The Audio-Visual Media on Cognitive Learning Outcomes

Wanda Manulang[1*], Haifaturrahmah[2], Linda Sekar Utami[3], Syaharuddin[4], Siti Ala[5] iD

[1,2] Elementary School Teacher Education, Universitas Muhammadiyah Mataram, Mataram, Indonesia
[3] Department of Physics Education, Universitas Muhammadiyah Mataram, Mataram, Indonesia
[4] Department of Mathematics Education, Universitas Muhammadiyah Mataram, Mataram, Indonesia
[5] Department of Chemical Engineering, Curtin University, Bentley, Australia

A B S T R A K

Dalam meningkatkan hasil belajar kognitif siswa, diperlukan penggunaaan media yang tepat pada proses pembelajaran. Penggunaan media audio visual sangat tepat dalam meningkatkat hasil belajar siswa. Tujuan dari penelitian ini adalah untuk menganalisis kembali hasil-hasil penelitian pada tingkat akurasi pengaruh hasil belajar kognitif siswa dalam menggunakan media audio visual. Metode yang digunakan dalam penelitian ini adalah meta analisis. Data diperoleh dari database pengindeks seperti Google Scholar, Doaj, dan Scopus. Kemudian dilakukan filtrasi data pada hasil penelitian yang memuat nilai uji fisher (F), uji student (t), uji korelasi (r), dan jumlah siswa (N).Hasil analisis data menggunakan software JASP sebanyak 49 data terdapat adanya pengaruh yang signifikan dalam meningkatkan hasil belajar kognitif siswa menggunakan media audio visual. Dalam analisis data pada jenjang SD terdapat pengaruh sebesar 72%, pada jenjang SMP terdapat pengaruh sebesar 77% dan pada jenjang SMA terdapat pengaruh sebesar 92%. Kemudian pada klasifikasi mata pelajaran sosial dan budaya terdapat pengaruh sebesar 82% dan pada mata pelajaran ipa dan matematika terdapat pengaruh sebesar 68%. Dari hasil perbandingan tingkat akurasi pengaruh tersebut dapat dilihat bahwa penggunaan media audio visual sangat besar pengaruhnya pada jenjang SMA dan pada klasifikasi mata pelajaran sosial dan budaya sangat besar pengaruhnya.

A B S T R A C T

Suitable media in the learning process is required to improve students' cognitive learning outcomes. Utilizing visual and audio media is precise in enhancing students' learning outcomes. This study aims to re-analyze previous studies on the accuracy levels of the effect of students' cognitive learning outcomes in using audio-visual media. The method used in this research is Meta-analysis. The data was acquired from indexing databases such as Google Scholar, Doaj, and Scopus. Afterward, the study conducted data filtration on the research result that contains Fisher test score (F), student test (t), correlation test (r), and the number of students (N). The result of data analysis using JASP software is that as many as 49 data significantly improve students' cognitive learning outcomes using audio-visual media. In data analysis at the elementary school level, the effect is 72%; at the junior high school level, the effect is 77%; and at the senior high school level, the effect is 92%. Then, in the classification of social and cultural subjects, the effect is 82%, while in science and mathematics subjects, the effect is 68%. From comparing the accuracy level of the impact, one can observe that using audio-visual media has an enormous influence at the high school level and on social and cultural subject classification.

1. INTRODUCTION

Education is a deliberate and planned effort to foster a learning and studying environment so that students actively develop their potential and have spiritual (religious) strength, self-control, personality, intelligence, noble character, and skills that they and society require (Bosica et al., 2021; Farozin et al., 2020). A learning media is an activity utilized as a learning source to obtain knowledge, skill, and positive values from learning activities. Media is a means of communication, either printed or audio-visual, including its hardware technology (Hutauruk & Sidabutar, 2020; Susanti & Zahri, 2022). Technological and scientific developments have impacted the implementation and availability of teaching materials in schools and

educational institutions. Technological developments and their predominant role in using teaching aids such as props, sound, images, audio-visual and other school materials adapt to curriculum developments and demands, materials, methods and qualifications so that students can achieve their learning goals (Rafianti et al., 2018; Schmidt et al., 2014).

An audio-visual media combines audio and visual, or it can be called viewing and hearing media. Typically, video media functions create something authentic, even though it is physically unreal. Learning by using the dual senses of sight and hearing may benefit students to understand better the lesson material explained by the teacher (Affiati et al., 2021; Winarto et al., 2020). This audio-visual media can also enhance students' comprehension and strengthen memory, so they are eventually expected to optimize their potential and abilities (Gading & Dian Kharisma, 2017; Marlena et al., 2019). Using audio-visual media, teachers can make the contents of teaching materials for students more efficiently, ultimately, and optimally (Ariasa, 2018; Fuady & Mutalib, 2018; Hukama, Muhifbatul, Laihat, 2017). Audio-visual media implementation can be practised at the elementary, junior high and high school levels to improve cognitive learning outcomes. At the elementary school level, there are many studies such as from; (Novita et al., 2019; Pratama et al., 2018; Putri et al., 2018). Previous study state audio-visual media has a positive effect on student learning outcomes in grade V (Abdullah & Maryati, 2019). These results can be seen from the output of statistical data analysis which proves that H_a is accepted by the acquired t-test, t_{count} 3.214 > t_{table} 2.045. In other research, audio-visual media has a positive effect on improving student learning outcomes in class IV with 22 students participating (Adittia, 2017). These results can be seen from the data analysis from the t-test results obtained t_{count} 9.247 > t_{table} 1.720. Next, the study shows that the influence of audio-visual media can improve student learning outcomes in the types of work lesson material (Patmawati et al., 2018). These results can be proven from the average experimental class activity of 0.67 and research from other study also proving that there is a positive impact from the application of the audio-visual media cooperative model in applying high school science learning (Aristo et al., 2019). The results of the hypothesis using the t test obtained t_{count} 1.684> t_{table} 1.676.

Implementing audio-visual media also has a positive effect on cognitive learning outcomes at the junior high school level, as reported by previous studies (Kharismayani et al., 2019; Lestari et al., 2022; Widiya et al., 2022; Yunita Putri & Sandra, 2020). In previous study, there is an influence of audio-visual (video) media on mathematics learning outcomes (Jusmiana et al., 2020). These results are seen from the t-test analysis output, which obtained t_{count} of 2.329 and t_{table} of 2.007. Later on, other research stated that implementing audio-visual media through learning videos can improve learning outcomes in the cognitive aspects of the tested students (Hastutik, 2020). These results are reflected through the t-test output, t_{count} 3.269 > t_{table} 1.688. Applying audio-visual media also has a positive effect on student learning outcomes at the high school level, as shown in the following studies (Nasution, 2022; Taufik & Gaos, 2019; Triasih et al., 2020). Previous research shows a significant influence on student learning outcomes between the average learning outcomes of students who use audio-visual media and those who do not use audio-visual media in the learning process on virus lesson material (Amri, 2021; Susanti & Zahri, 2022; Tanjung, 2021). These results can be seen from the data analysis using the t-test; the t_{count} value is 2.319 > t_{table} 1.713 with a 0.05 significance level.

Previous studies can be used as a reference to expand the number of theories that will be used to explore the research conducted. This research was conducted by reviewing existing data, both in the form of articles and journals and other sources of reports (Saputro, 2022; Sulfemi & Kamalia, 2020; Triari, 2021; Windasari & Sofyan, 2019). The urgency of this research needs to be done to provide a more accurate estimate of the effect of audio visual media on cognitive learning outcomes. Therefore the purpose of this study is to re-analyze the results of research on the accuracy of the effect of cognitive learning outcomes using audio visual media to obtain new findings as evidence of the truth of existing knowledge.

2. METHOD

This research employed a meta-analysis method. This meta-analysis is a research conducted by the researcher by collecting, reviewing, and analyzing data from the results of several previous types of research (Othman et al., 2020). The study collected the data by browsing and exploring Google Scholar articles using "audio visual media" and "learning outcomes" keywords. The research procedure are explained according to Figure 1.
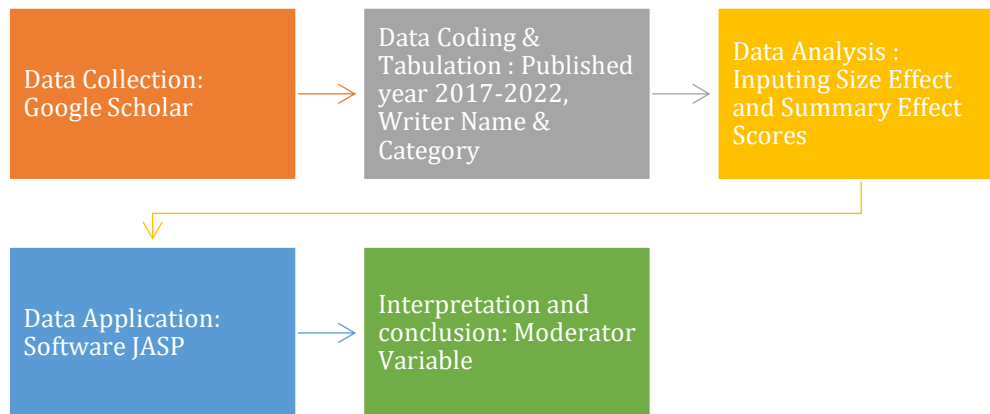
Figure 1. Research Procedure

The data source in this research is taken from the journal indexer database which contains relevant research results in accordance with the research topic. So that the population of this study consists of keywords related to the research topic, namely "Audio Visual Media" and "Learning Outcomes". This is in accordance with the inclusion and exclusion criteria set in the data collection process. The inclusion criteria include (1) search keywords "Audio Visual Media" and "Learning Outcomes"; (2) articles published in 2017-2022; (3) articles in Indonesian or English. At the same time, the exclusion criteria include (1) the amount of data (N); the correlation coefficient value. Data sources were taken from indexing databases including Scopus, Doaj, and Google Scholar. From the data collected, it was filtered or selected into samples from the study, namely data that only met the inclusion and exclusion criteria. After the data is collected according to the inclusion and exclusion criteria, at this stage the researcher tabulates the data according to the data that has been collected including Year, Author's name, level, subject, number of students, fisher's test value (F), correlation test value (R), Effect size (ES) and Standard Error (SE). At this stage, the researchers conducted a series of tables containing coded data conforming to the required analysis, including (1) Fisher's test value; (2) correlation test; and (3) the number of research subjects (samples).

After the researcher tabulates the data then performs converted the F- and t-value to r-value; The following formula is used to calculate the value of Fisher's test (F), student test (t) and correlation test (r) . From the correlation test (R) value found, the researchers then calculated the Effect size (ES) and Standard error (SE) values for each data found using the formula In analyzing the data, the researchers used several formulas to calculate the Effect size (ES) and Standard Error (SE) values. The criteria for drawing conclusions conforming to the category of influence level are determined by the Effect Size (ES) and Standard Error (SE) values. ES value category conforming to Table 1.

Table 1. Estimation Coefficient Category

Effect Size (ES)	Category
0.00 – 0.199	Extremely Weak
0.20 – 0.399	Weak
0.40 – 0.599	Moderately High
0.60 – 0.799	High
0.80 – 1.97	Extremely High

3. RESULT AND DISCUSSION

Result

The results of the analysis from various data sources published in the last five years (2017-2022), There are 90 datasets that match the criteria and 49 data fit the complete data criteria. Complete data has the number of students (N), Correlation Test (R), Fischer test scores (F), and Hypothesis Test (T). Based on the results of data analysis, the effect size and standard error values are calculated shows that 8 data include in the "Weak" category, 12 data are incorporated in the "Moderately High" category, 3 data are included in the "High" category, and 26 data are incorporated into the "Extremely High" category. Furthermore, the study conducted hypothesis testing and publication bias tests on the obtained data using data analysis assisted with JASP software. The hypothesis test is based on the z-value and p-value in Table 2 of the JSAP output.

Table 2. Hypothesis Test Result

	Estimate	Standard Error	Z	p
intercept	0.772	0.054	14.412	< 0.001

Note. Wald test.

Based on Table 2, which shows the coefficients, the estimated value is 0.772, the standard error is 0.054, the z-value is 14.412, and the p-value is 0.001, which means it is smaller than the 5% (0.05) significance value. It means that the H_0 hypothesis is rejected; in this case, the true effect size is not equal to 0. In other words, audio-visual media significantly affects students' cognitive learning outcomes. This test is conducted to see whether the collected data can be used as a representative population sample. This test can be seen using the rank correlation and regression test values. Based on the results of data analysis, it was obtained Kendall's value as 0.064, indicating a significant correlation coefficient between effect size and variance. Then the p-value of 0.518 is more significant than 0.05, which suggests that the H_0 hypothesis is accepted; in other words, it indicates publication bias. This study conducted the test to detect the file drawer effect to see and estimate how many studies do not indicate publication bias. File drawer analysis is show in Table 3.

Table 3. File Drawer Analysis

	Fail-safe N	Target Significance	Observed Significance
Rosenthal	5.9088	0.050	<0 .001

Table 3 shows how many studies have an average effect size equal to 0, which must be added to the research sample so that research results are free from publication bias. It shows that the Fail-safe N value is 5.9088, which is the number of publications that must be added. This value is not mandatory if it is based on the Rank Correlation and Regression Method results because there is no indication of publication bias.
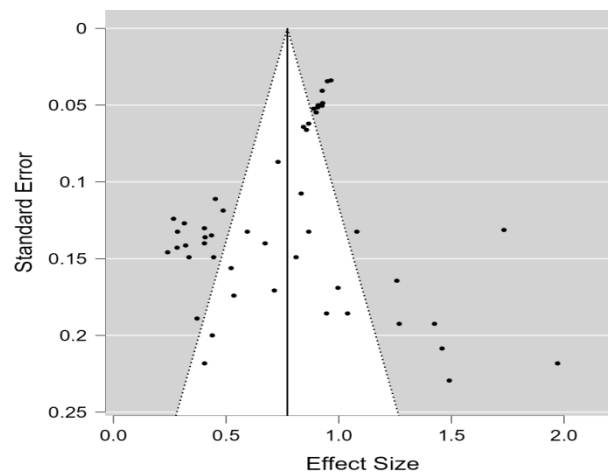

Figure 2. Funnel Plot

Based on the above Figure 2, it can be concluded that there is no lost or missing study marked with an open circle, the whole circle closed. The next part is the effect of Audio Visual Media on Cognitive Learning Outcomes based on educational level and subjects. The analysis result using JASP is displayed in Table 4.

Table 4. Moderator Variable

Levels and Subjects	N	Estimate	RE Model	Category
Elementary	27	0.717	0.72 [0.57, 0.86]	High
Junior High	11	0.767	0.77 [0.61, 0.92]	High
Senior High	11	0.923	0.92 [0.67, 1.18]	Extremely High
Social and Culture	32	0.819	0.82 [0.72, 0.91]	Extremely High
Science and Math	17	0.679	0.68 [0.44, 0.92]	High

Based on Table 4, one can observe that audio-visual learning media greatly influences students' cognitive learning outcomes. At the elementary level, the effect is 72%; at the junior high school level, the effect is 77%; and at the high school level, the effect is 92%. Later on, in subjects classification, it is apparent that this audio-visual media has a very high impact on social and cultural learning 82% and on science and mathematics subjects by 68%. The data processing results show that implementing audio-visual media for cognitive learning outcomes is an excellent learning medium at every level. The moderator variable analysis is required to observe the influence based on the publication year and the data amount. The data analysis uses JASP Software, the result as in Table 5.

Table 5. Moderator Variable

Variable	Distribution	N	p-Rank Test	RE	Category
Year	2017	7	1.000	0.82 [0.55, 1.09]	Extremely High
	2018	6	0.719	0.76 [0.32, 1.19]	High
	2019	11	0.583	0.61 [0.38, 0.84]	High
	2020	7	0.138	0.72 [0.53, 0.92]	High
	2021	3	1.000	1.00 [0.80. 1.21]	Extremely High
	2022	15	0.426	0.85 [0.66, 1.03]	Extremely High
Data	< 50	32	0.673	0.89 [0.79, 0.99]	Extremely High
	>50	17	0.383	0.54 [0.36, 0.73]	Moderately High

Based on Table 5, the analysis results above show that the effect of audio-visual media on students' cognitive learning outcomes in 2017 was 82%; in 2018, the effect was 76%; and in 2019, the effect was 61%; in 2021, the effect went up to 1.00 and in 2022 it decreased slightly to 85%. Then, based on the data, it can be seen that data below 50 has a very high effect of 89%, and data above 50 has a moderately high impact of 54%.

Discussion

Subsequently, the effect of audio-visual media on students' cognitive learning outcomes is classified based on the year of publication. It is in line with previous study state the lowest was in 2019, with a 61% effect (Mashudi et al., 2021; Nasution, 2022). Furthermore, based on the amount of data (N), the highest value is obtained, data below 50 with an 89% acquisition like research from others study that found the effect is 89% (Fatimah et al., 2022). The results of research analyzing the effect of audio-visual media on students' cognitive learning outcomes are proven to improve student learning outcomes. From the results of data analysis at the elementary school, junior high school and senior high school levels in this study the most influential is at the senior high school level by 92% and from the results of data analysis in social and culture and science and math subjects in this study the most influential is social and culture by 82%.

The incorporation of audio-visual media in educational settings has been a subject of significant interest due to its potential impact on cognitive learning outcomes. Numerous studies have explored the relationship between the use of audio-visual media and cognitive learning, revealing both advantages and challenges (Hasanah et al., 2022; Nengsih et al., 2022). On one hand, visual aids, animations, and auditory stimuli have been found to enhance comprehension and retention of information. These multimedia elements can cater to diverse learning styles, making the educational experience more engaging and accessible.

However, the effectiveness of audio-visual media depends on various factors, including the quality of content, instructional design, and individual differences among learners. It is crucial to consider the appropriateness of media materials in aligning with learning objectives and the subject matter (Afriza, 2022; Fauzi, Hilmi, 2017). Additionally, overreliance on audio-visual aids without fostering critical thinking or active participation may diminish the desired cognitive outcomes. Therefore, while audio-visual media holds promise for improving cognitive learning outcomes, thoughtful integration and pedagogical considerations are essential for maximizing its educational benefits.

This research provides positive implications for the potential to improve the quality of learning through the use of audio-visual media. Educators can consider the use of this technology as an effective tool to improve understanding and retention of information at a cognitive level. The research results show that audio-visual media can support various student learning styles. Educators can explore a variety of learning approaches, allowing for better adaptation to students' individual needs and preferences. The limitations of this study are that some of the data sources collected by researchers only apply to research results in Indonesia, which cannot be generalized to a higher or international level, then for indexing databases limited to national indexers have not been explored in international indexers such as Scopus and the

variables used by researchers are limited to learning outcomes not yet explored for other variables such as motivation, interest, and others.

4. CONCLUSION

Based on this research, it can be concluded that the results of the analysis of the effect of audio-visual media on students' cognitive learning outcomes are proven to improve student learning outcomes. It can be seen from the results of the analysis of the comparison of the accuracy level of the effect of the application of audio-visual media has a tremendous impact at the high school level and on the classification of socio-cultural subjects. Therefore, this audio visual media needs to be used frequently in the learning process in the classroom.

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