

Effectiveness of Interactive Learning Media (ILM) on English Vocabulary Mastery of Indonesian Students: A Meta-Analysis Study

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Abstract: Effectiveness of interactive learning media (ILM) on english vocabulary mastery of Indonesian Students: A meta-analysis study. Previous research examining the effectiveness of interactive learning media (ILM) shows inconsistent results. **Objectives:** This research aims to conduct a meta-analysis study regarding the effectiveness of using ILM on English vocabulary mastery and identify what factors moderate the influence of ILM on students' English vocabulary mastery. **Methods:** This reserch uses meta-analysis method. This meta-analysis synthesized 20 primary studies that met the inclusion criteria. **Findings:** The results of analysis using the random-effects approach obtained a combined effect value of 1.10 (large effect). This value shows that the use of ILM has a big influence and is more effective than conventional learning media. The results of the moderator variable analysis show that the variables sample size, education level, region, and type of ILM moderate the impact of ILM use on students' English vocabulary mastery. **Conclusion:** The findings of this meta-analysis provide more accurate results regarding variation effects of inconsistent size and enrich knowledge about the effectiveness of using ILM.

Keywords: interactive learning media, meta-analysis, and mastery vocabulary.

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■ INTRODUCTION

Interactive Learning Media (ILM) has become one of the learning approaches adopted in the english language learning system in various countries in the last decade. With advances in digital technology, ILM offers various interactive features that can make english learning more interesting and effective (Kuprienė et al., 2017; Prabawati et al., 2021). Technologies such as web-based applications, interactive software, and e-learning platforms enable students to actively participate in the learning process, explore english vocabulary in depth, and receive immediate feedback on their exercises. In addition, ILM also provides teachers with the opportunity to personalize learning materials according to the

needs and abilities of each student, thereby significantly improving their english language understanding and skills (Muslem & Abbas, 2017; Samal, 2024). The integration of ILM into educational curricula in various countries shows great potential in overcoming the challenges of traditional english language learning and preparing the younger generation to face the challenges of the era of globalization.

The use of ILM is often associated with increasing students' mastery of english vocabulary because of its ability to provide a more interesting and interactive learning experience (Kounlaxay et al., 2021). Through the use of animation, simulations, and educational games, ILM is able to simplify complex language concepts to make

them easier to understand and interesting for students (Rachmavita, 2020). ILM allows students to learn at their own pace, providing an opportunity to review material without time pressure (So et al., 2019). Features such as immediate feedback and adaptive assessment help students quickly catch errors and correct them, thereby improving their understanding (Anwar et al., 2019). ILM can also increase students' learning motivation by providing challenges according to ability level, as well as rewards and recognition for their achievements, all of which contribute to increasing overall English vocabulary mastery (Hussein et al., 2022).

A number of studies have been conducted to evaluate the effectiveness of ILM on students' English vocabulary mastery at various educational levels and regions in Indonesia. However, the results are inconsistent. Several studies show that the use of ILM has a better impact in improving students' mastery of English vocabulary when compared to conventional learning methods (for example, Aini & Muryanti, 2022; Biola et al., 2021; Damayanti & Kristiantari, 2022; Erawati, 2016; Firdaus & Muryanti, 2020). However, other studies have found that the use of ILM does not provide better results (for example, Jelatu et al., 2018; Khotimah, 2018). These differences in findings may raise doubts for educational policymakers, especially English language educators, in making decisions regarding the use of ILM. Therefore, more comprehensive and systematic research is needed to examine the factors that influence the effectiveness of ILM.

Problems related to inconsistencies in research findings regarding the effectiveness of using ILM on students' mastery of English vocabulary can be overcome by using an appropriate research approach. For this purpose, researchers can analyze various primary studies to draw more accurate conclusions by using meta-analysis studies (Badawi et al., 2023;

Martaputri et al., 2021; Mawardi et al., 2024; Muhtadi et al., 2022; Pujiriyanto et al., 2023; Purnomo et al., 2022; Setiawan et al., 2022; Sulistyowati et al., 2023). Meta-analysis combines various primary research results and aims to find the causes of differences in findings that are useful for considering future practice (Mullen, 2013). In contrast to single experimental research, meta-analysis research is able to provide more objective results and conclusions regarding the relationship between the two variables studied (Borenstein et al., 2021). Therefore, this research will use a meta-analysis study to obtain more accurate conclusions about the use of ILM on students' English vocabulary mastery so that English educators can consider the use of ILM in the future.

Meta-analysis research related to the use of interactive learning media was previously carried out by Ji et al. (2024) and Li et al. (2022). However, this research did not focus on investigating how effective the use of ILM is in the English language learning context. This needs to be done because ILM has characteristics that are different from other technological media, such as higher interactivity, the ability to adapt to individual student needs, and special features that can directly support the mastery of complex English vocabulary. By examining the effectiveness of using ILM specifically, we can understand more deeply the extent to which this media can improve students' vocabulary mastery and identify the most effective aspects of ILM to be implemented in English language learning.

Based on the needs above, this research aims to overcome the limitations of previous research with two main objectives: (1) evaluating the effectiveness of implementing Interactive Learning Media (ILM) on students' overall English vocabulary mastery, and (2) identifying differences in the effectiveness of ILM at various levels of students' English vocabulary mastery based on research moderator variables. This is important to help English educators determine the

most optimal conditions for implementing ILM to improve students' vocabulary mastery. The aim of this research will be achieved by analyzing primary studies conducted regarding the impact of ILM on students' english vocabulary mastery in Indonesia using meta-analysis studies. The following research questions are focused on:

- Does the use of ILM have a significant impact on students' mastery of english vocabulary in Indonesia compared to conventional methods?
- Is there a difference in the effectiveness of using ILM on students' mastery of english vocabulary in Indonesia based on the following educational levels: (a) PAUD, (b) Elementary School, and (c) Junior High School?
- Is there a difference in the effectiveness of students' use of english vocabulary in ILM in Indonesia based on the following educational levels: (a) PAUD, (b) Elementary School, and (c) Junior High School?

- Is there a difference in the effectiveness of implementing ILM for students' english vocabulary in Indonesia based on the following regions: (a) western Indonesia, (b) central Indonesia, and (c) eastern Indonesia?
- Is there a difference in the effectiveness of students' use of english vocabulary ILM in Indonesia based on the following types of ILM: (a) mobile learning, (b) educational games, (c) animated videos, (d) multimedia, and (e) interactive modules?

■ METHOD

Research design

This research uses a meta-analysis design to evaluate the effect of implementing ILM on students' English vocabulary mastery. The meta-analysis design was chosen with the aim of integrating previous research findings, thereby providing a clearer picture of the impact of implementing ILM on students' english vocabulary mastery.

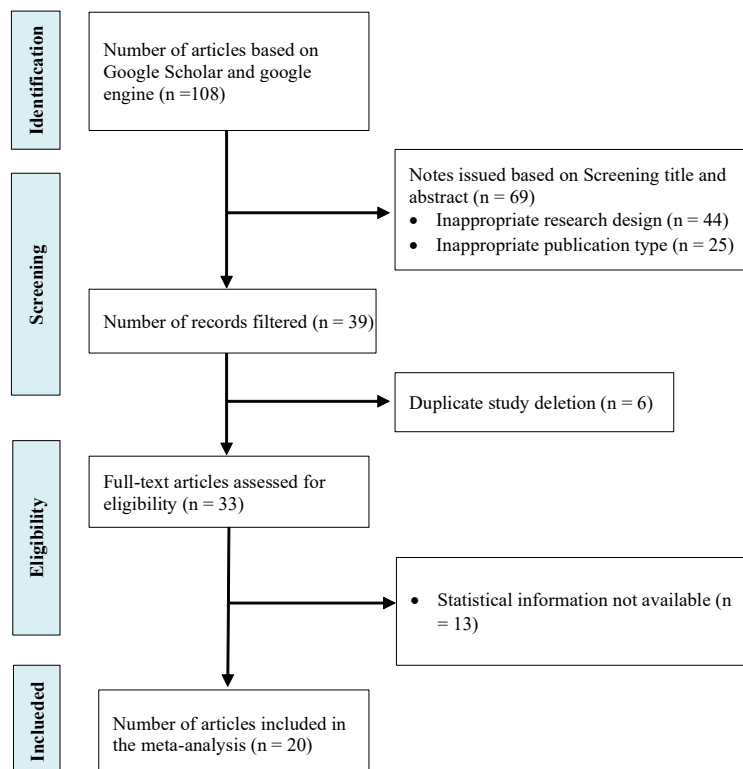


Figure 1. Screening process the literature uses PRISMA

Criteria Inclusion and Data Collection

The inclusion criteria set for this meta-analysis include: (1) research articles published between 2019 and 2024; (2) using experimental, quasi-experimental, or observational research designs with a clear control group; (3) Studies must report data on english vocabulary mastery using ILM; (4) Research must be conducted in Indonesia; and (5) provide sufficient statistical data to calculate the effect size. Data collection was carried out via Google Scholar and the Google search engine. The initial data collected is then filtered through four stages, namely identification, screening, eligibility and inclusion. The screening results yielded 20 primary studies that met the criteria for inclusion in this meta-analysis. Screening Process literature can be seen in figure 1 below.

Data Analysis

Comprehensive Meta-Analysis (CMA) software version 3. The stages in the meta-analysis

scheme applied include: 1) measuring the effect size of each study regarding the effect of implementing Interactive Learning Media (ILM) on students' mastery of english vocabulary; 2) calculating pooled effect sizes and evaluating publication bias issues; and 3) analyzing moderator variables to identify factors that moderate the influence of ILM on students' english vocabulary mastery. The process of interpreting effect sizes in assessing the influence of implementing ILM in this research refers to the classification developed by Cohen (2017). The effect size categories (g) based on this are: 1) The "negligible" category if the effect size value is $0.00 < g < 0.19$; 2) Category "small effect" if the effect size value is $0.19 < g < 0.49$; 3) Category "medium effect" if the effect size value is $0.49 < g < 0.79$; 4) "large effect" category if the effect size value is $0.79 < g < 1.29$; and 5) The "very large effect" category if the effect size value $g > 1.29$. The data analysis process using CMA software can be seen in Figure 2 below.

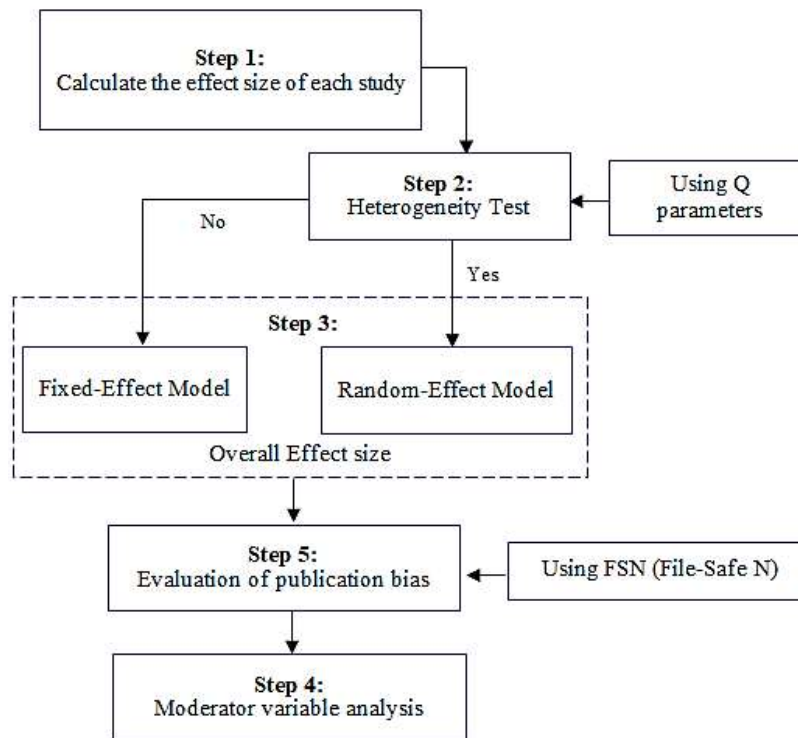


Figure 2. Data analysis scheme using CMA software

■ RESULT AND DISCUSSION

The effectiveness of ILM on Mastery English Vocabulary Student by Whole

The first aim of this analysis is to assess the effect of using ILM on students' overall english vocabulary mastery. Effect calculation results The size of each study with the help of CMA

version 3 software is presented in Table 1 below.

Table 1 shows the overall effect size variation ranging between -0.35 and 7.86, with 95% confidence limits. Meanwhile, Table 2 explains the results of the descriptive meta-analysis based on the estimation method.

Table 1. Effect size for every study

No	Author	Effect Size	Confidence Interval (CI)		Standard error
			Lower Limits	Upper Limits	
1	Aini & Muryanti, 2022	1.27	0.72	1.82	0.28
2	Violin et al., 2021	2.10	1.57	2.63	0.27
3	Damayanti & Kristiantari, 2022	1.02	0.57	1.47	0.23
4	Erawati, 2016	3.09	2.38	3.80	0.36
5	Firdaus & Muryanti, 2020	1.32	0.79	1.85	0.27
6	Fitra, 2023	0.97	0.38	1.56	0.30
7	Hayati et al., 2021	0.79	0.28	1.30	0.26
8	Indah & Muryanti, 2023	0.65	0.18	1.12	0.24
9	Monica & Muryanti, 2023	0.63	0.26	1.00	0.19
10	Muryanti, 2022	0.36	-0.15	0.87	0.26
11	Novaria et al., 2024	1.05	0.56	1.54	0.25
12	Qamariah et al., 2023	0.99	0.52	1.46	0.24
13	Rizky, 2021	0.91	0.42	1.40	0.25
14	Susantini & Kristiantari, 2021	1.23	0.74	1.72	0.25
15	Shahid et al., 2024	0.42	-0.05	0.89	0.24
16	Terananda et al., 2020	0.45	-0.04	0.94	0.25
17	Jelatu et al., 2018	0.13	0.02	1.44	0.36
18	Warohmah & Wahyuningsih, 2019	0.18	-0.29	0.65	0.24
19	Khotimah, 2018	0.19	0.36	1.22	0.22
20	Kusumah et al., 2020	0.79	0.31	1.22	0.21

Table 2. Heterogeneity analysis and pooled effect sizes

Estimation Method	<i>k</i>	<i>g</i>	<i>p</i>	<i>df</i>	Heterogeneity			Decision
					<i>Q</i>	<i>p</i>	<i>i</i> ²	
Random-Effect	20	1.10	0.00	19	694.14	< 0.01	91.02	Reject H ₀
Fixed-Effect	20	1.02	0.00	19				

Based on Table 2 above, the Q value is $694.14 > \chi^2$ ($df = 19; p = 0.05$). It can be concluded that the variation in the overall effect size of the study is heterogeneous. Therefore, the estimation model used to calculate the pooled effect size is random effects. Based on the random effects estimation model, the combined effect size obtained was ($g = 1.10; p < 0.001$). Effect value This size is included in the very large effect category. Thus, it can be concluded that the use of ILM has a very big influence on students' mastery of english vocabulary. This finding is in line with meta-analysis research conducted by Juandi et al. (2021), who found that the use of technological media has a significant effect on student achievement. In addition, a meta-analysis study conducted by Akçay et al. (2021) and Higgins et al. (2017) also found that the use of technology has a significant effect on student learning achievement. The consistency of research results from various studies can provide stronger strength in recommending the use of ILM as an effective learning media approach to increase students' mastery of english vocabulary.

Interactive learning media can motivate children to learn in an interesting and fun way. This makes students more active and involved in the learning process, so they are better prepared to expand their vocabulary (Chotimah, 2021). Interactive learning media can also overcome sensory limitations by presenting information visually, audio, and interactively. This allows children to interact directly with their environment and clarify the presentation of messages and information (Andreani & Ying, 2019). A more interactive learning process allows children to interact directly with the material, so that learning is clearer and more interesting. In addition, interactive learning media can also increase the efficiency of teachers' time and energy in delivering material (Rahimi, & Allahyari, 2019).

The Effectiveness of ILM on Mastery vocabulary Language English Based on Moderator Variables

Deep moderator variables This research includes amount sample, level education, region, and type of ILM. Table 3 presents results analysis moderator variable.

Table 3. Analysis moderator variable

Moderator Variables	k	g	p	Heterogeneity			Decision
				df	Qb	p	
Sample size							
Large (> 30)	11	1.03	0.00	1	15.39	0.00	Reject H_0
Small (\leq 30)	9	1.25	0.00				
Level of Education							
Preschool	6	0.91	0.00	2	23.47	0.00	Reject H_0
Elementary school	10	1.27	0.00				
Junior high school	4	0.84	0.00				
Region							
Western Indonesia	12	0.12	0.00	2	25.10	0.00	Reject H_0
Central Indonesia	7	2.19	0.00				
eastern Indonesia	1	0.72	0.00				
ILM Type							
Mobile Learning	5	2.46	0.00	4	34.05	0.00	Reject H_0
Educational Games	3	5.09	0.00				
Animation Videos	2	5.99	0.00				
Multimedia	3	1.04	0.00				
Interactive Module	2	1.23	0.00				

Sample Size

Table 3 shows a Qb value of 25.39, this value is greater than χ^2 ($df=1; p=0.05$). These results indicate that the magnitude of the influence on english vocabulary mastery using ILM does not differ significantly based on sample size. This finding is in line with the findings of a number of previous studies, such as those reported by Yakar (2021), Karagon and Esen (2019), Juandi et al. (2021), and Purnomo et al. (2022). Their study found that in a small sample size, the use of technology-based learning media tends to produce an effect bigger size. The recommendation that can be drawn from these findings is that to achieve a higher level of effectiveness in using ILM for students' mastery of english vocabulary, it is recommended to use a smaller class capacity. Even though there are significant differences between the educational level groups that we analyzed, the use of ILM was proven to be effective in increasing students' mastery of english vocabulary in each of these groups.

Level of education

Table 3 shows a Qb value of 23.47, this value is greater than χ^2 ($df=2; p=0.05$). These results indicate that the magnitude of the influence on english vocabulary mastery using ILM does not differ significantly based on education level. This result is also in line with the findings of Juandi et al. (2021) and Mawardi et al. (2024), who also found that the educational level variable moderates the influence of the technology used on student learning achievement. Even though there are significant differences between the educational level groups that we analyzed, the use of ILM was proven to be effective in increasing students' mastery of english vocabulary in each of these groups.

Region

Table 3 shows a Qb value of 25.10, this value is greater than χ^2 ($df=2; p=0.05$). These

results indicate that the magnitude of the influence on english vocabulary mastery using ILM does not differ significantly based on region. This finding is in line with research by Purnomo et al. (2022) and Zuliana et al. (2025) who also found that regional variables moderated the effectiveness of using the flipped model classroom on student learning achievement. Even though there are significant differences between the educational level groups that we analyzed, the use of ILM was proven to be effective in increasing students' mastery of english vocabulary in each of these groups.

ILM Type

Table 3 shows a Qb value of 34.05, this value is greater than χ^2 ($df=4; p=0.05$). These results indicate that the magnitude of the influence on english vocabulary mastery using ILM does not differ significantly based on the type of ILM. These findings are in line with Akçay's et al. (2021) and Juandi et al. (2021), who found that the type of technology can influence the impact of using technology-based learning on student learning achievement. Even though there are significant differences between the ILM type groups that we analyzed, the use of ILM was proven to be effective in increasing students' english vocabulary mastery in each of these groups.

■ CONCLUSION

This research was conducted by integrating previous findings related The influence of using ILM on students' mastery of english vocabulary, both overall and on several research moderator variables. The results of the analysis reveal that the use of ILM has a positive impact on students' mastery of english vocabulary and is more effective compared to learning media conventional. Assessment of the effectiveness of ILM based on moderator variables shows that the effectiveness of using ILM on students' mastery of english vocabulary is different

significantly based on moderator variables sample size, education level, region, and type of ILM. Although the use of ILM is certain to have a big influence on students' mastery of english vocabulary, these results are only based on research with certain criteria. Some similar studies were not analyzed because the required statistical information was insufficient. For the purposes of this study, only four study moderator variables were examined. Meanwhile, we have not included several others, such as year of research, type of publication, material lessons, and the length of treatment for analysis. Therefore, further research requires in-depth investigation to determine the effectiveness of ILM using several characteristics that have not been studied.

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