# The Effect Of Students' Motivation, Emotions, And Cognitive Engagement On English Vocabulary Learning Moderated By Augmented Reality Implementation At School X, Jakarta

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**Abstrak**

Prestasi akademik di masa kanak-kanak memengaruhi kemampuan beradaptasi dan fungsionalitas siswa di Sekolah X; sangat penting untuk memahami faktor-faktor yang memengaruhi proses ini. Selanjutnya, augmented reality (AR) adalah teknologi yang menggabungkan informasi digital, seperti gambar, video, dan audio, ke dalam tempat yang sebenarnya, memfasilitasi pembelajaran melalui kesenangan tugas, keterlibatan, dan motivasi. Penelitian ini menyelidiki faktor-faktor yang memengaruhi prestasi dalam pembelajaran kosakata bahasa Inggris menggunakan implementasi AR di Sekolah X, seperti motivasi, emosi, dan keterlibatan kognitif, antara siswa usia 9 sampai 15 tahun. Penelitian ini melibatkan 52 siswa di kelas lima sampai sembilan di Sekolah X, Jakarta. SmartPLS 4 digunakan untuk melakukan analisis data. Hasil penelitian ini menunjukkan bahwa emosi memiliki pengaruh terbesar terhadap prestasi belajar kosakata bahasa Inggris dibandingkan variabel lainnya, diikuti dengan keterlibatan kognitif yang memiliki pengaruh terbesar kedua. Motivasi berpengaruh positif terhadap prestasi belajar kosakata bahasa Inggris, meskipun tidak kuat. AR juga berpengaruh positif terhadap hubungan motivasi dengan prestasi belajar kosakata bahasa Inggris, tetapi tidak berpengaruh positif terhadap hubungan emosi dengan prestasi belajar bahasa Inggris. AR tidak memiliki pengaruh yang signifikan terhadap hubungan antara keterlibatan kognitif dengan prestasi belajar bahasa Inggris.

**Abstract**

*Academic performance in childhood affects students' adaptability and functionality at School X, Jakarta; it is critical to understand the factors that influence this process. Further, augmented reality (AR) is a technology that merges digital information, such as images, videos, and audio, into actual places, facilitating learning through task pleasure, engagement, and motivation. This study investigates the factors that influence academic achievement in English vocabulary learning using AR implementation at School X, such as motivation, emotions, and cognitive engagement, among students ages 9 to 15. The study involves 52 students in grades five through nine at School X. SmartPLS 4 was used to do the data analysis. The results of this study show that emotions have the largest effect on English vocabulary learning achievement compared to other variables, followed by cognitive engagement, which has the second largest impact. Motivation has a positive effect on English vocabulary learning achievement, although it is not strong. AR also has a positive effect on the relationship between motivation and English vocabulary learning achievement, but it does not have a positive effect on the relationship between emotions and English vocabulary learning achievement. AR has no significant influence on the relationship between cognitive engagement and English vocabulary learning achievement.*

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## 1. INTRODUCTION

Vocabulary is essential in language learning; its deficiency inhibits the correct development of communication (Alqahtani 2015, 22). One of the most common challenges in English class at School X is a lack of interest in looking up word definitions. Students fail to broaden and deepen their vocabulary, which is crucial for developing a strong foundation in the English language.

Currently, there are issues in the educational field that education experts do not know how to successfully address. Many of the solutions to these challenges are as simple as including

aspects of emotions, motivation, and cognitive engagement in the curriculum (Gutiérrez and Expósito 2015, 43). This study will look at whether these aspects have an impact on academic success in English vocabulary learning using AR at School X. Currently, there are issues in the educational field that education experts do not know how to successfully address. Many of the solutions to these challenges are as simple as including aspects of emotions, motivation, and cognitive engagement in the curriculum (Gutiérrez and Expósito 2015, 43). This study will look at whether these aspects have an impact on academic success in English vocabulary learning using AR at School X. "Academic performance" will be understood as the evaluation that the students and the teacher make of their vocabulary knowledge. Various factors, such as the student, teacher, parent, and school factors, can all influence academic achievement, but this study only focuses on the student component.

The importance of motivational, emotional, and cognitive aspects and their influence on the lexical development of the English language has led this research to search for potential predictors of these factors in students at School X. It shows a current need to implement new methodologies and resources, such as AR, in primary and secondary education classrooms to curb demotivation and poor academic performance.

The relevance of motivational, emotional, and cognitive factors in the lexical development of the English language has prompted this study to look for potential predictors of these variables in students at School X, Jakarta. Implementing augmented reality technology will make learning more optimal and creative, promoting good attitudes and school achievements.

The investigation will help raise awareness about the advantages of using AR over traditional forms of education.

## 2. LITERATURE REVIEW

Today, vocabulary acquisition has proven to be a critical component in the development of interlanguages (Sanhueza, Ferreira, and Sáez 2018, 274). In the case of English, mastery of the language requires learning a large vocabulary that allows communication in this language.

Motivation is a driving force that can stimulate people to participate in activities. It is also defined as the motivation for a person to repeat a behavior because it motivates students to work hard to learn and to continue learning (Lai and Chang 2021, 2).

Emotions are present in many aspects of our lives and play an essential role in education. If a student is not predisposed to learn or experiences strong negative emotions, he is unlikely to reach his full potential (Paredes, Gómez, and Velázquez 2020, 1).

Cognitive engagement is defined by Buchner, Buntins, and Kerres (2021, 286-287) as the effort and motivation that learners put into learning with multimedia instruction. Wen (2020, 2) defines cognitive engagement as students' cognitive participation in learning activities.

Dirin and Laine (2018, 1) define augmented reality (AR) as a fusion of digital and real-world data. This blending of the real and virtual worlds has been used for a wide range of purposes. Augmented reality can be used to make learning media more attractive for learning English vocabulary.
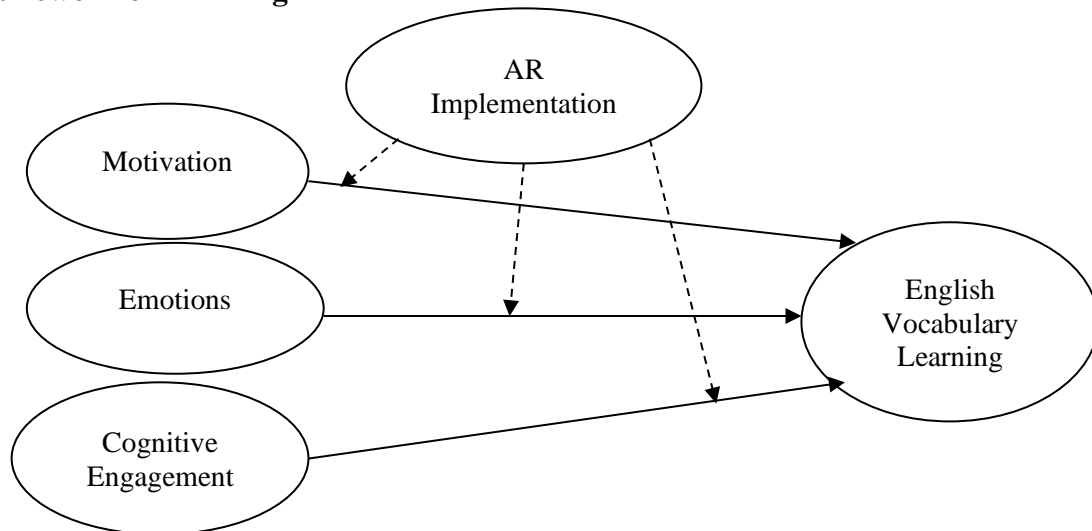
**2.1. Framework of Thinking**



**Figure 2.1. The effect of students' motivation, emotions, and cognitive engagement on**

**English vocabulary learning moderated by augmented reality implementation**

Motivation is essential to vocabulary learning in foreign language classrooms (Ji and Shin 2019, 13).

The effect of positive emotions on English vocabulary memorization is consistent with previous research showing that emotions elicited during stimulus encoding affect associative memory recall (Li et al., 2020, 19). Negative emotions lower academic performance, whereas positive ones boost it (Garcia and Durán 2017, 71).

Wen's study (2022, 2) focused on students' collaborative cognitive engagement during the learning process to enhance and deepen their understanding of active vocabulary learning in language classrooms.

Khan, Johnston, and Ophoff (2019, 1-2) examine how using augmented reality promotes learning motivation. Their research was based on previous studies that occurred in various countries and specifically looked at the relationship or impact of AR on motivation.

Dirin and Laine's study (2018, 11) identifies the positive emotions that participants experienced while using augmented reality applications. They determined these emotions from information gathered through observations, questionnaires, interviews, and the think-aloud method.

Buchner, Buntis, and Kerres (2021, 286) show that the implementation of AR-induced immersion is related to cognitive engagement and thus learning gain. Similarly, in her study, Wen (2020, 2) examined the effectiveness of AR-designed activities, focusing on the cognitive engagement of students, which refers to students' cognitive participation in learning activities.

**2.2.Hypothesis**

Based on the problem statements above, in this research study, there are several hypotheses.

Hypothesis 1: There is a positive effect of motivation on students' English vocabulary learning achievement at School X.

Hypothesis 2: There is a positive effect of emotions on students' English vocabulary learning achievement at School X.

Hypothesis 3: There is a positive effect of cognitive engagement on students' English vocabulary learning achievement at School X.

Hypothesis 4: There is a positive effect of motivation on students' English vocabulary learning achievement using AR implementation at School X.

Hypothesis 5: There is a positive effect of emotions on students' English vocabulary learning achievement using AR implementation at School X.

Hypothesis 6: There is a positive effect of cognitive engagement on students' English vocabulary learning achievement using AR implementation at School X.

## 3. RESEARCH METHOD

Once the problem statement was specified, the initial scope of the investigation was defined, and the hypotheses were formulated. The approach used in this research was quantitative. SmartPLS 4 was used to process and analyze all the data. It is a graphical user interface for PLS-SEM.

The respondents included 52 female and male students, averaging 9 to 15 years old, and were English students from School X in South Jakarta. The data collection was done using questionnaires through Google Forms. It was conducted from October through November 2022, term 2 of the academic year 2022–2023. Grades five through nine were chosen because their age was better suited to using the Arcapedia application.

The researcher has developed an application that allows users to interact with 3D objects using their fingers. It was developed using the latest version of the Unity tool with the help of C++, an object-oriented programming language. It uses a 2D and 3D graphics engine that is reshaping the video gaming industry.

Data were collected from a population of primary and junior high school students in South Jakarta. There were four types of instruments, and each of the instruments was given at a different time. To avoid respondent bias, a four-point Likert scale was used in this study.

### 3.1 Instruments

The achievement in learning vocabulary in English has been evaluated according to academic performance, following the lesson plan for the second term of the 2022–2023 school year. VLT and Quizizz were used for the assessment, and test scores were normalized so that larger numerical feature values did not override smaller numerical feature values (Singh and Singh 2020, 2).

There are no calculations for validity and reliability on this variable because grade reports are used.

In this study, the IMMS survey components were used to assess students' motivation to learn English vocabulary. A 36-item situational measure of students' reactions to instructional materials was used to measure motivation. The instruments are based on the items developed by Lai and Chang (2021, 4.5).

The Achievement Emotions Questionnaire (AEQ) is a theory-based measuring tool that allows for the evaluation of distinct emotions in a variety of circumstances (Bieleke et al. 2020, 36). The hopelessness dimension is not included in the instrument.

Students' desire and forethought are key components of their engagement in learning (Alrashidi, Phan, and Ngu 2016). The questionnaire comprises four subscales with 25 items, using a 4-point Likert scale. Cognitive engagement is a cognitive function with several interpretations and classifications.

Cronbach's alpha and composite reliability are used to test the reliability of the items. Convergent and Construct validity is assessed through the value of Average Variance Extracted (AVE).

Augmented reality is the fusion of two extreme systems, the actual and the virtual. It superimposes information over the observed reality, allowing the user to create an interactive interpretation. This sort of technology can be employed in the acquisition of foreign languages, which is the goal of this study (Pranoto et al. 2017, 181).

### 3.2 Data analysis

In this study, data analysis is done using the partial least squares–structural equation modeling (PLS–SEM) approach and path analysis. The SmartPLS 4 program is implemented to process the data. Path analysis is used to examine and assess the links between a group of observable variables.

Utilizing the measurement model assessment or outer model assessment, the validity and reliability of the construct measures were assessed.

### i) Convergent and Construct Validity

Convergent validity is a quality measure of a measurement instrument, which is typically a set of question statements. When a measurement model has acceptable convergent validity, the loadings should be 0.5 or higher. Indicators that do not meet these criteria may be excluded from the analysis (Amora 2021, 1).

### ii) Construct Reliability

An exploratory factorial analysis was performed to reduce the data to factors (Zeynivandnezhad et al. 2019, 74). Cronbach's alpha is used to assess the value of internal consistency, or construct reliability. Items with factor loadings less than 0.500 were eliminated from the model due to weak convergent validity and unreliability.

After a measurement model evaluation, descriptive statistics may be used if valid and reliable items were acquired. According to its definition, "descriptive statistics" is a subfield of statistics that deals with summarizing and presenting data derived from the population or a sample using proper procedures (Ortega & Tejedor 2021, 4–5).

The evaluation of the structural model examines how the variables relate to one another and how well the independent variables can account for the dependent variable. This study examined the impact of education and second language research on academic achievement. The path analysis approach was used in this study's hypothesis test. Path coefficients, which range from 0 to 0.10, 0.11 to 0.30, 0.30 to 0.50, and > 0.50, can be interpreted as representing weak, low, moderate, and significant effect sizes (Hair & Alamer 2022, 7).
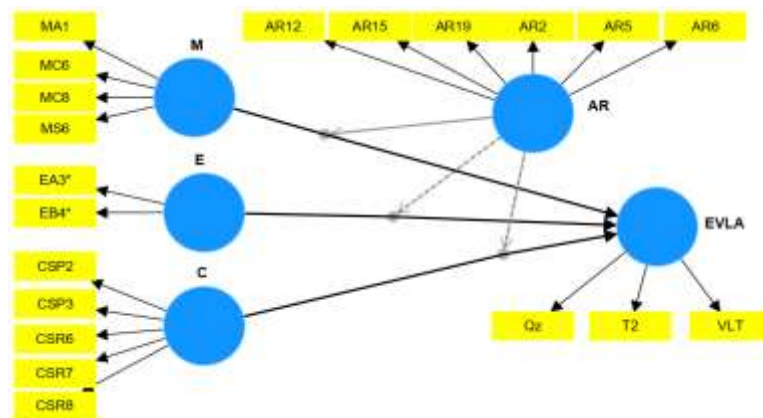
### 3.3. Research Model



**Figure 3.1. Research model of the study.**
**Source:** Result of data processing, 2022.

## 4.  RESULT AND DISCUSSION

The measurement model's composite reliability, convergent validity, discriminant validity, and construct validity were all evaluated. As a result, the measurement model evaluation assessed the data's validity and reliability in this study.

AVE is a quality measure of a measurement instrument, which is typically a set of question statements. To conclude that a measurement model has acceptable convergent validity, the loadings should be 0.5 or higher. Indicators that do not meet these criteria may be excluded from the analysis (Amora 2021). The AVE value obtained for each latent variable after data processing is shown in Table 4.1.

**Table 4. 1. AVE value of each variable.**

| Variable | Average Variance Extracted (AVE) |
|---|---|
| AR | 0.573 |
| Cognitive | 0.569 |

| | |
|---|---|
| Emotions | 0.752 |
| Learning Achievement | 0.707 |
| Motivation | 0.621 |

**Source:** Result of data processing, 2022.

The original data was examined for the load factor for each element in each variable. Items with factor loadings less than 0.500 were removed from the model because of poor convergent validity and unreliability. Table 4.2 indicates the results of re-estimating the remaining items.

**Table 4.2. Convergent validity assessment result**

| Variable | Item | Factor Loading | Convergent Validity |
|---|---|---|---|
| AR | AR12 | 0.800 | Valid |
| | AR15 | 0.724 | Valid |
| | AR19 | 0.753 | Valid |
| | AR2 | 0.706 | Valid |
| | AR5 | 0.747 | Valid |
| | AR6 | 0.807 | Valid |
| Cognitive | CSP2 | 0.788 | Valid |
| | CSP3 | 0.746 | Valid |
| | CSR6 | 0.754 | Valid |
| | CSR7 | 0.757 | Valid |
| | CSR8 | 0.725 | Valid |
| Emotions | EA3 | 0.976 | Valid |
| | EB4 | 0.744 | Valid |
| Motivation | MA1 | 0.857 | Valid |
| | MC6 | 0.856 | Valid |
| | MC8 | 0.707 | Valid |
| | MS6 | 0.718 | Valid |
| Learning Achievement | Qz | 0.850 | Valid |
| | T2 | 0.812 | Valid |
| | VLT | 0.859 | Valid |

**Source:** Result of data processing, 2022

Table 4.3. shows that the composite reliability results are greater than 0.800. The variable with the highest composite reliability was AR, with a value of (0.889), while motivation had the lowest composite reliability. Despite this, the construct reliability obtained in all variables has a high level of internal consistency.

**Table 4.3. The composite reliability value of each variable.**

| Variable | Cronbach's alpha | Composite |
|---|---|---|
| AR | 0.855 | 0.889 |
| Cognitive | 0.812 | 0.868 |
| Motivation | 0.733 | 0.857 |
| Learning Achievement | 0.793 | 0.878 |
| Emotions | 0.808 | 0.867 |

**Source:** Result of data processing, 2022.

For the English Vocabulary Learning Achievement variable, three valid items were obtained. The distribution of the results obtained with each item of this variable is shown in Table 4.4.

**Table 4.4. Data distribution of the English Vocabulary Learning Achievement variable**

| Valid Item | Not Meeting Expectation | Approaching Expectation | Meeting Expectation | Exceeding Expectation |
|---|---|---|---|---|
| VLT | 3.85% | 3.85% | 15.38% | 76.92% |
| Qz | 11.54% | 9.62% | 26.92% | 51.92% |
| T2 | 7.69% | 25.00% | 30.77% | 36.54% |

**Source:** Result of data processing, 2022.

VLT is one of three valid items that measure students' English vocabulary learning achievement. From the results, it was deduced that more than half of the students obtained a good score, the equivalent of (76.92%), with a mean for this item of (93). This points out that expectations were exceeded, and it produced an optimal result not only with this item but also in the other two, Qz and T2.

The Motivation has four valid entries, according to the data analysis. Table 4.5 summarizes the distribution of questionnaire responses.

**Table 4.5. Data distribution of Motivation variable**

| Valid Item | Scale 1 | Scale 2 | Scale 3 | Scale 4 |
|---|---|---|---|---|
| **MA1** | 1.92% | 19.23% | 53.85% | 25.00% |
| **MC6** | 7.69% | 17.31% | 48.08% | 26.92% |
| **MC8** | 1.92% | 15.38% | 48.08% | 34.62% |
| **MS6** | 0.00% | 7.69% | 30.77% | 61.54% |

**Source:** Result of data processing, 2022.

Most students agree English classes are easy and that they can pass the exams without difficulty. With the greatest percentages in MC8 and MS6, it can be determined that the students agree that the teacher's comments make them feel terrific and joyful in class.

Emotions are defined as a sequence of interactions, reactions, and factors in education. When these are correctly handled, they can influence and improve students' performances. Table 4.6 summarizes the distribution of the questionnaire responses.

Table 4.6. Data distribution of the Emotions variable

| Valid Item | Scale 1 | Scale 2 | Scale 3 | Scale 4 |
|---|---|---|---|---|
| **\*EA3** | 1.92% | 5.77% | 21.15% | 71.15% |
| **\*EB4** | 7.69% | 13.46% | 26.92% | 51.92% |

**Source:** Result of data processing, 2022.

*Note*: * item is reverse scored.

Students in English class do not exhibit anger or boredom during their vocabulary learning process. Students are in total control of their emotions. Most students strongly disagree that they wish they didn't have to attend class because it makes them angry. More than half of the students surveyed (78.84%) strongly disagree.

According to the data analysis results, there are six valid items for Cognitive Engagement. The distribution of questionnaire responses is shown in Table 4.7.

**Table 4.7. Data distribution of the Cognitive Engagement variable**

| Valid | Scale 1 | Scale 2 | Scale 3 | Scale 4 |
|---|---|---|---|---|
| **CSR6** | 1.92% | 7.69% | 48.08% | 42.31% |
| **CSR7** | 1.92% | 7.69% | 40.38% | 50.00% |
| **CSR8** | 1.92% | 23.08% | 40.38% | 34.62% |

| | | | | |
|---|---|---|---|---|
| **CSP2** | 3.85% | 21.15% | 34.62% | 40.38% |
| **CSP3** | 1.92% | 21.15% | 30.77% | 46.15% |

**Source:** Result of data processing, 2022.

Most students displayed strong cognitive engagement, as proven by their ability for self-regulation in response to CSR6, CSR7, and CSR8. The trend of these items revealed that when most respondents read a question, they make sure they understand what they are asked to do before beginning.

**Table 4.8. Data distribution of the Augmented Reality variable**

| Valid Item | Scale 1 | Scale 2 | Scale 3 | Scale 4 |
|---|---|---|---|---|
| **AR2** | 11.54% | 15.38% | 28.85% | 44.23% |
| **AR5** | 9.62% | 9.62% | 26.92% | 53.85% |
| **AR6** | 3.85% | 19.23% | 51.92% | 25.00% |
| **AR12** | 3.85% | 9.62% | 46.15% | 40.38% |
| **AR15** | 0.00% | 7.69% | 59.62% | 32.69% |
| **AR19** | 1.92% | 9.62% | 36.54% | 51.92% |

**Source:** Result of data processing, 2022.

As seen on Table 4.8, the survey had six items that determined the level of usefulness of the ARCApedia augmented reality application. The data distribution revealed a higher percentage (92.31%) for item AR15. According to the last valid AR2 item, more than half of the respondents felt secure using it to learn English vocabulary.

The R-squared ($R^2$) value was employed in this study to analyze the structural model using the goodness-of-fit model test. Path coefficient analysis was used to investigate the correlations between the variables (Sánchez et al., 2021, 48). A confirmatory factor analysis was conducted to validate the remaining instrument elements as shown in Figure 4.1.
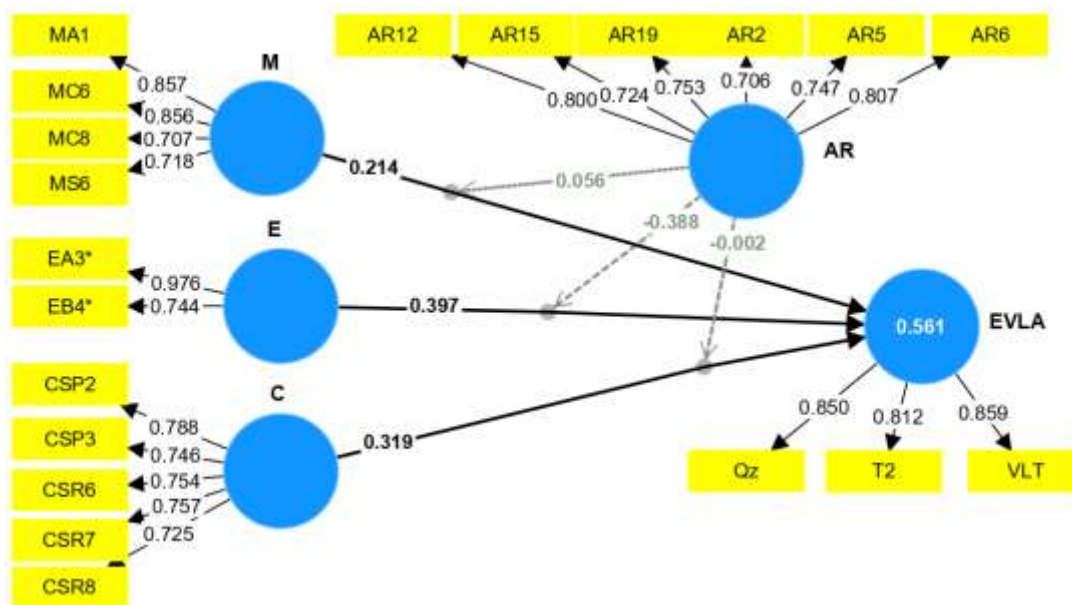


**Figure 4.1. The Path Model result of PLS-SEM Confirmatory Factor Analysis.**
**Source:** Result of data processing, 2022.

The coefficient of determination, or $R^2$, illustrates how independent variables affect dependent variables. Higher values of the $R^2$ signify a stronger explanatory power (Hair et al. 2021, 118).

**Table 4.9. The $R^2$ value result.**

| Variable | $R^2$ |
|---|---|

| | |
|---|---|
| Student's Vocabulary Learning Achievement | 0.561 |

**Source:** Result of data processing, 2022.

According to the outcome, the R² value is 0.561, as shown in Table 4.9, indicating moderate explanatory power. This figure also suggested that motivation, emotions, cognitive engagement, and AR implementation explained 56.1% of the variable students' English vocabulary learning achievement, with the remaining 43.9% explained by other factors.

The path analysis approach was used in this study's hypothesis test. Path coefficients were computed and examined. The findings of the hypothesis test are displayed in Table 4.10. Out of six hypotheses, four are supported.

The non-supported hypotheses were:
- There is a positive effect between emotions and the student's English vocabulary learning achievement using augmented reality implementation.
- There is a positive effect between cognitive engagement and the student's English vocabulary learning achievement using augmented reality implementation.

**Table 4.10. The path coefficient value results**

| Relationship | Hypothesis | Path Coefficient | Result |
|---|---|---|---|
| Motivation English Vocabulary Learning Achievement | There is a positive effect between motivation and the student's English vocabulary learning achievement. | +0.214 | Supported |
| Emotions English Vocabulary Learning Achievement | There is a positive effect between emotions and the student's English vocabulary learning achievement. | +0.397 | Supported |
| Cognitive Engagement English Vocabulary Learning | There is a positive effect between cognitive engagement and the student's English vocabulary learning achievement. | +0.319 | Supported |
| Augmented Reality Motivation and English Vocabulary | There is a positive effect between motivation and the student's English vocabulary learning achievement using augmented reality implementation. | +0.056 | Supported |
| Augmented Reality Emotions and English Vocabulary | There is a positive effect between emotions and the student's English vocabulary learning achievement using augmented reality implementation. | -0.388 | Not Supported |

| | | | |
|---|---|---|---|
| Augmented Reality Cognitive Engagement and English | There is a positive effect between cognitive engagement and the student's English vocabulary learning achievement using augmented reality implementation. | -0.002 | Not Supported |

**Source:** Result of data processing, 2022.

Augmented reality in education is still in its infancy and needs more study and development. Research should last over one term, and the population's grade level must be the same. Costs are high, especially for smartphones that have or are compatible with ARcore (aka Google Play Services for AR).

## 5. CONCLUSIONS

This study examined the relationship between motivation, emotions, and cognitive engagement in English vocabulary learning moderated by AR implementation. It was found that the greater the impact of motivation, the higher the students' vocabulary learning achievement in English class. Additionally, the role of augmented reality in moderating the relationships between motivation and English vocabulary learning achievement has a positive impact. However, the moderating effect of augmented reality implementation on the relationships between emotions and cognitive engagement is negative. This indicates that AR implementation weakens the relationship between emotions and vocabulary learning achievement.

School X's cognitive engagement and emotion have moderate path coefficients toward English vocabulary learning performance. To improve these two aspects, teachers should create techniques to encourage and motivate students to be more active participants in their own learning. Furthermore, because augmented reality has a moderating effect on the variables of motivation, emotions, and cognitive engagement, the school could create a division dedicated to the development and implementation of this technology, collaborate with a team to develop a more appealing application, and promote the use of augmented reality because it helps students reduce negative emotions.

This study only focused on vocabulary learning in English, but the potential of augmented reality is vast. AR can be used to teach other subjects, such as science and math, which may benefit students at School X. School X could place a greater focus on students' emotional development by offering support and help not just in the academic area.

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