Exploring the Effectiveness of AI-Generative Tools in Improving Vocabulary and Engagement among Elementary School Students in Oman

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ABSTRACT
Generative AI is a type of artificial intelligence that can enhance English vocabulary acquisition significantly. This study deploys a mixed methods approach investigating the effectiveness of AI-generative tools in improving the vocabulary and engagement of Omani 4th grade students in English Subject. Data was gathered using three instruments: (1) an English achievement test (pre-posttest), (2) an observation checklist and (3) a semi-structured interview. The pre-posttest measures the impact of using the Curipod tool on the students' English vocabulary. The sample includes 62 fourth-grade students at Al-Abrar School for Basic Education (grades 1-4), 30 students in the experimental group and 32 in the control group. The observation checklist inspects the 62 students across both groups while the semi-structured interview was administered to two teachers responsible for the groups. The findings indicate that students exposed to the Curipod tool showed significant improvement in their post-test and that they exhibited higher levels of engagement than those who did not use the tool. Therefore, the study recommends that educators and policy makers integrate AI-driven tools such as Curipod into Oman's English education to enhance vocabulary acquisition and academic performance. They should also provide teachers with structured training to assist them using these technologies effectively.
KEYWORDS: generative artificial intelligence, curipod tool, K-12 education, vocabulary acquisition, effectiveness, engagement.

INTRODUCTION
Due to the rapid advancement of technology and the impact of the COVID-19 dilemma, educational associations have hastened to adjust swiftly to the evolving situations. Accordingly, teachers start using platforms like Moodle and Microsoft Teams to teach students directly and provide supplementary tools for independent learning. These platforms have become essential in maintaining the continuity of education during these challenging times (Kashoob & Attamimi, 2021). Many scholars emphasize the benefits of online educational platforms. For instance, Jabbar Alkubaisi et al. (2021) investigate the effectiveness of Blackboard, Moodle and Google Classroom and their impact on education in Oman assessing their usability, content quality and overall effectiveness. The findings point out that all three platforms support education in Oman, with Blackboard ranking the highest in terms of usability and content quality. They also confirm that effective online learning platforms are influenced by factors such as teacher training, student motivation and access to technology.

Currently, the integration of AI in education renovates e-learning by personalizing experiences, automating administrative tasks and offering adaptive learning pathways for students. Firat (2023) argues that the incorporation of AI tools can improve the structure of learning management systems and online learning opportunities. Concepcion and Espino (2023) highlight the potential of AI in enhancing LMS platforms and providing personalized learning experiences for students which can effectively improve students' engagement and motivation.

Dewi et al. (2021) underline the potential benefits of integrating AI tools with traditional English teaching methods to provide a more personalized and interactive learning experience. In the context of EFL, Jiang (2022) explores six popular applications of AI: AI chatbots, intelligent tutoring systems, automatic assessment systems, neural machine translation tools, intelligent virtual environments and affective computing in ITSs. The study confirms that these AI tools can deliver personalized feedback, on-demand support and immersive and interactive learning experiences assisting students to improve their language skills and self-regulated learning abilities.

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Similarly, AI tools have a significant impact on enhancing English vocabulary. According to Qasem et al. (2023), interactive AI tools like dialog chatbots are instrumental in improving learning English for Specific Purposes vocabulary. Furthermore, Noviyanti (2020) demonstrates that AI-driven pronunciation education leads to significant advancements in vocabulary acquisition. Al-Humaidi et al. (2021) argue that Omani students face a major obstacle when communicating in English due to their limited vocabulary which are attributed to different factors involving learners, learning settings, curriculum and teachers as identified through the perspectives of multiple stakeholders. In addition, Liao (2023) explores the user's retrieval behavior in English mobile learning, focusing on AI-based English Vocabulary Test Research (AI-EVTR) on Cognitive Web Services Platforms. The study aims to enhance the effectiveness of English vocabulary instruction through AI and pre-test behavior analysis. Despite the initial low motivation of the experimental group, statistical analysis, including independent sample tests, reveals significant improvements in spelling between pre- and post-tests of the experimental group suggesting that AI-based tools can effectively enhance English vocabulary learning on digital platforms.

Considering the challenges mentioned above and the critical role of AI in English vocabulary teaching, this research intends to take a step further and assess the impact of Curipod on teaching vocabulary and engagement of Omani 4th grade students in English classes.

Definitions of Terms:

- Effectiveness: The degree of success in producing a desired result or achieving a goal (Gager, 2018). Operationally, it refers to the degree of success attained by learners using the Curipod tool to raise the vocabulary level and enhance the engagement of the fourth-grade students.
- Curipod tool: AI-generative tool that enables teachers to produce digital content and activities to motivate students and stimulate curiosity, discussion and critical thinking in classrooms (Sbardella & Montanucci, 2024). It is operationally defined as an interactive educational site where English content and activities are uploaded and delivered to students to facilitate discussions, provide assignments and activities and evaluate results to elevate the vocabulary level and engagement of fourth-grade students.
- Academic achievement: The results or accomplishments that individuals achieve in educational environments which are usually assessed by completing assignments, exams and other educational activities (Cooper et al., 2006). Operationally, it refers to the score that a learner obtains in the English vocabulary posttest, which the subject's teacher conducts.
- Engagement: A complex concept that includes behavioral, emotional and cognitive aspects highlighting various ways of students' interactions with their learning environment (Fredricks et al., 2004). It is operationally defined as the emotional and cognitive measurement of student participation in English classes using observation checklists and interviews as tools to evaluate students' engagement.

LITERATURE REVIEW

THEORITICAL BACKGROUND

Integrating AI tools into education offer potential to enhance learning experience, adapt instruction and boost students' engagement which align with constructivist learning principles to empower learners to actively engage with content, explore and construct their own understanding (Thongprasit & Wannapiroon, 2022). Jackson (2024) also declares that AI supports constructivist learning theory by emphasizing active engagement, knowledge construction and personalized learning experiences and that AI technologies, such as Intelligent Tutoring Systems, facilitate active learning through interactive scenarios and immediate feedback. AI adapts content and strategies suitable to individual students' needs and creates personalized learning environments allowing them to actively participate in the learning process and explore topics at their own pace aligning with the constructivist principle that learners construct meaning through hands-on experiences and personalized interactions with AI systems.
Grubaugh et al. (2023) explore integrating AI tools with the constructivist philosophy of education to augment teaching and learning methods emphasizing that AI's adaptive capabilities are consistent with the constructivist principles as they offer personalized and enriching learning experiences. While applying AI platforms such as ChatGPT, BARD and Microsoft Bing, educators can elevate constructivist pedagogy boosting students' engagement, metacognition and conceptual change. The study also highlights the importance of preserving humanistic values in AI integration to sustain an ethical and inclusive educational environment.

AI in English Language Learning Context:

Dewi et al. (2021) examine using AI chatbots to improve students' language skills and self-regulated learning abilities. The study involves 30 students from the English Department at Universitas Airlangga, Indonesia. It finds out that implementing AI chatbots positively influences learners' language skills and SRL abilities and affirms the potential benefits of integrating AI tools with traditional teaching methods to provide a more personalized and interactive learning experience. However, it identifies the need for further research related to adopting AI in education to fully realize these tools' potential.

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Jiang (2022) reviews the application of AI in education focusing on teaching and learning English as a foreign language (EFL). The study evaluates six main applications of AI in the EFL context including: automatic assessment systems, neural machine translation tools, intelligent tutoring systems, AI chatbots, intelligent virtual environments and emotional computing in ITSs. These AI tools offer personalized feedback, on-demand support as well as immersive and interactive learning experiences assisting students to improve their language skills and self-regulated learning abilities. The review suggests that AI can potentially empower EFL teaching and learning, but further research and development are required to harness its benefits.

Liao (2023) investigates the user retrieval behavior of English mobile learning with a particular focus on AI-based English Vocabulary Test Research (AI-EVTR) on Cognitive Web Services Platforms. This study explores the effectiveness of English vocabulary instruction by incorporating AI and pre-test behavior analysis adopting a quasi-experimental design consisting of two groups: an experimental group and a control group. The experimental group used an APP-assisted vocabulary questionnaire to help them learn English whereas the control group adopted a conventional teaching method. The collected data was analyzed using statistical methods such as independent samples. The study proposes that although the experimental group lacked the motivation to use the web provided, their spelling significantly improved between the pre- and post-tests showing that language learning on websites is an applicable option for students demonstrating the significant role of AI-based tools in enhancing English vocabulary learning.

Additionally, Qasem et al. (2023) examine using dialog chatbots as interactive online tools to boost learning of English for Specific Purposes (ESP) vocabulary. The study observes how well students learned ESP vocabulary using the chatbot and evaluates their attitudes utilizing this strategy. The findings point out that vocabulary knowledge of the experimental group significantly improved compared to the control group and that the participants had positive attitudes towards using the chatbot, with most of them finding it helpful and enjoyable. The study argues that using a dialog chatbot as an interactive online tool can effectively enhance ESP vocabulary learning and improve students' attitudes toward learning. Another study conducted by Oktadela et al. (2023) at SD-IT Iman Syafei Pekanbaru Elementary School aims to enhance students' vocabulary using an AI chatbot application. The training focuses on enriching English vocabulary, cultivating interest and creativity in English and improving participants' communication skills using English. The training provides a combination of lectures, demonstration and hands-on practice methods stressing on learning by doing and practical application. Although the AI chatbot application was still unfamiliar, the training's outcomes display that all participants were enthusiastic and motivated to learn and that they acquired knowledge of using the application and could continue learning independently, anytime and anywhere.

Polyzi and Moussiades (2023) explore the development and impact of an online application as a learning assistant designed to enhance vocabulary acquisition applying interactive methods such as games, quizzes and chatbots. This study involves 20 students enrolled in an English course at the International Hellenic University in Kavala, Greece who were learning English at a proficiency level and aiming to improve their vocabulary skills. They were divided into two groups: Group A and Group B based on their pre-test results to ensure comparable English proficiency levels in both groups in two stages. In the first stage of the study, Group A was the control group, studying a vocabulary section from a book while group B was the experimental group deploying the proposed application to learn the same vocabulary section. In the second stage, the roles of the two groups were reversed. This crossover design ensures that all participants experienced both methods allowing for a more comprehensive comparison of their effectiveness. Post tests and questionnaires were used to assess the efficacy of the application and to gather feedback from the students regarding their perceptions and satisfaction. The results imply positive students' feedback reporting that the interactive and engaging nature of the application made the learning process more enjoyable and effective.

Kazu and Kuvvetli (2023) investigate the influence of AI-driven pronunciation education on English language vocabulary acquisition employing "Games for Learning English" web service. The research, authorized by the Ministry of National Education, examines how pronunciation training affects word retention among 56 high school students (34 females, 22 males) aged 14-15 using pre-test and post-test design. It adopts an experimental approach with purposeful sampling and qualitative feedback that was gathered through post-experiment semi-structured interviews. The experimental group received AI-based speech recognition pronunciation training while the control group used phonetic alphabet pronunciation. The findings reveal that the experimental group showed a significant improvement in vocabulary acquisition compared to the control group, highlighting the effectiveness of AI techniques in pronunciation teaching.

Zhang and Huang (2024) conducted a comprehensive study assessing the influence of chatbots based on Large Language Models (LLMs) on second language learners' vocabulary acquisition. The study applies mixed methods

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combining qualitative observations and quantitative assessments to measure receptive and productive vocabulary knowledge. It involves 52 foreign language students randomly divided into experimental and control groups. The experimental group interacted with an AI Chatbot based on LLMs for eight weeks whereas the control group did not. Results indicate notable improvements in both receptive and productive vocabulary acquisition among students who interacted with the chatbot compared to those who did not, underscoring the potential of AI-driven educational tools to enrich language learning experiences and permit further exploration in diverse educational contexts. The study stresses chatbot's significant role in enhancing vocabulary learning outcomes, promoting incidental vocabulary acquisition and supporting students' self-regulated learning processes.

The Impact of Technology on Students' Engagement and Academic Performance:
Technology positively influences students' engagement leading to improved learning outcomes across different subject areas. Morris and Parker (2014) investigate the relationship between classroom technology and students' engagement and note that growing usage of educational technologies in higher education improves learning outcomes and student engagement. They emphasize the importance of incorporating technology into the development of curricula to enhance learner engagement across behavioral, emotional and cognitive dimensions. The study shows that educational technologies positively affect student satisfaction, motivation, performance and sense of connection.

Correspondingly, the study by Serrano et al. (2019) on Technology-Enhanced Learning in higher education focusing on increasing student engagement through blended learning approaches underscore the extensive use of educational technologies to respond to the changing requirements of higher education, particularly with the transition to online education. It underlines the significance of incorporating substantial levels of technology into curriculum design and delivery to effectively engage students, proposing that educational technology creates opportunities for designing and providing learning resources.

Bedenlier et al. (2020) conducted a systematic review within the arts and humanities domain exploring how educational technology can improve students' engagement in higher education. The study examines 42 peer-reviewed studies on language acquisition that were mostly published in East Asian nations between 2007 and 2016. The evaluation focuses on how well assessment tools, blogs and mobile learning are deployed to foster participation. According to the review, instructional technology augments students' involvement, with behavioral engagement being the most noticeable aspect. However, it asserts the importance of combining technology with efficient education to avoid student disengagement.

Heilporn et al. (2021) investigate instructors' strategies in higher education exploring educators' various approaches and practices to enhance students' engagement, interaction and learning outcomes in Blended Learning (BL) settings. It offers insights into how teachers construct interactive learning practices for higher education students utilizing technology and traditional teaching methods effectively. The findings point out that combining well-structured courses, clear communication, digital tools and carefully selected activities can enhance student engagement in blended learning.

Pechenkina et al. (2017) explore the effect of using gamified mobile learning apps on students' academic success, retention and engagement. The sample includes 711 first-year accounting and science students. The study signifies that students utilizing the app achieved higher final grades and were less likely to fail the subject showing that gamified mobile app positively impact student engagement, retention and academic achievement.

Eltahir et al. (2021) study the influence of game-based learning (GBL) on students' academic performance, motivation and engagement in an Arabic language grammar course at Ajman University. They employ a case study with a quasi-empirical design including 107 students who were split into two groups: the experimental group (n = 54), using a game-based classroom response system, and the control group (n = 53), which did not apply the system. The results disclose that students in the experimental group showed greater growth in their understanding of the ideas covered in the course and displayed greater motivation than the control group students.

In contrast, during the COVID-19 pandemic Salta et al. (2021) explore students' engagement in online and face-to-face learning settings. The study reveals little emotional involvement with online learning, indicating a disparity in emotional connection between the two learning modes. Aguilera-Hermida (2020) also investigate college students' attitudes, adoption and use of emergency online learning (EOL) during the pandemic. It identifies a relationship between students' cognitive engagement and their attitudes, noting a decline in cognitive engagement during the pandemic. Moreover, Aguilera-Hermida (2020) examine the association between cognitive engagement and students' attitudes toward EOL delivery methods. The study concludes that students exhibited negative attitudes toward EOL and had lower cognitive engagement levels.

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Furthermore, Alawamleh et al. (2020) detect a decline in online learning communication between students and their instructors during the COVID-19 pandemic. This implies a potential challenge in maintaining effective communication and interaction between students and instructors in the online learning environment which could affect student engagement negatively.

Based on the above studies, it is obvious that AI tools and online platforms play an imperative role in enhancing students' engagement and academic performance during the learning process. Similarly, Curipod is an AI tool that assists teachers create engaging and thought-provoking digital classroom activities (Sbardella & Montanucci, 2024) attracting students' attention and improving their performance. In addition, Al-Humaidi et al. (2021) state that Omani students encounter difficulties when communicating in English due to their limited vocabulary. Accordingly, the study investigates using the Curipod tool to enhance the engagement and vocabulary acquisition of fourth grade students in Oman.

METHODOLOGY

RESEARCH DESIGN

This study employs a mixed-method research design to explore the impact of an AI-generated tool (Curipod) on vocabulary acquisition and engagement levels of fourth-grade students in English subject in Oman. Kashoob and Attamimi (2021) suggest that upcoming studies could benefit from applying mixed-methods approach combining various methods to gather data such as questionnaires, observations and interviews. This study intends to obtain more comprehensive and insightful findings by conducting pre-posttest, observation checklists and semi-structured interviews for complementation purposes. Specifically, it employs a Concurrent Nested Design to gather and analyze quantitative and qualitative data concurrently. In this design, the primary method is quantitative research while qualitative research is the secondary method. The combination of both methodologies within a single study provides a richer understanding of the research questions. The specifics of this research design are depicted in Figure 1 below:

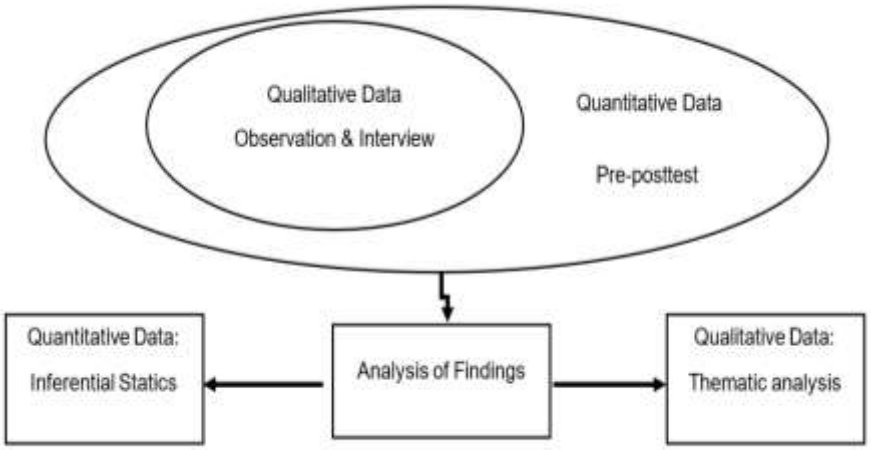

Figure 1. Concurrent Nested Mixed Method Research Design

This study examines the impact of the Curipod tool using quantitative and qualitative data. In the quantitative section, the effect of the independent variable (the Curipod tool) on the dependent variable (the achievement test) was evaluated employing a quasi-experimental design, more precisely, a non-equivalent control group design. Al-Saeedi et al. (2017) state that experimental approach is usually carried out when the goal is to expect future corrective or preventive changes required for the studied phenomenon. In the qualitative part, an observation checklist and semi-structured interviews were utilized to evaluate students' engagement while using the Curipod tool.

The Quantitative Method (Research Primary Method)

This research incorporates an experimental group and a control group, applying both pre- and post-test, as illustrated in Figure 2 below. The experimental group worked with the English materials deploying the AI-generative tool (Curipod) whereas the control group worked with the same materials following a conventional teaching method. The performance of both groups was compared after the intervention to gauge the impact of the AI-generative tool-based learning on the experimental group.

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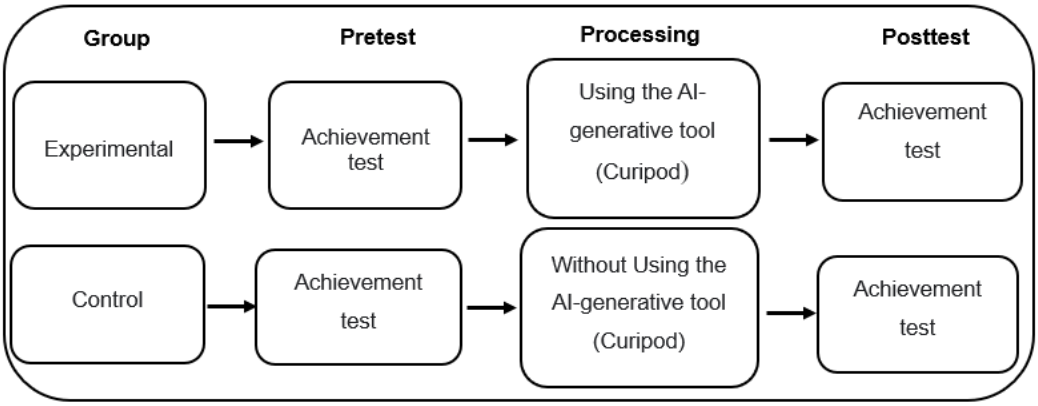

Figure 2. Experimental Design of the Study

The sample of the study includes (n=62) fourth-grade students from Al-Abrar School for Basic Education (Grades 1-4) in the Wilayat of Al Hamra. The selection of this school is based on convenience, as the researcher was available there. The research sample was split into two sections:

1. The Study's Main Sample: It involves (n=62) fourth-grade students; two fourth-grade classes (control and experimental) randomly chosen from the six classes available at the school to ensure equal representation, minimize selection bias and enhance the generalizability and validity of the study's findings. The distribution of the main study sample among the study groups is illustrated in Table (1) below.

Table 1: Distribution of the Main Study Sample to the Study Groups

No	School	Group	Teaching strategy	No. of students	Total
1.	Al-Abrar School for Basic Education (1-4)	Experimental	Using the AI-generative tool (Curipod)	30	62
2.	Al-Abrar School for Basic Education (1-4)	Control	Without using the AI-generative tool (Curipod)	32	

2. The Exploratory Sample: It contains 32 fourth-grade students from the same school, selected applying a random sampling method. The researcher administered an achievement test to these students to validate and ensure the reliability of the study instrument.

Data Collection Tools:

Achievement Test

It addresses the first research question and was prepared to meet the following requirements:

1. Determining the purpose of the test to measure the vocabulary level of the 4th-grade students in the English language.
2. Determining procedural educational objectives which were structured based on Bloom's taxonomy of cognitive domains, specifically targeting the levels of remembering, understanding and application.
3. Preparing the specification table that includes a range of factors which are: the educational objectives of the educational content, the number of questions aligned with cognitive levels (recall, comprehension, application) and the significance weight of the lessons and objectives.
4. Formulating test questions considering a number of factors such as presenting the question as a direct question or an incomplete sentence to ensure clarity, scientific accuracy, specificity and brevity. The test has ten multiple-choice questions that were designed to be straightforward and free from complexity and ambiguity.
5. Instructions for using the test are crucial for its application, so the following aspects were considered when preparing them: using clear and precise language, providing a brief overview of the test, detailing its structure and explaining the answering method.
6. Psychometric characteristics of the test include:
    - Test Validity: Content and Face validity was applied to measure the test validity. The researcher presented the achievement test to several senior English teachers and a group of female teachers at AL-Abrar school (1-4), and they evaluated the test in terms of its appropriateness for the students' level, clarity and accuracy.

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- Test Reliability: To verify the consistency of the study scale, the researcher administered the test to 32 participants in a pilot group. The test has high stability as indicated by the Cronbach Alpha value of 0.78.

7. Test correction method depends on giving students a mark for the correct answer and zero for the wrong answer. The test results are used as indicators for the students' achievement in the units that the study focused on.
8. The final version of the English vocabulary test: After implementing the previous steps and considering the comments specified by the experts, the test's final draft was ready to use.

The Qualitative Method (Secondary Method):
A qualitative approach was carried out using semi-structured interviews and an observational checklist which allow the researcher to gather rich and detailed data providing valuable insights into the effectiveness of the Curipod tool to enhance fourth-grade students' English vocabulary.

Observation Checklist:
It was utilized to record the behavior and interactions of the study's participants as well as the events taking place during the English classes. The observation checklist was prepared in accordance with several studies related to students' engagement. Three instruments developed by Lee et al. (2019), Zaabanoot (2021) and Cevikbas and Kaiser (2021) were selected to determine students' engagement indicators. The final version of the checklist comprises two dimensions: emotional and cognitive engagement considered as main themes, with three indicators for each (see Table 2). For about four weeks, the observation checklist was employed to observe and record the performance of the study's sample: the Control group (n=32) and the Experimental group (n=30). Then, the data obtained was synthesized and analyzed based on the pre-existing themes and indicators stated in the checklist.

Table 2. The Observation Checklist

Engagement Dimensions	**Indicators**
Emotional	• Interest and Motivation • Perceived Usefulness • Sense of Connection and Belonging
Cognitive	• Critical Thinking and Application • Collaborative Learning • Seeking Support and Clarification

Three instructional and learning technology experts and a psychology expert from Sultan Qaboos University (SQU) reviewed the observation checklist's content and face validity and it was adjusted based on their comments. Its credibility was evaluated using Peer Debriefing as a criterion for trustworthiness. Peer debriefing is a valuable strategy with supervisors and educators identifying weaknesses and managing perceptions and biases (Guba, 1981). In this process, the researcher shared the findings of the observation checklist with supervisors and educators, and their insights and feedback were used to refine and enhance the checklist.

The observation checklist was administered by the researcher to both the experimental and control groups involved for about four weeks. Permission to record behavior was obtained from the participants and their privacy was ensured as the groups' identities were coded using letters (G1, G2).

Semi-structured Interviews:
Semi-structured interviews were employed to comprehensively understand students' engagement and this instrument was validated by three experts in the instructional and learning technology department and a psychology expert from Sultan Qaboos University (SQU). Then the questions were then modified based on their feedback. The semi-structured interview has three questions: the first two were directed to both teachers to assess students' emotional and cognitive engagement whereas the third question, concentrating on how well the tool increased student participation, was directed to the experimental group's teacher, who employed the Curipod tool in her class.

Semi-structured interviews were conducted with the two instructors responsible for teaching the experimental and control classes. Their input provided additional qualitative data as they played a significant role in implementing the Curipod tool during the study. The interviews were carried out face-to-face and typically took from 25 to 30

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minutes each. The participants' permission to record the interviews was obtained to ensure their privacy and their identities were coded using the letters (T1, T2).

The trustworthiness of the interview questions aligns with the criteria for qualitative research as specified by Forero et al. (2018), specifically credibility criteria (Member check and Peer briefing). First, the interviews' findings were delivered to the participants for review and validation to confirm the accuracy and authenticity of the collected data (Member check). Then, the researcher discussed the interview process and findings with English teachers, experts in the field and supervisors to gain additional insights and perspectives (Peer briefing).

Data Analysis for Quantitative and Qualitative Data:
The study's mixed research approach involves using an achievement test (pre- and post-test), observation checklist and semi-structured interviews to collect quantitative and qualitative data. The data gathered from the pre- and post-test addresses the first research question while the information gathered from the observation checklist and interviews addresses the second research question. These two sets of data complement each other and support the conclusions drawn from the research intervention which involved using Curipod in the learning process.

The achievement test was analyzed by descriptive statistics using SPSS software, such as means and standard deviations, to address the first research question. Following the intervention, an independent sample t-test was applied to see whether there were any significant differences in the achievement test scores of the two groups, control and experimental.

Observation checklist was analyzed using deductive thematic analysis to manually evaluate the data using pre-existing themes or codes drawn from previous literature as a lens to explain data in a "top-down" approach (Ho & Limpaecher, 2024). This study emplyed pre-existing themes and codes which the researcher selected from previous studies and then modified and refined to suit the study's nature. The themes include emotional and cognitive engagement, and each one contains several indicators adapted to measure students' engagement (see Table 2). Then, data collected was categorized according to these themes and the validation was gained. Next, the checklist was administered to the target audience, and the data was documented and coded according to the pre-established themes and indicators.

The semi-structured Interviews transcripts were manually analyzed employing inductive thematic analysis. It is a "bottom-up" method that focuses on starting with the dataset as the foundation of investigating and deriving meaning (Ho & Limpaecher, 2024). Initially, the interviews were recorded, transcribed and then a script for each interview was developed. Codes were then assigned to capture the content and identify patterns and themes. The interview questions were analyzed according to the identified themes.

Research Procedures:
The school made all the necessary preparations to conduct the study providing a computer laboratory which was well-stocked with sufficient computer devices and supported by a good internet connection. Moreover, the school's administration and teachers were supportive of introducing the study and collaborated actively during its implementation. The researcher's role was to observe the classes and data collection process. The study's procedure included the following steps:

1. Reviewing previous research and works connected to the topic.
2. Selecting the suitable AI tool for the study and identifying the school, course content and class.
3. Addressing all logistic matters such as obtaining formal approval from the ILT department and the Ministry of Education.
4. Randomly assigning two classes to either the experimental group or the control group.
5. Preparing the activities and e-lessons in the Curipod educational platform for the experimental group.
6. Developing the study tools including: an English achievement test, an observation checklist and interview questions, and then validating them by experts.
7. Administering the pretest to both groups.
8. Conducting the experiment by applying the activities and content developed using the Curipod tool to the experimental group over eight weeks during the second semester of the 2023/2024 academic year.
9. Administering the posttest to the study groups.
10. Implementing the observation checklist and semi-structured interviews with the study participants.
11. Correcting and tabulating data, drawing conclusions, interpretation and discussion.
12. Formulating recommendations and suggestions according to the results of the study.

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FINDINGS

The study's mixed-method approach provides comprehensive results concerning the effect of the AI-generative tool (Curipod) on fourth-grade students' English vocabulary acquisition and their classroom engagement. Regarding the first RQ, the results indicate that students who applied the Curipod tool during the learning process improved their English vocabulary more than those who did not. Table 3 shows that there was no significant difference in mean pretest scores between the control group (M =3.06; SD= 1.81) and experimental group (M= 2.57; SD= 1.57) before the intervention, (t(60)= 1.15, p>.05). The p-value is 0.26 (p>.05).

Table 3: Independent Samples T-test Results for Pre-test

Groups	n	Mean*	SD	Df	t-value	p-value
Control group	32	3.06	1.81	60	1.15	0.26
Experimental group	30	2.57	1.57			

*Total score=10

On the other hand, Table 4 demonstrates a statistically significant difference between the post-test mean scores of the experimental group (M=8.00; SD=1.76) and the control group (M=6.47; SD=1.87), (t(60) =3.32, p=0.002< .05) in favor of the experimental group.

Table 4: Independent Samples T-test Results for Post-test

Groups	*n*	Mean*	SD	Df	t-value	*p*-value
Control group	32	6.47	1.87	60	3.32	0.002
Experimental group	30	8.00	1.76			

*Total score=10

The findings for the second RQ reveal that students who utilized the Curipod tool showed a high degree of engagement in both domains (cognitive and emotional) as highlighted by the observation checklist and semi-structured interviews. Students in the experimental group exhibited higher levels of interest and motivation and perceived usefulness compared to the control group. The teacher of the experimental group stated, "*I've noticed a significant increase in students' active participation, enthusiasm, and motivation when interacting with the platform…"* They also showed high levels of attention and actively applied perceived knowledge to solve difficult questions. Conversely, students in the control group felt bored and unmotivated by the learning materials presented to them. A student from the control group said, *"We get bored with this type of activities, and it does not stimulate my motivation to learn. We want the class to be more enjoyable..."*

Furthermore, sense of connection and belonging to the learning community play a crucial role in shaping students' engagement. For instance, students who had access to Curipod worked together, shared ideas and supported each other in solving challenges. In contrast, students in the control group showed various levels of engagement as some exhibited strong sense of belonging to the learning process whereas others preferred to work alone. In the interview, the teacher of the control group confirmed that not all students demonstrate the same level of interaction in the classroom setting.

It was also noticed that the content and activities developed using the Curipod tool offered the students opportunities to apply critical thinking skills and cooperate with peers during task completion. However, in the control group, some students applied their higher order thinking skills and sought meaning from their peers when answering challenging questions while others showed difficulties in employing knowledge and hesitated to participate in group work activities.

Experimental group students actively sought help from the instructor and their peers. Their teacher confirmed, *"When engaging in collaborative content and activities, students seek help from both the instructor and their peers when they can't understand a concept taught in the class…"* This can be attributed to the atmosphere of enjoyment and enthusiasm promoted by the Curipod tool that encouraged them to seek support. On the other hand, students in the control group could not communicate with their peers and the teacher as their teacher said, *"some students may hesitate to ask their peers for help when they encounter difficulties understanding a concept taught in class. Similarly, they may not want to communicate with the instructor privately for extra assistance…"*

Overall, the observations and interviews' results clarify the quantitative outcomes of the experimental group showing notable improvement in vocabulary and that the active engagement with the content and activities enabled a deeper understanding of the content. Thus, using the Curipod tool encouraged students to actively

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engage with the content and activities, apply critical thinking skills, seek clarification and communicate with their peers.

Summary of the Main Findings:
This study explores the effect of the AI-generative tool (Curipod) on improving vocabulary acquisition and increasing the engagement of Omani fourth-grade students in English classes. The main findings of this study are as follows:

- The results of the pre- and post-test propose that students using the Curipod tool during the learning process exhibited significant improvement in their English vocabulary than the group that did not apply the tool.
- Students who utilized the Curipod tool displayed high levels of engagement across all dimensions as highlighted by the observation checklist and semi-structured interviews.

DISCUSSION
Discussion of the First Research Question:
The first research question was," Are there any statistical differences in the fourth-grade students' English vocabulary between the experimental group and control group? The results indicate statistically significant differences between the experimental group's and the control group's mean scores on the post-test in favor of the experimental group. This could be attributed to the activities and content developed by the Curipod tool which created an atmosphere of excitement and enjoyment for the students. This environment motivates students to ask questions, clarify concepts and seek assistance from their teacher and peers, potentially leading to boost their academic performance.

This finding aligns with previous studies results (Liao, 2023; Oktadela et al., 2023; Qasem et al., 2023) confirming that implementing various AI tools in English vocabulary instruction has a positive impact on students' English vocabulary acquisition. The mentioned studies, discussed above in the literature section, share similarities with the current research in terms of contextual focus, application of AI tools for vocabulary enhancement and the research instruments employed. Thus, AI-generative learning platforms such as the Curipod tool can improve the students' vocabulary comprehension ability by providing an anxiety-free learning environment, a self-regulation learning process, more engagement in the target language and extensive practice.

Discussion of the Second Research Question:
The second research question was" What is the impact of the AI-generative tool (Curipod) on the engagement of Omani 4th grade students in English classes?". The findings of observation checklist and semi-structured interviews reveal a noticeable level of engagement observed across both emotional and cognitive dimensions concerning using the Curipod tool. This can be attributed to the effectiveness of the content and activities developed through the Curipod tool that stimulates students' engagement in the classroom setting.

These findings are consistent with the outcomes of several studies such as Heilporn et al. (2021) indicating that combination of well-structured courses, clear communication, digital tools and carefully selected activities can boost students' engagement in blended learning. Morris and Parker (2014) claim that instructional technology could improve student motivation, performance, connection and pleasure. Serrano et al. (2019) declare that educational technologies could have prospects for creating and distributing instructional materials which could augment student involvement in behavioral, affective and cognitive domains. Bedenlier et al. (2020) assert that technologies like blogs, mobile learning and evaluation tools encourage participation. Similarly, research by Pechenkina et al. (2017) and Eltahir et al. (2021) point out that applying games-based learning positively affect students' academic performance, motivation and engagement.

On the other hand, the findings of the observation checklist and semi-structured interviews addressing the second question contradict with the findings stated by Salta et al. (2021) and Aguilera-Hermida (2020) which identify a decline in students' emotional involvement and cognitive engagement in online learning during the COVID-19 pandemic. Furthermore, Alawamleh et al. (2020) recognize a decrease in the degree of communication in online learning between instructors and students during the pandemic. These contradictions could be explained by a number of factors. Firstly, study populations and context variations may lead to different experiences and outcomes. Secondly, methodological differences, such as the tools and measures employed for assessment, could yield contrasting results. Finally, temporal differences and evolving circumstances during the pandemic could also account for discrepancies as educational practices and student's experiences may have varied over time and across different pandemic phases.

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CONCLUSION

This study intends to evaluate the effectiveness of an AI-generative tool (Curipod) in improving vocabulary acquisition and engagement of Omani 4th grade students in English classes. Data was collected using three instruments: (1) an English achievement test (Pre-Posttest), (2) an observation checklist and (3) semi-structured interviews. The findings of this study demonstrate that students in experimental group, who utilized the Curipod tool, showed a significant development in English vocabulary and displayed a higher degree of engagement in the emotional and cognitive domains compared to students in the control group. Consequently, the study concludes that AI-generative tools such as Curipod not only improve vocabulary acquisition but also create a more interactive and engaged environment.

Overall, integrating AI-generative tools, such as Curipod, holds promising potential for enhancing English language learning outcomes and promoting students' engagement among fourth-grade Omani students. Future research can benefit from this study's results as a guide for further exploration of the effectiveness of AI tools in teaching languages.

SUGGESTIONS

In consideration of the study's findings, the following suggestions are recommended:

- Educators and policymakers should explore incorporating AI-driven tools such as Curipod into English language education throughout schools in Oman. This incorporation can enhance students' vocabulary acquisition and boost overall academic accomplishments.
- Teachers should be provided with training and professional development programs to proficiently integrate AI tools into their teaching approaches. This training is crucial for educators to optimize the advantages of technology within classroom settings and promote students' engagement.
- Curriculum developers should investigate methods to integrate AI-powered educational technologies into the curriculum offering students interactive and personalized learning experiences.
- Continuous evaluation and assessment of AI tools' effectiveness in language learning contexts are crucial. Therefore, researchers should conduct longitudinal studies to gauge the long-term effects of incorporating Curipod and similar technologies on students' language proficiency and academic achievements.
- Policymakers need to allocate resources to ensure that schools have access to AI-driven educational technologies, promoting equitable access across various regions. This action aims to narrow the digital gap and ensure all students receive quality education.
- Establishing a robust team comprising researchers, educators, policymakers and technology developers is vital to effectively incorporate AI tools into education. Such teams can help develop innovative tools and strategies that benefit teachers and students.

LIMITATIONS

The main limitations of this study are as follows:

- Sample Size and Generalizability: The study's limited sample size could compromise its ability to generalize the results to a larger population, potentially making them not fully representative of all students or diverse educational contexts.
- Measurement of Engagement: The observation checklist deployed to assess the students' engagement may not fully encompass all dimensions of engagement that could influence the study's results.

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