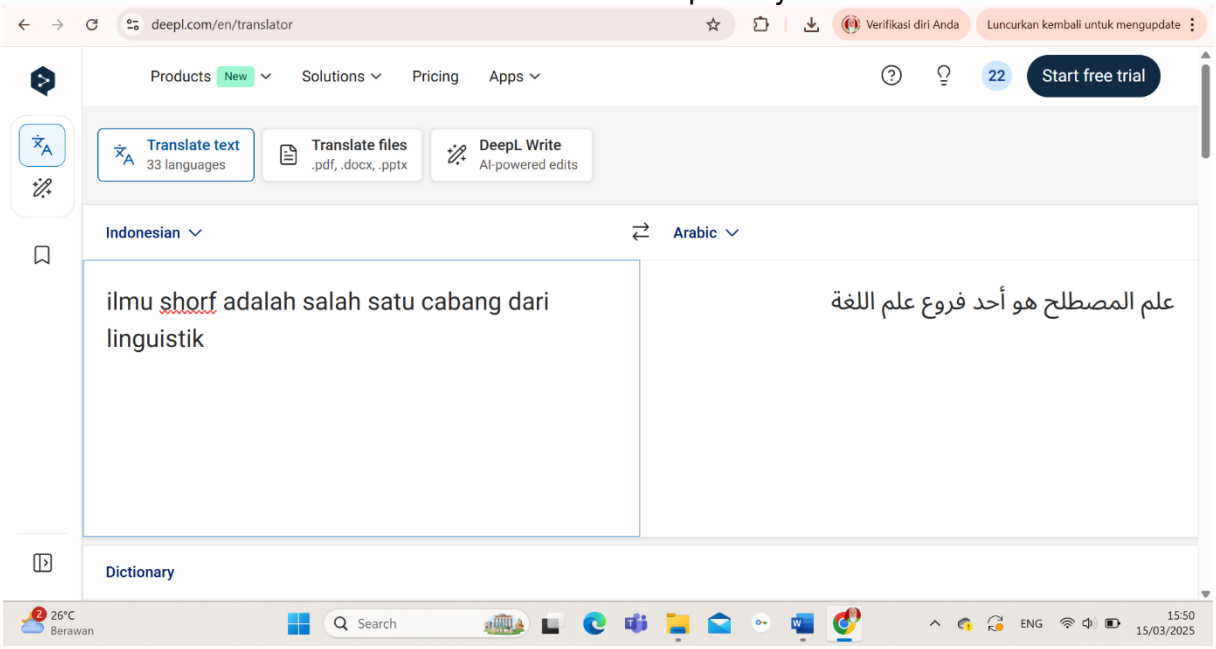
Z1 concluded, "I am also in the process of completing a thesis on maharah qira'ah, and it is very helpful with the existence of DeepL, especially in terms of translating." This shows that even though Gen Z considers DeepL to be practically effective, they still combine it with other learning resources or strategies to deepen their morphological abilities. This attitude shows that Gen Z has a flexible approach in integrating technology into the Arabic language learning process, especially for morphological aspects.

A Comparison of Millennial and Gen-Z Perceptions of Using DeepL to Improve Syntax Skills

This study shows that there is a significant difference in perception between Millennials and Generation Z in using DeepL to improve syntactic skills in learning Arabic at UIN Walisongo Semarang. The Millennial generation, although no stranger to technology, tend to use DeepL as an additional tool and rely more on conventional methods such as grammar books or lecturer guidance. They appreciated DeepL's ability to provide sentence translations, but felt that the app lacked depth in explaining complex syntactic structures and nahwu rules thoroughly. On the other hand, Generation Z shows greater acceptance of DeepL and considers that the sentence structure presented is generally in accordance with Arabic grammar rules. They make use of the translation variation feature to compare and understand different forms of sentence structure that correspond to the frequently used mufradat. DeepL is also considered helpful in

understanding word order, particle usage, as well as the position of subjects, predicates, and objects in sentences. However, Gen Z is still aware that DeepL has not been able to explain the rules of nahwu in depth, so they consider it more suitable as a syntactic learning tool, rather than as the main source of understanding Arabic grammar.

Picture 3 : use of DeepL in syntax



This study found that the Millennial Generation has a tendency to see DeepL as a complementary tool in understanding the syntax of the Arabic language. M1 states,

> *"I use DeepL just to get an initial idea of the translation, but for sentence structure I keep the nahwu book open."*

This shows that they still rely on traditional approaches. M3 also adds, *"DeepL sometimes structures the sentences accordingly, but doesn't explain why they are in a certain position."* The need for in-depth explanations led them to refer to other sources. M5 corroborates this view by saying, *"I understand sentence structure better after discussing with the lecturer than just looking at the results of DeepL's translation."* Thus, while DeepL helps in early comprehension, Millennials still need other methods to deepen syntactic comprehension.

In contrast to Millennials, Generation Z shows a greater interest in DeepL in syntax aspects. Z1 explains,

> *"I think DeepL is very useful. From the sentence structure, I can see the position of the subject and the object more clearly."*

This suggests that Gen Z uses DeepL to dissect sentence structures practically. Z2 added, *"DeepL composes sentences according to the rules, although it still needs to be re-examined if you want the results to be really accurate."* This awareness shows a critical approach to technology. Z3 also stated, *"I often see sentence patterns from multiple translation options in DeepL, so I can tell which structure is commonly used."* With its translation variation feature, DeepL assists Gen Z in identifying common syntactic patterns that are frequently used.

Despite being more open to technology, Generation Z doesn't fully rely on DeepL as a primary source for learning syntax. Z4 says, *"DeepL's translation is helpful, but it doesn't explain why verbs are placed at the beginning or middle of a sentence."* This shows that although practical, DeepL has not been able to replace an in-depth explanation of nahwu. Z5 affirms,

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"DeepL is suitable for beginners or for quick checks, but to learn the rules in full, I still use books or learning videos."

This signifies a combination of digital and traditional approaches. In fact, Z3 added, *"If I really want to understand sentence structure, I still have to open the nahwu book."* So, even though they are taking advantage of DeepL, Gen Z is still aware of its limitations in explaining grammatical theory in full.

Meanwhile, Millennials also recognize the benefits of DeepL, even if only as a complement. M2 said,

"I like to check the results of DeepL to see if my sentence structure is correct, but I still match it with the science of nahwu."

They do not reject technology, but use it carefully. M4 adds, *"DeepL does help when translating Arabic texts, but I can't completely rely on it because there is no grammatical explanation."* The need for depth of analysis is the main consideration. Even M1 said, *"I am more comfortable if I learn sentence structure from a book that has clear rules."* Millennials show a tendency to verify technological results with more academic and reliable sources.

The conclusion of these findings shows that there is a difference in approach between the two generations to the use of DeepL in improving syntactic skills. Gen Z tends to take advantage of DeepL's flexibility, as Z2 says,

"I like that DeepL gives me an alternative translation that I can compare."

While Millennials are more cautious, as M5 says, *"Technology can help, but I still need an explanation from a lecturer or a book."* Z1 also emphasized, *"From DeepL I learned the structure of sentences, but I still find out why that's the case."* This means that both generations are equally aware that DeepL is not the primary source of understanding syntax, but the difference lies in how they utilize it: Gen Z is more flexible and exploratory, while Millennials still prioritize accuracy and depth through traditional sources.

Table 2: Comparison of millennial and gen-z's perceptions on using DeepL for Arabic language learning

Aspek	**Millennial Generation**	**Gen-Z**
Phonology	Consider DeepL less effective due to the absence of audio or pronunciation features. They prefer conventional methods like guidance from lecturers or audiovisual media to learn proper articulation and tajwid.	View DeepL as helpful for early reading stages of Arabic texts because of its simple and familiar sentence structures, although the lack of pronunciation tools remains a limitation.
Morphology	Use DeepL to understand basic vocabulary and sentence structures but find it lacking in providing in-depth explanations of word formation and inflection patterns (tashrif). They prefer classical texts, grammar books, or instructor input for	Believe DeepL helps enrich vocabulary and presents word patterns that reflect morphological variations. Although it doesn't explain grammar rules, its sentence constructions are useful for recognizing word forms.

	deeper morphological understanding.	
Syntax	Find DeepL useful for basic sentence translation but insufficient for grasping complex syntactic structures or comprehensive grammar rules. They continue to rely on textbooks and direct instruction for mastering syntax.	Perceive DeepL as helpful in understanding sentence structures, word order, and the use of particles. The translation variations support the learning of syntax, though not a replacement for formal grammar instruction.

Discussion

The generational differences in utilizing DeepL reflect distinct patterns of digital adaptation and learning strategies. Millennials tend to use DeepL as a supplementary tool rather than a primary source, aligning with their preference for conventional, text-based, and instructor-guided methods. In contrast, Generation Z integrates DeepL more actively into their learning routines, especially when exploring sentence structures and morphological patterns. This contrast highlights that the difference lies not only in digital proficiency but also in how each generation constructs linguistic meaning through digital interaction. Piaget's constructivist theory is particularly relevant here, emphasizing that learners build understanding based on individual experiences. Millennials, shaped by an analog-to-digital transition, remain anchored to traditional learning methods. Generation Z, however, raised in a fully digital environment, embraces experimentation and innovation. Therefore, the use of DeepL is not only operationally different but also conceptually distinct, as each generation interprets and integrates AI tools according to their educational upbringing and cognitive frameworks in the Arabic language learning process.

Analyzing phonology, morphology, and syntax reveals how linguistic representations in DeepL are interpreted critically by each generation. Millennials are particularly sensitive to DeepL's phonological limitations and tend to revert to conventional learning sources such as lecturer recordings and audiovisual media. Generation Z, although equally aware of these limitations, responds by seeking alternative digital platforms offering interactive phonological exercises. In morphology, Millennials remain cautious and prefer validation from classical texts or expert instruction. Conversely, Generation Z is more accepting of digital representations as a starting point for further exploration. These differences suggest that linguistic inputs from AI tools like DeepL are not universally accepted but filtered through generational lenses. Such variations underscore the importance of recognizing AI not just as a learning facilitator but also as a trigger for linguistic reflection. While Millennials adopt a cautious and confirmatory approach, Generation Z takes an exploratory and adaptive stance—revealing how AI-facilitated learning is shaped by cognitive trust, generational values, and the degree of technological immersion.

The differing approaches to DeepL also reflect the influence of social dynamics as explained in Bandura's social learning theory. Generation Z exhibits learning behaviors grounded in digital observation and interaction—whether through online forums, learning communities, or multimedia content. Their learning is shaped by exposure to peer models in digital environments, resulting in faster adaptation to new tools. Millennials, on the other hand, rely

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more heavily on direct interaction with instructors or academically traditional communities. These behaviors underscore how the learning context affects technological engagement. Millennials use DeepL for preliminary insights but seek confirmation from trusted sources, whereas Generation Z embraces it as part of a broader digital ecosystem. This supports Bandura's assertion that environment and observed behaviors play a significant role in shaping learning choices. The generational contrast in AI engagement is not merely technological but deeply rooted in the surrounding social learning culture. Consequently, educational strategies must consider how learners' environments—digital or analog—affect their agency in adopting tools like DeepL in mastering Arabic language structures.

According to Prensky's Digital Native theory (2001), Generation Z displays a cognitive orientation that favors non-linear, fast-paced, and multitask-driven learning. In Arabic language acquisition, this is evident in their simultaneous use of multiple apps while studying syntax or morphology, including DeepL. Millennials, however, are more comfortable with sequential, deep-focus learning, using DeepL in a step-by-step process: translating, analyzing, then cross-checking. These preferences not only reflect technological habits but also fundamental differences in information processing. Generation Z navigates data with speed, while Millennials exhibit more thoroughness and evaluative thinking. Both strategies offer distinct advantages, but they also necessitate different support systems. DeepL integration must therefore be flexible, catering to the fast-processing and multitasking strengths of Gen Z while also accommodating the systematic, validation-oriented approach of Millennials. This implies a need for instructional designs that are inclusive of generational processing styles, ensuring that both cohorts can engage with AI-enhanced language learning effectively. Cognitive diversity, informed by generational context, becomes a central consideration in optimizing DeepL's pedagogical function.

From a pedagogical standpoint, these findings suggest that integrating AI tools like DeepL into Arabic language education requires a generation-sensitive approach. Curriculum design should account for Millennials' selectiveness and Generation Z's exploratory digital habits. Blended learning models offer an ideal solution, combining traditional classroom methods with digital platforms to accommodate both generations' preferences. Moreover, providing targeted training for educators is crucial, as many instructors may lack the skills to guide students in using AI tools critically and effectively. These sessions should emphasize both technical usage and analytical evaluation, equipping learners to interpret AI outputs with discernment. Additionally, improving AI tools to better address the specific linguistic features of Arabic—particularly in pronunciation and morphology—is vital. Partnerships between educational institutions and tech developers can lead to tailored AI solutions aligned with pedagogical needs. Ultimately, this research emphasizes the value of viewing AI integration not as a one-size-fits-all solution, but as a flexible, evolving strategy responsive to generational diversity. By aligning technology with cognitive styles and pedagogical demands, the educational community can enhance the efficacy of Arabic language instruction in the digital era.

Conclusion

This research reveals a stark contrast between Millennials and Generation Z in utilizing DeepL for Arabic language learning. Rather than serving as the primary tool for acquiring skills in phonology, morphology, and syntax, DeepL is integrated into learning in distinct ways by each generation. Millennials, though technologically literate, still uphold conventional methods, using DeepL as a supplementary aid rather than a central learning resource. They perceive AI tools as insufficient for delivering in-depth linguistic analysis and continue to rely on classical texts and

lecturer guidance for mastering word forms and sentence structures. In contrast, Generation Z demonstrates not only a strong embrace of technology but also a critical and strategic approach in using AI tools. They do not rely solely on DeepL but actively combine it with specialized applications such as the Arabic Morphology Analyzer and engage in online discussions to deepen their syntactic understanding. Their skepticism regarding AI's limitations fosters a more evaluative and adaptive mindset, highlighting that digital fluency is paired with discernment. This challenges the assumption that AI adoption in education is passive or uniform across learners. Instead, this study shows that technological adoption in language learning is shaped by generational habits and cognitive strategies. The AI revolution, therefore, has not displaced traditional methods but has diversified the learning landscape through differentiated generational responses.

This study also contributes theoretically by reaffirming the relevance of Marc Prensky's (2001) digital native theory, Piaget's (1972) constructivism, and Bandura's (1986) social learning theory within the context of AI-assisted Arabic language learning. The findings highlight that while Millennials—as digital immigrants—tend to rely on structured, instructor-led methods, Generation Z—as digital natives—exhibits a more fluid and self-directed engagement with digital tools. Importantly, Generation Z does not blindly trust AI; rather, they use it strategically, blending it with other digital and traditional resources based on learning objectives. This nuanced behavior expands the understanding of digital nativity beyond mere technological familiarity to include evaluative and tactical usage. However, this research is limited in scope, as it only investigates students at UIN Walisongo Semarang and may not reflect patterns at other Islamic universities. Future studies should expand the sample to include diverse institutional contexts to assess whether generational patterns in AI usage are consistent across settings. Moreover, longitudinal research could uncover how attitudes toward AI evolve over time, especially as both technology and educational environments continue to change. Such studies would provide deeper insight into the dynamic role of AI in transforming Arabic language education across Indonesia's Islamic higher education landscape.

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