



INTERNATIONAL JOURNAL OF
MODERN EDUCATION
(IJMOE)
www.ijmoec.com



ENHANCING THE STUDENTS' ENGAGEMENT IN LEARNING ENGLISH ALPHABET BY USING ARPHABET APPLICATION

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Article Info:

Article history:

Received date: 28.08.2024

Revised date: 12.09.2024

Accepted date: 31.01.2025

Published date: 03.03.2025

To cite this document:

Ishak, Z., Roslan, W. A. Q. W., & Helmi, R. A. A. (2025). Enhancing The Students' Engagement In Learning English Alphabet By Using Arphabet Application. *International Journal of Modern Education*, 7 (24), 65-79.

DOI: 10.35631/IJMOE.724004

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Abstract:

Due to the present COVID-19 health crisis, schools and institutions rushed to introduce online education, which has begun to negatively impact the quality of education for millions of students worldwide. This pandemic has highlighted the necessity to adopt cutting-edge educational technologies, including augmented reality, to enhance the teaching process. The main objective is that researchers want to identify the factors that affect students' engagement when learning the alphabet using traditional methods. This research aims to enhance the existing traditional method by introducing a new application and learning method to children called ARPHABET, that brings collaboration with Augmented Reality. Students can interact with AR that has an AR marker on it. With the results, the researcher can possibly make improvements to the learning experience and response towards alphabet learning. The researcher conducted interview sessions for teachers and post-test usability tests for a total of 30 children to validate the students' engagement when using AR for learning. The researcher used Instructional Material Motivation survey (IMMS) questions with the support of the ARCS model. The researcher concluded that the type of learning and contents in the learning application lead to the increase of student's engagement in learning if the collaboration of augmented reality technology is included in the learning activity.

Keywords:

Augmented Reality; Interactive Learning; Student Motivation; ARCS Model; IMMS Survey

Introduction

Since 2020, the world has faced an unprecedented global health crisis due to the COVID-19 pandemic, which has had profound impacts on nearly every aspect of life. The virus has spread worldwide, affecting all countries and creating critical challenges for public health. Maintaining health and preventing the spread of COVID-19 has become a paramount concern for everyone. One significant repercussion of the pandemic has been its impact on education. UNESCO reported that school closures in response to the pandemic have affected nearly half of the student population globally, prompting a rapid shift to digital teaching and learning methods. The transition to digital learning has highlighted existing issues within traditional educational approaches. According to Sarkhosh, & Pour (2016) traditional teaching methods often involve the passive transfer of knowledge from teacher to student, leading to disengagement and lack of focus among students. In contrast, innovative technologies like augmented reality (AR) offer the potential to transform the learning environment. AR can create immersive and interactive experiences, enabling students to engage more deeply with the curriculum, discover new interests, and retain fundamental concepts more effectively (Chin et. al., 2023).

The current study focuses on addressing "attention issues in learning," a broad spectrum of difficulties that students might encounter in various settings, including home, school, and the community. The researcher aims to test the ARphabet demo application with parents and teachers to gauge user satisfaction before its introduction to children. The primary objective of this experiment is to investigate the impact of AR-based instructional resources on students, particularly those who struggle with maintaining attention. By conducting interviews with teachers, the researcher seeks to gather insights into the student learning experience and the potential benefits of AR in education. This initiative is part of the broader context of the fourth industrial revolution, characterized by rapid technological advancements that are transforming society and influencing daily life. According to Schwab (2024), the fourth industrial revolution emphasizes the need for technological progress to have meaningful and beneficial impacts on the general public and education. Therefore, this study aims to explore how AR can contribute to improving educational outcomes, particularly for students with attention challenges, by providing an engaging and effective learning tool.

Literature Review

COVID-19 Outbreak Impacts On Students' Learning And Teaching

Many schools, universities, and colleges worldwide suspended classroom teaching due to the novel coronavirus (COVID-19) pandemic and switched to online teaching Mahdy (2020). This shift to online learning was necessary as the pandemic drastically altered the educational landscape, requiring the closure of all kindergartens, schools, and other institutions. In an attempt to prevent students from missing lessons, they continued their education at home. However, home confinement due to COVID-19 increased anxiety and tension among students, impairing their ability to focus on academics Duraku & Hoxha (2020). Additionally, these changes impacted students' interest in online classes. Homeschooling also posed a significant challenge for parents, affecting their productivity and having a profound impact on children's social and academic development (Burgess & Sievertsen, 2020). Globalization has further highlighted the inefficacy of traditional verbal teaching methods, rendering them

outdated and less effective Ramli et.al., (2023). As a result, parents have a crucial responsibility to create a conducive learning environment at home for their children.

While Mahdy (2020) effectively highlights the rapid shift to online learning as a necessary response to the pandemic, the study primarily focuses on the logistical aspects and lacks an in-depth exploration of the long-term psychological impacts on students. Duraku & Hoxha (2020) addresses the increased anxiety and tension among students, a critical factor in understanding the challenges of online learning. However, this study could be strengthened by a more comprehensive examination of coping mechanisms that students can use. Burgess & Sievertsen (2020) provides valuable insights into the dual impact of homeschooling on parents' productivity and children's development, emphasizing the social and academic ramifications. Yet, the study's limitation lies in its general approach, which does not account for the varying experiences across different socioeconomic backgrounds. This gap suggests the need for more targeted research that considers the diversity of family situations. Ramli et.al., (2023) points out the outdated nature of traditional verbal teaching methods in the context of globalization, arguing for the adoption of more interactive and engaging pedagogies. While this perspective is valuable, the study would benefit from empirical evidence demonstrating the effectiveness of alternative methods, such as digital and interactive learning tools. Overall, the existing literature underscores the significant disruption caused by the COVID-19 pandemic to traditional education systems, highlighting the urgent need for innovative solutions. However, these studies collectively suggest a need for more nuanced research that addresses the diverse experiences of students and families, as well as empirical evaluations of new teaching methodologies. Discussing these strengths and limitations adds depth and context to the review, ensuring a comprehensive understanding of the impact of COVID-19 on education.

The Student's Attention Observation Using Keller's ARCS Model Of Motivation

To determine how well students pay attention both before and after utilizing augmented reality technology, the researcher will apply John Keller's thesis. According to studies by John Keller, a learning experience cannot be successful unless the learners are truly and appropriately motivated Li & Keller (2018). The attention, relevance, confidence, and satisfaction (ARCS) model is one frequently used motivational design approach (Jeon, 2021). This model was created by an American educational psychologist named John Keller in 1979. The four fundamental components of ARCS model implementation using information and communication technologies (ICT) are attention, relevance, confidence, and satisfaction Subbiah (2024). These are explained as follows:

- Attention (A): The goal of utilizing ICTs in novel circumstances is to immediately pique students' interest, curiosity, and enthusiasm, encouraging their active participation.
- Relevance (R): Refers to how the creative aspect that was incorporated into the learning process made the students feel in relation to their own needs, preferences, and experiences.
- Confidence (C): This has to do with the learner's subjective experience and sense of accomplishment; it's the belief that learning will be completed by the time the lesson ends.
- Satisfaction (S): This component has to do with the student's attitude toward their educational experiences. They maintain appropriate motivation levels if, as a result,

they are happy with the experience since they are successfully finishing tasks (Hwang & Son, 2021).

The studies' findings might not be consistent despite applying the ARCS paradigm in many nations and situations. This is due to the possibility that some learning tactics won't be effective in a given learning environment or with a specific student demographic Fang et.al., (2024). According to the model, in order to motivate students, the teacher or instructional materials must: (1) capture and hold the students' attention; (2) explain why the students need to learn the material; (3) cultivate in the students the belief that they can succeed if they put in the necessary effort; and (4) assist the students in feeling rewarded and proud of themselves Anuar, Nizar & Ismail (2021).

In a research by Pamela Hogle, John Keller argued that the previous existing models make a point of external stimuli too heavily and motivated learners need more attention to be adapted Subbiah (2024). A study has been done by Fang et.al, (2024) on E-learning by using the ARCS model, which confirmed the validity of this model for the systematic design of motivationally enhanced instruction in E-learning (Durrani & Kamal, 2021). In summary, augmented reality technology must, according to the ARCS model, draw the interest of young learners, be relevant to them, instill confidence in them, and leave them feeling fulfilled after interacting with it Anuar, Nizar & Ismail (2021).

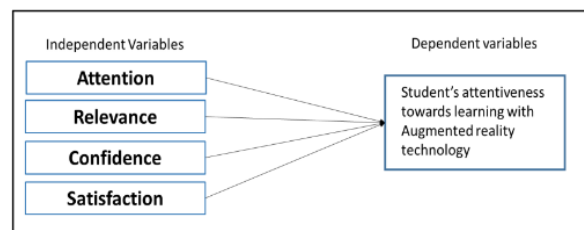


Figure 1: John Keller's ARCS Model

Since the ARCS model was thoroughly established and verified over 30 years ago Anuar, Nizar & Ismail (2021), researchers from a wide range of regions have employed it in a variety of scenarios, including face-to-face classes and online settings. A study by Anuar, Nizar & Ismail (2021) was carried out to examine the effectiveness of using the ARCS model on students' motivation and achievement. The published research findings were divided into four categories which are affective domain, cognitive domain, learner behaviors, and other psychological traits as shown in Figure 1.

Affective Domain

The affective domain encompasses elements like students' motivation, attitudes and sentiments for the course, and continuing motivation. According to quantitative research, individuals who used the ARCS-enhanced learning resources had more positive attitudes about the subject (Subbiah, 2024 & AlNajdi, 2022). Positive attitudes and feelings about the ARCS techniques were the subject of non-quantitative study outcomes Yu et.al, (2022).

Cognitive Domain

The primary cognitive domain outcome was how well students performed on tests. Forsblom (2022) postulated that one potential explanation for the lack of significance in achievement was

the particular educational setting and participants. Another assumption that might have an impact on the study's findings was the experiment's relatively short duration (Kaya & Ercag, 2023). Additionally, it's feasible that in some circumstances the researchers' particular choice of ARCS strategies won't work. As a result, these authors urged more investigation to be carried out in order to examine the impacts of the ARCS model in various contexts for cognitive domain.

Learner Behavior

This category contains parameters such as task completion time, quantity of forum posts, quantity of assignments turned in, and retention rate for the course. After completing the ARCS-enhanced computer-based education, Gasmi, & Benlamri (2022) hypothesized that students' numbers of forum posts and assignment submissions increased dramatically, indicating improved active learning practices. According to Bhakti et.al (2021), pupils engaged fully in ARCS-based learning activities. This research revealed that the ARCS group or class had greater retention and completion rates than the control group or class in the absence of ARCS treatments. According to Bhakti et.al (2021), students in the experimental group that received emails based on the ARCS model had a lower failure rate and a greater retention rate.

Physiological Traits

Researchers hypothesized that the ARCS model might potentially have an impact on students' other psychological features or that certain psychological traits would result in motivational disparities among students. According to Stockdale et.al, (2023) participants' various psychological qualities linked to self regulated learning were both positively and negatively impacted by ARCS techniques. After learning the ARCS-enhanced texts, it is observed that individuals with lower situation-outcome-expectancies (SOE) ratings were more motivated and achieved more, but not people with higher SOE scores. After receiving ARCS-enhanced teaching, participants' self-sufficiency increased, according to Laurens-Arredondo (2022) findings.

Methodology

The researcher conducted the research involving two areas including social sciences and information technology, mixed methods used to investigate student's attentiveness on the use of AR application in which data collected supports the findings between each other. At the beginning, a qualitative method involved an interview session with the prospective teachers to get the most important assessment and method of learning and also another quantitative method involved the student with the help of parents when interacting with the AR content.

Research Method

This study was conducted in four main phases as shown in Figure 2. First phase is preliminary analysis, second phase is design, third phase is development, and fourth phase is testing and evaluation. Each of the main phases contain the processes to be demonstrated and described in each phase of the following section.

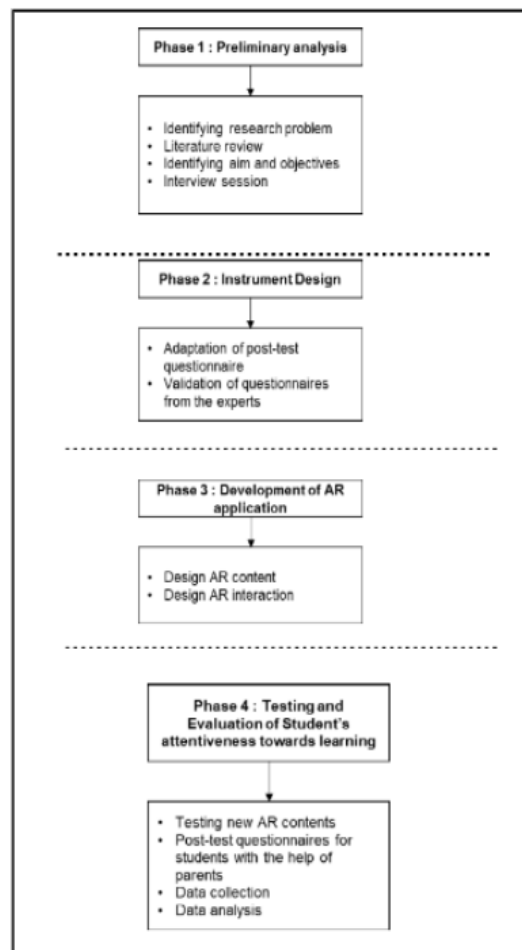


Figure 2: Research Method Phase

Interview Sessions

Interview sessions are handled with the teachers to collect the information regarding the method of learning and student's assessment. This interview consisted of open-ended questions to converse with the teacher and collect the in-depth data about the students. The mode of the data collection is online by using Zoom Meeting. The researcher chose this mode due to adjusting the new norms along with the physical distancing guidance. A brief summary of the research was sent to the teacher, who agreed to share information about their experiences. Five teachers agreed to take part in the interview sessions.

As noted above, a total of five teachers were included in the study, and the small sample size allowed for a deeper analysis of experiences and enabled the researcher to identify the common themes that comprised the experiences of the children learning. The researcher then scheduled the meeting times with the participants. Basically, in depth qualitative research is based on interviews that are recorded and then transcribed [10]. The researcher recorded the sound files and then analyzed it using interpretative phenomenological analysis (IPA). In addition, the IPA study may therefore contain an interpretation, but it can make the analysis richer and more complete [11].

Development of ARphabet

The literature review for earlier applications and the views of teachers on the transfer of traditional method learning to AR learning technology were the basis for the development of the AR contents. Additionally, the application's augmented reality content is a key factor in getting students to focus on learning the English alphabet. To create the application, the researcher will use the Vuforia SDK and Unity 3D software. Learning objectives, evaluation tools, activities, content, subject matter analysis, lesson planning, and media selection are all covered throughout the design phase.

The design phase should be systematic and specific. Systematic means a logical, orderly method of identifying, developing and evaluating a set of planned strategies targeted for attaining the project's goals. Specific means each element of the instructional design plan needs to be executed with attention to details. This book consists of three letters which are A, B and C, for example as shown in Figure 3 All the letters have different designs so the target audience not only interacts with the augmented reality application but also can learn the alphabet through books.

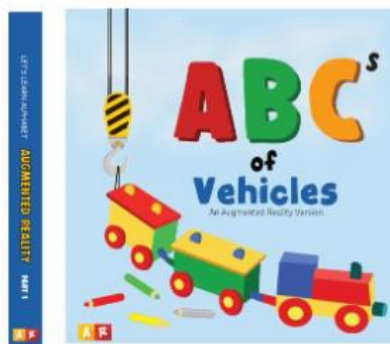


Figure 3: ARphabet Book Design

The researcher collected all the files and models into the assets folder in Unity and started to develop the application from scene to scene. In this phase, the researcher starts to compile the assets by doing the coding and target marker for application and also flashcard as shown in Figure 4. The researcher also put the textures and UV map before dragging the assets into the Unity assets folder.

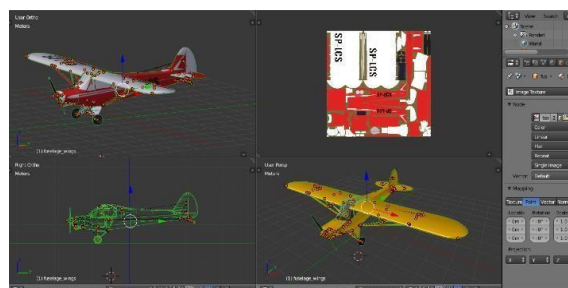


Figure 4: Sample of 3D Model

Post-test Experimental Group

Respondents in this second phase are 30 kindergarten students from the Klang Valley area. The researcher selected the experimental group to interact with the ARphabet application with the

help of parents. This set of questionnaires will be completed with the help of parents at home. The questionnaire consisted of 30 questions based on the students' engagement and focal point towards learning at home by using an AR application after interacting with AR contents. The survey is divided into 4 sections with the IMMS ARCS model instrument to which the participants responded using a five-point Likert-type scale ranging from 1(Strongly Disagree) 2(Disagree) 3(Neutral) 4(Agree) 5 (Strongly Agree). This section included 17 statements that asked about students' attention when interacting with ARPHABET. The post-test questionnaire that was executed and had been evaluated using statistical software and structured modeling called Statistical Package for Social Science (SPSS) program for Windows (Version 26.0). This method is to measure the frequency, mean value and standard deviation for each of the questions, find the type of AR content according to the student's perspective and to discover the type of vital data according to the student's attentiveness.

Data Analysis and Findings

IPA Analysis

This methodology is used to get information about how people think, feel and act and what they know. To gain this understanding, interpretive phenomenological analysis (IPA) was used to answer the following research questions:

RQ1: What are the factors that affect the student's engagement when learning the alphabet using traditional methods?

Table 1: Emergent Themes for Teacher Farhana

Name	Descriptive/ Frequently Used	Linguistic /Keywords	Conceptual Comments	Emergent Themes
Farhana	Focus	The student does not focus in class when using traditional method	The students usually can focus for only 10-20 minutes when using traditional method	Students' attention
	Dissapointed	Do not sit still	Students started to move here and there without looking at the teachers.	
	Frustrated	"Bodies in the class but therir mind was already drifting, pensive for a moment"	She felt disappointed because the teachers in the kindergarten were rarely exposed to the apps to play	

Based on Table 1, as themes began to emerge within and across transcripts, an additional table was created to help visualize not only where the themes diverged but also to identify how themes might have a relationship with the research questions. Specific quotes were used to check the correspondence between analysis with the actual words of the participants. Then, the table helps to combine the narratives of all participants, and to highlight common experiences related to students' attentiveness in learning.

Traditional Method In Learning IPA Analysis

All 5 teachers certainly used whiteboards and flashcards in their own ways before the pandemic happened. In addition, Irdina uses more traditional methods than modern learning," I want to write uppercase or lowercase of any kind, and I still have to use a whiteboard to do it". She said that the student will be playing against it and writing the alphabet improperly. In this case, both Aziana and Irdina are still using the traditional method but previously approached a new alternative which is a technology and modern learning due to the pandemic COVID-19 during the first Movement Control Order (MCO). For Farhana, one of the ways that she implemented it was by pasting the flashcards and writing letters on the whiteboard. In this case, she thinks that it raises the students' thinking skills rather than keep on learning with the same materials such as books.

Acceptance Of Students Regarding Traditional Method

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Teacher's Opinion Towards Augmented Reality

The researcher thinks that AR should have their own level of learning so that all the students from different ages can use the AR. The AR does not cause problems for teachers to find material and at the same time she can maintain the traditional method like reading the AR books even though they cannot react with the AR. Aziana said that it is better than the traditional method, "the generation loves to watch visual animations that are more realistic and attractive. But she also said that it requires a high cost to buy gadgets because each student must have a gadget to interact with AR otherwise it will take time for learning. The AR does not cause problems for teachers to find material and at the same time she can maintain the traditional method like reading the AR books even though they cannot react with the AR. It does not seem to be relevant to use the only traditional method because students now live in the 21st century, so they would prefer more to technology and gadgets.

Learning Method Vs. Student's Engagement

When the researcher asked about what methods do they prefer to improve students' attentiveness in learning, they answered, "both." The teachers think that students are more comfortable with technology, and when they are comfortable enough, they will stay focused

for a long period of time. So, both methods can be used in the classroom and all students will get the same satisfaction when using both methods whether they are slow learners or fast learners.

Post-Test IMMS Survey

Cronbach's Alpha Test Based on ARCS Model

Initially, the internal consistency analysis of the 41 items across four sections (Attention, Relevance, Confidence, and Satisfaction) yielded a favorable Alpha value ($\alpha > 0.70$), indicating that the questionnaire items were reliable and internally consistent.

Table 2: Reliability Statistics

Constructs	No. of Items	Alpha (α)
Attention	17	.816
Relevance	10	.883
Confidence	7	.831
Satisfaction	5	.883

Moving on to the results in Table 2, we observe high mean scores for each section of the ARCS model, indicating positive attitudes towards learning ARPHABET. Specifically, the mean scores for Attention and Confidence are 4.13 and 4.07 respectively, falling within the interval length of agreement with statements. These high mean scores reflect students' strong agreement and satisfaction with the use of AR environments for interactive learning. Moreover, the consistency in high scores across all sections of the ARCS model suggests a consistent and positive perception of ARPHABET among students. This consistency indicates that students perceive ARPHABET as effective in enhancing their attention, relevance, confidence, and satisfaction in learning material, as supported by Deepti Prit Kaur's research findings. In summary, the internal consistency analysis and mean scores in Table 2 highlight the reliability and positive perception of ARPHABET among students. The consistency in high scores across all sections underscores the effectiveness of AR technology in improving student engagement and learning outcomes.

Recommendation of ARPHABET Application To Others

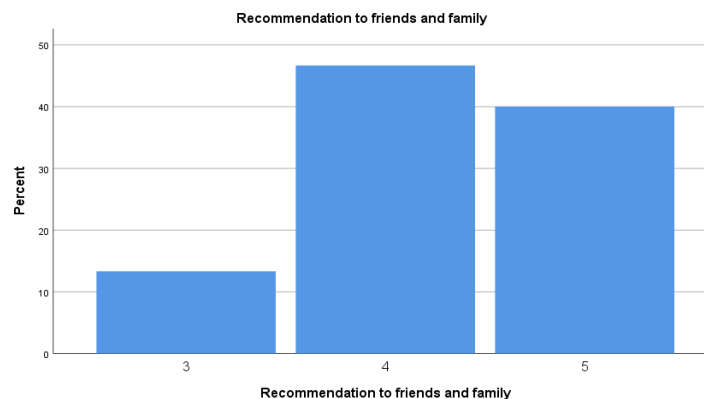


Figure 5: Bar Charts Of Recommendation Results

All respondents answered the question as shown in Figure 5. A total of 12 parents (40.0%) highly recommended the ARPHABET application to friends and family. Other 14 parents recommended the application and they answered the agreed Likert scale with a percentage of 46.7%. Another 3 respondents with a percentage of 13.3% just being neutral. In summary, the data indicates a positive reception of the ARPHABET application among parents, with a majority expressing recommendations. Moreover, students demonstrate high levels of attentiveness, relevance, confidence, and satisfaction in learning with ARPHABET, as evidenced by the internal consistency analysis and mean scores across the ARCS model sections. These findings underscore the effectiveness and positive impact of AR technology in enhancing learning experiences and student engagement.

Discussions Of Results

RQ1- What Are The Factors That Affect The Student's Engagement When Learning Alphabet Using Traditional Method

From the interview sessions, most of the teachers said that students started to get distracted by the environment and pensive for a moment in the class. This is because students nowadays love gadgets and are bored with traditional method learning because they used the same medium every year and are not well-introduced with interactive learning like augmented reality. After the researcher did the post-test survey, the result was found positively significant with the opinions said by the teachers in the interview sessions. A total of 17 students (56.7%) strongly agree that ARPHABET application can build the children's curiosity towards AR and 15 (50.0%) of the students wanted to continue the next lesson in ARPHABET without expecting any rewards from their parents or teachers.

RQ2- What Are The Available Technologies For Students To Learn The English Alphabet?

Based on the second research question, the researcher identified and conducted literature reviews for the available technologies for students to learn the English alphabet. Letter sets are everywhere. These consecutive sets of images and letters speak to the phonetics of any given dialect and shape the establishment of numerous dialects within the world. The researcher chose 10 different products that are usually used AR for learning. All of them were choosing the same target audience and demographics which are 5 to 6 years old. This development paves the way for researchers to explore and engage in discussions regarding the implementation of

these promising technologies, which have the potential to enhance and support education [12]. The restructuring of society is greatly influenced by the technological revolution, which acts as a potent social force in transforming the environment into a knowledge-based economy. Hence, the researcher found that there are multiple media contents used in technology but they are using different concepts to catch students' attention in learning.

RQ3- Does Student's Engagement Work The Same For AR Technology As It Does For Traditional Learning Methods?

The functional of user interface design also play a big role in order to impact the students' engagement towards learning. Good interface can help to attract those students, engage them and turn them into leads. One of the factors that have been identified is the learning method supports the student's engagement in learning. From the interview sessions, most of the teachers said that students started to get distracted by the environment and pensive for a moment in the class. This is because students nowadays love gadgets and are bored with traditional method learning because they use the same medium every year and are not well-introduced with interactive learning like AR. A total of 17 students (56.7%) strongly agree that ARPHABET application can build the children's curiosity towards AR and 15 (50.0%) of the students wanted to continue the next lesson in ARPHABET without expecting any rewards from their parents or teachers.

This result clearly indicated that students are content with the new interactive learning methods, such as augmented reality, and that this can increase kids' interest in learning, particularly with the alphabet. The researcher concluded that the student's attentiveness did not work the same for AR as it does for traditional learning methods. The student learning time is longer when they interact with AR compared to the traditional method. Teachers felt relieved that they did not struggle anymore to find learning materials if AR mediums are already introduced among the kindergarten in Malaysia. A teacher also mentioned that the researcher should introduce the ARPHABET application to the Ministry of Education because it is a good medium of learning that can attract the students' attention. Because of this, Teacher Farhana would rather introduce augmented reality (AR) to an urban area first than a rural one where there aren't enough resources to engage with AR.

Recommendations For Future Work

All researchers definitely have limitations in conducting their research including this research. There are some limitations in this study that can be used as a reference for future research. Future research might involve more participants, especially on the post-test survey involving parents or teachers so that the data obtained will be from various perspectives. In Malaysia, private and public kindergartens may have different missions, visions perspectives, and target students. The information displayed in the ARPHABET application might be different according to the criteria from the other area. Last but not least, for further research, the researchers can do more research on the student's attention and behavior especially in Malaysia.

Conclusions

Overall, by broadening the understanding of students' attentiveness towards learning, this research provides valuable insights for educators and policymakers seeking to improve educational practices. Understanding how students engage with learning materials, particularly through augmented reality (AR) technology, can inform the development of more effective

teaching strategies and learning environments. The study highlights the effectiveness of AR learning compared to traditional methods, offering evidence-based support for integrating AR technology into educational settings. This finding can inform decisions regarding the adoption and implementation of AR technology in schools and educational institutions, potentially improving student engagement, retention, and overall learning outcomes. The research has practical implications for educators, particularly in kindergarten settings, by introducing a new application that measures students' attentiveness in learning. This application can serve as a valuable tool for assessing and improving student engagement, informing instructional practices, and enhancing the overall learning experience. The findings of this research underscore the importance of teacher training and professional development in effectively integrating AR technology into the classroom. Educators can benefit from training programs that equip them with the skills and knowledge to utilize AR tools, enhance classroom experiences, and inspire students' curiosity and critical thinking skills (Faridi et.al, 2021).

This research serves as a catalyst for future studies exploring the potential of AR technology in education. Future research can build upon these findings to investigate the long-term effects of AR-enhanced learning, explore different applications of AR technology across various subjects and educational levels, and further advance our understanding of how technology can enhance teaching and learning processes. In summary, this research contributes to advancing educational practices by demonstrating the benefits of AR technology in improving student attentiveness and learning outcomes. It offers practical implications for educators, policymakers, and researchers to leverage AR technology effectively in educational settings and inspires future studies to explore its broader impact on teaching and learning.

Acknowledgements

The authors would like to express their profound gratitude to the Graduate School and Graduate Center for their invaluable support. Their assistance was instrumental in facilitating the successful completion and dissemination of this project. The authors deeply appreciate the Graduate School and Graduate Center's unwavering commitment to advancing scholarly research and academic excellence. Their support has significantly contributed to the enhancement of academic knowledge and the promotion of high-quality research. Moreover, The authors would like to acknowledge and extend special gratitude to Global Academic Excellence (M) Sdn Bhd for granting the Publication Grant Scheme for this project. This generous support has been instrumental in enabling the successful completion of our research and the dissemination of our findings. We appreciate the commitment of Global Academic Excellence (M) Sdn Bhd to advancing academic scholarship and fostering innovation. Their endeavors that contribute to the broader academic and scientific community.

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