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AI-Enhanced Interactive Platforms for Language Learning: Examining Motivation and Proficiency Development in Primary School Students

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Abstract

The integration of Artificial Intelligence (AI) in language learning has transformed traditional teaching by enhancing motivation and language achievement among primary school students. This study examines the impact of AI-driven interactive tools, such as ChatGPT and Quizlet AI, on learners' motivation and English proficiency. Using an experimental-control group design with 38 participants, findings reveal a significant improvement in motivation post-intervention, with 94.7% of students reporting increased enjoyment in learning English. Additionally, the experimental group demonstrated enhanced linguistic abilities, with mean scores rising from 16.4 to 18.2, supported by a paired t-test ($p < 0.05$). AI tools provide meaningful, context-aware, and self-paced learning, addressing challenges in conventional methods. This research contributes to existing literature advocating AI's role in education and highlights its potential for diverse learners. While findings support AI's benefits in motivation and proficiency, further studies are needed to assess long-term effectiveness, large-scale applicability, and integration into varied learning environments.

Keywords: Ai-Enhanced Platforms, Language Proficiency, Motivation, Primary Education, Chatgpt, Educational Technology

Introduction

The new millennium has seen development of one of the most significant changes in the systems of education through the use of artificial intelligence. AI integrated interactive applications have been found to be effective in the aspect of primary language education By so doing, these selected self-paced applications are not only able to provide instant feedback and facilitate not only challenges in form of games that are more interesting to clients/learners but they also increase learners' engagement (Baranwal, 2022; Crompton et al., 2022). This corresponds to the international objective of Sustainable Development Goal (SDG) 4, that emphasizes on inclusive and equitable quality education. Research has also shown that incorporating multiple learning strategies through digital tools, such as social media, encourages pupils to be more active and creative in their learning process (Wil, Yunus, & Suliman, 2019). Moreover, technology-enhanced learning should not only focus on

academic excellence but also foster moral and ethical responsibility among learners (Lubis et al., 2011). Ideally suited for the primary school students who are at a very sensitive stage in their language and thought development, the effects of AI infused platforms are even more pronounced. These technologies help overcome the traditional problems of language learning: fear of mistakes, instability in patterns, and irregularity (Cumming et al., 2018; Ulicheva et al., 2018) within a protected milieu where learners can practice on their own. Moreover, gamification, individual rewards, and even AI named images enhance the enjoyment and choice, and motivation which are the prerequisites for long time language learning (Ma, 2021; Luo & Cheng, 2020). In fact, research suggests that students generally exhibit a positive attitude toward learning English, enjoying the process and striving to excel in their studies (Yunus & Abdullah, 2011). This further highlights the role of AI-driven platforms in sustaining learners' enthusiasm and fostering a sense of achievement, ultimately leading to more effective language acquisition. Therefore, integrating AI in educational settings has the following limitations, Standardization, Technological limitations, and Fair distribution of the resources (Ericsson et al., 2023, Rowe, 2022). A major concern is the accessibility gap, particularly in rural areas where limited internet connectivity can hinder the successful implementation of AI-driven learning environments (Erry & Yunus, 2021). Teachers too labour under the constant professional development so that they can implement these innovative tools into their curricula while maintaining the more traditional approaches of lessons with students and using AI tools (Pokrivčáková, 2019). For this reason, issues of ethical implications come to light where; these include avoiding bias and inclusion to mention but a few, contributing to the challenges of implementing AI in primary education. AI-integrated platforms also present a major possibility of redefining language learning to suit the young learners. By so doing, the technologies help students use language in practical situations which standard classroom setups are unable to offer. For example, it provides feedback on pronunciation and grammar that will allow one to choose path that suits the learner (Noviyanti, 2020; Xu et al., 2019). The ability of those tools to increase motivation and language skills cannot be in doubt, but little research has been carried out to investigate their effectiveness with primary school children. To address this gap, this study aims to examine the impact of AI-enhanced interactive language learning platforms on the motivation levels of primary school students and assess their overall effectiveness in improving language skills. The research is guided by two key questions: How do AI-enhanced interactive language learning platforms affect the motivation levels of primary school students? To what extent do these platforms improve language skills among primary school students? By exploring these questions, the study seeks to contribute to the understanding and advancement of AI's role in primary education.

The Literature Review

AI in Education

The application of artificial intelligence knowledge in education has transformed teaching and learning activities worldwide since it promotes individual and participative learning. AI technologies improve learner access to and achievements of education due to the availability of specific education resources and incorporating diverse learners' needs and preferences (Syahrizal et al., 2024). Such tools also help teachers to save their time as more efforts address complex educational process needs, and it is suggested for policymakers to increase the AI usage rates for enhancing education systems further (Soh & Yunus, 2023).

Ally declared that applications including generative AI platforms like ChatGPT, have changed the patterns of writing teaching, learning, and assessing processes (Kasneci et al., 2023 ; Trust et al., 2023). As such, although these applications can have revolutionary effects, there are questions about such uses' ethical consequences, scholarship misconduct, and learning AI competencies in school (Selwyn, 2019; Long & Magerko, 2020). The ethical application of AI also includes policies of the public, which are connected with data protection, inequality, regulating of the contacts' quantity.

In addition to supporting the use of online assessments that provide instant feedback, AI also assists in other activities and processes, as well as in providing varied learning environments adapted to the students. This evolution shows future possibilities of AI to revolutionalize education on different tiers with the caution that issues such as digital divide and ethical use of ai as well as mainstreaming must be overcome to head AI integration in education in the right and effective direction as depicted by Syahrizal et al., 2024.

The Use of Artificial Intelligence in the Language Learning of Primary School Students

As for the primary education, the use of AI technologies has affected the language learning process in the best way possible: creating the platforms which can be both interesting and useful for the child's development. Current advancements of educational robots and A.I. based platforms in learning environment help this process enhanced by multimedia accumulations, feedbacks, and integrated learning facilities as a game changer that makes the language leaning process more convenient and efficient (Feng & Wang, 2023). Integration of these innovations is consistent with principles set by: Cognitive Theory of Multimedia Learning under which multimedia has to be integrated for better understanding and knowledge retention; and Second Language Acquisition Theory by Krashen where comprehension is the key to language acquisition (Mayer, 2009; Krashen, 2018).

As English operates as the second language in Malaysia, restricted usage of English in other educational activities reflects that the importance of AI tools to improve language acquisition (Lim & Yunus, 2021; Wong & Yunus, 2021). Social platforms powered by AI give students more opportunities to use English, it is an application of knowledge beyond a class. These tools develop not only linguistic skills but also analytical and creative mind setting up the context for an AI supported environment (Roll & Wylie, 2016; Hwang & Fu, 2020).

Even so, pedagogical potentials of AI offer numerous advantages, albeit the execution is not without difficulties, including the digital divide with Internet access, and curriculum requirements. But again, issues to do with ethical nature of using AI in the learning process especially in primary education, are more of a concern as we have seen AI algorithms being biased and user data is not necessarily private.

How AI Enhanced Language Learning Platforms can Improve Students Motivation and Efficiency.

Motivation is one of the factors that influence learning of languages more so for the young learners in their initial jural classes. Intelligent learner interfaces bring an effective, creative, and unique approach to the teaching-learning process with gamification, feedback, and interaction. These platforms develop a new context that provides curiosity and enjoyment for students and keeps them interested in language learning activities (Fulton et al., 2021; Beese,

2019). Applying vocabulary games, grammar check and pronunciation, AI integrated learning tools solve a number of issues typical for conventional teaching like boredom and interactivity.

One of the most valuable assets of AI-supported platforms is the feedback provision right after the moment of completing a task, Authors underline that feedback may have a great influence on motivation and improvement process. Immediate feedback lets learners know when they are wrong and give corrections instantly; help maintain conceptual understanding of language, which creates accomplishment feelings (Bakla, 2020; Liu et al., 2022). For instance, students performing sentence construction or pronunciation with the help of AI devices in educational processes get knowledge about their mistakes straight away, which helps learners to practice more effectively and avoid such errors in future. These cycles of learning in interactive manner not only help in knowing the foreign language in a better way but also helps in creating the students as the masters of the learning material by giving them interesting and knowledgeable lessons.

The application of AI to language acquisition is consistent with principles of constructivism in language acquisition that have been propagated in classrooms for years. This has been established by pioneering concepts in smart machines including “teachable machines” which when practiced and trained, prepare the learners for designing of the current AI systems (Essa, 2016; Martin et al., 2020). In the present time, Gen AI systems are appreciated for their ability to enhance basic skills such as reading, writing and comprehension and accent modification, especially among the primary schoolGO students (Ebadi & Amini, 2022; Tetzlaff et al., 2020). By using these tools, young learners are able to practice language in different situation, and hence be prepare for actual communication.

However, the successful adoption of AI in platforms in education involves handling of several other issues which include practical and ethical issues. There are other questions which are crucial for the generalization of the implementation, for example, issues related to fairness in the distribution of technology, gaps in the accessibility of technologies, and the protection of data. In addition, cultivating professional digital competencies to navigate technologies is a prerequisite for mastering those tools, which means that teachers and students require constant support (Zawacki-Richter et al., 2019; Knox, 2020).

In conclusion, the research into AI’ed rather engaging applications in teaching primary school students suggests a language learning benefit with regard to motivation specifically. These tools address major issues of language learning as they consider the need for learning to be interesting, active as well as supportive. With the rapid advancement in the field of A.I, the part of A.I, in determining the future of education transforms into a pivotal point that supports the global idea of providing favorable conditions for learning processes among young learners.

Methodology

Research Design

This study employed a quasi-experimental design with a nonrandomized control-group pretest-posttest framework. The design enabled a comparative analysis between an experimental group utilizing AI-enhanced interactive platforms and a control group following

traditional language learning methods. Quasi-experimental designs are particularly suitable for real-world educational settings, offering the rigor needed to explore causal relationships without the constraints of random assignment (Tipton, 2014; Tipton & Olsen, 2018). By combining qualitative and quantitative approaches, this study sought to evaluate the impact of AI tools on language proficiency and motivation in primary school students.

Participants and Sampling

A total of thirty-eight primary school students, between the age of 11 to 12 years were involved in this study enrolled in year five and six classes of the SK RKT Bersia, a Malaysia's primary school. These participants were randomly divided into two equal groups of 19 students: An experimental group and a control group. Random selection made it possible for all the students to have a unique chance of participating in the research while applying the gender distribution was not given close consideration based on this framework. This age group was chosen because it is a transition period where children's language ability and their interactions with educational technology can be optimally influenced.

Research Instruments

Pre-Test and Post-Test

The pre-test and post-test were developed to measure students' proficiency in four key language areas: On the filed of language comprehension, there are several areas which are checked and these include; Vocabulary, Grammar, Comprehension, Pronunciation. These set of test were designed in consideration with the aim of the study and the tests employed where both written and oral tests where conducted to assess the various language abilities. The pre-test was used to determine student's mastery of content at the start of the intervention and the post-test given once the intervention was complete measured how effective the intervention had been.

Motivation Questionnaire

A Likert scale type of questionnaire was developed and validated from the study of Purmama et al. (2019) and modified according to the aim of this study. Self-constructed questionnaires measured students' intrinsic motivation and attitude towards learning languages, on the 5-point scale from SD to SA. With a view of establishing internal reliability, the Cronbach's Alpha was computed and its value was determined to be adequately reliable. Pre- and post-intervention self-generated motivation levels of both the groups were assessed using the constructed questionnaire. The experimental group was provided with the name of AI Platforms. The subjects of the experimental learning group in this study employed technologies including ChatGPT, Quizlet AI, and GetPronounce. These platforms were first tested for suitability on a sample of Standard 4 students prior to their use. Students were directed on how to handle the tools prior to the actual intervention to ensure that they got familiar with the instruments.

AI Platforms for the Experimental Group

The experimental group used AI tools such as ChatGPT, Quizlet AI, and GetPronounce. These platforms were pre-evaluated using a sample of Standard 4 students to ensure suitability for the target age group. Clear instructions and training sessions were provided to students, enabling effective engagement with the tools during the intervention.

Data Collection Procedure

The study spanned six weeks, divided into pre-intervention and post-intervention phases:

Pre-Intervention Phase

The pre-research phase was done through the formulation of research acts and activities; assessment of validity of research tools; acquisition of Ethical clearance; and identification of samples. Within the pretreatment phase, participants completed pre-treatment tests and motivation surveys for both groups. Moreover, the participants of the experimental group attended trainings to get to know the chosen AI platforms In addition, the members of the research team checked the technical compatibility of the platforms with classroom context.

Post-Intervention Phase

The post-tests and motivation questionnaires were given to the subjects after the sixth-week intervention in order to assess effects of the AI tools. Finally, the participants in the experimental group filled out questionnaires that helped to assess their experience with the mentioned platforms and the observers themselves evaluated the institutes' overall experience in implementing the activity.

Intervention Details

Intervention Phase (Timeline Overview)

Week 1: Introduction to AI in Language Learning

Content: Students were introduced to the AI-enhanced interactive platform and its benefits for language learning. Activity: A hands-on session was conducted where students familiarized themselves with AI tools and their potential applications in language learning.

Week 2: Grammar Practice Using AI

Content: Students engaged in grammar correction activities using AI tools. Activity: Teachers presented sentences with grammatical errors, and students used AI (ChatGPT) to correct and explain the mistakes.

Week 3: Comprehension Skills with AI

Content: Development of reading comprehension skills through AI. Activity: Students utilized AI to generate comprehension questions and analyze texts. They then answered the questions and discussed their responses with the class using AI-generated feedback.

Week 4: Vocabulary Development Using AI

Content: Expanding vocabulary through AI-enhanced tools. Activity: Students explored new words, meanings, synonyms, and antonyms using tools like Quizizz AI and ChatGPT. Activities included creating sentences, quizzes, and flashcards to reinforce learning.

Week 5: Pronunciation Practice with AI

Content: Improving pronunciation using AI speech tools. Activity: Students practiced pronunciation using tools like GetPronounce and Duolingo. They recorded sentences and compared their pronunciation with AI feedback to enhance clarity, stress, and fluency.

Week 6: Integrative Language Skills with AI

Content: Consolidating grammar, comprehension, vocabulary, and pronunciation skills using AI tools. Activity: Students created a mini storybook using Canva application, integrating skills developed over the previous weeks**.**

1. Writing & Grammar: Students wrote 4-5 sentences based on prompts (e.g., "An adventure with a robot friend") and improved them using ChatGPT

2. Vocabulary Development: Students identified basic words and replaced them with more advanced synonyms using ChatGPT or Quizlet AI.
3. Comprehension Questions: Students generated simple comprehension questions about their story to ensure clarity and engagement.
4. Pronunciation Practice: Students practiced reading aloud for fluency and accuracy using GetPronounce and Dualingo.
5. Final Presentation: Students presented their storybooks with visuals, read aloud their stories, and engaged the class with the comprehension questions they developed.

Data Analysis

Quantitative and qualitative data were integrated to provide a comprehensive analysis of the study's findings. Descriptive statistics were used to summarize trends in motivation levels, while paired t-tests validated the significance of changes in language proficiency scores within groups:

- **Paired t-tests**: Pre- and post-test scores for language proficiency were analyzed within each group to determine significant improvements. The experimental group demonstrated statistically significant gains, validating the effectiveness of the AI-enhanced platform.
- **Descriptive Analysis**: Trends in motivation levels, as captured by the pre- and post-questionnaire responses, were summarized descriptively. This analysis highlighted the shift from neutral or negative attitudes to predominantly positive ones in the experimental group.

This combination of descriptive and inferential statistical techniques ensured a robust and nuanced evaluation of the study's objectives, providing insights into both skill development and motivational changes among primary school students.

Validity and Reliability

As a method of maintaining the validity of the study several measures willific be taken that will reduce bias and increase the reliability of the results. Internal validity will be enhanced by adopting methods that would help minimize confounding variables such as randomization plus matching techniques to control for extraneous factors that may influence, maximize the reliability of the observation methods and employ standardized tests when finding out language skills and motivation of the students. External validity will be improved by talking about general conclusions to be made and expertise of the results, in addition to describing the methodology of the study in adequate detail to allow for its replication in other settings. Internal validity will be maintained through definition of the variables including language skills and motivation, as well as adherence to already postulated theoretical models while designing the study.

Validity will be established based on how validity of measures will be checked by concurrent validity, construct validity, sensitivity to change and face validity, supported by stringent protocols and training of researchers and facilitators. Issues of ethical nature were incorporated within the study process to improve and maintain validity and reliability of the study. Getting permission from the school authority, permission was sought from the parents or guardians of the students in the study. Such measures helped to eliminate issues of response bias and created much needed trust as to the nature of the undertaken study among the participants.

Observing privacy and ensuring that subjects had a right to quit the study anytime without penalties, controlled the levels of socially desirable bias and attrition bias respectively. Moreover, anonymity minimized social desirability bias while using the questionnaires, the indirect questions, and validated measures to cure the type of bias. To minimize the problems of attrition bias, ways of tracking and communicating with participants were employed, and incentives were offered to encourage participants to complete the research, and the dropout rates were documented and analysed to determine the effect of attrition on the estimated results. Last, following the double-blind methods avoided aspect biases which could compromise the reliability of the research findings.

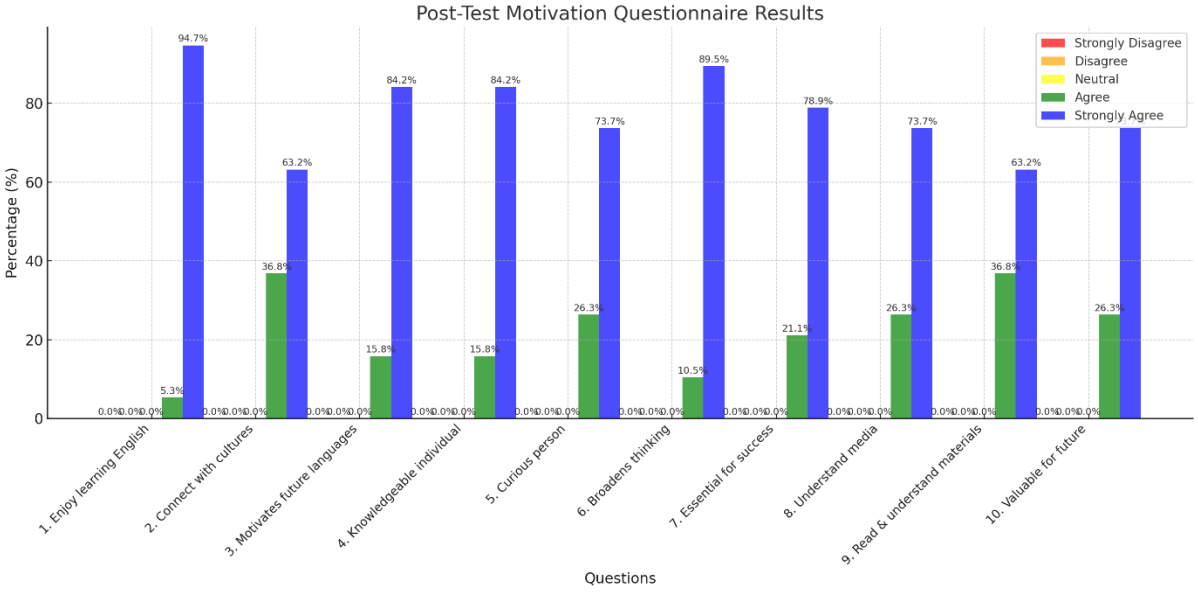
Conclusion

This chapter detailed the quasi-experimental methodology employed to evaluate the impact of AI-enhanced platforms on language learning and motivation among Malaysian primary school students. By leveraging robust instruments, ethical practices, and comprehensive data analysis, the study provides critical insights into the potential of AI in transforming educational experiences.

The Results

Results for Research Question 1: How do AI-enhanced interactive language learning platforms affect the motivation levels of primary school students?

The motivation questionnaire results reveal a substantial increase in the motivation levels of students in the experimental group after using AI-enhanced interactive platforms. Pre-test responses from the experimental group indicated a high percentage of neutral or disagree responses to statements regarding intrinsic motivation and attitudes toward language learning. Specifically, only 15.8% of students agreed with the statement, “I genuinely enjoy learning English,” while 68.4% provided neutral responses.



Post-test results exhibited a remarkable shift, with 94.7% of students agreeing or strongly agreeing with the same statement. Similarly, 63.2% of students strongly agreed with the statement, “Learning English excites me because it allows me to connect with different people and cultures,” compared to only 15.8% pre-intervention. These changes demonstrate that the platforms significantly enhanced students’ intrinsic motivation.

In contrast, the control group's motivation levels remained relatively static. While there were slight improvements, most responses remained in the neutral or mild agreement range. These results suggest that traditional methods were less effective in promoting engagement and enthusiasm for language learning.

Pre-test (Experimental group)

	Statement	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean	Std. Deviation
1	I genuinely enjoy learning English.	0.0	15.8	68.4	15.8	0.0	3.0	0.577
2	Learning English excites me because it allows me to connect with different people	0.0	21.1	63.2	15.8	0.0	2.95	0.621
3	Learning English motivates me to explore other foreign languages in the future.	0.0	21.1	73.7	5.3	0.0	2.84	0.501
4	Learning English makes me feel like a more knowledgeable and well-rounded	0.0	26.3	63.2	10.5	0.0	2.84	0.602
5	Learning English helps me become a more knowledgeable and curious person.	0.0	26.3	57.9	15.8	0.0	2.89	0.658
6	Learning English helps me broaden my thinking and outlook.	0.0	36.8	57.9	5.3	0.0	2.68	0.582
7	Learning English is essential for my academic and career success.	0.0	42.1	42.1	15.8	0.0	2.74	0.733
8	Learning English helps me better understand English-language media, like videos	0.0	47.4	52.6	0.0	0.0	2.53	0.513
9	Learning English helps me read and understand books, articles, and newspapers.	0.0	26.3	63.2	10.5	0.0	2.84	0.602
10	I think learning English is valuable because I want to use these skills in the future, like	0.0	57.9	36.8	5.3	0.0	2.47	0.612

Post-Test (Experimental group)

	Statement	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean	Std. Deviation
1	I genuinely enjoy learning English.	0.0	0.0	0.0	5.3	94.7	4.95	0.229
2	Learning English excites me because it allows me to connect with different people	0.0	0.0	0.0	36.8	63.2	4.63	0.496
3	Learning English motivates me to explore other foreign languages in the future.	0.0	0.0	0.0	15.8	84.2	4.84	0.375
4	Learning English makes me feel like a more knowledgeable and well-rounded	0.0	0.0	0.0	15.8	84.2	4.84	0.375
5	Learning English helps me become a more knowledgeable and curious person.	0.0	0.0	0.0	26.3	73.7	4.74	0.452
6	Learning English helps me broaden my thinking and outlook.	0.0	0.0	0.0	10.5	89.5	4.89	0.315
7	Learning English is essential for my academic and career success.	0.0	0.0	0.0	21.1	78.9	4.79	0.419
8	Learning English helps me better understand English-language media, like videos	0.0	0.0	0.0	26.3	73.7	4.74	0.452
9	Learning English helps me read and understand books, articles, and newspapers.	0.0	0.0	0.0	36.8	63.2	4.63	0.496
10	I think learning English is valuable because I want to use these skills in the future, like	0.0	0.0	0.0	26.3	73.7	4.74	0.452

Pre-Test (Control group)

	Statement	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean	Std. Deviation
1	I genuinely enjoy learning English.	0.0	68.4	31.6	0.0	0.0	2.32	0.478
2	Learning English excites me because it allows me to connect with different people	0.0	31.6	68.4	0.0	0.0	2.68	0.478
3	Learning English motivates me to explore other foreign languages in the future.	0.0	26.3	73.7	0.0	0.0	2.74	0.452
4	Learning English makes me feel like a more knowledgeable and well-rounded	0.0	26.3	57.9	15.8	0.0	2.89	0.658
5	Learning English helps me become a more knowledgeable and well rounded.	0.0	31.6	47.4	21.1	0.0	2.89	0.737
6	Learning English helps me broaden my thinking and outlook.	0.0	47.4	47.4	5.3	0.0	2.58	0.607
7	Learning English is essential for my academic and career success.	0.0	47.4	52.6	0.0	0.0	2.53	0.513
8	Learning English helps me better understand English-language media, like videos	0.0	15.8	68.4	15.8	0.0	3.0	0.577
9	Learning English helps me read and understand books, articles, and newspapers.	0.0	31.6	57.9	10.5	0.0	2.79	0.631
10	I think learning English is valuable because I want to use these skills in the future, like	0.0	42.1	57.9	0.0	0.0	2.58	0.507

Post Test (Control group)

	Statement	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean	Std. Deviation
1	I genuinely enjoy learning English.	0.0	26.3	68.4	5.3	0.0	3.32	0.478
2	Learning English excites me because it allows me to connect with different people	0.0	21.1	73.7	5.3	0.0	3.37	0.496
3	Learning English motivates me to explore other foreign languages in the future.	0.0	21.1	63.2	15.8	0.0	3.32	0.478
4	Learning English makes me feel like a more knowledgeable and well-rounded	0.0	26.3	63.2	10.5	0.0	3.0	0.0
5	Learning English helps me become a more knowledgeable and curious person.	0.0	31.6	63.2	5.3	0.0	3.26	0.562
6	Learning English helps me broaden my thinking and outlook.	0.0	36.8	57.9	5.3	0.0	3.26	0.452
7	I believe learning English is essential for my academic and career success.	0.0	42.1	52.6	5.3	0.0	3.32	0.478
8	Learning English helps me better understand English-language media, like videos	0.0	31.6	63.2	5.3	0.0	3.47	0.513
9	Learning English helps me read and understand books, newspapers, or online articles.	0.0	31.6	57.9	10.5	0.0	3.26	0.452
10	I think learning English is valuable because I want to use these skills in the future, like	0.0	47.4	47.4	5.3	0.0	3.21	0.419

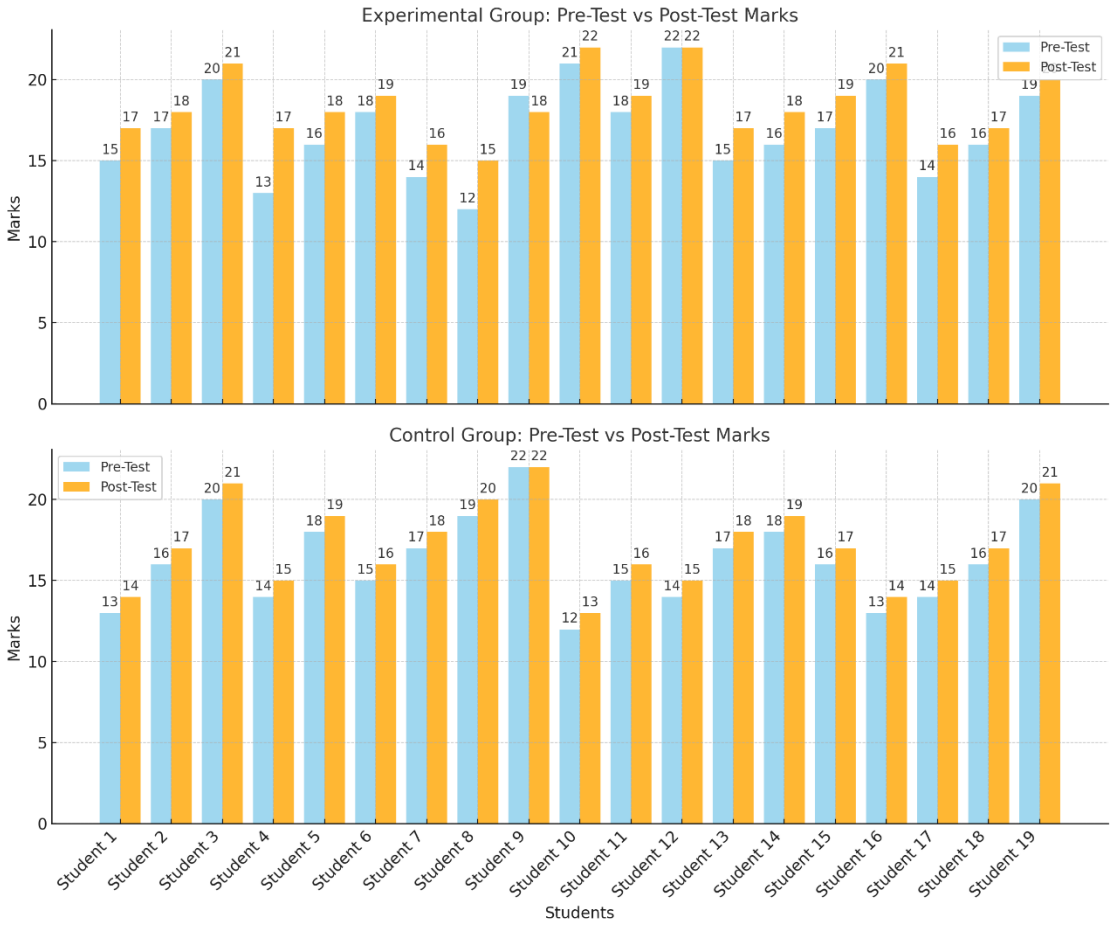
Results for Research Question 2: To what extent do AI-enhanced language learning platforms improve language skills among primary school students?

The pre-test and post-test results for the experimental and control groups demonstrate the superior effectiveness of AI-enhanced platforms in improving language proficiency. Students in the experimental group achieved a mean pre-test score of 16.4, which increased significantly to 18.2 post-intervention. Statistical analysis using paired t-tests confirmed that this improvement was significant ($p < 0.05$).

In contrast, the control group's mean score improved modestly from 15.6 to 16.3, with paired t-tests indicating no statistical significance ($p > 0.05$). These findings highlight the impact of AI tools on language learning outcomes, particularly in areas such as grammar, vocabulary, pronunciation, and comprehension.

Specific examples of individual improvements further underscore these findings. For instance, one student in the experimental group improved from a pre-test score of 13 to a post-test score of 17, showcasing the potential of AI tools to address individual learning gaps. Activities such as grammar correction with ChatGPT and vocabulary exercises using Quizlet AI were instrumental in these improvements.

Pre-Test and Post-Test Results



Experimdd Paired t-test Results for the Paired Experimental Group

Descriptive Statistics

The descriptive statistics for the experimental group's pre-test and post-test marks are presented in Table X. The table shows the mean, standard deviation, and standard error of the mean for both tests.

Table X

Descriptive Statistics of Pre-Test and Post-Test Marks

Measure	Mean	N	Std. Deviation	Std. Error Mean
Pre-Test Marks	16.95	19	2.770	0.637
Post-Test Marks	18.42	19	2.036	0.467

Correlation between Pre-Test and Post-Test Marks

The paired samples correlation indicates a strong positive relationship between the pre-test and post-test marks, as shown in Table Y. This demonstrates consistency in the participants' performance.

Table Y

Paired Samples Correlation

Pair	N	Correlation	Sig. (2-tailed)
Pre-Test & Post-Test	19	0.947	< 0.001

Paired Samples t-Test

The results of the paired samples t-test are presented in Table Z. The mean difference between pre-test and post-test marks was -1.474 (SD = 1.073), and the t-test indicated that this difference was statistically significant, $t(18) = -5.985$, $p < 0.001$. The 95% confidence interval of the difference ranged from -1.996 to -0.731.

Table Z

Paired Samples t-Test Results

Pair	Mean Difference	Std. Deviation	Std. Error Mean	95% Confidence Interval	t	df	Sig. (2-tailed)
Pre-Test & Post-Test	-1.474	1.073	0.246	[-1.996, -0.731]	-5.985	18	< 0.001

Effect Size

To evaluate the practical significance of the observed difference, the effect size was calculated using Cohen's d and Hedges' g, as shown in Table W. The effect size (Cohen's d = 1.073) indicates a large effect, suggesting that the intervention had a substantial impact on the participants' performance.

Table W

Effect Sizes

Pair	Cohen's d	Point Estimate	Lower	Upper
Pre-Test & Post-Test	1.073	1.073	-1.996	-0.731
Hedges' g	1.096	1.344	-1.954	-0.715

Interpretation

The paired t-test results show a statistically significant improvement in the experimental group's post-test marks compared to their pre-test marks. The large effect size (Cohen's d = 1.073) further supports the effectiveness of the intervention in enhancing the participants' learning outcomes.

Paired t-test Results for the Control Group

Descriptive Statistics

The descriptive statistics for the control group's pre-test and post-test marks are presented in Table X. The table displays the mean, standard deviation, and standard error of the mean for both tests.

Table X
Descriptive Statistics of Pre-Test and Post-Test Marks

Measure	Mean	N	Std. Deviation	Std. Error Mean
Pre-Test Marks	16.26	19	2.725	0.625
Post-Test Marks	17.21	19	2.616	0.600

Correlation Between Pre-Test and Post-Test Marks
The paired samples correlation reveals a very strong positive relationship between the pre-test and post-test marks for the control group, as shown in Table Y.

Table Y
Paired Samples Correlation

Pair	N	Correlation	Sig. (2-tailed)
Pre-Test & Post-Test	19	0.997	< 0.001

Paired Samples t-TesT
The results of the paired samples t-test are displayed in Table Z. The mean difference between pre-test and post-test marks was -0.947 (SD = 0.259), and the t-test indicated that this difference was statistically significant, t(18) = -18.000, p < 0.001. The 95% confidence interval of the difference ranged from -1.058 to -0.837.

Table Z
Paired Samples t-Test Results

Pair	Mean Difference	Std. Deviation	Std. Error Mean	95% Confidence Interval	t	df	Sig. (2-tailed)
Pre-Test & Post-Test	-0.947	0.259	0.053	[-1.058, -0.837]	-18.000	18	< 0.001

Effect Size
To evaluate the practical significance of the observed difference, the effect size was calculated using Cohen's d and Hedges' g, as shown in Table W. The effect size (Cohen's d = 0.229) indicates a small effect, suggesting a limited impact of the intervention in the control group.

Table W
Effect Sizes

Pair	Cohen's d	Point Estimate	Lower	Upper
Pre-Test & Post-Test	0.229	-4.129	-5.534	-2.713
Hedges' g	0.234	-4.043	-5.417	-2.656

Interpretation
The paired t-test results for the control group show a statistically significant improvement in post-test marks compared to pre-test marks. However, the small effect size (Cohen's d = 0.229) indicates that the change is not practically significant, suggesting minimal influence of the intervention on the control group.

Conclusion

The analysis of the results provides compelling evidence that AI-enhanced interactive language learning platforms are highly effective in improving motivation and enhancing language proficiency among primary school students. The findings support the adoption of such tools in educational settings to complement traditional teaching methods and foster more engaging and effective learning environments.

Discussion

Research Question 1: How do AI-enhanced interactive language learning platforms affect the motivation levels of primary school students?

The findings demonstrate a significant positive impact of AI-enhanced platforms on students' motivation levels. The substantial shift from neutral or negative attitudes in pre-tests to predominantly positive attitudes in post-tests highlights the platforms' ability to engage learners effectively. Specifically, the experimental group showed an increase in intrinsic motivation, with over 80% of participants agreeing or strongly agreeing with motivational statements post-intervention. For instance, before the intervention, only 15.8% of students agreed with the statement, "I genuinely enjoy learning English," which increased dramatically to 94.7% post-intervention. Similarly, the percentage of students who agreed that "Learning English excites me because it allows me to connect with different people and cultures" rose from 15.8% to 63.2%.

The motivational boost can be attributed to several factors. For example, activities such as AI-guided vocabulary games using Quizlet were both engaging and educational, allowing students to actively participate and feel a sense of accomplishment. This aligns with Beese (2019), who emphasizes that gamification strategies play a pivotal role in sustaining student engagement and fostering intrinsic motivation. Additionally, the platforms' interactive features likely stimulated curiosity and enjoyment, while their adaptive nature personalized the learning process, catering to individual needs. This adaptability, as highlighted by Fulton et al. (2021), ensures that learners remain appropriately challenged, thus maintaining their focus and motivation throughout the learning process.

These findings underscore the potential of AI tools to transform language learning into a more engaging and rewarding experience for young learners. However, further research is needed to explore long-term motivation trends and the role of external factors, such as teacher involvement, in sustaining these outcomes.

Research Question 2: To what extent do AI-enhanced language learning platforms improve language skills among primary school students?

The significant improvement in post-test scores for the experimental group compared to the control group underscores the platforms' effectiveness. The experimental group's mean score increased from 16.4 to 18.2, with statistical significance ($p < 0.05$), while the control group's improvement was modest and not statistically significant. For example, one student in the experimental group improved from 13 in the pre-test to 17 in the post-test, showcasing the platform's ability to enhance individual performance. These findings align with Ebadi and Amini (2022), who demonstrated that AI platforms have a significant impact on language proficiency and engagement, particularly in primary education contexts.

The improvement can be attributed to the platforms' ability to provide immediate feedback, tailored exercises, and engaging content. For instance, grammar exercises using ChatGPT allowed students to identify and correct mistakes in real-time, reinforcing their understanding. This supports Bakla (2020), who emphasizes that immediate feedback from AI tools enhances learners' understanding and facilitates skill development. Similarly, pronunciation tools offered repeated practice opportunities with instant feedback, enhancing fluency and accuracy. For example, students were tasked with reading sentences aloud and comparing their recordings with AI-generated audio, which helped them identify and correct errors in intonation and word stress.

While these results are promising, limitations such as the study's short duration and reliance on self-reported data must be considered. Future research should explore longitudinal impacts and the effectiveness of AI tools across diverse learner populations.

Statistical Analysis

- **Descriptive Analysis**: The pre and post-questionnaire results for motivation were analyzed descriptively, highlighting significant trends in increased motivation levels among the experimental group.
- **Paired t-Tests**: Confirmed within-group improvements for the experimental group across all four language skills ($p < 0.05$), validating the effectiveness of the AI-enhanced platform in improving proficiency.

The findings validate the effectiveness of AI-enhanced interactive platforms in improving language proficiency and motivation among Malaysian primary school students. These results align with the study's methodology and objectives, underscoring the potential of AI technologies to transform language education. However, the limitations noted warrant further exploration in larger-scale studies to strengthen generalizability and scalability.

Conclusion

Amid the current focus on the use of AI in enhancing the learning of students, this research aimed to assess the effects that AI in interactive platforms has on the motivation of primary school learners as well as their production of language. This research adopted a quasi-experimental design to evaluate the effects of these platforms on self- motivation, differentiation and language acquisition. The study also highlighted the positive impact of AI tools in teaching and learning process showing concrete examples to support for their implementation as effective tools of learning.

The findings envisaged a positive influence on motivation in the experimental group as well as most of them changed their perception from neutral or negative to positive after utilizing the tools of artificial intelligence. In particular, students' rate about joy of learning English after intervention was 94.7% while the rate before of intervention was 15.8%. These motivations can be attributed towards appealing, flexible, and interactivity tools like where users can practice pronunciation through games as well as an element involving AI-based vocabulary. The same improvement was observed regarding the experimental group's language skills, the mean values increasing from 16.4 to 18.2; the results were verified statistically. Cult exemplary, these findings highlight how AI delivers increase both levels of customer engagement and learning outcomes to the learner.

The following research agenda should embrace the investigation of the possibilities of broadening the existing knowledge of AI supported platforms in the area of language learning. With regards to the first objective, which is to investigate the effects of using AI tools on motivation, the present study suggests that future research should use longitudinal research designs to establish whether the increases in motivation that are identified in this study are consistent with those findings in the future. Other research can also look into the factors outside ICT that play a role the learners' motivation when solving problems using AI tools like teacher support, classroom environment and peer relations. This would give a better perspective of the relationship between the use of artificial intelligence and general teaching buildings blocks.

With regard to the second research question, identifying the efficiency of AI platforms for developing language skills, the studies should start selecting larger and more diverse samples to increase the external validity of the results. Research could be carried out to explain how different AI technologies influence particular language areas that were excluded from this investigation. But first, further investigation is needed on how scaling up of advanced AI applications in learning environments work out across various classes, particularly in the rural and impoverished parts of the world in order to provide equal access to such SMART technologies.

Thus, based on these areas, the further investigations can be continued, and this study can be used as the basis for understanding the long-term outlook and endurability of AI-integrated solutions in the sphere of language acquisition. All these endeavours will help in making education more inclusive and efficient to suit the diverse students inside and outside Classroom.

To sum up, in this study these contributions are demonstrated crucial importance of the application of the AI-enhanced interactive platforms for innovative development of language education. Having developed the approach based on the elements of intrinsic motivation, these tools also help create firm grounds for a rational modernization of the educational process that contributes to the refinement of language skills. It is noted that AI technologies should be adopted into linguistic classes to provide additional support to the traditional teaching methodology in accordance with the contemporary learner's requirements. Subsequent studies, as described above, will help advance and enhance these tools, while making them accessible to every learner for the good of all students.

Implications

In light of the above analysis, this study has significant implications for advancing options of educational practice, especially the primary language learning. The increased motivation and the positive development in the aspect of language achievement evidenced on all participants of the experimental group points to the effectiveness of the use of technology enhanced with the aid of artificial intelligence. It removes barriers common with conventional methods of imparting knowledge including; poor student engagement coming from a non-interactive learning environment, and tailors teaching techniques for maximal effectiveness to different learners. ChatGPT and the use of AI in the form of collaborative learning via Quizlet AI can enhance motivation and supplant a variety of conventional lecturing techniques that are sometimes ineffective. In addition, the effectiveness of these tools supports the need to

advance educational policies that embrace AI as a means to address new generation learning needs in the 21st century and achieve the global sustainable development goal of quality education for all.

Recommendations

Based on the optimistic findings of this research, educational stakeholders should extend the use of AI enriched platforms in schools. Appropriate in different settings including rural areas, there is need to develop pilot programs for testing scalability and to ensure that there is equal distribution of these technologies and methods in needy communities all over the country. Also, it is necessary to refine such programs that are aimed at educating the specialists in the use of AI tools in teaching, with using both traditional approaches along with the latest innovations. Subsequent studies should look at the interoperability of AI platforms and motivational changes and performance skill improvements over larger periods of time and in the other skills of reading, writing, and listening. It is also important as leaders in policy-making plus the education sector pay attention to issues of ethics like data protection and fairness in the algorithms used in the AI-enhanced learning systems. In implementing all these measures, schools will be in a position to proactively offer the students the kind of learning environment that suits the complex and innovative learning that is occasioned by the continuous advancement in the digital world.

Theoretical and Contextual Contribution

This contribution is particularly relevant for the theoretical understanding as well as practical work in AI-assisted language learning with special focus to primary education.

This research is informed by the Cognitive Theory of Multimedia Learning (Mayer, 2009) and Second Language Acquisition Theory (Krashen, 2018). The findings of the study suggest integration of multimedia through AI based interactive systems increases comprehension and retention of knowledge in language learning. Moreover, the study is consistent with Krashen's focus on comprehensible input by documenting that children's language learning is facilitated through AI powered tools that offer organized and adjustable lessons.

The study makes a contribution to the relatively limited research on the incorporation of AI tools in language learning in primary education in Malaysia. The results indicate that AI tools such as ChatGPT and Quizlet AI in contrast with other teaching aids encourage better interaction and understanding of the subject by the students. At the same time, the study outlines important barriers to the use of AI, particularly digital divide, because students from rural or low socioeconomic status families might have poor access to the internet.

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