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Strengthening Water Safety Literacy as a Strategy for Mitigating Water Activity Risks in the Community

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Abstract

ABSTRACT

Background: Water safety literacy among community members remains relatively low despite the growing number of water-based activities for recreation, sports, education, and daily life. Limited knowledge and skills related to water safety increase the risk of drowning and other water-related accidents. Therefore, educational interventions are needed to improve public awareness and preparedness.

Aim: This community service program aimed to strengthen water safety literacy as a strategy to mitigate risks associated with water activities and promote a culture of safety within the community.

Methods: The program used a participatory approach consisting of needs identification, analysis, training, mentoring, and evaluation. Participants included students, youth, teachers, and community members. Activities involved educational sessions, discussions, water safety simulations, self-rescue practices, and participatory evaluations. Program effectiveness was assessed through pre-test and post-test measurements and qualitative observations.

Results: The findings showed significant improvements in participants' knowledge and awareness of water safety. Pre-test and post-test results indicated that 80% of participants improved their scores by more than 20 points after the program. Participants also demonstrated better abilities in identifying hazards, applying safety procedures, and performing self-rescue techniques. Qualitative findings revealed increased awareness of water safety and stronger commitment to safe behavior during water-based activities.

Conclusion: Strengthening water safety literacy is an effective strategy for improving community preparedness and reducing risks associated with water activities. The integration of educational materials, simulations, and practical experiences enhanced participants' knowledge, skills, and awareness. This program has the potential to be replicated in other communities to support the development of a sustainable water safety culture.

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INTRODUCTION

Water-based activities are widely undertaken by communities for recreational, sporting, educational, and economic purposes. As an archipelagic country with more than 17,000 islands and

vast aquatic resources, Indonesia has significant potential for the development of various water-based activities. However, the high level of interaction between people and aquatic environments also increases the risk of water-related accidents, including drowning, injuries caused by currents, and other emergency situations that may threaten human life (WHO, 2024). Therefore, water safety has become an important issue that requires attention from governments, educational institutions, and communities.

According to the WHO (2024), drowning is one of the leading causes of unintentional injury-related deaths worldwide. More than 300,000 people die from drowning each year, with the majority of victims coming from low- and middle-income countries. Children and adolescents are among the most vulnerable groups. In Indonesia, the high incidence of drowning is often associated with poor swimming ability, limited knowledge of water safety, and inadequate preparedness to respond to emergencies in aquatic environments (Stallman et al., 2017).

Water safety refers to the knowledge, attitudes, and skills required to prevent and reduce the risk of accidents in aquatic environments (Moran et al., 2012). Water safety literacy extends beyond swimming competence and includes an understanding of water hazards, safe decision-making, self-rescue skills, the proper use of safety equipment, and the ability to provide first aid in water-related emergencies (Langendorfer & Bruya, 1995). Individuals with higher levels of water safety literacy are generally better equipped to recognize risks and take appropriate preventive actions before accidents occur.

Despite its importance, water safety literacy remains relatively low among many community members. Water-based activities are often viewed merely as recreational or sporting pursuits without adequate awareness of the associated risks. Previous studies have shown that low levels of water safety awareness contribute to increased risks of drowning and aquatic accidents, particularly among young people (Moran et al., 2012; Quan et al., 2015). Furthermore, water safety education has not yet been optimally integrated into educational programs or community empowerment initiatives. Consequently, many individuals still lack the basic skills necessary to protect themselves during aquatic emergencies.

From a disaster risk reduction perspective, improving water safety literacy is an effective preventive strategy for reducing the incidence of water-related injuries and fatalities. Mitigation efforts should focus not only on emergency response but also on enhancing the capacity of individuals and communities to recognize, anticipate, and respond appropriately to potential hazards. Therefore, strengthening water safety literacy should be carried out systematically through educational and training programs that actively engage community members.

Based on these conditions, this community service program was implemented under the title “Strengthening Water Safety Literacy as a Strategy for Mitigating Water Activity Risks in the Community.” The program was designed to improve community knowledge, skills, and awareness regarding water safety through educational activities, basic water safety training, self-rescue simulations, and instruction on emergency response procedures in aquatic environments. The program also aimed to foster a sustainable safety culture, particularly among individuals who live near or frequently engage in activities around water environments.

Through this initiative, community members are expected to gain a better understanding of water-related risks, adopt safer behaviors in aquatic settings, and develop greater preparedness for emergency situations. By enhancing water safety literacy, individuals can acquire practical knowledge and skills while actively contributing to the creation of safer and more sustainable water-based environments. Therefore, this community service activity is expected to serve as a strategic effort to prevent water-related accidents and improve public safety on a broader scale.

METHOD

This community service program was designed in response to the high risk of water-related accidents resulting from the low level of water safety literacy among community members. Each stage of the program reflected a commitment to increasing public awareness, knowledge, and skills in addressing potential hazards in aquatic environments. The community service team acted as a partner by listening to community needs, understanding local environmental conditions, and collaboratively developing solutions through an educational and participatory approach. The implementation stages are described as follows.

Identification

The first stage involved identifying community needs and mapping the potential risks associated with water-based activities. This process aimed to design a program that was relevant to the needs, conditions, and characteristics of the target community. Data were collected through participatory observations and in-depth interviews with community members, local leaders, teachers, youth groups, and stakeholders involved in water-related activities. This stage enabled the service team to understand the community's level of water safety knowledge, common water-based practices, and the risks frequently encountered. Community safety concerns served as the foundation for identifying problems and developing appropriate intervention strategies.

Analysis

The second stage involved analyzing water safety literacy needs and determining the educational content to be delivered. The analysis focused on several aspects of water safety, including hazard recognition, safe behavior in aquatic environments, self-rescue skills, proper use of safety equipment, and emergency response procedures. Environmental characteristics such as rivers, ponds, lakes, and recreational water areas were also considered. The findings were used to develop contextualized educational materials and training activities that were easily understood and applicable to participants.

Training

Following the analysis stage, training activities were conducted to strengthen community capacity in water safety. Participants included students, youth, teachers, community members, and other relevant stakeholders. Training topics covered basic water safety concepts, hazard identification, safety equipment usage, self-rescue techniques, and first-aid procedures for water-related accidents. In addition to lectures and discussions, participants engaged in simulations and practical exercises designed to improve water safety skills. Through this participatory approach, participants gained not only theoretical knowledge but also practical experiences applicable to everyday situations.

Mentoring

Throughout the program, the service team provided intensive mentoring to participants. Mentoring served not only as program monitoring but also as a platform for consultation, discussion, and reinforcement of participants' understanding of water safety practices. Participants were encouraged to share their experiences, challenges, and needs related to implementing water safety principles. Feedback collected during this stage was used to improve and refine the program.

Evaluation

A participatory evaluation was conducted to assess the overall effectiveness of the program. The evaluation involved participants, community leaders, and the service team. It aimed to measure participants' understanding of the materials, changes in attitudes toward water safety, and their ability to apply acquired skills. Evaluation methods included observations, reflective discussions, and pre-test and post-test assessments. Educational materials and follow-up recommendations were also provided to support program sustainability. Collaboration with local governments, schools, and community organizations was encouraged to expand and sustain water safety literacy initiatives.

Through this approach, the community service program focused not only on improving technical knowledge of water safety but also on promoting a sustainable safety culture within the community. Each stage was implemented through dialogue and collaboration, fostering a sense of ownership among participants. As a result, community members were expected not only to understand water safety concepts but also to apply them in their daily lives. Strengthening water safety literacy is expected to enhance community preparedness, reduce the risk of water-related accidents, and promote a long-term culture of safety in aquatic environments.

RESULTS AND DISCUSSION

Results

In the era of globalization, characterized by rapid technological and information advancements, community engagement in water-based activities has continued to increase for recreational, sporting, educational, and economic purposes. However, this increase has not been accompanied by adequate knowledge and awareness of water safety. As a result, the risk of water-related accidents remains high. In response to this issue, this community service program was designed to strengthen water safety literacy as a strategy for mitigating risks associated with water activities through an educational, participatory, and contextual approach.

The findings demonstrated that the water safety literacy strengthening program has strong potential to improve community awareness and preparedness regarding water-related risks. During the initial identification stage, it was found that most participants lacked an understanding of basic water safety principles, including the use of safety equipment, self-rescue techniques, and first-aid procedures for water-related emergencies. Interview results indicated that more than 75% of participants had never received formal water safety training. Furthermore, field observations revealed that many community members frequently engaged in activities in rivers, ponds, and recreational water areas without fully understanding the associated hazards.

Through educational sessions and training activities, participants began to recognize the relationship between water-based activities and the importance of applying water safety principles. Increased awareness emerged as participants realized that most water-related accidents could be prevented through appropriate knowledge and behavior. Water safety concepts were introduced through lectures, group discussions, safety simulations, and practical self-rescue exercises.



Figure 1. Water Safety Literacy Socialization and Education Program for Participants

A total of 30 participants, including students, youth, teachers, and community members, demonstrated increased understanding of water safety concepts following the training. Pre-test and post-test results showed that 80% of participants improved their scores by more than 20 points. Detailed data on participants' learning outcomes are presented in [Table 1](#).

Table 1. Improvement in Water Safety Literacy Understanding

Category	Number of Participants	Pre-test	Post-test	Description
Students	12	56	81	10 of 12 participants (83%) improved by more than 20 points.
Youth	8	58	80	6 of 8 participants (75%) showed significant improvement.
Teachers	5	62	85	All participants demonstrated improved understanding.
Community Members	5	55	78	4 of 5 participants (80%) improved by more than 20 points.
Average	30	57.8	81.0	80% of participants demonstrated score improvement.

Active participation emerged as one of the key findings of this program. Many participants actively asked questions regarding emergency response procedures in aquatic environments, the proper use of life jackets, and safe rescue techniques for drowning victims. During simulation activities, participants showed high enthusiasm in practicing self-rescue techniques and basic water safety procedures. These findings suggest that practice-based learning provides deeper understanding than theoretical instruction alone.

From the community perspective, the program offered valuable learning experiences relevant to everyday life. Many participants realized that water safety is not solely the responsibility of lifeguards or authorities but a shared responsibility that should be understood and practiced by everyone engaging in water-based activities.

Discussion

The implementation of the Water Safety Literacy Strengthening Program was conducted over a two-month period through a series of educational activities, training sessions, simulations, and mentoring programs. The participants included students, youth, teachers, and community members who regularly engage in water-based activities. Throughout the learning process, participants were provided with opportunities to understand various risks associated with water activities and to practice essential safety skills required in emergency situations.

The success of combining theoretical instruction with practical simulations in this program aligns with the theory of experiential learning, which states that a person's best understanding comes through real-world action and reflection. When participants directly practice water self-rescue simulations, theoretical information that was initially abstract transforms into motor skills that are firmly embedded in their memory. Several studies on disaster prevention also confirm that mitigation education involving active community participation is far more effective in changing safety behaviors than one-way lecture methods. By directly engaging both physical and emotional aspects through hands-on exercises, this program successfully accelerates the development of participants' mental preparedness when facing real-life emergency situations. This demonstrates that strengthening safety literacy should not stop at merely memorizing text but must be realized through real-life experiences that are contextual to daily life.

The findings revealed that the participatory approach effectively increased participants' active engagement in the learning process. Participants not only received information but also gained hands-on experience through water safety simulations and practical exercises. These direct learning experiences helped participants develop a deeper understanding of the importance of preventive actions and preparedness in reducing the risk of water-related accidents.

During the program, facilitators observed a significant increase in participants' confidence when dealing with emergency situations. Individuals who previously had limited knowledge of basic water safety procedures became capable of explaining self-rescue techniques, identifying hazards in aquatic environments, and understanding the importance of using safety equipment. These findings

suggest that improving water safety literacy contributes not only to knowledge acquisition but also to positive changes in attitudes and safety-related behaviors.

During the evaluation sessions, most participants reported that the program provided valuable learning experiences and should be continued on a regular basis. Approximately 90% of participants recommended that similar programs be incorporated into school activities and community initiatives. Qualitative findings further indicated increased awareness of the importance of fostering a safety culture in water-based activities.

The mentoring process enabled the community service team to adapt learning methods according to participants' needs. Feedback from participants was utilized to improve educational materials, simulation methods, and learning media, making them more accessible and effective for different age groups. Documentation of the activities showed that the learning environment was active, collaborative, and enjoyable, contributing to the development of a positive learning culture.

One of the major achievements of this program was the emergence of a strong commitment among participants to become water safety advocates within their communities. Several participants expressed their willingness to share the knowledge and skills they had acquired with family members, friends, and local community groups. This finding demonstrates that the program not only enhanced individual knowledge and competencies but also has the potential to generate a multiplier effect in promoting a broader culture of water safety within society.



Figure 2. Participants and Community Service Team in the Water Safety Literacy Strengthening Program

Implications

The improvement in water safety literacy through this program has had a tangible impact on changing people's daily behavior, making them more cautious when near bodies of water. This new awareness is shifting the common perception that water safety is no longer merely about swimming ability, but rather a life skill that involves understanding risks and mental preparedness. In the long term, as this understanding spreads, the number of fatal accidents—such as drownings—in the surrounding area can be significantly reduced. Furthermore, this program highlights the importance of developing local safety guidelines that can serve as a shared reference for local villagers. Thus, this investment in education not only saves lives today but also shapes a future generation that is far more vigilant and safe.

Contribution of Community Service

This community service initiative made a significant contribution by bridging the information gap regarding self-rescue procedures, which have long been inaccessible to the general public. The community service team successfully delivered practical educational materials and pioneered hands-on simulations in the field, which were proven to boost participants' confidence. Through a friendly, dialogue-based approach, this initiative also fostered the emergence of water safety advocates who are ready to share their knowledge with their families and immediate neighbors. Institutionally, this program reinforces the university's tangible role in addressing concrete problems currently faced by the surrounding community. The success of this intervention has also given rise to an environmentally friendly disaster preparedness learning model that is ready to be adapted by other regions.

Limitations

Although this program ran very smoothly and was warmly received, there are several limitations that must be honestly acknowledged. The implementation period, which lasted only two months, was still considered too short to truly gauge a permanent shift in the community's safety culture. Furthermore, the limited number of training participants—only 30 people—means that the program's direct impact has not yet reached all segments of the village population equally. Limitations in simulation equipment also mean that field exercises cannot yet cover all variations of extreme water conditions, such as strong river currents or the actual depths of lakes. Finally, the evaluations conducted so far have only assessed short-term changes in knowledge immediately after the training was completed.

Suggestions

Given the limitations identified, it is recommended that similar educational programs be held periodically and on an ongoing basis, involving a larger number of participants from various neighborhood associations. Local governments and schools are encouraged to integrate this water safety curriculum into extracurricular activities or the regular schedules of village residents. Additionally, the installation of hazard warning signs and the provision of basic safety equipment, such as life jackets, around public water areas should be implemented immediately through community collaboration. Researchers and community service workers are also encouraged to conduct periodic monitoring several months after the program to assess whether these safety behaviors continue to be consistently practiced. Strong collaboration among the community, academics, and village officials will be key to sustaining this culture of safety.

CONCLUSION

This community service program demonstrates that strengthening Water Safety literacy is an effective strategy for improving community awareness, knowledge, and skills in minimizing risks associated with water-based activities. Through collaboration among the community service team, community members, students, and various stakeholders, water safety was not only understood as theoretical knowledge but also applied as an essential life skill in everyday activities.

The improvement in participants' understanding, positive changes in attitudes toward water safety, and increased awareness of safe behaviors in aquatic environments indicate that the program generated positive impacts on cognitive, affective, and psychomotor domains. These findings suggest that water activity risk mitigation can be effectively implemented through educational approaches that are participatory, contextual, and sustainable.

Through reflective learning experiences and hands-on practice, participants gained a better understanding of water-related hazards, self-rescue techniques, the use of safety equipment, and emergency response procedures. Furthermore, the program successfully promoted a safety culture that encourages individuals to take greater responsibility for their own safety and the safety of others during water-based activities.

The success of this program indicates that improving Water Safety literacy not only contributes to reducing water-related accidents but also plays an important role in developing a more resilient, prepared, and safety-conscious community. Therefore, similar programs should be continuously

developed and expanded to reach broader segments of society and serve as a sustainable model for water safety education in the future.

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AUTHOR CONTRIBUTION STATEMENT

JU conceived and designed the community service program, drafted the manuscript, and supervised the project. AP and NS developed the educational materials and coordinated the field observations. AN and AM led the water safety simulations and practical training sessions. All authors contributed to data analysis, reviewed the manuscript, and approved the final version.

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