

Audiovisual Education to Improve Basic Life Support Skills Among Students at SMAN 9 Banjarmasin

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ABSTRACT

A life-threatening situation like cardiac arrest necessitates prompt Basic Life Support (BLS) assistance. High school students' poor BLS proficiency emphasizes the need for efficient teaching strategies, including multimedia materials, to enhance both knowledge and practical abilities. This study aimed to ascertain how SMAN 9 Banjarmasin students' Basic Life Support (BLS) abilities improved following audiovisual-based instruction. This research used a pre-experimental design using a One Group Pretest–Posttest Design and a quantitative methodology. Using a proportionate random sampling approach, 67 eleventh-grade students made up the sample. An observation sheet for BLS skills was used to gather data. The Wilcoxon Signed Rank Test with a 95% confidence level was employed for data analysis. All respondents (100%) fell into the need for improvement category prior to the intervention. Following instruction, 33 respondents (49.25%) fell into the capable group in the second week, 60 respondents (89.55%) fell into the proficient category in the third week, and all respondents (100%) fell into the proficient category in the fourth week. The findings of the Wilcoxon test revealed a p-value of 0.000 ($p < 0.05$), indicating a statistically significant difference in students' BLS skills following the intervention. However, because this study used a single-group pre-experimental design without a control or comparison group, the observed improvement cannot be attributed solely to the audiovisual intervention. Repeated testing and practice effects may also have contributed to the improvement. Students at SMAN 9 Banjarmasin demonstrated improved Basic Life Support (BLS) skills following audiovisual education, suggesting that audiovisual-based instruction may be a useful complementary strategy rather than a standalone approach for health education programs in schools.

Keywords: audiovisual media, basic life support, education, high school students, skills

INTRODUCTION

The rapid stopping of the heart's pumping action, which stops blood supply to the brain and other organs, is the hallmark of cardiac arrest, a medical emergency that may result in death in a matter of minutes if treatment is delayed (Patel et al., 2021). An estimated 263,711 episodes of out-of-hospital cardiac arrest (OHCA) were handled by emergency medical services (EMS) in the United States in 2024, with 137,119 cases recorded to CARES; over 71% of these cases took place at home (CARES, 2025). Additionally, the WHO states that cardiovascular disease causes approximately 17 million deaths per year (WHO, 2026). Cardiovascular disease causes 651,481 deaths annually in Indonesia (Ministry of Health of the Republic of Indonesia, 2023). According to the 2023 Indonesian Health Survey, the prevalence of heart disease in South

Kalimantan was 0.66%, with 891 cases overall, including 357 in Banjarmasin City (Marisa et al., 2025). These numbers demonstrate the significance of knowing Basic Life Support (BLS) techniques as a kind of first aid before medical personnel arrive (Alamsyah & Handayani, 2024).

Teenagers, especially those in high school, are an excellent target audience for BLS instruction because they have the cognitive and psychomotor skills necessary to comprehend and apply first aid techniques. Nonetheless, a number of studies show that students and the general population continue to have inadequate BLS competency. While Baweja et al. (2024) discovered that only 31.75% of high school students had heard of BLS and almost 83% had never had official training. Sumartini et al. (2021) reported that students' BLS skills were categorized as poor before receiving BLS education.

The use of audiovisual materials is one teaching strategy that can be used to improve BLS abilities. By integrating audio and visuals, this medium can present information in an engaging and comprehensible way, making it easier for students to understand cardiopulmonary resuscitation (CPR) techniques.. While Oktafiani and Fitriana (2022), and Suleha (2023) report that audiovisual media can improve students' knowledge, attitudes, motivation, and preparedness regarding the provision of Basic Life Support (BLS), research by Maulana et al. (2023) shows that education using audiovisual aids and simulations significantly enhances students' capabilities as bystanders. Ten students participated in a pilot study at SMAN 9 Banjarmasin, and the results showed that none of the participants had ever observed or provided assistance during a cardiac arrest occurrence, were acquainted with Basic Life Support, or had previously undergone BLS training. These results emphasize the need of good instruction to raise students' BLS proficiency. However, although previous studies have reported positive outcomes of audiovisual-based BLS education, evidence regarding its application among high school students in the specific context of SMAN 9 Banjarmasin remains limited. Furthermore, previous studies have generally focused on BLS knowledge, attitudes, preparedness, or immediate skill outcomes, while evidence on the progressive development of BLS skills through repeated audiovisual instruction and weekly skill assessments among high school students remains limited. This study addresses this gap by examining the development of students' BLS skills over a four-week period following audiovisual education, providing a context-specific contribution to BLS education among high school students at SMAN 9 Banjarmasin. The absence of prior BLS exposure identified in the pilot study further highlights the need to examine whether audiovisual-based instruction can support the development of

BLS skills among students in this setting. Thus, the purpose of this research was to examine how instruction using audiovisual medium improved students' Basic Life Support (BLS) abilities at SMAN 9 Banjarmasin.

METHODS

In May 2026, a quantitative research using a pre-experimental one-group pretest–posttest design was carried out at SMAN 9 Banjarmasin, Indonesia. There were 269 eleventh-graders in the study population. The sample size was determined using a population-proportion approach based on Arikunto (2013), in which 25% of the total population was selected, resulting in 67 students ($269 \times 25\% = 67.25$, rounded to 67). This approach was selected to obtain a feasible sample comprising approximately one-quarter of the accessible study population within the school setting. However, because the sample size was not determined using a formal power analysis based on an expected effect size, the sample should be interpreted primarily within the context of the study population and setting, and the findings may have limited generalizability beyond SMAN 9 Banjarmasin. To account for any dropouts or exclusion during data collection, seven more students roughly 10% of the computed sample were prepared as reserve participants. As a result, 74 students were ready for recruitment, and 67 responses made up the final research sample. After determining the number of responses from each class based on the percentage of students in each class using a proportionate random sample approach, random selection was carried out. Students who had not previously received BLS training or had formal experience in cardiac arrest management were eligible to participate.

Based on the American Heart Association's (AHA) criteria and recommendations for CPR among laypeople, Setiawan and Prasetya (2025) observation checklist for Basic Life Support (BLS)/Cardiopulmonary Resuscitation (CPR) abilities was adapted and used to assess students' skills. The checklist evaluates environmental safety, victim responsiveness, airway opening, CPR continuity and accuracy, and chest compressions. Each item was rated on a three-point scale: 1 (needs improvement), 2 (capable), and 3 (proficient), with the overall score transformed into a 0–10 scale and categorized as proficient (8–10), capable (6–7), or needs improvement (0–5). Before the intervention, participants performed CPR as a pretest, followed by weekly video-based BLS instruction and skill assessments using the same checklist for four weeks. These repeated assessments were used to monitor changes in BLS performance; however, the observed improvement may also have been influenced by testing and practice

effects due to repeated exposure to the assessment and CPR procedures. The instrument was originally developed by Setiawan and Prasetya (2025), whose undergraduate thesis is archived in the Universitas Sari Mulia institutional repository, and was adapted for the present study.

Standardized BLS/CPR protocols from the American Heart Association (2020) and the Republic of Indonesia's Ministry of Health served as the foundation for the observation tool. Since the tool was based on existing CPR evaluation criteria and standardized processes, statistical validity and reliability tests were not carried out independently. Because each assessment question accurately reflected the CPR abilities being tested and the observer used similar evaluation criteria for both the pretest and posttest, content validity was deemed to be satisfied. However, independent reliability testing, such as inter-rater reliability, was not performed for the observation checklist. In addition, BLS performance was assessed by a single observer, which may introduce measurement bias, particularly because the same students were assessed repeatedly each week. The observer was also aware of the assessment time point (i.e., the week of assessment) and was not blinded, which may have introduced expectation bias when evaluating changes in students' BLS performance. Therefore, this limitation should be considered when interpreting the observed changes in BLS skill scores. The study's goals, methods, and advantages were explained to each participant, and participation was entirely voluntary. Because the participants were high school students, informed consent was obtained from their parents or legal guardians, and assent was obtained from the students before participation. Participants' names were kept private, and the researcher made sure that the information gathered was solely used for scholarly study. The appropriate ethics committee granted ethical permission prior to the study being carried out. With Ethical Clearance No. 207/KEP-UNISM/IV/2026, the Institute for Research and Community Service at Universitas Sari Mulia's Research Ethics Committee granted ethical permission.

Descriptive statistics, such as mean, minimum, maximum, frequency, and percentage, were used to characterize the characteristics of the respondents and their BLS skill scores. The Wilcoxon Signed Rank Test was used to compare CPR skill scores between Week 1 (pretest) and Week 4 (posttest) after audiovisual BLS instruction at a significance level of $p < 0.05$, since the measures were paired data from the same individuals and the data were not normally distributed. A statistically significant difference between Week 1 (pretest) and Week 4 (posttest) BLS skill scores was defined as a $p\text{-value} < 0.05$. The analysis was carried out on the 67 respondents who finished the survey since the sample size was established using a

population-based technique based, with seven extra respondents prepared solely as reserve participants in case of dropout or exclusion.

RESULTS

Univariate Analysis

Univariate analysis was used to describe the characteristics of the respondents and the distribution of BLS skill levels before and after the audiovisual education intervention.

Table 1. Age Distribution of Respondents by Class

			Age				Total
			16 Years Old	17 Years Old	18 Years Old	19 Years Old	
Class	XI A	f (n)	2	8	0	0	10
		%	20.0	80.0	0.0	0.0	100.0
	XI B	f (n)	1	9	0	0	10
		%	10.0	90.0	0.0	0.0	100.0
	XI C	f (n)	3	5	2	0	10
		%	30.0	50.0	20.0	0.0	100.0
	XI D	f (n)	1	7	0	1	9
		%	11.1	77.8	0.0	11.1	100.0
	XI E	f (n)	1	6	2	0	9
		%	11.1	66.7	22.2	0.0	100.0
	XI F	f (n)	2	5	3	0	10
		%	20.0	50.0	30.0	0.0	100.0
	XI G	f (n)	2	5	2	0	9
		%	22.2	55.6	22.2	0.0	100.0
Total		f (n)	12	45	9	1	67
		%	17.9	67.2	13.4	1.5	100.0

Most respondents were 17 years old, indicating that the majority of participants were in mid-adolescence, characterized by the cognitive and psychomotor competence necessary to understand and conduct Basic Life Support (BLS) methods.

Table 2. Gender Distribution of Respondents by Class

			Gender		Total
			Male	Female	
Class	XI A	f (n)	2	8	10
		%	20.0	80.0	100.0
	XI B	f (n)	2	8	10
		%	20.0	80.0	100.0
	XI C	f (n)	3	7	10
		%	30.0	70.0	100.0
	XI D	f (n)	5	4	9
		%	55.6	44.4	100.0
	XI E	f (n)	4	5	9

		Gender		Total
		Male	Female	
XI F	%	44.4	55.6	100.0
	f (n)	2	8	10
XI G	%	20.0	80.0	100.0
	f (n)	6	3	9
Total	%	66.7	33.3	100.0
	f (n)	24	43	67
		35.8	64.2	100.0

The majority of respondents in this study were female. Female respondents constituted the largest proportion of the study participants.

Table 3. BLS Skill Level Before Audiovisual Education (Pretest)

			Pretest (Week 1)	Total
			Needs Improvement	
Class	XI A	f (n)	10	10
		%	100.0	100.0
	XI B	f (n)	10	10
		%	100.0	100.0
	XI C	f (n)	10	10
		%	100.0	100.0
	XI D	f (n)	9	9
		%	100.0	100.0
	XI E	f (n)	9	9
		%	100.0	100.0
	XI F	f (n)	10	10
		%	100.0	100.0
	XI G	f (n)	9	9
		%	100.0	100.0
Total	f (n)		67	67
	%		100.0	100.0

All of the respondents (100%) were in the “needs improvement” category before instruction, meaning the students’ low initial BLS skills were due to a lack of prior formal training or instruction.

Table 4. BLS Skill Level in Week 2 After Audiovisual Education

			Week 2		Total
			Needs Improvement	Capable	
Class	XI A	f (n)	5	5	10
		%	50.0	50.0	100.0
	XI B	f (n)	5	5	10
		%	50.0	50.0	100.0
	XI C	f (n)	5	5	10
		%	50.0	50.0	100.0
	XI D	f (n)	6	3	9

			Week 2		Total
			Needs Improvement	Capable	
XI E		%	66.7	33.3	100.0
		f (n)	3	6	9
XI F		%	33.3	66.7	100.0
		f (n)	3	7	10
XI G		%	30.0	70.0	100.0
		f (n)	7	2	9
		%	77.8	22.2	100.0
Total		f (n)	34	33	67
		%	50.7	49.3	100.0

By the second week about half of the respondents had moved to the “capable” group, indicating an improvement in skills. This means that the employment of audio-visual elements in education was beginning to enhance the students’ ability.

Table 5. BLS Skill Level in Week 3 After Audiovisual Education

			Week 3		Total
			Capable	Proficient	
Class	XI A	f (n)	1	9	10
		%	10.0	90.0	100.0
	XI B	f (n)	2	8	10
		%	20.0	80.0	100.0
	XI C	f (n)	1	9	10
		%	10.0	90.0	100.0
	XI D	f (n)	0	9	9
		%	0.0	100.0	100.0
	XI E	f (n)	0	9	9
		%	0.0	100.0	100.0
	XI F	f (n)	1	9	10
		%	10.0	90.0	100.0
	XI G	f (n)	2	7	9
		%	22.2	77.8	100.0
Total		f (n)	7	60	67
		%	10.4	89.6	100.0

By the third week, most responders were in the “proficient” group, proving that practice and repeated audiovisual education had contributed to increased BLS proficiency.

Table 6. BLS Skill Level in Week 4 After Audiovisual Education

			Week 4	Total
			Proficient	
Class	XI A	f (n)	10	10
		%	100.0	100.0
	XI B	f (n)	10	10
		%	100.0	100.0
	XI C	f (n)	10	10

	%	100.0	100.0
XI D	f (n)	9	9
	%	100.0	100.0
XI E	f (n)	9	9
	%	100.0	100.0
XI F	f (n)	10	10
	%	100.0	100.0
XI G	f (n)	9	9
	%	100.0	100.0
Total	f (n)	67	67
	%	100.0	100.0

In the fourth week, all respondents were in the “proficient” group, indicating that incremental practice and audio-visual education improved BLS skills.

Table 7. Descriptive Statistics of BLS Skills by Class and Week

	Class	Week 1	Week 2	Week 3	Week 4
XI A	Min	4.30	4.60	7.60	9.30
	Max	5.60	6.30	9.30	10.00
	Mean	4.7900	5.7300	8.5600	9.5400
	Median	4.6000	5.8000	8.6000	9.3000
	Std. Dev	.42544	.55787	.54406	.33066
XI B	Min	3.60	5.00	7.60	9.30
	Max	5.60	6.30	9.60	10.00
	Mean	4.7300	5.8300	8.6300	9.6700
	Median	4.8000	5.8000	8.6500	9.6000
	Std. Dev	.61473	.47621	.71188	.30930
XI C	Min	3.60	5.00	7.60	9.30
	Max	5.60	6.30	9.30	10.00
	Mean	4.7300	5.7700	8.5900	9.4600
	Median	4.8000	5.8000	8.6000	9.3000
	Std. Dev	.63078	.47621	.49092	.23664
XI D	Min	4.00	5.00	8.00	9.30
	Max	5.60	6.00	9.30	10.00
	Mean	5.0222	5.6333	8.8000	9.5111
	Median	5.3000	5.6000	9.0000	9.6000
	Std. Dev	.53333	.33912	.41533	.23688
XI E	Min	3.30	5.30	8.30	9.30
	Max	5.30	6.30	9.30	10.00
	Mean	4.0778	5.8333	8.8111	9.5556
	Median	4.0000	6.0000	8.6000	9.6000
	Std. Dev	.60162	.35000	.35158	.28771
XI F	Min	4.00	5.30	7.60	9.30
	Max	5.60	6.30	9.30	10.00
	Mean	4.7900	6.0300	8.6700	9.6700
	Median	4.6000	6.3000	8.8000	9.6000
	Std. Dev	.49766	.38601	.52079	.30930
XI G	Min	4.00	5.00	7.60	9.30
	Max	5.60	6.30	9.60	10.00

	Class	Week 1	Week 2	Week 3	Week 4
Total	Mean	4.7000	5.4889	8.5333	9.7444
	Median	4.6000	5.6000	8.6000	9.6000
	Std. Dev	.58095	.46218	.66521	.26034
	Min	3.30	4.60	7.60	9.30
	Max	5.60	6.30	9.60	10.00
	Mean	4.6955	5.7642	8.6537	9.5925
	Median	4.6000	5.6000	8.6000	9.6000
	Std. Dev	.59427	.45183	.52838	.28779

Descriptive statistics showed a progressive increase in the mean BLS skill score across the observation period, accompanied by a decrease in the standard deviation by Week 4. The declining standard deviation suggests that students' BLS performance became more consistent over time. However, because the mean score approached the upper end of the scoring scale by Week 4, the reduced variability may also partly reflect a ceiling effect of the scoring instrument.

Bivariate Analysis

The Wilcoxon Signed Rank Test was used in the bivariate analysis to compare the BLS skills of students at SMAN 9 Banjarmasin between Week 1 (pretest) and Week 4 (posttest) after the audiovisual education intervention.

Table 8. Wilcoxon Signed Rank Test – Ranks

		Ranks		
		N	Mean Rank	Sum of Ranks
Week 4 (Posttest) -	Negative Ranks	0 ^a	.00	.00
Week 1 (Pretest)	Positive Ranks	67 ^b	34.00	2278.00
	Ties	0 ^c		
	Total	67		

The Wilcoxon test showed that all respondents had positive ranks when comparing their BLS skill scores between Week 1 (pretest) and Week 4 (posttest), with no negative ranks or ties. The findings indicated that the BLS skills of the students improved following training using audio-visual materials.

Table 9. Wilcoxon Signed Rank Test – Test Statistics

	Test Statistics ^a
Z	Week 4 (Posttest) - Week 1 (Pretest) -7.126 ^b
Asymp. Sig. (2-tailed)	.000

The Wilcoxon test results showed a significant difference in BLS skill scores between Week 1 (pretest) and Week 4 (posttest) following the audio-visual teaching intervention. This finding indicates an improvement in students' BLS skill scores over the assessment period.

Table 10. Distribution of BLS Skill Categories Before and After Audiovisual Education

Skill Category	Week 1		Week 2		Week 3		Week 4	
	n	%	n	%	n	%	n	%
Needs Improvement	67	100	34	50.75	0	0.0	0	0.0
Capable	0	0.0	33	49.25	7	10.45	0	0.0
Proficient	0	0.0	0	0.0	60	89.55	67	100
Total	67	100	67	100	67	100	67	100

Regarding the distribution of BLS skill categories, there was a continuous improvement from Week 1 to Week 4, with all respondents progressing from the “needs improvement” category in Week 1 to the “proficient” category by Week 4. This pattern indicates the development of students' BLS skills throughout the four-week audiovisual education period.

DISCUSSION

Assessing students' Basic Life Support (BLS) skills prior to education using audiovisual media

The students had poor BLS abilities prior to learning using audiovisual medium. This circumstance was associated with the inadequate availability of BLS teaching resources and hands-on training in the educational setting, which left students with insufficient CPR experience. Health education, according to Notoatmodjo (2022), is a learning process that aims to improve individual capacities via modifications in knowledge, attitudes, and skills. The low initial performance observed in this study may reflect the students' limited prior exposure to BLS education and hands-on CPR training. This interpretation is supported by Baweja et al. (2024), who reported that only 31.75% of high school students had heard of BLS and nearly 83% had never received formal BLS training. The findings of the present study are consistent with this situation, as the students entered the intervention with limited prior exposure to BLS and demonstrated low baseline practical skills. This suggests that the lack of previous BLS learning opportunities may be an important consideration when assessing students' initial ability to perform CPR.

The poor competence level suggested that students still lacked a thorough understanding of the steps involved in conducting CPR, including ensuring environmental safety, determining the victim's level of responsiveness, asking for assistance, and administering chest compressions in accordance with protocol. People in the early phases of cognitive-motor learning often have

difficulty performing a sequence of activities accurately and systematically. This is particularly important because effective CPR requires the integration of several sequential actions rather than knowledge of individual steps alone. Students may recognize the concept of CPR but still experience difficulty translating that knowledge into correct practical performance when they have not previously practiced the procedure. These results are in line with studies by Sumartini et al. (2021) and Maulana et al. (2023), which demonstrated that students' initial BLS capacities were inadequate before receiving instruction or training. Thus, the low pre-intervention scores in this study indicate a need for structured BLS education that combines understandable instructional materials with opportunities for practical skill development. Establishing students' baseline abilities is also important because it provides a reference point for evaluating changes in BLS performance following educational interventions.

Assessing students' Basic Life Support (BLS) skills after education using audiovisual media

The students' BLS abilities gradually improved after receiving instruction using audiovisual materials. The improvement was observed alongside students' repeated opportunities to watch the instructional material and perform CPR during the four-week intervention period. This pattern suggests that the combination of audiovisual instruction and repeated practice may have supported the development of students' BLS skills. This interpretation is consistent with Allan et al. (2023), whose systematic review and meta-analysis found that school-based CPR training using different instructional modalities can improve students' CPR performance. The opportunity to repeatedly perform and receive assessment of CPR procedures may also have contributed to the observed improvement, particularly because the same skills were assessed at each stage of the intervention. The progressive changes observed across the four assessment points are important because BLS performance requires students to coordinate several sequential actions, including assessing the situation, opening the airway, and performing chest compressions correctly. Repeated exposure to the instructional content and opportunities to practice these procedures may have helped students become more familiar with the sequence and requirements of CPR performance.

By combining audio and visual information, audiovisual media may have contributed to students' understanding of BLS procedures. This is in line with Mayer's (2020) Cognitive Theory of Multimedia Learning, which describes how learning may be aided by combining words, pictures, and sounds. The gradual improvement observed in this study provides a practical context for this learning principle, as students were repeatedly exposed to the same

BLS procedures through audiovisual materials and subsequently applied them during skill assessments. However, the improvement should not be interpreted as the effect of audiovisual media alone because repeated practice and repeated assessment occurred throughout the intervention. These results are consistent with previous studies showing that the use of audiovisual media may improve BLS knowledge and abilities (Maulana et al., 2023; Oktafiani & Fitriana, 2022; Saidu et al., 2023; Suleha, 2023).

Analysis of the difference in students' BLS skills before and after the educational intervention using audiovisual media

The analysis showed a significant difference in students' BLS skill scores between Week 1 (pretest) and Week 4 (posttest) following the audiovisual educational intervention. All respondents showed positive ranks, with no negative ranks or ties, indicating that the BLS skill scores of all 67 respondents were higher at Week 4 than at Week 1. These findings demonstrate a consistent improvement in students' BLS performance between the beginning and the end of the four-week assessment period. The change from the “needs improvement” category in Week 1 to the “proficient” category in Week 4 also indicates that the improvement was not limited to a small number of participants but was observed across the entire study group.

These findings can be interpreted in relation to Mayer (2020) Cognitive Theory of Multimedia Learning, which emphasizes that learning can be supported when information is presented through coordinated verbal and visual channels. In this study, audiovisual materials provided students with information about BLS procedures that could subsequently be applied during practical performance. The combination of audiovisual instruction and repeated opportunities to perform CPR may therefore have supported the transition from limited baseline performance to higher BLS skill levels by the end of the intervention.

Previous studies further support the effectiveness of video-based and audiovisual approaches in improving BLS skills (Maulana et al., 2023; Oktafiani & Fitriana, 2022; Saidu et al., 2023; Suleha, 2023). Recent systematic reviews have also reported that technology-based and school-based CPR training can improve adolescents' CPR knowledge and skills (Allan et al., 2023; Lim et al., 2022). The present findings are consistent with this body of evidence, while also showing the pattern of skill development across four assessment points in the study setting. However, because participants were assessed repeatedly using the same BLS skill assessment, the improvement cannot be attributed solely to the audiovisual materials. Repeated practice, familiarity with the assessment procedure, and exposure to the instructional content may also

have contributed to the observed changes. Therefore, the significant Week 1-Week 4 difference should be interpreted as an overall improvement in BLS skill scores during the intervention period rather than as evidence that audiovisual education alone caused the improvement. The findings suggest that audiovisual education may serve as a useful complementary approach to support BLS skill development among high school students.

CONCLUSION

Students at SMAN 9 Banjarmasin demonstrated improved Basic Life Support (BLS) skills between Week 1 (pretest) and Week 4 (posttest) following audiovisual education. Their skills developed progressively from the needs-improvement category in Week 1 to the proficient category by Week 4. The Wilcoxon Signed Rank Test showed a significant difference in BLS skill scores between Week 1 and Week 4, with all respondents showing positive ranks. These findings suggest that the improvement in BLS skills may be associated with audiovisual education and repeated practice; however, the absence of a control group and the potential effects of repeated assessment and observer-related bias prevent definitive attribution of the improvement to the audiovisual intervention alone. Further research using controlled designs, blinded or multiple assessors, and longer follow-up periods is recommended to evaluate the sustainability of these skills and determine the effectiveness of audiovisual education more conclusively.

LIMITATION

When evaluating the results, it is important to take into account the many limitations of this research. First, the observed increase in BLS abilities cannot be solely attributed to the audiovisual education intervention due to the use of a pre-experimental one-group pretest–posttest design without a control group. Furthermore, only eleventh-grade students at SMAN 9 Banjarmasin participated in the research, which may restrict the results' applicability to students from other schools or age groups with distinct features. The results cannot determine if the learned BLS abilities will be sustained over an extended length of time since the research also utilized a very short observation period.

Second, because the BLS skill evaluation was done within the research period, long-term skill retention was not assessed. The increase in performance could have also been a result of repeated practice and exposure to the instructional materials throughout the intervention period. Additionally, BLS performance was assessed by a single observer who was aware of the

assessment time point and was not blinded to the week of assessment, which may have introduced measurement and expectation bias. Individual characteristics including prior exposure to BLS knowledge, learning experiences, and variations in students' practical skill performance were not thoroughly examined. To find out if the gain in BLS abilities is maintained over time, future research should use controlled study designs, include bigger and more varied groups, and do follow-up evaluations several months after the intervention.

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