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Academic digital applications supporting vocabulary instruction for university students: How do English instructors perceive their use?

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Despite growing interest in integrating educational technology into vocabulary instruction, several areas remain underexplored. This study aims to investigate English as a Second Language (ESL) instructors' perceptions of integrating Academic Digital Applications (ADAs) into vocabulary teaching and learning. Focusing on these perceptions has the potential to influence pedagogical practices and the implementation of vocabulary instruction in higher education contexts. Using an explanatory sequential mixed-methods design, data were collected from 106 ESL instructors across ten private universities. Guided by the Technology Acceptance Model (TAM), the study examined instructors' perceptions in relation to *perceived usefulness*, *perceived ease of use*, and attitude. Overall, instructors reported positive perceptions of ADAs integration, noting that these tools supported vocabulary teaching and learning, pronunciation awareness, formative assessment, and oral fluency, while promoting context-rich vocabulary practice and spontaneous target language use, thereby contributing to communicative competence. These perceptions were shaped by demographic factors, including teaching experience, academic qualifications, and age, as well as contextual factors, including institutional support, prior technological experience, and instructional preparedness. The findings are synthesised in a conceptual model adapted from TAM, incorporating both demographic and contextual factors. The study further provides practical implications for curriculum design and professional development by outlining how instructor training and institutional support can enhance the effective integration of ADAs into daily teaching practices in ESL vocabulary instruction.

Keywords: instructors' perception, speaking skills, ADAs, TAM, vocabulary instruction

1. Introduction

Vocabulary is a central element in English as a Second Language (ESL) acquisition, as it plays a pivotal role in mastering a second language (Bedilu & Degefu, 2024). However, many ESL students face challenges when learning vocabulary through traditional instructional approaches, such as paper-based games and teacher-centred memorisation activities. These methods often require considerable time and effort while providing limited opportunities for authentic language use, particularly in speaking tasks. As a result, students struggle to apply newly acquired vocabulary in meaningful oral communication. Moreover, some ESL instructors continue to rely on traditional approaches due to factors such as teaching experience, familiarity with conventional pedagogies, and resistance to technological change (Sa'di et al., 2021). This reliance reflects broader pedagogical tensions within ESL education regarding how vocabulary instruction should be mediated in increasingly technology-enhanced learning environments. Given these challenges, there is a growing need for instructional approaches that not only support vocabulary learning but also facilitate communicative language use and learner engagement (Bedilu & Degefu, 2024).

Academic Digital Applications (ADAs), including tools increasingly aligned with or integrated into generative artificial intelligence environments, have emerged as promising resources for supporting vocabulary instruction (Hsieh & Lee, 2023). In this study, ADAs are defined as digital platforms specifically including Duolingo, Quizlet, digital dictionaries, YouTube, and Kahoot. These applications are examined collectively to capture ESL instructors' perceptions of their role in supporting vocabulary teaching and learning, formative assessment practices, speaking development, and instructional convenience. Accordingly, ADAs are conceptualised as a unified category of digital resources for English vocabulary instruction, irrespective of variations in their technological design or functionality. However, the growing integration of digital applications in language education has also generated ongoing scholarly debate concerning whether the effectiveness of such technologies derives primarily from the tools themselves or from the pedagogical practices through which instructors implement them. While technology-centred perspectives often emphasise usability, accessibility, and measurable learning outcomes, sociocultural and pedagogical perspectives argue that digital tools only become educationally meaningful through teacher mediation, contextual adaptation, and communicative classroom interaction.

Despite growing interest in integrating digital applications into vocabulary teaching and learning, prior research has largely focused on student outcomes or tool effectiveness, with limited attention to instructors' perspectives on pedagogical integration. For example, Altakhaineh et al. (2023) examined the challenges instructors faced when using ADAs in vocabulary teaching, highlighting technical and contextual barriers. Kassim and Said (2020) investigated the effects of ADAs on student vocabulary acquisition but did not examine how instructors' perceptions influenced implementation. Jomaa et al. (2024) focused on the convenience and usability of ADAs for vocabulary learning, but their study did not consider speaking-focused instructional tasks. Although these

studies demonstrate the potential of digital tools to enhance vocabulary learning, much of the existing literature adopts a predominantly technology-centred orientation that conceptualises ADAs as independent instructional tools whose effectiveness can be evaluated primarily through student performance and functional efficiency. Such perspectives risk overlooking the pedagogical mediation through which instructors interpret, adapt, and integrate digital applications within authentic communicative language-learning environments. Consequently, limited attention has been paid to how instructors conceptualise the role of ADAs in supporting speaking-focused vocabulary instruction, formative assessment, and classroom interaction in ESL contexts.

Speaking-focused vocabulary instruction is particularly critical because it supports communicative competence and oral fluency, enabling students to use target vocabulary in authentic contexts. Understanding instructors' perceptions is essential to ensure that ADAs are effectively integrated into these oral-focused activities. Both Teng (2022) and Kassim and Said (2020) emphasise the need to investigate instructors' perspectives as a key determinant of effective classroom implementation. This issue is theoretically significant because communicative language teaching and technology-enhanced learning frameworks increasingly emphasise that language development is socially mediated and shaped by pedagogical interaction rather than by technological exposure alone. Examining instructors' perceptions therefore contributes to broader debates concerning teacher cognition, pedagogical agency, and the contextual enactment of digital pedagogy in ESL education.

Addressing this gap is critical because neglecting instructors' perspectives may lead to inconsistent adoption, misalignment with curriculum objectives, and underutilisation of technology to support oral language development. By foregrounding instructors' perspectives, this study provides insight into pedagogical decision-making and operational practices that mediate the effective integration of ADAs in authentic ESL teaching contexts. Using an explanatory sequential mixed-methods design, it examines instructors' perceptions of ADAs in relation to vocabulary instruction, speaking development, formative assessment, and instructional convenience. Rather than merely identifying whether ADAs are effective, this study advances existing knowledge by reconceptualising digital vocabulary instruction as a pedagogically mediated process shaped by instructors' beliefs, classroom practices, and communicative objectives. In doing so, the study extends current understandings of technology-enhanced vocabulary pedagogy beyond tool functionality and student outcomes by highlighting the central role of instructors in sustaining meaningful and contextually responsive language-learning experiences. Furthermore, the study offers practical implications for curriculum design, professional development, and the creation of pedagogically aligned digital resources. This approach enables a nuanced account of how instructors interpret, enact, and sustain technology-mediated vocabulary instruction, thereby addressing a critical but underexplored aspect of ESL education in higher education settings.

2. Technology acceptance model

This study is grounded in the Technology Acceptance Model (TAM), originally developed by Davis (1989), which has been widely applied and extended in educational technology research to explain instructors' technology adoption decisions. Although TAM originated as a general model of technology acceptance, later research in educational settings has established its relevance for explaining how instructors evaluate digital tools according to their pedagogical effectiveness and compatibility with instructional practices (perceived usefulness), as well as their practicality in classroom contexts (perceived ease of use) (e.g. Gan et al., 2024; Kong, 2025).

TAM comprises two core constructs: perceived usefulness and perceived ease of use. In the context of this study, perceived usefulness refers to the extent to which ESL instructors believe that integrating ADAs enhances vocabulary instruction, speaking-focused activities, and formative assessment. Perceived ease of use, meanwhile, relates to instructors' perceptions of how effortlessly ADAs can be integrated into vocabulary instruction, classroom interaction, and formative assessment.

These constructs are particularly important in instructor-led contexts, as they influence not only instructors' attitudes toward technology but also their decisions about continued classroom use. As demonstrated by Deris and Shukor (2019), instructors' perceptions of usefulness and ease of use significantly influence their intention to adopt and continue using digital tools in pedagogically meaningful ways. In this study, TAM is adapted to the ESL vocabulary context by examining instructors' perceived usefulness and ease of use of ADAs in relation to their perceived pedagogical roles, including speaking-oriented vocabulary tasks, formative assessment, and alignment with course learning outcomes. Accordingly, TAM functions as an analytical lens for interpreting instructors' perceptions of ADAs in relation to vocabulary teaching and learning, speaking development, instructional convenience, and assessment practices, rather than merely as a descriptive model of technology acceptance.

3. Literature review

3.1 Incorporating ADAs into vocabulary teaching

Research has highlighted the potential benefits of integrating ADAs into vocabulary teaching for ESL students. Latip and Mahadi (2021) reported that ESL instructors found visual and auditory tools to be effective in enhancing vocabulary teaching by saving time, enriching instructional delivery, and addressing pedagogical limitations. These tools not only streamlined the teaching process but also contributed to improving the quality of students' comprehensible input. Furthermore, ADAs were perceived as valuable instructional resources that support vocabulary learning by promoting active student engagement, rather than relying on passive information delivery or rote memorisation.

Despite the documented benefits of educational technology in vocabulary instruction, a notable challenge has also been reported. Altakhaineh et

al. (2023), for example, reported that some ESL teachers expressed concerns about the additional time required for the preparation and design of materials when using ADAs. In contrast, Jomaa et al. (2024) presented opposing findings, indicating that such applications can, in fact, save teachers time and represent an emerging trend in vocabulary teaching. From a theoretical perspective, these findings suggest that instructors' perceptions of ADAs are shaped not only by technological features, but also by pedagogical and contextual factors. Within TAM, *perceived usefulness* and *perceived ease of use* can therefore be understood as context-dependent constructs influenced by instructional and institutional realities. These contrasting perspectives underscore the role of instructors' pedagogical beliefs and contextual practices in shaping perceptions of ADAs integration in vocabulary teaching.

Moreover, Paksi et al. (2023) emphasised the formative assessment capabilities of certain ADAs, noting that these tools provide teachers with detailed performance reports that support ongoing revision and refinement of vocabulary teaching. Despite these advantages, Altaqhaine et al. (2023) also cautioned against the excessive use of ADAs, arguing that overreliance on such tools may reduce classroom interaction and student engagement. Similarly, Alkhazraji (2025) asserted that the inappropriate use of ADAs can hinder instructional objectives, particularly those involving teacher-student interaction.

Given these mixed findings, it is essential to examine ESL instructors' perceptions of ADAs integration in vocabulary teaching. Understanding these perspectives can contribute to a more context-sensitive understanding of technology integration in ESL vocabulary teaching and inform more balanced implementation strategies.

3.2 Incorporating ADAs into vocabulary learning

A growing body of research has explored students' perceptions of integrating ADAs into vocabulary learning. Overall, these studies report that students generally hold positive attitudes and express satisfaction with such integration (Alqahtani, 2024; Klimova & Polakova, 2020; Kohnke, 2020; Pham, 2022; Sathyaselan et al., 2025; Yawiloeng, 2020). These positive perceptions are commonly associated with the potential of ADAs to foster learner autonomy, facilitate vocabulary development, and create collaborative and engaging learning environments. Additionally, they are shown to enhance students' interest and motivation in vocabulary development (Sa'di et al., 2021; Sathyaselan et al., 2025). These benefits, in turn, contribute to students' broader language development goals. From a theoretical perspective, these findings align with technology acceptance assumptions that learners' perceptions of usefulness and learning value influence attitudes toward digital tools. However, existing literature has primarily emphasised learning outcomes and learner satisfaction, with comparatively limited attention to the pedagogical conditions shaping the effective integration of ADAs in vocabulary learning contexts.

Furthermore, Alqahtani (2024) found that students perceived ADAs to be particularly beneficial in supporting vocabulary learning through visual text

features. Similarly, Pham (2022) observed that such applications aid learners not only in understanding vocabulary meaning more efficiently and engagingly, but also in improving pronunciation. However, not all findings are uniformly positive. Yawiloeng (2020) reported that some students encountered difficulties in comprehending vocabulary through technological tools, which led to frustration and a decline in confidence when using ADAs. This suggests that, while digital tools can enhance vocabulary learning, they may also hinder it when not effectively implemented or matched to students' needs.

Another advantage highlighted in the literature is the time and effort saved through app-based learning (Alqahtani, 2024). ADAs can also function as tools for formative assessment, enabling students to evaluate their vocabulary knowledge regularly (whether weekly or more frequently) and receive corrective feedback (Klimova & Polakova, 2020; Sathyaselan et al., 2025). According to Tu et al. (2020), students indicated that such features help them maintain focus and minimise distractions, although some found the repetitive nature of these assessments to be monotonous. On the other hand, teachers in Kassim and Said's (2020) study voiced reservations about relying on ADAs for vocabulary assessment. They questioned the accuracy of these tools in evaluating student performance and expressed concern that they might serve more as a distraction than a reliable assessment method.

These varied findings suggest that the effectiveness of ADAs may depend not only on learner perceptions, but also on the pedagogical decisions and implementation practices shaped by ESL instructors. Understanding instructors' perspectives is therefore important for developing a more comprehensive account of technology integration in vocabulary learning contexts. Given the divergent experiences and perceptions reported in the literature, further investigation into instructors' views is warranted.

3.3 Variable differences and the integration of ADAs in vocabulary teaching

Given the reported relationship between ESL instructors' demographic variables and their integration of ADAs into vocabulary instruction, this area warrants further investigation. Although limited research has examined this issue, existing studies provide some insight. For instance, Sa'di et al. (2021) explored the influence of age on teachers' use of ADAs in vocabulary teaching and found that younger teachers were more likely to adopt such technologies due to their perceived contribution to vocabulary learning. In contrast, older instructors were less likely to use ADAs, often perceiving them as less effective in supporting vocabulary development. Regarding gender, Jomaa et al. (2024) reported no significant influence on instructors' perceptions of ADAs integration in vocabulary teaching. From a theoretical perspective, these demographic variables may function as contextual influences shaping instructors' perceptions of usefulness and ease of use within TAM-informed technology adoption processes. However, the role of broader demographic and contextual factors within technology acceptance processes in ESL vocabulary instruction remains underexplored. Consequently, the present study extends this line of inquiry

by examining not only age and gender, but also teaching experience and academic qualifications in shaping ESL instructors' perceptions and use of ADAs in vocabulary instruction.

3.4 Gaps in the literature and positioning of the present study

A critical review of the existing literature reveals persistent gaps that warrant further scholarly attention. Although considerable research has examined students' perspectives on vocabulary learning (Alqahtani, 2024; Klimova & Polakova, 2020; Kohnke, 2020; Pham, 2022; Sathyaselan et al., 2025; Tu et al., 2020; Yawiloeng, 2020), teachers' perspectives on vocabulary teaching (Altakhaineh et al., 2023; Jomaa et al., 2024; Latip & Mahadi, 2021; Paksi et al., 2023;), and teachers' perspectives on vocabulary learning (Kassim & Said, 2020; Sa'di et al., 2021), much of these studies have addressed isolated dimensions of vocabulary instruction without offering a comprehensive or integrative view. Moreover, the majority of studies have been conducted in K–12 educational settings (Altakhaineh et al., 2023; Latip & Mahadi, 2021; Paksi et al., 2023; Kassim & Said, 2020; Sa'di et al., 2021) or public university contexts (Alqahtani, 2024; Jomaa et al., 2024; Klimova & Polakova, 2020; Kohnke, 2020; Tu et al., 2020; Yawiloeng, 2020), with private universities remaining largely underexplored (Sathyaselan et al., 2025). Additionally, although the role of interaction in language learning has been explored (Klimova & Polakova, 2020), the specific contribution of ADAs to the development of speaking skills – an area where many ESL students continue to face challenges – has not been systematically investigated.

Responding to these deficiencies, and following the recommendations of Kassim and Said (2020) and Teng (2022) to conduct mixed-methods research centered on ESL instructors' perceptions, this study aims to fill these voids, the present study aims to address these research voids. It focuses on ESL instructors' perceptions of integrating ADAs into vocabulary instruction within private university contexts, with a particular emphasis on speaking skills. In doing so, it seeks to offer a more comprehensive and nuanced account of technology integration in vocabulary instruction.

Importantly, this study distinguishes itself from prior research by explicitly grounding its investigation within a theoretical framework. It examines three critical factors influencing instructors' perceptions: (a) *perceived usefulness*, referring to the perceived enhancement across teaching, learning, resources, formative assessment, and verbal interaction; (b) *perceived ease of use*, reflecting the extent to which integration reduces instructional effort; and (c) *attitude toward use*, capturing instructors' openness to adopting educational technologies.

By addressing these overlooked areas, this study advances theoretical understanding while providing practical insights for the integration of ADAs in ESL instruction. In particular, it highlights the potential of educational technologies to enhance vocabulary instruction and support the development of

speaking skills – an area that remains underexplored and underdeveloped in the current literature.

The primary aim of this study is to investigate ESL university instructors' perceptions of integrating ADAs into vocabulary instruction. To achieve this aim, the following research questions were developed:

- RQ1: What perceptions do ESL university instructors have regarding the integration of ADAs into English vocabulary instruction?
- RQ2: What demographic differences (e.g., teaching experience, age) influence ESL university instructors' perceptions of integrating ADAs into English vocabulary instruction?

4. Methodology

4.1 Research design

An explanatory sequential mixed-methods design was adopted to achieve complementarity, allowing each methodological phase to enhance, elaborate, and illustrate the other's findings (Cohen et al., 2018). The study began with a quantitative phase, in which ESL instructors' perceptions were collected via a questionnaire. Patterns and trends identified in the questionnaire responses guided the development of the interview protocol and helped prioritise the interview questions, ensuring that the qualitative phase directly explored areas highlighted by the quantitative data. The qualitative phase consisted of in-depth interviews conducted to further explore and explain the quantitative findings. The interviews were particularly valuable for clarifying unexpected, contradictory, or ambiguous responses, providing a more nuanced and comprehensive understanding of vocabulary instruction. Together, the two phases offer complementary insights: the quantitative data provide a broad overview of instructors' perceptions, while the qualitative data deepen understanding of how and why these perceptions influence instructional decision-making. This integration enabled the study to move beyond descriptive patterns of technology use by contextualising instructors' perceptions within broader pedagogical and demographic realities. As a result, the combined findings contributed to an enhanced theoretical understanding of how contextual factors shape instructors' perceptions of usefulness and ease of use in relation to the integration of ADAs in vocabulary instruction. Figure 1 illustrates the explanatory sequential mixed-methods design of this study.

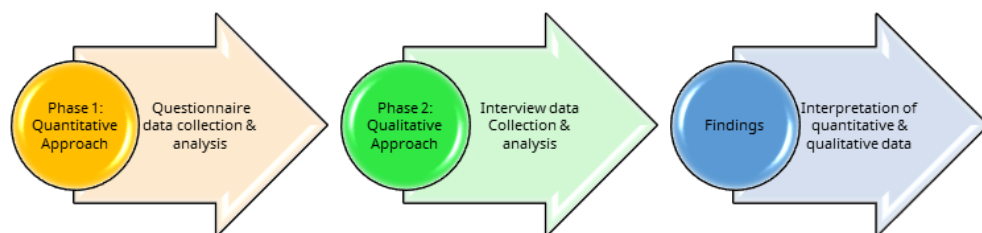


Figure 1. Explanatory sequential mixed-methods design

4.2 Participants

In this study, ten accredited private universities in the United Arab Emirates (UAE) participated. Some institutions follow an Arabic curriculum, while others adopt British or Australian curricula. All participating universities were involved in both the questionnaire and interview phases of data collection. The total population comprised 115 ESL instructors across these institutions.

Of this population, 106 instructors constituted the accessible sample and participated in the questionnaire phase, representing approximately 92% of the target population. The remaining nine instructors were not included due to accessibility constraints at the time of data collection.

A criterion-based sampling strategy was employed (Cohen et al., 2018), targeting instructors who met the study's inclusion criteria, specifically, those specialising in English language instruction and familiar with using ADAs in vocabulary teaching. Demographic information of the participating instructors is presented in Table 1.

Using a sample size calculator with a 95% confidence level, 3% margin of error, 50% population proportion, and a population size of 115, the minimum required sample size was determined. The obtained sample of 106 respondents exceeded this requirement, indicating that the questionnaire data provide a statistically robust representation of the population. Given the high participation rate and near-complete coverage, the quantitative findings can be generalised to ESL instructors within the participating institutions.

Table 1. Demographic information of ESL instructors

Category	Element	Number	Percentage
Gender	Males	47	44.3%
	Females	59	55.7%
Is English your native language?	Yes	22	20.8%
	No	84	79.2%
Age	21–35	12	11.3%
	36–45	37	34.9%
	46–55	49	46.3%
	> 56 years	8	7.5%
Highest academic qualification	Bachelor	7	7%
	Master	59	55.7%
	PhD	40	37.7%
Teaching experience in higher education	1–4	14	13.2%
	5–10	21	19.8%
	>10 years	71	67%

4.3 Questionnaire

The questionnaire was developed in alignment with the TAM to assess 106 ESL instructors' perceptions of the *perceived usefulness* and *ease of use* of ADAs

in vocabulary instruction, as well as their attitudes toward their integration. A cross-sectional design was employed, with data collected through a web-based questionnaire distributed via Google Forms. The instrument consisted of two sections: the first gathered demographic information, including gender, age, years of experience in higher education, native language status, and academic qualifications; the second comprised 48 closed-ended items organised into seven thematic clusters: teaching, learning, resources, formative assessment, oral interaction, ease of use, and attitude. Responses were recorded on a five-point Likert scale (strongly agree to strongly disagree).

The instrument was adapted through modifications to the questionnaires developed by Klimova and Polakova (2020), Latip and Mahadi (2021), and Paksi et al. (2023). Prior to the main data collection, a pilot study involving 29 ESL instructors from two private universities was conducted to assess the instrument's reliability and validity. The internal consistency of the questionnaire, as measured by Cronbach's alpha, was 0.963, indicating excellent reliability (Cohen et al., 2018). For content validity, the instrument was reviewed by a panel of experts in English language teaching, who provided evaluations to ensure the relevance, clarity, and appropriateness of the items for the intended research objectives.

4.4 Semi-structured interview

Fourteen instructors volunteered from the pool of 106 questionnaire respondents to participate in the semi-structured interviews. Participants were purposively selected to ensure diversity in teaching experience, institutional context, and familiarity with ADAs. This selection ensured that the qualitative phase captured a range of perspectives relevant to the research questions while remaining manageable for in-depth analysis. While the interview sample represents a subset of the questionnaire respondents, it was appropriate for the qualitative phase of this explanatory design, which prioritised depth of understanding and explanatory insight to complement and extend the quantitative findings and support analytic and conceptual generalisation. Consistent with qualitative research conventions, this sample size was adequate to achieve data saturation and generate rich, detailed insights (Creswell & Creswell, 2018).

Patterns and trends identified in the questionnaire responses guided the development and prioritisation of the interview questions, ensuring that the qualitative phase directly explored areas highlighted by the quantitative data. Interviews continued until no substantially new themes emerged, indicating data saturation.

To enhance the content validity of the interview protocol, twelve open-ended questions were piloted with three ESL instructors from different universities. Feedback from the pilot study was used to refine the interview questions prior to the formal data collection phase. Table 2 presents the final interview questions. Interviews were conducted face-to-face during the middle of the 2024–2025 academic year, scheduled according to instructors' availability and

preferences, and lasted between 45 minutes and one hour, allowing sufficient opportunity for probing and eliciting detailed responses.

To ensure the credibility and dependability of the qualitative data, member checking was employed, with preliminary interpretations returned to participants for verification and clarification, and the data analysis process was subjected to peer review by an expert in the field. Additionally, rich contextual descriptions of participants and teaching contexts were provided to support the transferability of the findings to similar ESL instructional settings.

Table 2. Interview questions

Theme	Sample questions
Teaching	- What do you think about integrating ADAs into your vocabulary teaching?
Convenience	- Is the integration of ADAs into vocabulary instruction convenient for you? How?
Learning	- How can integrating ADAs into vocabulary instruction help your students learn the word's meaning, form, pronunciation and usage? - How can the integration of ADAs into vocabulary instruction broaden your students' vocabulary? - How do you integrate ADAs in your vocabulary teaching? Give an example. - How do you engage your students to use ADAs in learning vocabulary? - How has the integration of ADAs into vocabulary instruction motivated your students to learn vocabulary?
Formative assessment	- How can integrating ADAs into vocabulary instruction help you to formatively assess students' vocabulary learning? - Which specific ADAs do you use to monitor students' progress, and why?
Speaking skills	- How can integrating ADAs into vocabulary instruction improve your students' speaking skills? - Are there certain ADAs that you find more effective for promoting oral interaction? Why?
Challenges	- What difficulties have you faced in integrating ADAs into your vocabulary teaching?

4.5 Ethical issues

To ensure adherence to ethical research standards, ESL instructors were provided with detailed information about the study's purpose, significance, and procedures. Informed consent was obtained through signed consent forms, emphasising the voluntary nature of participation and assuring confidentiality of all data. To protect anonymity, numerical codes were assigned to participants in place of names (e.g., Inst.1, Inst.2, Inst.3), ensuring privacy throughout the research process.

4.6 Data analysis

The questionnaire and interview data were analysed in accordance with the mixed-methods framework proposed by Creswell and Creswell (2018). Quantitative data were processed using SPSS (Version 26). The analysis proceeded in two stages: (1) descriptive statistics, including means (M) and standard deviations (SD), were calculated for all questionnaire items to summarise overall response patterns; and (2) inferential analyses were conducted, including independent-samples t-tests to examine differences based on gender and native language status, and one-way ANOVA to compare perceptions across age groups, teaching experience, and academic qualifications. These analyses addressed the study’s research questions by identifying both overall trends and statistically significant group differences.

Qualitative interview data were analysed thematically using a systematic coding process, resulting in eight overarching themes that captured instructors’ perceptions of ADAs integration in vocabulary instruction. These qualitative findings complemented and contextualised the quantitative results, providing deeper insight into instructors’ attitudes, instructional practices, and rationale for using ADAs. Figure 2 illustrates the step-by-step process of qualitative data analysis.



Figure 2. Qualitative data analysis steps

5. Findings

5.1 ADAs in vocabulary instruction

The findings emerged from a combination of quantitative analysis of questionnaire data and thematic analysis of open-ended responses, allowing for triangulation of instructors’ views on the integration of ADAs. These insights shed light on the pedagogical, emotional, and interactional benefits that ADAs offer for vocabulary instruction. Consequently, the results are structured into thematic sections corresponding to these affordance dimensions, incorporating evidence from both questionnaires and interviews. The integrated findings are presented across seven distinct sections.

5.1.1 ADAs for vocabulary teaching. ADAs appear to function as affective and attentional engagement facilitators in vocabulary instruction. Questionnaire findings in Table 3 (M = 4.24) indicate strong endorsement of their use, particularly in relation to improved student concentration (M = 4.12), advantages over traditional methods (M = 3.89), and reduced boredom (M = 2.00). Rather than being interpreted only as positive perceptions, these patterns suggest a recurring interpretive pattern whereby the interactive and game-like features

of ADAs are associated with redirected student attention and sustained engagement during vocabulary learning tasks. Interview data reinforce this interpretation, with Inst.3 highlighting that ADAs help to “create fun” and increase student engagement, indicating that engagement is not incidental but closely linked to perceived design affordances of these tools.

A more nuanced pattern emerges in relation to instructional efficiency as a conditional affordance. While time-saving benefits were positively rated ($M = 3.60$), the moderate mean and variability across responses suggest that efficiency is not uniformly experienced. Instead, it appears to be mediated by instructors’ familiarity with ADAs and their ability to integrate them purposefully into lesson design. This is supported by interview accounts such as “The ADAs save time; they save effort” (Inst.7) and “In less time, I teach more” (Inst.2), which indicate perceived gains in productivity. However, these gains should be interpreted as contingent rather than intrinsic, reflecting the role of digital pedagogical competence in shaping outcomes.

In addition, ADAs demonstrate a multimodal cognitive support function, particularly through the integration of visuals and interactive task formats. Instructors’ references to platforms such as Kahoot illustrate how varied input modes and question types are used to enhance repetition, review, and retention (Inst.2; Inst.5). This suggests that ADAs may support vocabulary learning through multimodal information processing, where meaning-making is facilitated across visual and linguistic channels, rather than relying solely on verbal explanation.

Although overall perceptions are strongly positive, some instructors expressed caution regarding expanding the number of tools used. This indicates that adoption is not driven solely by perceived benefit but also by pragmatic considerations such as workload, manageability, and technological saturation. Taken together, the findings suggest that ADAs operate as teacher-mediated pedagogical affordances, whose effectiveness in vocabulary instruction is shaped by engagement dynamics, multimodal input, and instructors’ contextual and technical constraints.

Table 3. Mean scores and standard deviations for teaching-related items

Item	M	SD
1. I use ADAs to teach vocabulary effectively.	4.24	0.75
2. I integrate ADAs into my vocabulary teaching when focusing on vocabulary knowledge.	4.16	0.82
3. I use ADAs to help my students focus on my vocabulary teaching.	4.12	0.81
4. I use ADAs in teaching vocabulary better than traditional methods.	3.89	0.95
5. My implementation of ADAs makes my teaching of vocabulary boring.	2.00	0.90
6. My implementation of ADAs distracts students from my teaching of vocabulary.	2.03	0.84
7. I use ADAs to save my time in vocabulary teaching.	3.60	1.10

5.1.2 ADAs for vocabulary learning. In Table 4, the quantitative findings indicate consistently strong endorsement of ADAs across multiple dimensions of vocabulary learning, particularly in relation to learning multiple words ($M = 4.28$), meaning inference, pronunciation, and learner independence ($M = 4.26$), word forms ($M = 4.11$), and correct usage ($M = 4.01$). However, the qualitative data suggest that these perceptions are not simply reflective of tool effectiveness, but are structured through a pattern of pedagogical mediation, whereby instructors actively align specific digital affordances with distinct dimensions of vocabulary knowledge.

Across the dataset, a consistent mechanism emerges: instructors associate higher perceived effectiveness with ADAs when there is a clear affordance, pedagogy, and learning outcome alignment. For pronunciation, for instance, high agreement ($M = 4.26$) corresponds with deliberate exploitation of multi-modal affordances such as audio input, phonetic transcription, and comparative models. This indicates that pronunciation development is conceptualised not as a by-product of exposure, but as an outcome of targeted engagement with specific technological features. In this sense, ADAs function as phonological scaffolding systems whose effectiveness is contingent upon intentional instructional activation.

A similar relational pattern is evident in meaning and contextual usage ($M = 4.01$). Rather than treating vocabulary learning as memorisation, instructors consistently frame effectiveness in terms of depth of semantic processing. The data suggest that ADAs are perceived as effective when they facilitate retrieval practice within meaningful contexts, indicating a shift from surface-level interaction to contextualised cognitive engagement. This positions digital tools as mediators of processing depth rather than repositories of vocabulary content.

Importantly, the findings also reveal a moderating mechanism linked to institutional and curricular constraints. The evaluation of YouTube pronunciation input, for example, demonstrates that perceived effectiveness is not inherent to the tool but is filtered through normative pedagogical standards. This introduces a conditional dimension to effectiveness, where alignment with curricular identity (e.g., British vs. American pronunciation norms) shapes instructors' valuation of ADAs.

Finally, the preference for multifunctional applications (e.g., dictionaries, Quizlet, Duolingo) indicates an emerging conceptualisation of ADAs as integrated cognitive ecosystems rather than discrete tools. These platforms are valued because they consolidate multiple dimensions of vocabulary knowledge within a single interface, thereby reducing cognitive fragmentation and supporting coordinated vocabulary development.

Overall, the findings suggest a conceptual shift from viewing ADAs as technologically effective tools to understanding them as affordance-based pedagogical systems. Their perceived impact on vocabulary learning is therefore not intrinsic, but emerges through a mediating chain involving instructor agency, affordance selection, and contextual alignment. This positions effectiveness as a relational construct shaped by instructional decision-making rather than technological capability alone.

Table 4. Mean scores and standard deviations for learning -related items

Item	M	SD
8. ADAs improve students' vocabulary learning.	4.23	0.71
9. ADAs enable my students to learn the meaning of a word.	4.26	0.66
10. ADAs enable my students to guess the meaning of a word.	4.14	0.79
11. ADAs enable my students to learn the form of a word.	4.11	0.74
12. ADAs enable my students to pronounce a word correctly.	4.26	0.73
13 ADAs enable my students to learn the correct usage of a word.	4.01	0.68
14. ADAs enable my students to learn a number of words.	4.28	0.62
15. ADAs enable my students to learn independently.	4.26	0.65

5.1.3 ADAs for vocabulary expansion. Table 5 indicates strong instructor agreement that ADAs meaningfully support vocabulary expansion by extending access to resources, multimodal input, and practice opportunities. High mean scores for access to audio-visual materials ($M = 4.26$), information retrieval ($M = 4.24$), activity range ($M = 4.23$), and increased practice time ($M = 4.15$) suggest that instructors view vocabulary development as an extended, learner-driven process rather than a bounded classroom activity. Interview data reinforce this interpretation, showing that instructors value ADAs not for surface exposure but for their capacity to deepen lexical engagement.

Several instructors identified dictionary applications as central to vocabulary expansion, as they enable students to explore synonyms and deepen their understanding of word meanings (Inst.2, Inst.3, Inst.8, Inst.12), indicating a focus on semantic depth rather than isolated word learning. Autonomy emerged as a key affordance, with Kahoot described as promoting independent learning beyond prescribed lexical sets: “students can download material prepared by other teachers... so they play independently” (Inst.2). Multimodal tools further supported lexical growth through contextualised exposure. Inst.5 highlighted “YouTube videos and transcripts to expose students to new vocabulary and collocations,” while Inst.8 noted that the dictionary application “encourages incidental vocabulary learning through repeated exposure in different contexts.”

Taken together, these findings suggest a recurring mechanism of vocabulary development mediated by ADAs: vocabulary expansion occurs through a cycle of exposure–engagement–reinforcement, where multimodal input increases initial exposure, interactive and autonomous use sustains engagement, and repeated contextual encounters consolidate lexical knowledge.

Three interrelated patterns can therefore be identified. First, ADAs function as exposure amplifiers by increasing the density and diversity of input (audio, visual, and textual), which broadens students' encounter with target vocabulary. Second, they operate as engagement facilitators by shifting students from passive reception to active exploration (e.g., searching meanings, selecting content, or playing independently). Third, they enable reinforcement through repeated, contextualised encounters that support incidental learning

and retention. These patterns indicate a relationship between modality, learner autonomy, and depth of lexical processing: richer multimodal environments and higher autonomy appear to promote deeper semantic processing rather than surface-level memorisation. In this sense, vocabulary expansion is not attributed to ADAs as tools per se, but to the interaction between technological affordances and pedagogical mediation that activates repeated meaning negotiation and contextual reinforcement.

Overall, the integrated findings suggest that ADAs support vocabulary expansion through autonomous engagement, multimodal input, and contextualised practice. However, variations in instructor confidence and application choice indicate that their effectiveness is conditional, relying on pedagogically informed selection and alignment with instructional goals rather than inherent technological affordances alone.

Table 5. Mean scores and standard deviations for resources-related items

Item	M	SD
16. I use various ADAs to maximise the resources of my vocabulary teaching.	4.17	0.68
17. Using various ADAs increases the vocabulary learning resources available to students.	4.16	0.71
18. Using ADAs provides students with more audio and visual examples.	4.26	0.85
19. Using ADAs enables students to use a wide range of vocabulary activities.	4.23	0.75
20. Using ADAs helps students access needed information.	4.24	0.74
21. Using ADAs enables students to dedicate more time to practicing vocabulary.	4.15	0.74

5.1.4 ADAs for formative assessment in vocabulary learning. In Table 6, the data indicate a generally positive but differentiated orientation among instructors toward using ADAs to support formative assessment in vocabulary learning. The moderate-to-high mean score for using ADAs to assess and adjust teaching ($M = 3.75$) suggests that instructors recognise their potential for informing instructional decisions, although this perception is less consistent than for teaching- and engagement-related functions. In contrast, stronger agreement was evident for the use of ADAs to provide immediate feedback and support self-assessment ($M = 4.16$), indicating that instructors tend to associate these tools more strongly with responsive, feedback-oriented functions.

This pattern suggests a conceptual differentiation in how ADAs are positioned, with greater emphasis on feedback-mediated formative uses compared to evaluative assessment functions. Interview data further elaborate this distinction, as several instructors described a clear separation between learning-oriented and assessment-oriented uses. Inst.2 stated, “I do not use any application for assessing purposes, but only for learning words,” while Inst.9 attributed limited assessment use to contextual constraints, noting, “Not really, due to the fact of distance learning.” Similarly, Inst.11 characterised

tools such as YouTube as input-oriented rather than evaluative, stating, “I see the YouTube video as a provider of new vocabulary in an authentic setting, and the students should incorporate these words into their language use only.” These accounts indicate that limited use of ADAs for assessment is linked to pedagogical judgements about appropriateness and validity rather than rejection of digital tools. Across the interviews, instructors’ decisions appear to be shaped by perceptions of whether digital tools are appropriate for learning facilitation versus measurement purposes. This suggests that epistemic beliefs about assessment validity may influence how ADAs are categorised and used within instructional practice.

In contrast, instructors who integrated ADAs into formative assessment highlighted affordances related to immediacy, interaction, and feedback. Inst.13 described using “a game-based application, such as Kahoot, to assess students’ learning through its immediate feedback and grading feature,” while Inst.14 emphasised how ADAs support student reflection through “instant feedback within the application environment.” These accounts suggest that integration into formative assessment is more likely when tool functionalities align with core formative principles such as feedback, reflection, and learner regulation.

The quantitative findings on error correction ($M = 3.89$ – 3.90), alongside strong agreement on rapid feedback ($M = 4.13$), further indicate that instructors distinguish between corrective and supportive dimensions of assessment. Overall, ADAs are predominantly associated with formative feedback functions, while their use for more formal evaluative purposes appears contextually and pedagogically contingent.

Taken together, the findings suggest a conceptual model in which the use of ADAs for formative assessment is shaped by the interaction of (1) epistemic beliefs about assessment legitimacy, (2) perceived affordances for feedback and student regulation, and (3) contextual conditions influencing implementation.

Table 6. Mean scores and standard deviations for formative assessment-related items

Item	M	SD
22. ADAs help me assess and modify my vocabulary teaching accordingly.	3.75	0.93
23. ADAs get quick feedback on students’ vocabulary learning.	4.13	0.74
24. I encourage my students to use ADAs to get useful corrective feedback when making errors in vocabulary.	3.89	0.89
25. I encourage my students to use ADAs to determine their errors.	3.90	0.94
26. I encourage my students to use ADAs to test their vocabulary knowledge.	4.16	0.66
27. I encourage my students to use ADAs to self-assess their vocabulary regularly.	4.02	0.74
28. I encourage my students to use ADAs to modify their learning when making errors in vocabulary.	3.87	0.72

5.1.5 ADAs for enhancing speaking skills. As shown in Table 7, the findings indicate a generally positive orientation among ESL instructors toward the use

of ADAs in supporting speaking development and classroom interaction. The mean score indicating that ADAs facilitate instructor–student interaction ($M = 3.97$) suggests that instructors perceive these tools as complementing, rather than displacing, communicative engagement in vocabulary instruction. This perception is reinforced by interview evidence, with Inst.2 noting that ADAs “contributed to the improvement of students’ speaking skills by enabling them to practise target vocabulary during presentations.” Such accounts indicate that instructors view ADAs as mediating pedagogical tools that can prompt oral production and structured interaction, rather than as technologies that isolate learners from communicative practice. This pattern suggests that instructors evaluate ADAs primarily through their capacity to support communicative participation and guided oral engagement, positioning interactional value as a central dimension of perceived usefulness in vocabulary instruction.

The perceived benefits extend to collaborative and task-based speaking activities. The relatively high mean score for collaborative vocabulary learning ($M = 3.95$), together with instructors’ agreement that ADAs support the use of vocabulary in conversation ($M = 3.80$; $M = 3.81$), suggests that these applications are viewed as facilitating peer interaction and spoken vocabulary use. This is reflected in Inst.4’s description of YouTube-mediated tasks, in which students “followed videos by summarising or discussing them with the relevant vocabulary.” Similarly, Inst.5 highlighted the pedagogical value of dictionary applications through “features like pronunciation guides and example sentences,” indicating that instructors value ADAs that scaffold oral production by integrating lexical form, meaning, and contextualised use in speaking-oriented tasks. Collectively, these findings suggest that instructors perceive ADAs as most effective when embedded within communicative and collaborative tasks that connect vocabulary knowledge with contextualised spoken use.

At the same time, instructors articulated more nuanced views regarding the limits of digital mediation for speaking development. Inst.6 observed that “while certain applications such as dictionary applications enhanced pronunciation, they were less effective in fostering spontaneous spoken interaction,” suggesting a perceived distinction between supported oral practice and emergent, unplanned speech. This concern is echoed in Inst.3’s caution that “excessive reliance on multiple applications or overuse of a single tool may reduce engagement and interaction.” These perspectives indicate an awareness that, if not carefully managed, digital tools may risk proceduralising interaction or constraining authentic communicative exchange. This distinction suggests that instructors differentiate between structured language support and authentic communicative spontaneity, implying that the pedagogical value of ADAs is mediated by the extent to which classroom tasks sustain meaningful interaction.

Nevertheless, the relatively lower agreement that overuse of ADAs reduces classroom interaction ($M = 3.75$) suggests that instructors do not view technology itself as the primary barrier to effective speaking development. Rather, the findings imply that the pedagogical impact of ADAs on speaking and interaction is contingent upon moderation, task design, and alignment with communicative objectives. Instructors perceive ADAs as valuable resources for supporting

oral vocabulary development and collaborative interaction, particularly when integrated in ways that preserve communicative purpose and student engagement rather than substituting for face-to-face interaction. Overall, the findings point to a conditional acceptance of ADAs in speaking instruction, where perceived effectiveness is shaped less by technological presence alone and more by pedagogical integration, communicative alignment, and interactional design.

Table 7. Mean scores and standard deviations for oral interaction-related items

Item	M	SD
29. Using ADAs in my vocabulary teaching helps me to interact with my students.	3.97	0.96
30. Overuse of ADAs while teaching vocabulary reduces my interaction with students.	3.45	1.09
31. Using ADAs enables my students to learn vocabulary in a collaborative environment.	3.95	0.78
32. Using ADAs helps my students in improving their performance in oral interaction.	3.76	0.86
33. Using ADAs maximises their involvement in vocabulary learning through conversation.	3.80	0.90
34. Using ADAs supports my students to use vocabulary in conversations.	3.81	0.85

5.1.6 ADAs as a tool for instructor convenience. In Table 8, the data indicate a generally positive orientation among ESL instructors toward the convenience and accessibility of ADAs for vocabulary instruction. The consistently high ratings for ease of use ($M = 4.18$) and teacher convenience ($M = 4.16$), reinforced by interview descriptions of ADAs as “free,” “accessible,” and requiring “minimal preparation,” suggest that instructors’ perceptions are closely tied to usability and workload reduction. This pattern indicates that instructors evaluate ADAs not only through pedagogical effectiveness but also through their capacity to support manageable and sustainable teaching practices. In this sense, ADAs are valued not solely for their pedagogical affordances, but also for their ability to streamline instructional processes and reduce cognitive and logistical demands.

However, the slightly lower mean for reduced instructional effort ($M = 3.81$), combined with instructors’ observations that some applications require additional preparation time, introduces a critical nuance. These findings suggest that perceptions of efficiency are conditional rather than universal. The perceived efficiency of ADAs is not inherent to the technology itself but is contingent upon design simplicity, teacher familiarity, and alignment with existing practices. This relationship highlights how technological affordances interact with contextual and pedagogical factors to shape instructors’ acceptance and continued use of ADAs. When digital tools increase preparation time or instructional complexity, their perceived advantage diminishes.

Taken together, the integrated findings suggest that instructors’ adoption of ADAs is mediated by considerations of sustainability and practical workload

management as much as by pedagogical value. Convenience functions not merely as a peripheral benefit but as a central determinant of continued integration. More broadly, the findings imply that instructors' acceptance of ADAs emerges through a balance between perceived pedagogical value and practical instructional demands. Thus, the effectiveness of ADAs is shaped by the interaction between technological affordances, teacher expertise, and the pragmatic realities of classroom practice.

Table 8. Mean scores and standard deviations for ease of use-related items

Item	M	SD
35. ADAs are easy to use for me while teaching vocabulary.	4.16	0.73
36. ADAs are easy for my students to use while learning vocabulary.	4.18	0.66
37. ADAs save my students' time while learning vocabulary.	3.97	0.79
38. ADAs are convenient for me by reducing my effort while teaching vocabulary.	3.81	0.95
39. ADAs are convenient for my students by reducing their efforts while learning vocabulary.	3.89	0.82
40. ADAs ease access to information while teaching vocabulary.	4.16	0.63
41. ADAs are generally easy to use in vocabulary teaching.	4.11	0.63

5.1.7 Instructors' attitudes toward using ADAs. The findings in Table 9 reveal a positive orientation among instructors toward integrating ADAs into vocabulary instruction. The high mean scores for preference to integrate ADAs ($M = 4.30$) and comfort in doing so ($M = 4.25$) suggest that instructors do not view these applications merely as externally imposed innovations, but as tools that align with their professional identity and instructional values. Interview data deepen this interpretation. When Inst.2 observed that "students were more engaged in discussions during or after application use," and Inst.4 described the applications as supporting "natural and collaborative learning," instructors implicitly positioned ADAs as catalysts for dialogic and interaction-oriented pedagogy rather than as passive content-delivery platforms. This pattern suggests that instructors' acceptance of ADAs is shaped not only by technological functionality, but by the extent to which these tools support communicative and student-centred pedagogical practices.

Importantly, the perceived benefits extend into the domain of learner autonomy. Instructors' accounts of students exploring word families and independently retrieving lexical information indicate that ADAs are conceptualised as enabling epistemic agency, shifting students from recipients of vocabulary input to active constructors of lexical knowledge. Gamified features, highlighted by Inst.1, Inst.3, and Inst.6, further reinforce this shift by embedding motivation within the task structure itself. Thus, the integration of ADAs appears to operate not only at the level of efficiency or engagement, but also at the level of classroom epistemology by reshaping how vocabulary learning is enacted. The findings, therefore, suggest a relationship between perceived

learner autonomy, learner engagement, and instructors’ positive attitudes toward ADA integration.

While attitudinal readiness is high, implementation is moderated by material and institutional constraints. Financial burdens borne personally by instructors, time required for preparation, and technological instability introduce friction into otherwise positive orientations. This divergence between strong motivational endorsement and uneven contextual support suggests that integration is less a function of belief alone and more a negotiated process shaped by institutional ecology. The fact that some instructors reported minimal challenges further indicates variability in infrastructural access and digital capital. This variability implies that positive attitudes alone are insufficient to ensure sustained integration, as institutional conditions mediate the translation of pedagogical beliefs into classroom practice.

Taken together, the findings suggest that instructors demonstrate high intrinsic motivation and pedagogical alignment with ADAs, yet their ability to operationalise this orientation depends on contextual affordances. The integration of ADAs in vocabulary instruction therefore emerges as a context-dependent pedagogical process shaped by the interaction between instructor beliefs, learner engagement, technological design, and institutional affordances.

Table 9. Mean scores and standard deviations for attitude-related items

Item	M	SD
42. I like to integrate ADAs in vocabulary teaching and learning.	4.30	0.69
43. My students like me to integrate ADAs in vocabulary teaching and learning.	4.18	0.69
44. I enjoy teaching vocabulary while using ADAs.	4.23	0.68
45. I feel comfortable while integrating ADAs into my vocabulary teaching.	4.25	0.66
46. My students feel relaxed while integrating ADAs into vocabulary learning.	4.12	0.69
47. My students feel motivated to learn vocabulary while using ADAs.	4.17	0.72
48. I will continue integrating ADAs in teaching and learning vocabulary in the future.	4.23	0.73

5.2 Demographic variables

The analysis indicates that instructors’ engagement with ADAs in vocabulary instruction appears to be more closely associated with professional and career-related variables than with personal demographic characteristics. As shown in Table 10, neither gender nor native language status yielded statistically significant differences in ADAs integration (gender: $t(105) = -0.07$, $p = .944$; native language: $t(105) = .062$, $p = .951$). These findings suggest that ADAs adoption in this context is not meaningfully differentiated by these demographic attributes. This interpretation is further supported by the qualitative findings, as the majority of instructors indicated that ADAs use aligned well with students’ learning preferences and was generally perceived as more effective than

traditional vocabulary teaching methods. As Inst.12 expressed, “It is a very good idea. It would be much better than the traditional way of teaching vocabulary.” These perceptions reflect the primacy of pedagogical considerations, particularly perceived instructional usefulness and responsiveness to student expectations, within digitally mature higher education environments. In such contexts, technology integration appears institutionalised and professionally normative, thereby diminishing the influence of gender or whether English is the instructor’s native language. This pattern suggests a shift from identity-based determinants of technology adoption toward context-driven pedagogical rationalisation, where instructional value judgements override demographic variation.

Table 10. One-sample t-test of gender and English as a native language

Variable	M	SD	t	df	Sig. (2-tailed)	Mean difference
Gender						
Male	1.53	0.50	-.070	105	.944	-.003
Female	2.00	0.00				
Is English your native language?						
Yes	1.00	0.00	.062	105	.951	.00245
No	1.70	0.46				

In contrast (Table 11), teaching experience, academic qualification, and age significantly influenced instructors’ perceptions of ADAs integration (all $p < .001$). Instructors with 5–10 years of experience reported the highest levels of engagement ($M = 4.44$), followed by those with 1–4 years ($M = 4.27$), whereas those with more than 10 years of experience reported comparatively lower engagement ($M = 3.78$). Academic qualification also showed significant variation, with PhD holders ($M = 4.22$) and Bachelor’s degree holders ($M = 4.17$) reporting higher engagement than Master’s degree holders ($M = 3.79$). Age-related differences were evident: younger instructors (21–35; $M = 4.00$) reported the highest engagement, followed by those aged 46–55 ($M = 3.28$), while instructors aged 36–45 and over 56 (both $M = 3.00$) demonstrated comparatively lower levels of engagement. These statistically significant differences were further illuminated by the interview data, particularly regarding time-related constraints in ADAs integration. Several instructors (Inst.1, Inst.2, Inst.3, and Inst.9) reported limited time to learn new applications, redesign instructional materials, and search for and prepare ADAs-based resources. Technical challenges, such as difficulties in displaying application content, were also noted.

Together, these findings indicate a workload–adaptation mechanism, whereby engagement with ADAs is mediated not simply by age or experience per se, but by the interaction between professional demands, available cognitive/temporal resources, and institutional support for technological upskilling. The convergence of quantitative and qualitative findings suggests that variations in ADAs engagement are closely linked to professional workload,

technological adaptation demands, and institutional support structures. Rather than being attributable to isolated individual characteristics, these factors operate as interconnected constraints shaping instructors' capacity to adopt and sustain ADAs use in vocabulary instruction. Overall, the findings indicate that effective ADAs integration depends on targeted professional development and structural support aligned with instructors' career stage and qualifications rather than purely personal attributes.

Table 11. One-way ANOVA of instructors' age, teaching experience, and academic qualification

Variable	M	SD		Sum of squares	df	Mean square	F	Sig (P-value)
Age								
21–35	4.00	0.12	Between groups	3.676	3	1.225	15.362	.000
36–45	3.00	0.13	Within groups	8.135	102	.080		
46–55	3.28	0.28	Total	11.811	105			
>56	3.00	0.16						
Teaching experience in higher education								
1–4 years	4.27	0.13	Between groups	8.517	2	4.258	133.160	.000
5–10 years	4.44	0.15	Within groups	3.294	103	.032		
>10 years	3.78	0.19	Total	11.811	105			
Academic qualification								
Bachelor	4.17	0.11	Between groups	4.700	2	2.350	34.034	.000
Master	3.79	0.17	Within groups	7.111	103	.069		
PhD	4.22	0.36	Total	11.811	105			

6. Discussion

This section interprets the findings concerning the integration of ADAs into vocabulary instruction in relation to the existing literature review. Overall, the findings indicate that ESL instructors hold predominantly positive orientations toward integrating ADAs into vocabulary instruction, aligning with previous research (Alqahtani, 2024; Klimova & Polakova, 2020; Kohnke, 2020; Latip & Mahadi, 2021; Pham, 2022; Sathyaselan et al., 2025; Yawiloeng, 2020). This convergence confirms the general assumption in the literature that perceived pedagogical value is a primary driver of ADAs acceptance in vocabulary instruction contexts. ADAs were positioned as pedagogically enabling tools that enhance instructional efficiency, support professional growth, and align with contemporary digitally teaching practices. However, this endorsement was neither uncritical nor unconditional. While Altakhaineh et al. (2023) identified increased workload as a primary barrier to ADAs integration, the present findings partially extend this claim by showing that workload does not function as a barrier to adoption itself, but rather as a moderating condition influencing the depth, continuity, and sustainability of integration. Concerns regarding

excessive application use, student confusion, financial costs, institutional limitations, preparation time, and technical constraints indicate that positive perceptions coexist with structural and logistical realities. Thus, ADAs integration appears contingent upon institutional infrastructure and manageable professional demands rather than purely favourable attitudes. This nuance refines existing literature by shifting the explanation from attitudinal resistance to implementation conditions.

From a learning perspective, the findings suggest that ADAs contribute meaningfully to lexical development, particularly in enhancing semantic knowledge and contextualised vocabulary use, supporting Pham (2022). This finding confirms prior evidence on the vocabulary facilitation role of digital tools while also extending it by specifying that such gains are primarily associated with meaning-focused dimensions of vocabulary knowledge rather than pronunciation development. The perceived benefits extend to deeper lexical processing, including the acquisition of synonyms, antonyms, and incidental vocabulary, reinforcing claims that digital tools can facilitate autonomous learning. Nevertheless, improvements in pronunciation appeared limited, especially in contexts where applications emphasised American English models over British English varieties. This challenges the implicit assumption in some prior studies that ADAs provide uniformly balanced support across all dimensions of vocabulary acquisition, suggesting instead a more selective affordance profile. The findings further underscore the importance of pedagogical moderation. Overextension through multiple applications risks cognitive overload and diminished engagement, whereas exclusive reliance on a single tool may reduce motivational novelty. Although ADAs were considered useful for vocabulary assessment (Klimova & Polakova, 2020), reservations about reliability, alignment with learning objectives, and constraints within distance-learning environments suggest that technological affordances must be critically evaluated against assessment validity principles. These findings reinforce the view that learning outcomes depend on instructional design quality rather than technological presence alone.

With respect to speaking, ADAs integration appears to provide scaffolding for oral vocabulary use through interactive prompts and listening features. Such affordances can facilitate lexical retrieval and structured participation during communicative tasks. However, the impact on spoken fluency remains conditional. Excessive technological mediation may inadvertently reduce authentic teacher–student interaction (Alkhazraji, 2025; Altakhaine et al., 2023), echoing previously reported classroom interaction concerns in the literature regarding digital substitution effects in language pedagogy. This finding extends previously reported classroom interaction concerns by demonstrating that such substitution effects are not inherent to ADAs, but emerge under conditions of over-reliance and weak pedagogical integration. Additionally, lower-proficiency students demonstrated uneven engagement with speaking-oriented features, suggesting that task design and digital confidence intersect with technological affordances. In several instances, applications were not fully used for communicative dialogue, particularly when tools were designed primarily for

pronunciation drills rather than interactive exchange. These findings indicate that ADAs can support spoken vocabulary development, but their contribution to communicative competence depends on intentional pedagogical orchestration rather than passive integration. This reinforces and extends prior calls for pedagogically mediated technology use by specifying the role of proficiency level and task design as conditioning factors.

Regarding demographic variables, the absence of statistically significant differences across gender and native language status suggests that ADAs integration operates within a professional–institutional framework rather than along demographic lines. This pattern reflects the increasing normalisation of educational technology across instructor profiles. The non-significant gender effect aligns with Jomaa et al. (2024), thereby confirming their findings on the limited explanatory power of gender in technology adoption in similar instructional contexts. In contrast, age, academic qualification, and teaching experience demonstrated significant variation. Higher engagement among younger instructors, PhD holders, and those with moderate teaching experience (5–10 years) may reflect differences in technological self-efficacy, adaptive flexibility, and professional workload distribution. Conversely, comparatively lower engagement among older and highly experienced instructors, particularly those holding a Master’s degree, may be associated with time-intensive adaptation demands and established pedagogical routines rather than diminished competence. Consistent with Sa’di et al. (2021), age-related variation appears linked to differential engagement with technological innovation, but the present findings extend this relationship by showing that age interacts with career stage and qualification level rather than operating as an isolated predictor. Overall, the findings suggest that ADAs integration is shaped more by career-stage positioning and institutional support structures than by inherent demographic attributes, thereby challenging purely demographic explanations of technology adoption and strengthening structurally oriented interpretations of technology acceptance.

The findings can be interpreted through the lens of the TAM, particularly its core constructs of *perceived usefulness*, *perceived ease of use*, and *behavioural intention* (Davis, 1989; Deris & Shukor, 2019). Participants’ positive orientations toward ADAs integration reflect strong perceptions of usefulness (viewing ADAs as effective in enhancing vocabulary instruction) and ease of use (perceiving them as capable of streamlining teaching tasks). Within the TAM framework, these evaluative beliefs are theorised to strengthen behavioural intention to adopt and sustain technology use. As illustrated in Figure 3, the study proposes a refined TAM model in which technology acceptance is re-conceptualised as a career-embedded and institutionally mediated process rather than an individual perception-driven mechanism alone. Specifically, demographic factors such as teaching experience, age, and academic qualification were associated with differential engagement levels, indicating that technology acceptance operates within career-stage conditions rather than being evenly distributed across user groups. Additionally, contextual variables (including institutional support such as training provision and resource availability, prior

technological experience, and instructional preparedness) appear to function as structuring conditions that shape the formation of *perceived usefulness* and *perceived ease of use*, rather than acting as simple external antecedents.

This represents a conceptual refinement of TAM in which external variables are not treated as peripheral inputs, but as layered mediating conditions that configure how core TAM beliefs are constructed across different professional strata. These factors indirectly shape behavioural intention through their differential influence on *perceived usefulness* and *perceived ease of use*. Accordingly, the model advances TAM by specifying a context-sensitive pathway of technology acceptance in which career stage and institutional infrastructure systematically condition belief formation. This interpretation underscores the importance of integrating contextual and demographic dimensions into TAM-based analyses of digital tool adoption in vocabulary instruction.

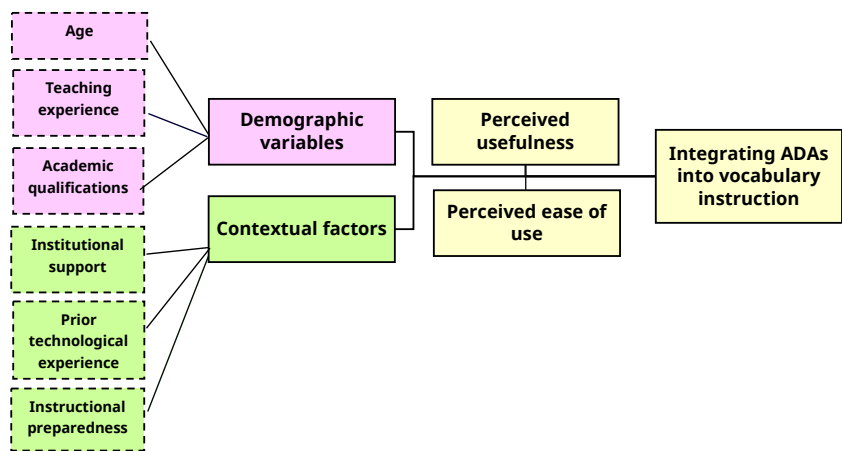


Figure 3. Adapted TAM for ESL instructors' use of ADAs in vocabulary instruction

7. Conclusion

This study investigated ESL instructors' perceptions of integrating ADAs into vocabulary instruction. Findings indicate generally positive attitudes toward ADAs use, particularly for promoting oracy and supporting students' verbal interaction. However, variation across age, academic qualification, and teaching experience suggests that engagement with technology is shaped by demographic, professional, and institutional factors. Despite favourable perceptions, ADAs remain underutilised for formative assessment, vocabulary expansion, and structured oral practice.

The study advances understanding of ADAs integration by reframing technology adoption as a contextually mediated pedagogical process rather than an individual attitudinal decision. It demonstrates that TAM constructs operate within, and are shaped by, pedagogical practices and institutional conditions, thereby extending the explanatory scope of TAM in ESL vocabulary instruction.

Practically, instructors should be supported to integrate ADAs into formative assessment, contextualised vocabulary tasks, and oracy-focused activities

through structured lesson design models in which tools are explicitly assigned to pre-task, while-task, and post-task stages to support vocabulary acquisition and oral production. Professional development should therefore move beyond general training to practice-based workshops where instructors design, trial, and evaluate ADA-supported vocabulary lessons. At the institutional level, this requires competency-based training in task design, alignment of ADAs with learning outcomes, and use of analytic rubrics for assessing oral vocabulary use, supported by curated repositories and sustained technical assistance.

The study is limited by its reliance on self-reported data, which may not fully capture actual instructional practices or student learning outcomes. Future research should triangulate instructor perceptions with classroom observations or experimental measures of vocabulary and oral proficiency development. Longitudinal and comparative studies are also recommended to examine how demographic variables such as age, teaching experience, and academic qualification influence sustained ADA integration over time, thereby strengthening the validity and generalisability of findings across ESL higher education contexts.

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