



# Meta-analysis of IT-Based Learning Media for Elementary School Students

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**Abstract.** This meta-analysis is motivated by the fact that teachers still have not optimized the use of Information and Technology (IT)-based learning media, especially in elementary schools. The purpose of this meta-analysis is to identify 1) the effect size of IT-based learning media based on grade level at the elementary school level, 2) the effect of IT-based learning media based on the type of media used in elementary schools, and 3) effect size of IT-based learning media based on the material used as learning content in elementary schools. In this study, we used a meta-analysis of 15 articles as samples from national journals, and the instrument was a coding category. The results showed that 1) the effect size of IT-based learning media based on the best grade level in class IV was 1.07 (very high category), 2) the effect size of IT-based learning media based on the Edmodo media type was 2.21 (high influence category), and 3) the effect size IT-based learning media based on the science material was 1.29 (very high influence category). Accordingly, we formulated some recommendations. First, further study should investigate the implementation of IT-based learning media in elementary schools in grade IV. Second, the recommended media is Edmodo, because it is the most effective IT-based learning media in elementary schools. Third, it is recommended to use It-based learning media in science material of elementary schools I.

**Keywords:** Effect size · Edmodo · IPA

## 1 Introduction

The rapid development of science and technology has affected the world of education, especially in learning activities. In learning activities, there are components related to the learning process. The learning component consists of educators, students, learning objectives, learning methods, learning models, teaching materials, learning tools or learning media, and evaluation tools. One critical component of the learning process is teaching tools or learning media. Learning media has a vital function in helping educators convey material to students and facilitate students' understanding of the material presented by educators so that they can achieve learning objectives. This is in accordance with the statement conveyed by [1] that learning media are everything that can be used to channel messages (learning materials) so that they can stimulate students' attention, interests,

thoughts, and feelings in learning activities to achieve learning goals. The learning media was previously dominated by paper-based learning media. However, the development of learning technology has changed this trend into Information and Technology (IT)-based learning media. Examples of paper-based media are posters, charts, sticky boards, and many more. As for IT-based learning media, examples are PowerPoint media, video, android-based media, augmented reality, adobe flash, and many more. But in reality, educators, especially educators in elementary schools, still lack knowledge about using IT-based learning media that are suitable for use in learning. Therefore, an analysis of previous related studies is essential to identify and understand IT-based learning media suitable for learning in elementary schools.

This meta-analysis was conducted on research articles that discussed IT-based learning media in elementary schools, published in the last five years, and published in national journals with ISSN. However, none of our gathered research articles were published in 2017. We obtained the IT-based learning media articles by searching through SINTA and Google Scholar. Then the classification was completed based on the type of media used, the level of education, namely the grade level in elementary school, and the material used in the study.

Therefore, the formulation of the problem from this meta-analysis research was 1) how is the effect size of IT-based learning media in elementary schools based on education level or grade level in elementary schools?; 2) how is the effect size of IT-based learning media in elementary schools based on the type of media?; (3) how is the effect size of learning media IT-based in primary schools based on the materials used in primary schools?

## 2 Methods

This study used a meta-analysis method by reviewing several research articles published in national journals. Meta-analysis is quantitative because it uses numerical calculations and statistics for practical purposes, such as for compiling and extracting information from a large amount of data, which is not facilitated by other methods [1]. This meta-analysis research used 15 research articles published in national journals discussing IT-based learning media in elementary schools in the last five years (2017–2022).

Coding in meta-analysis is the most critical requirement to facilitate data collection and analysis. Accordingly, the instrument in this meta-analysis was a coding sheet. Further, the variables used in coding helped us attain the information needed to calculate the influence of IT-based learning media in elementary schools, consisting of the authors' names, years, research titles, the participants' grades, along with the material or subject, and types of IT-based learning media being used.

The steps for tabulating data consisted of 1) identifying the type of research and research variables, then entered in the appropriate variable column, 2) identifying the mean and standard deviation of the experimental group data before treatment, control group, or after treatment for each subject or sub research that has been tested, 3) calculating the frequency distribution and effect size by using the Glass formula [1] specifically for data with testing. The calculation was completed based on the mean and standard deviation by finding the magnitude of the Effect size ( $\Delta$ ) by dividing the difference in

the mean of the experimental group (XE) with the mean of the control group (XK), with the standard deviation of the control group (SK).

$$\text{Effect size}(\Delta) = \frac{(XE) - (XK)}{SD \text{ control}}$$

$$(\Delta) = \text{Effect size}$$

$(XE)$  = the mean of the experimental group

$(XK)$  = the mean of the control group

$SD$  = Standar Deviasi

In addition, we used the following effect size criteria to interpret the calculation results.

- effect size 0.15 negligible effect
- 0.15 < effect size 0.40 small effect
- 0.40 < effect size 0.75 medium effect
- 0.75 < effect size 1.10 high effect
- 1.10 < effect size 1.45 very high effect
- 1.45 < effect size high influence

### 3 Results and Discussion

The analysis results of 15 research articles concerning the effects of IT-based learning media in elementary schools on student learning outcomes are presented in Table 1.

From the 15 articles, we also summarized the use of IT-based learning media in elementary schools based on grade level, as presented in Table 2.

The distribution of research on IT-based learning media in elementary schools is based on Table 2. The highest IT-based learning media usage was found in grades three to six, followed by a positive influence of learning media on learning outcomes. Then, research on IT-based learning media in elementary schools was mostly carried out in class V (46 %), then class IV (40.00%), and the least use of IT-based learning media was in grades III and VI. Meanwhile, the studies suggested the most significant effects of IT-based learning media was in class IV (very high category of 1.07), followed by the use of IT-based learning media in grade V elementary schools, which shows an increased effect of 0.85. Meanwhile, the implementation of IT-based learning media in third-grade and sixth-grade of elementary schools showed a small effect of 0.31 and 0.21, respectively. Due to the fact that class III is still considered to be low-class and the students are still considered to be young children, it is still not ideal for them to use IT-based learning resources. According to the statement conveyed [17], low-grade students are categorized as early childhood groups. Early childhood has not capable of using IT-based learning media independently. Besides, their learning activities still tend to follow the instructions and directions of educators. These students also require more

**Table 1.** Distribution of Article Sample

Study	Year	IT Media Type	Class	Theory	SD	Effect Size
[2]	2018	Powerpoint	III	Mathematics	15.7	0.31
[3]	2018	Adobe Flash	IV	IPS	9.96	1.21
[4]	2018	Audio Visual (Video)	IV	PKn	10.83	0.43
[5]	2019	Videos	V	IPA	7.87	0.67
[6]	2019	Edmodo	VI	IPA	4.00	2.21
[7]	2019	Camtasia (Video)	V	IPA	6.3	1.19
[8]	2019	Audio Visual (Video)	IV	Thematic	14.16	0.55
[9]	2020	Interactive using Adobe Flash	V	IPA	10.41	0.34
[10]	2020	Android	V	Mathematics	9.71	0.26
[11]	2021	Augmented Reality	IV	Thematic	8.17	0.95
[12]	2021	Videos	V	IPA	8.79	0.88
[13]	2022	Canva (Video)	IV	IPA	10.33	0.65
[14]	2022	Office 365	V	IPA	9.98	1.72
[15]	2022	Kinemaster (Video)	IV	IPA	2.78	2.66
[16]	2022	Flash	V	Mathematics	15.39	0.91

**Table 2.** Elementary School Grade Level Distribution

Class	Frequency	Relative Frequency (%)	Effect Size
III	1	6.67	0.31
IV	6	40.00	1.07
V	7	46.00	0.85
VI	1	6.67	0.21

attention from educators. Meanwhile, [18] states that students at low levels need more attention because their communicating skills are still deficient.

The distribution of IT-based learning media based on the type of media used in elementary schools is shown in Table 3.

The distribution of media types and Effect size is shown in Table 3. The analysis of the effect size shows a positive influence for all IT-based learning media in elementary schools, as presented in Table 3. The most frequently used type of IT-based learning media in elementary schools is video media (46.00%), with an effect size of 1.00 (high effect category). Its significant effect size is because it offers easier use and the ability to set the duration of time in the beginning. Besides, it does not involve students in their operation. This finding is linear with results of research [20], stating that 1) learning activities using video media can provide a fun and not boring atmosphere for students so

**Table 3.** Distribution of Learning Media Type and The Effect Size

Media Type	Frequency	Relative Frequency ( %)	Effect Size
Adobe Flash	3	20.00	0.82
Videos	7	46.00	1.00
Edmodo	1	6.67	2.21
Android	1	6.67	0.26
Augmented Reality	1	6.67	0.95
Office 365	1	6.67	1.72
PowerPoint	1	6.67	0.31

**Table 4.** Material Distribution

Theory	Frequency	Relative Frequency (%)	Effect Size
IPS	1	6.67	1.21
Civic Education	1	6.67	0.43
Science	8	53.33	1.29
Mathematics	3	20	0.25
Thematic	2	13.33	0.63

that students' attention is focused on videos containing the learning material, 2) events that are not physically viable to present in a classroom can be shown via video media, so students can find out more about these events, and 3) video media meet all students' distinct learning characteristics, starting from audio, visual or audio-visual learners. At the same time, the largest effect size is observed in Edmodo IT-based learning in elementary schools, with a score of 2.21 (high category). A study from (in Basori, 2013) described the advantages of Edmodo, which include 1) constructing learning that is not dependent on time and place, 2) facilitating an easier way for teachers to provide assessments to students, 3) providing opportunities for parents or guardians of students to monitor the learning activities and achievements, 4) realizing a more dynamic class because it enables the interaction of educators and students as well as students with students in terms of lessons and assignments, 5) facilitating multidisciplinary group work, and 6) encouraging a collaborative virtual environment that helps process-based learning.

The material distribution in the implementation of IT-based learning media based in elementary schools is presented in Table 4.

The type of learning material used in the implementation of IT-based learning media research in elementary schools is quite varied. Most of the IT-based learning media is implemented in the science material (53.33). This is supported by the largest effect size in science subjects, which was 1.29, categorized as a very high effect. This finding is

induced by the need to illustrate the science materials using IT-based learning media because it is challenging to visualize the materials directly. Accordingly, [21] states that biology or science materials are frequently difficult to be visualized directly, hindering students' comprehension.

## 4 Conclusion

The results showed that 1) the greatest effect size of IT-based learning media in elementary schools was in sixth grade, with a 1.07 score categorized as very high; 2) the most significant effect size of IT-based learning media based on the type of media used in the best elementary schools is Edmodo, with 2.21 score classified as a strong influence; and 3) the largest effect size of elementary school IT-based learning media based on the material is on science material, with 1.29 score in the very high influence category. Based on these results, further research is suggested to focus on the implementation of IT-based learning media in elementary schools in grade IV. Besides we also recommend the use of Edmodo as a learning media because it is the most effective IT-based learning media in elementary schools. Lastly, IT-based learning media is highly suggested to be used in science courses.

## References

1. M. L. Glass, G.V., McGaw B., & Smith, *Meta-Analysis in Social Research*. London: Sage Publications, 1981.
2. M. Salahuddin, K. Y. Margiati, P. Studi, P. Guru, and S. Dasar, "Pengaruh Penggunaan Media Microsoft Powerpoint," pp. 1–8, 2013.
3. A. Nurikhlas and S. Marli, "Pengaruh Multimedia Berbasis Program Adobe Flash," pp. 1–8.
4. Nasrullah, T. Sabri, and Rosnita, "PENGARUH PENGGUNAAN MEDIA AUDIO VISUAL TERHADAP HASIL BELAJAR PENDIDIKAN KEWARGANEGARAAN SEKOLAH DASAR NEGERI Media pembelajaran seperti yang diungkapkan oleh Gerlach & Ely 1971," vol. 07, no. 9, pp. 1–10, 2018.
5. S. Gowasa, F. Harahap, and R. D. Suyanti, "Perbedaan Penggunaan Media Powerpoint dan Video Pembelajaran terhadap Kemampuan Berpikir Tingkat Tinggi dan Retensi Memori Siswa pada Mata Pelajaran IPA di Kelas V Sd," *J. Temat.*, vol. 9, no. 1, pp. 19–27, 2019.
6. A. . Sobron, Bayu, Rani, and M. S., "Pengaruh Daring Learning terhadap Hasil Belajar IPA Siswa Sekolah," *Prosiding*, vol. 1, no. 1, pp. 1–5, 2019, [Online]. Available: [https://www.researchgate.net/publication/338713765\\_Pengaruh\\_Daring\\_Learning\\_terhadap\\_Hasil\\_Belajar\\_IPA\\_Siswa\\_Sekolah\\_Dasar](https://www.researchgate.net/publication/338713765_Pengaruh_Daring_Learning_terhadap_Hasil_Belajar_IPA_Siswa_Sekolah_Dasar).
7. S. Z. Harahap and U. S. Rezeki, "Pengaruh Penggunaan Media Pembelajaran Berbasis Ict Dan Gaya Belajar Terhadap Hasil Belajar Ipa Dan Keterampilan Bertanya Siswa Sd Negeri 060798 Medan Area," *J. Curere*, vol. 3, no. 2, pp. 26–32, 2019, doi: <https://doi.org/10.36764/jc.v3i2.245>.
8. S. M. & T. S. & H. K. Pangesti, "Pengaruh Media Audio Visual Terhadap Hasil Belajar Siswa Dalam Pembelajaran Tematik Kelas IV SD," *Pendidik. dan Pembelajaran Khatulistiwa*, vol. 8, pp. 1–8, 2019.
9. U. B. Harsiwi and L. D. D. Arini, "Pengaruh Pembelajaran Menggunakan Media Pembelajaran Interaktif terhadap Hasil Belajar siswa di Sekolah Dasar," *J. Basicedu*, vol. 4, no. 4, pp. 1104–1113, 2020, doi: <https://doi.org/10.31004/basicedu.v4i4.505>.

10. U. Wiranda and M. Masniladevi, “Pengaruh Media Pembelajaran Berbasis Android Pada Materi Pecahan Terhadap Hasil Belajar Siswa Di Sekolah Dasar,” *J. Pendidik. Tambusai*, vol. 4, no. 3, pp. 3045–3051, 2020, [Online]. Available: <https://jptam.org/index.php/jptam/article/view/808>.
11. T. Claudya, “濟無No Title No Title No Title,” vol. 07, 2019.
12. K. Dewi, N. P., Pagarra, H., & Khaerunnisa, “Pengaruh Penggunaan Video Pembelajaran Terhadap Hasil Belajar Siswa Sekolah Dasar Kelas Lima Di Kabupaten Takalar,” *Pinisi J. Educ.*, vol. 1, no. 3, pp. 151–160.
13. L. S. Sari and S. Fatonah, “Pengaruh Media Pembelajaran Berbasis Aplikasi Canva terhadap Motivasi dan Hasil Belajar IPA Siswa Kelas IV,” *J. Pendidik. Tambusai*, vol. 6, no. 1, pp. 1699–1703, 2022.
14. M. (2022). PANDE, M. W., ASWASULASIKIN, A., & MARHAMAH, “PENGARUH MEDIA PEMBELAJARAN BERBASIS OFFICE 365 TERHADAP BERPIKIR KRITIS DAN HASIL BELAJAR IPA SD KELAS V GUGUS IV KECAMATAN SAMBELIA,” *Inovasi, J. Berbantuan, Pendidik. Vol, Teknol.*, vol. 2, no. 2, pp. 196–205, 2022.
15. D. F. Dwi, A. Alfaroby, U. Muslim, and N. A. Medan, “Efektivitas Media Video Berbasis Aplikasi Kinemaster,” 2019.
16. F. R. Hadi, “Efektifitas Macromedia Flash Terhadap Pemahaman the Effectiveness of Macromedia Flash on Mathematics Concepts Understanding in,” vol. 4, no. 2, pp. 21–26, 2022.
17. I. zulvira Riri, Neviyarni, “Karakteristik Siswa Kelas Rendah Sekolah Dasar,” *J. Pendidik. Tambusai*, vol. 5, no. 1, pp. 1846–1851, 2021, [Online]. Available: <https://www.jptam.org/index.php/jptam/article/view/1187>.
18. Y. Helsa and A. K. Kenedi, “Edmodo-Based Blended Learning Media in Learning Mathematics,” *J. Teach. Learn. Elem. Educ.*, vol. 2, no. 2, pp. 107–117, 2019, doi: <https://doi.org/10.33578/jtelee.v2i2.7416>.

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