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Original Article

Effect of basic life support education using lecture and demonstration methods on teachers' knowledge and skills in managing drowning incidents: A pra-experimental study

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Abstract

Background: Drowning is a time-critical emergency that can rapidly lead to respiratory failure, hypoxic injury, cardiac arrest, and death when immediate assistance is not provided. Teachers in coastal and flood-prone school environments may act as first responders because they are often the nearest adults when drowning incidents occur among students. However, teachers frequently have limited formal exposure to Basic Life Support and drowning management procedures.
Objective: This study aimed to determine the effect of Basic Life Support education using lecture and demonstration methods on teachers' knowledge and skills in managing drowning incidents.
Methods: This study employed a quantitative pre-experimental design with a one-group pre-test and post-test approach. The study involved 20 teachers from the Muhammadiyah Panjang Foundation, Bandar Lampung, selected using total sampling. The intervention consisted of one structured 120-minute educational session using lecture, mannequin-based demonstration, guided practice, and feedback. Teachers' knowledge was measured before and after the intervention using a structured questionnaire, while skills were assessed after the intervention using a standard operating procedure-based observation checklist. Descriptive statistics were used to summarize respondent characteristics, knowledge scores, and post-intervention skill performance. The Wilcoxon signed-rank test was used to examine differences in knowledge scores before and after the intervention.
Results: Most respondents were female (80.0%) and aged 21–30 years (75.0%). All respondents had no previous experience in handling drowning victims or performing Basic Life Support. The mean knowledge score increased from 5.85 ± 1.140 before the intervention to 15.80 ± 0.410 after the intervention. The Wilcoxon signed-rank test showed a significant improvement in knowledge scores after the intervention ($Z = -3.965$; $p < 0.001$). The mean post-intervention skill score was 14.80 ± 0.523, indicating good practical performance after training.
Conclusion: Basic Life Support education using lecture and demonstration methods significantly improved teachers' knowledge and supported good post-intervention skills in managing drowning incidents. Schools in high-risk areas should integrate structured Basic Life Support training into routine emergency preparedness programs.

Background

Drowning remains a major public health problem because it can cause rapid respiratory failure, hypoxic injury, cardiac arrest, and death within a short period after submersion. (Dezfulian et al., 2024). Indonesia faces a substantial burden of unintentional drowning because its archipelagic geography, coastal settlements, rivers, and water-based daily activities increase community exposure to aquatic hazards. (Cenderadewi et al., 2024). Children and adolescents represent a vulnerable group because drowning incidents often occur suddenly during recreational, school-related, or community water activities. (Evans et al., 2021). Schools require prepared first responders because teachers often become the nearest adults when drowning or near-drowning incidents occur in educational and community environments. (Esser-Noethlichs & Hegland, 2025). Teacher readiness therefore becomes a critical element in the early chain of survival because immediate recognition, rescue activation, and basic life support can influence victim outcomes before professional help arrives. (Semeraro et al., 2021).

Basic Life Support education provides essential knowledge and practical skills because drowning victims require rapid assessment, airway management, effective ventilation, chest compression, and emergency referral after rescue. (Olasveengen et al., 2021). Current resuscitation guidance emphasizes system readiness because survival depends on

coordinated community response, trained lay rescuers, and timely emergency medical activation. (Semeraro et al., 2021). The 2024 focused update on drowning resuscitation highlights the importance of early rescue breathing, high-quality CPR, and context-specific resuscitation for drowning victims. (Dezfulian et al., 2024). Teachers need structured BLS education because theoretical understanding alone may not ensure accurate psychomotor performance during time-critical emergencies. (Greif et al., 2021). School-based emergency preparedness therefore requires educational strategies that improve both cognitive competence and procedural performance among teachers. (Minna et al., 2022).

Lecture-based education remains useful because it can deliver concepts, procedures, indications, and safety principles in a structured and time-efficient learning format. (Gad, 2021). Demonstration-based education strengthens practical learning because learners can observe correct procedures, imitate essential steps, and receive clearer mental models of emergency actions. (Giacomino et al., 2020). Social interaction during learning improves knowledge acquisition because learners can ask questions, compare understanding, and internalize new information through guided engagement. (De Felice et al., 2023). Resuscitation education guidelines recommend active, skills-oriented learning because CPR competence requires repeated exposure, feedback, and performance-based assessment. (Greif et al., 2021). The combination of lecture and demonstration may therefore provide a balanced approach because it addresses both knowledge formation and skill acquisition in BLS education. (Greif et al., 2020).

Skill retention remains a challenge in first aid and resuscitation education because learners may lose accuracy when training does not include practice, assessment, or reinforcement. (Minna et al., 2022). Simulation and demonstration methods can improve emergency response skills because learners experience realistic procedural sequences before facing real incidents. (Fibriansari et al., 2022). Effective group size also influences CPR teaching because small-group learning can increase practice opportunities, instructor observation, and corrective feedback. (Nabecker et al., 2021). Stress can impair decision-making during emergencies because acute pressure may reduce attention, slow judgment, and disrupt procedural execution. (Sarmiento et al., 2024). Teachers therefore need BLS education that strengthens knowledge, procedural confidence, and response accuracy under emergency conditions. (Greif et al., 2021).

Previous studies have examined resuscitation education, first aid training, drowning burden, and instructional methods in different populations and contexts. (Cenderadewi et al., 2024; Giacomino et al., 2020; Minna et al., 2022). However, limited evidence has specifically evaluated the effect of BLS education using lecture and demonstration methods on teachers' knowledge and skills in managing drowning incidents. (Esser-Noethlichs & Hegland, 2025; Fibriansari et al., 2022). This gap is important because teachers may serve as immediate responders in schools, coastal communities, swimming activities, and other child-centered environments. (Evans et al., 2021). A pre-experimental design can provide preliminary evidence because it allows researchers to measure changes in knowledge and skills before and after a structured educational intervention. (Creswell, 2018). Such evidence can support school health promotion because teacher-focused BLS education may improve early response capacity for drowning emergencies. (Prasetyo et al., 2023).

This study uses Basic Life Support education through lecture and demonstration methods because the intervention is expected to improve teachers' cognitive understanding and practical competence in drowning management. (Greif et al., 2021; Olasveengen et al., 2021). The intervention targets teachers because they occupy a strategic position as first responders during school-related emergencies involving children and adolescents. (Esser-Noethlichs & Hegland, 2025). The study measures knowledge and skills because both outcomes reflect essential readiness for recognizing drowning, initiating rescue response, and performing appropriate BLS procedures. (Minna et al., 2022). The findings may contribute to school-based emergency preparedness because they can inform practical training models for teachers in water-risk settings. (Semeraro et al., 2021).

This study aims to determine the effect of Basic Life Support education using lecture and

demonstration methods on teachers' knowledge and skills in managing drowning incidents.

Methods

Study Design

This study employs an analytical quantitative research design. Analytical quantitative methods are used to systematically and objectively analyze the relationships or influences between research variables. The study design utilizes a quasi-experimental method with a one-group pre-test and post-test design, in which participants received health education following the pre-test, followed by the post-test.

Sampling and Setting

The population in this study comprises all 20 teachers working at the Muhammadiyah Panjang Foundation. The sample in this study consists of 20 respondents, with the sample justification based on Sahir (2021), who states that the sample size for a quasi-experimental study should be between 10 and 20 participants per group, and Mooney et al. (2023), who assert that a sample size of 12 to 15 is sufficient to produce valid and reliable data in a small population. Sampling in this study was conducted using total sampling. To ensure the accuracy of the participant selection process, inclusion and exclusion criteria were established. Inclusion criteria included being a teacher at the Muhammadiyah 3 Panjang Foundation, specifically being officially registered as an educator at that school, being willing to participate in training on drowning management, and signing a consent form as a sign of willingness to participate in the study.

Exclusion criteria included teachers with serious medical conditions that could pose a risk during training, such as severe heart disease, acute respiratory disorders, or active seizures; teachers with significant physical limitations preventing them from performing the physical actions required in BHD; and teachers suffering from acute mental or psychological disorders that interfere with the learning process and the implementation of BHD techniques.

Instruments

The measurement tools used in this study were designed to assess two main variables: teachers' knowledge of water safety and their practical skills in handling drowning cases. Teachers' knowledge was measured using a questionnaire containing questions related to water safety concepts and procedures, while their skills were evaluated through an SOP checklist developed based on the guidelines of the Indonesian BCLS PERKI manual (2021). These instruments ensure that the collected data is relevant, standardized, and valid in accordance with applicable standards.

Intervention

The intervention was conducted in one structured training session using lecture and demonstration methods. The session lasted approximately 120 minutes and was delivered after the completion of the pre-test. The learning objectives were to enable teachers to recognize drowning as an emergency condition, identify signs of respiratory and circulatory compromise, activate emergency assistance, perform initial assessment safely, and demonstrate basic life support procedures for drowning victims according to the Indonesian BCLS PERKI manual.

The intervention consisted of four sequential stages. The first stage was a 10-minute orientation, including an explanation of training objectives, the importance of teachers as first responders, and the relevance of drowning preparedness in a coastal and flood-prone school environment. The second stage was a 35-minute lecture using PowerPoint slides covering the definition of drowning, risk factors, signs of drowning, safety principles for rescuers, emergency call activation, airway management, rescue breathing, chest compression, recovery position, and referral procedures. The third stage was a 35-minute demonstration conducted by a certified healthcare professional using a mannequin and drowning emergency scenario. The instructor demonstrated scene safety, responsiveness assessment, breathing assessment, airway opening, chest compression, rescue breathing, and post-resuscitation positioning.

The fourth stage was a 30-minute guided practice session in which teachers practiced the procedures individually or in small groups under direct supervision. During this stage, the instructor and researcher observed the participants' performance using a standardized SOP checklist. Immediate corrective feedback was provided after each practice attempt to ensure that participants understood the correct sequence and technique. The session ended with a 10-minute question-and-answer and reflection session before the post-test was administered.

Data Collection

Data collection was conducted in three stages. In the first stage, eligible teachers were informed about the study objectives, procedures, voluntary participation, confidentiality, and their right to withdraw at any time. Teachers who agreed to participate signed the informed consent form. After that, respondents completed the pre-test knowledge questionnaire to assess their baseline knowledge regarding drowning management and basic life support.

In the second stage, respondents received basic life support education using lecture and demonstration methods. The educational material was delivered through PowerPoint slides, oral explanation, mannequin-based demonstration, and guided practice. The demonstration was facilitated by a certified healthcare professional in collaboration with the researcher. After the lecture and demonstration, respondents were given the opportunity to ask questions and practice the basic life support procedure under supervision.

In the third stage, respondents completed the post-test knowledge questionnaire to evaluate changes in knowledge after the intervention. Teachers' basic life support skills were assessed only after the intervention using an SOP-based observation checklist. Therefore, this study reported post-intervention skill performance and did not analyze changes in skill scores from pre-test to post-test. The skill findings were interpreted as the level of teachers' practical ability after receiving education and demonstration, not as evidence of skill improvement over time.

Data Analysis

Data were analyzed using univariate and bivariate analysis. Univariate analysis was used to describe respondent characteristics, knowledge scores before and after the intervention, and post-intervention skill scores. Numerical data were presented using mean, standard deviation, minimum–maximum values, and 95% confidence intervals where appropriate, while categorical data were presented using frequency and percentage.

Before conducting bivariate analysis, the normality of the knowledge score distribution was tested using the Shapiro–Wilk test because the sample size was less than 50 respondents. The normality test showed that the pre-test and post-test knowledge scores were not normally distributed. Therefore, the Wilcoxon signed-rank test was used to examine differences in teachers' knowledge before and after the intervention. Skills were measured only after the intervention; therefore, no pre-post comparative statistical test was conducted for skill scores. Post-intervention skill scores were analyzed descriptively to describe teachers' practical performance after receiving the educational intervention.

Ethical Considerations

Research ethics were upheld by maintaining the confidentiality and rights of respondents, ensuring their privacy, and preventing any threats to them. This study underwent an ethical review conducted by the Health Research Ethics Committee at Malahayati University on November 24, 2025, with reference number 5081/EC/KEP-UNMAL/XI/2025.

Results

This study involved 20 teachers from the Muhammadiyah Panjang Foundation who participated in Basic Life Support education using lecture and demonstration methods. The results are presented in sequence, beginning with the demographic characteristics of the respondents, followed by teachers' knowledge scores before and after the intervention, post-

intervention skill performance, and the statistical analysis of knowledge changes. The demographic characteristics included gender, age, and previous experience in handling drowning victims or performing Basic Life Support.

Table 1. Characteristics of Respondents

Variable	n	%
Gender		
Male	4	20
Female	16	80
Age		
21–30 years	15	75
31–40 years	2	10
>40 years	3	15
Previous experience in handling drowning/BLS		
Yes	20	100
No	0	0

Based on Table 1, most respondents were female teachers, with 16 respondents or 80.0% of the total sample, while male teachers accounted for 4 respondents or 20.0%. Most respondents were in the 21–30-year age group, comprising 15 respondents or 75.0%, followed by respondents aged more than 40 years with 3 respondents or 15.0%, and respondents aged 31–40 years with 2 respondents or 10.0%. These findings indicate that the participants were predominantly young adult teachers who may have sufficient physical capacity to participate in Basic Life Support training activities. In terms of previous experience, all respondents, namely 20 teachers or 100.0%, reported no prior experience in handling drowning victims or performing Basic Life Support. This finding confirms that the educational intervention was highly relevant because the respondents had not previously been exposed to structured training in drowning management and Basic Life Support procedures.

Table 2. Teachers' Knowledge Scores Before and After Basic Life Support Education

Knowledge Score	Mean	Std. Deviation	Std. Error Mean	Min–Max	95% Confidence Interval
Pre-test	5.85	1.140	0.233	5–8	5.36–6.34
Post-test	15.80	0.410	0.092	15–16	15.61–15.99

Based on Table 2, teachers' knowledge scores increased after the implementation of Basic Life Support education using lecture and demonstration methods. The mean pre-test knowledge score was 5.85 with a standard deviation of 1.140, a standard error mean of 0.233, a score range of 5–8, and a 95% confidence interval of 5.36–6.34. After the educational intervention, the mean post-test knowledge score increased to 15.80 with a standard deviation of 0.410, a standard error mean of 0.092, a score range of 15–16, and a 95% confidence interval of 15.61–15.99. These results indicate that teachers' knowledge became higher and more homogeneous after receiving the educational intervention. The narrower post-test score range and lower standard deviation also suggest that most respondents achieved relatively similar knowledge levels after the lecture and demonstration sessions. Therefore, the descriptive findings show a clear increase in teachers' knowledge regarding the management of drowning incidents after Basic Life Support education.

Table 3. Teachers' Skill Levels After Education Was Provided with Demonstrations

	Mean	Std. Deviation
BLS Skill	14.80	0.523

Based on Table 3, teachers' basic life support skills after the educational intervention were categorized as good. The mean post-intervention skill score was 14.80 with a standard deviation of 0.523, indicating that most teachers were able to perform the observed basic life support procedures according to the SOP checklist. Because skills were assessed only after the intervention, these findings describe teachers' post-intervention

practical performance and should not be interpreted as a pre-post improvement in skills.

Table 4. Wilcoxon Signed-Rank Test of Teachers' Knowledge Scores Before and After Basic Life Support Education

Comparison	Rank Category	n	Mean Rank	Sum of Ranks	Z	p-value
Post-test vs. Pre-test	Negative ranks	0	0.00	0.00	-3.965	<0.001
	Positive ranks	20	10.50	210.00		
	Ties	0	—	—		
	Total	20				

Based on Table 4, the Wilcoxon signed-rank test showed a significant difference in teachers' knowledge scores before and after Basic Life Support education using lecture and demonstration methods. All respondents showed increased knowledge scores after the intervention, as indicated by 20 positive ranks, while no respondents showed decreased or unchanged scores. The mean rank for the increased scores was 10.50, with a sum of ranks of 210.00. The test produced a Z value of -3.965 and a p-value of <0.001, indicating a statistically significant improvement in teachers' knowledge after the educational intervention. These findings demonstrate that Basic Life Support education using lecture and demonstration methods significantly improved teachers' knowledge in managing drowning incidents.

Discussion

This study found that Basic Life Support education using lecture and demonstration methods improved teachers' knowledge in managing drowning incidents. The mean knowledge score increased from 5.85 before the intervention to 15.80 after the intervention. All respondents showed increased post-test scores, and no respondents experienced decreased or unchanged scores. The Wilcoxon signed-rank test confirmed a statistically significant difference between pre-test and post-test knowledge scores. The post-intervention skill score also showed good practical performance after teachers received demonstration and guided practice. These findings indicate that structured education can strengthen teachers' preparedness as first responders in school-based drowning emergencies.

The increase in teachers' knowledge reflects the relevance of structured emergency education for non-health professionals in school environments. Teachers need clear conceptual understanding because drowning can cause hypoxia, respiratory failure, cardiac arrest, and death within a short time after submersion (Dezfulian et al., 2024). Schools in coastal and flood-prone areas require prepared lay responders because drowning risk increases in communities with frequent exposure to water hazards (Cenderadewi et al., 2024). Teachers occupy a strategic position because they supervise students during school activities and may become the first adults who recognize drowning emergencies (Esser-Noethlichs & Hegland, 2025). Basic Life Support knowledge helps teachers identify emergency conditions, activate assistance, and initiate appropriate early response before professional help arrives (Olasveengen et al., 2021). Community-based preparedness also supports the broader system of survival because early recognition and immediate response can improve emergency outcomes (Semeraro et al., 2021).

The finding that all respondents had no prior experience strengthens the importance of providing Basic Life Support education for teachers. Lack of prior exposure can limit teachers' ability to recognize danger signs, make rapid decisions, and perform correct first aid procedures during drowning incidents (Evans et al., 2021). Drowning education should target laypersons because immediate action often depends on people who are present at the incident location before emergency medical services arrive (Dezfulian et al., 2024). School-based training can fill this preparedness gap because teachers have continuous contact with

students and understand the physical risks in the school environment (Esser-Noethlichs & Hegland, 2025). First aid training is also relevant for non-health workers because simple and structured procedures can improve readiness in community emergency settings (Fibriansari et al., 2022). Health education programs can increase public awareness because repeated information exposure supports better understanding of preventive and emergency actions (Gad, 2021).

The combination of lecture and demonstration may explain the marked improvement in teachers' knowledge after the intervention. Lecture methods support cognitive learning because participants receive structured information about drowning, safety principles, emergency activation, airway management, rescue breathing, and chest compression (Greif et al., 2021). Demonstration methods strengthen procedural understanding because learners can observe correct actions before attempting to perform them independently (Giacomino et al., 2020). Learning through interaction improves knowledge acquisition because participants can ask questions, receive clarification, and build understanding through guided engagement (De Felice et al., 2023). Resuscitation education requires active learning because Basic Life Support competence depends on both conceptual knowledge and procedural accuracy (Greif et al., 2020). The integration of explanation, observation, and practice therefore creates a stronger learning pathway for teachers who have limited previous experience in emergency care (Minna et al., 2022).

The good post-intervention skill performance indicates that demonstration and guided practice can support practical competence after Basic Life Support education. Skill-based learning requires observation, repetition, and feedback because emergency procedures involve sequential psychomotor actions that must be performed accurately (Giacomino et al., 2020). First aid skills require appropriate evaluation because knowledge improvement does not always guarantee correct practical performance during emergency situations (Minna et al., 2022). Small-group or supervised practice can increase skill acquisition because instructors can observe participants directly and provide corrective feedback during performance (Nabecker et al., 2021). Simulation-based training can strengthen emergency response skills because learners practice realistic actions in a controlled environment before encountering real cases (Fibriansari et al., 2022). Practical teaching also supports resuscitation education because learners must translate information into effective airway, breathing, circulation, and referral actions (Olasveengen et al., 2021).

The significant improvement in knowledge also supports the value of teacher-focused emergency education in high-risk school settings. Teachers in coastal and flood-prone communities need emergency literacy because environmental hazards may expose students to water-related incidents during school or community activities (Cenderadewi et al., 2024). Drowning preparedness should involve schools because children require adult supervision and rapid assistance when aquatic emergencies occur (Evans et al., 2021). Teachers' emergency competence can strengthen the school safety system because they are available on-site and can initiate early response while waiting for professional responders (Esser-Noethlichs & Hegland, 2025). Public health education becomes more effective when it targets groups who have direct roles in protecting vulnerable populations (Prasetyo et al., 2023). Teacher training therefore extends drowning prevention beyond health facilities and places preparedness within everyday educational environments (Semeraro et al., 2021).

The study findings should be interpreted within the limitation that skills were measured only after the intervention. A post-intervention skill assessment can describe practical performance after training, but it cannot determine the magnitude of skill improvement from baseline (Minna et al., 2022). A pre-test and post-test skill design would provide stronger evidence because researchers could compare practical competence before and after the intervention (Creswell, 2018). A pre-experimental design can provide preliminary evidence, but it remains

vulnerable to internal validity threats because it does not include a control group (Mooney et al., 2023). Future studies should include comparison groups, repeated measurement, and retention assessment because Basic Life Support skills may decline without reinforcement over time (Greif et al., 2021). Periodic drills and refresher training should be considered because emergency response requires sustained readiness and confidence under stressful conditions (Sarmiento et al., 2024).

The findings have practical implications for school health programs and drowning prevention policies. Schools in high-risk areas should integrate Basic Life Support and drowning first aid into routine teacher capacity-building programs because early response can influence victim survival before referral (Dezfulian et al., 2024). Training programs should combine lecture, demonstration, simulation, and supervised practice because these methods address both knowledge and psychomotor skill development (Giacomino et al., 2020). School emergency preparedness should include standard operating procedures, emergency contact systems, referral pathways, and scheduled drills because survival depends on coordinated systems rather than isolated individual action (Semeraro et al., 2021). Teachers should receive repeated training because resuscitation education requires reinforcement, feedback, and performance evaluation to maintain competence (Greif et al., 2021). Collaboration with health professionals and local emergency services can improve training quality because expert guidance ensures that teachers practice procedures according to accepted resuscitation standards (Olasveengen et al., 2021). Thus, Basic Life Support education can become an important school-based intervention for reducing preventable drowning-related morbidity and mortality among students.

Conclusion and Recommendation

Basic Life Support education using lecture and demonstration methods significantly improved teachers' knowledge and supported good post-intervention skills in managing drowning incidents. The intervention was relevant because all respondents had no previous experience in handling drowning victims or performing Basic Life Support. The findings suggest that teachers can be prepared as school-based first responders when they receive structured, practical, and context-specific training. Schools located in coastal, riverine, and flood-prone areas should integrate drowning first aid and Basic Life Support training into routine emergency preparedness programs. School management should also develop simple emergency SOPs, provide emergency contact flowcharts, conduct periodic simulation drills, and collaborate with health professionals or local emergency services. Future studies should use a control group, larger sample size, pre-test and post-test skill assessment, and follow-up evaluation to measure skill retention over time.

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Declaration of conflict of interest

The authors declare no competing interests.

Declaration on the Use of AI

No AI tools were used in the preparation of this manuscript.

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