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Inclusive Health and First-Aid Education Assistance through Traditional Games as an Implementation of Local Wisdom for Children with Special Needs

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ABSTRACT

Children with special needs are more vulnerable to minor injuries due to limited motor coordination and low awareness of environmental risks, emphasizing the need for accessible first-aid education. This community service program aimed to improve inclusive health literacy and basic first-aid skills by integrating traditional games, *Bola Bekel* and *Ular Naga*, as culturally based learning media. A Participatory Action Research (PAR) approach was applied in collaboration with teachers and students at Widya Bhakti Special Needs School, Semarang, through planning, implementation, and evaluation stages. The adapted games introduced essential first-aid concepts, including recognizing common injuries, selecting appropriate first-aid equipment, and practicing simple response procedures through guided simulations. The program results showed increased student understanding of first-aid tools, greater confidence in performing basic first-aid actions, improved motor coordination, and enhanced social interaction. In addition, the activity strengthened partner empowerment by improving teachers' capacity to independently implement game-based first-aid learning and integrate it into school activities, supporting program sustainability. This program contributes to the development of culturally relevant, inclusive, and sustainable first-aid education models for children with diverse abilities.

ARTICLE INFORMATION

Keywords:
children with special needs; first aid; health education; inclusive; traditional games

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INTRODUCTION

Health education and first-aid instruction are fundamental components in strengthening children's safety, autonomy, and life skills. For children with special needs, this education becomes even more urgent due to their heightened vulnerability to injury. According to the World Health Organization, children with developmental disabilities face a 30–40% higher risk of unintentional injuries compared to typically developing peers (WHO & UNESCO, 2023). A preliminary study conducted through interviews with the principal and teachers of SLB Widya Bhakti Semarang revealed that the school does not yet provide a specific curriculum or structured material on First Aid (P3K). As a result, students lack fundamental knowledge and skills to manage minor injuries that frequently occur during school activities, particularly among Grade 5 students. Based on the motor development theory of Gallahue et al. (2012), children aged 10–11 are in the specialized movement stage, where they combine locomotor and manipulative skills in competitive play, increasing their susceptibility to falls and injuries. This is consistent with Jariono et al. (2023), who show that children with special

needs exhibit varied motor abilities, especially in coordination, muscle strength, and balance, making them more prone to instability and injury. These conditions underscore the need for innovative, accessible, and ability-responsive first-aid education, prompting the use of traditional game–based simulations as a contextual learning solution.

Based on initial observations and interviews with the principal and teachers at SLB Widya Bhakti Semarang, it was found that first aid for students is still handled in a simple, unstructured manner. Teachers usually respond to minor injuries based on personal experience, without standardized procedures or student-centered learning activities. Minor injuries frequently occur during physical activities and play, especially among upper-grade students, but these incidents have not been used as learning opportunities to develop students' awareness and basic first-aid skills. The school does not yet have a specific first-aid learning module tailored to the needs of children with special needs. Although basic first-aid equipment is available, it is rarely used as an educational tool, and students are not systematically introduced to the functions of first-aid tools. As a result, students tend to depend entirely on teachers when injuries occur and show low confidence in responding to simple situations. Teachers also reported difficulties in delivering first aid education that is engaging and appropriate to students' motor and cognitive abilities. These conditions indicate a clear gap between the need for first-aid education and current practices at the partner school, justifying the implementation of this community service program.

The existing literature highlights the benefits of experiential learning, peer collaboration, and activity-based instruction for students with diverse abilities. According to Tharris and Muise (2022), peer learning models have been shown to increase confidence, engagement, and decision-making accuracy during first aid practice. Meanwhile, according to Eddy et al. (2016), cooperative tasks strengthen procedural understanding in the context of health. Game-based learning also significantly improves children's concentration, engagement, and conceptual understanding, as reported in a meta-analysis by Alotaibi (2024). However, there is a gap when reviewing previous interventions: most studies rely on digital gamification or formal simulation tools that require high cognitive load, advanced motor coordination, or unequal access to technology for all learners. Research specifically targeting first aid education for children with special needs is still rare, especially in Indonesia, and there has been little exploration of culturally rooted, low-cost, and inclusive learning tools. This creates a clear mismatch between students' developmental needs and the instructional media commonly used in first aid programs.

Traditional games represent an underutilized yet highly promising learning medium that supports both physical and socio-emotional development. Studies show that traditional games enhance motor skills (Nurwahidah et al., 2023), cooperation, and role-sharing (Sitorus et al., 2023), while providing meaningful, culturally embedded learning experiences aligned with children's natural play patterns. Bola Bekel, with its focus on repetitive hand–eye coordination, strengthens fine motor skills essential for basic first-aid actions, whereas Ular Naga encourages gross motor participation, social interaction, instruction following, and emotional regulation. Despite these strengths, no published studies have systematically integrated traditional games into first-aid education for children with special needs, revealing a significant gap between cultural learning potentials and practical health instruction. Gamification trends in first-aid education (Vancini et al., 2023) further highlight the timeliness of integrating playful, meaningful, and contextually relevant methods. Therefore, the present program seeks to develop an inclusive, adaptive, and culturally rooted first-aid education model using traditional games to ensure that children with special needs can acquire essential health skills in an accessible, enjoyable, and developmentally appropriate manner.

Various recent studies confirm that first aid education is a key intervention in preventing unintentional injuries in children, especially for vulnerable groups. Shetty et al. (2025) show that

injury prevention programs and first aid training have a strong evidence base in improving child safety, in line with a systematic review by Tse et al. (2023), which confirms the effectiveness of first aid training programs for young children in building basic knowledge and responses to emergencies. Furthermore, Kaçan (2022) found that first aid training for families with intellectually disabled children reduced anxiety and increased parental preparedness, highlighting the importance of a comprehensive educational approach in the context of special needs. Similar efforts were also reported by Konthon et al. (2025), who developed an accident prevention program and P3K training in schools, demonstrating a positive impact on teachers' preparedness to handle incidents in early childhood education settings. Findings regarding the vulnerability of children with disabilities are reinforced by a meta-analysis by Shi et al. (2015), which shows that the risk of unintentional injury is significantly higher in children with disabilities than in typical children. On the other hand, strengthening motor skills, which play an important role in physical preparedness for injury, is also supported by Wainwright et al. (2020), who emphasize that physical literacy and good motor development can reduce the risk of injury. In addition, traditional games as a non-formal intervention medium have been proven to provide therapeutic benefits, as shown by Sujariah and Azizah (2025), who found that traditional games are effective in improving the social-emotional development of children with special needs, confirming their potential as an inclusive and contextual approach in supporting safety and first aid programs for all students.

METHOD

This community service project used a Participatory Action Research (PAR) design because this approach allows for active collaboration between students, teachers, and mentors at every stage of program planning, implementation, and evaluation. PAR was chosen because it can create an inclusive and empowering learning process, especially when involving children with special needs. Recent research confirms that PAR is effective in the context of disabilities, as it provides space for participants to equally determine the direction of activities, as demonstrated in a study of disability theater that positioned individuals with disabilities as active and critical partners (Hole & Schnellert, 2024). Similar findings were also reported by Ahlers et al. (2021), who found that PAR adaptations enabled meaningful engagement for co-researchers with intellectual and developmental disabilities through modifications to activities and communication. This activity was conducted at the Widya Bhakti Special Needs School in Semarang, Central Java, Indonesia, with fifth-grade students as the primary partners. The materials used included three sets of marbles, question cards, and a first aid kit as interactive learning media. The planning phase began with initial observations to identify students' abilities to recognize potential hazards, understand the basic functions of first aid kits, and interact during play. This baseline information served as the basis for designing interventions aligned with students' developmental characteristics.

In this community service program, teachers and schools are positioned as active subjects in the process of empowerment. From the planning stage, teachers are directly involved as partners in identifying priority injury cases, selecting learning objectives, and designing adaptations to traditional games that suit students' motor and cognitive characteristics. Teachers collaborate with the service team to develop game rules, instruction cards, and first-aid simulations, ensuring the activities are appropriate and relevant to the school context. During the implementation stage, teachers act as facilitators, leading the learning process, guiding student participation, and demonstrating appropriate first aid responses, while the service team provides guidance and support. In the evaluation phase, teachers participate in reflective discussions to assess student progress and identify opportunities for improving the learning design. The results of this program empowerment are demonstrated by increased teacher confidence and ability to independently implement game-based

first aid education, as well as the school's commitment to continue using adapted traditional games as part of routine health and safety learning activities, thereby supporting the sustainability of the program beyond the intervention period.

Discussions with teachers led to the selection of two traditional games that could be modified for use as health education media. The selection of these traditional games is supported by various findings showing that local play activities significantly contribute to children's physical and motor development. A meta-analysis by Abadi and Nugroho (2024) showed that traditional games consistently improve children's motor skills, particularly coordination. Arfanda et al. (2023) also confirmed that traditional play activities strengthen physical capacity and motor endurance. Furthermore, a systematic review conducted by Ginanjar et al. (2023) showed that early-age sports and play activities in Indonesia play a crucial role in laying the foundation for children's physical and social development, as well as active lifestyle habits. These findings support the selection of play media for this program, as it aligns with the developmental needs of children with special needs.

Next, instruction cards, first aid kit replicas, and game scenarios were developed to facilitate understanding of the learning process. This approach, which combines contextual adaptation, collaboration, and active participation, aligns with contemporary PAR research recommendations that emphasize flexibility, media modification, and the importance of co-creation to ensure activities are truly inclusive for children with special needs (Ahlers et al., 2021). This alignment also aligns with Syafril's (2021) view that traditional games can be a fun medium that supports various children's competencies. The implementation phase involved integrating first-aid learning into play activities. In the marbles game, students who were unable to retrieve the marbles were given a short quiz on first-aid procedures. This strategy helped improve the ability to recognize wound types, select appropriate first-aid equipment, and develop fine motor coordination, in accordance with motor development theory (Gabbard, 2018). The effectiveness of traditional games on motor skills is supported by the literature, which shows that these activities improve children's agility, movement precision, and motor stability (Saefullah et al., 2024).

In the dragon snake game, the learning process is developed through situational simulations. When the music stops, students receive a quiz card with examples of injuries, such as a scraped knee or a cut hand, and are then asked to demonstrate the correct first aid actions. This simulation approach is effective in strengthening contextual understanding and rapid response in children with cognitive disabilities, as reported by Sivrikaya et al. (2023), who found significant improvements in emergency response skills after simulation instruction. The evaluation and reflection phase was conducted to assess changes in students' knowledge, skills, and behavior. Observations included students' ability to apply plasters, their accuracy in naming the functions of first-aid kits, and the quality of their social interactions during the game. Additionally, interviews with teachers were conducted to determine changes in students' independence and attitudes. Data analysis was conducted descriptively to illustrate developments in cognitive, psychomotor, and socio-emotional aspects, in accordance with a play-based intervention approach that has demonstrated effectiveness through observation of children's natural behavior (Duan et al., 2024).

Data collection was conducted through observation and interviews. Observations were conducted during game sessions using observation sheets compiled around indicators such as the ability to recognize wound types, the accuracy of first-aid equipment selection, motor coordination, the speed of response to instructions, and social interaction. Recording techniques followed the guidelines of Miles et al. (2020), providing a context-rich description of student behavior. In addition, semi-structured interviews were conducted with the accompanying teacher and five students with simple verbal communication skills. The interviews explored participants' understanding of first aid materials before and after the activity, their experiences participating in traditional games, and

changes in their attitudes toward simple wound care. Interview recordings were fully transcribed and analyzed to obtain an in-depth understanding of the program's effectiveness from the participants' perspectives.

RESULTS AND DISCUSSION

The results showed significant improvements in students' knowledge, skills, and behavior after participating in a first aid-based educational game. The improvement patterns in the tables and graphs confirmed that modifying traditional games effectively supported students with special needs in their understanding. This aligns with Gulo et al. (2025), who emphasized that educational games improve focus, participation, and understanding of health concepts. Furthermore, the use of culturally relevant games also strengthens learning engagement, as explained in the concept of culturally responsive teaching (Gay, 2020). This framework supports the principle that learning activities that are clearly observable, visual, concrete, and structured are more easily understood by students with special needs, aligning with the concept of Visible Learning for SEL (Hattie et al., 2022)

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Table 1. Observation of the First Aid Kit Ball Game

Observation Findings	Description
Motor response	Some students had initial difficulty catching the ball and the beads, but their abilities improved after repetition.
Understanding First Aid	Students begin to understand how to perform first-aid measures, such as for abrasions, scratches, and bruises.
Concentration & focus	Marble activities increase students' focus.
social interaction	Students help each other when their friends have difficulty picking up seeds.



Figure 1. Implementation of the Bekel Ball Game for Students with Disabilities

The use of situation cards and quick quizzes that require instant responses significantly improved the ability to recognize injuries such as abrasions, scratches, and bruises. This mechanism strengthens contextual understanding, supporting Nastiti et al. (2024), who found that educational games improve the accuracy of identifying minor injuries. The use of replica first-aid kits also strengthens procedural memory, supporting Hidayat's (2024) findings on the effectiveness of simulation media. This type of learning aligns with the concept of culturally sustaining pedagogies (Paris & Alim, 2023), as it integrates local practices into the educational context, making students feel more connected to the material. In addition, the effectiveness of these strategies depends on the importance of early identification and assessment of children with special needs, which serves as the basis for selecting appropriate learning media and intervention approaches tailored to students'

abilities and needs, as emphasized by Irvan (2020). Furthermore, this multi-sensory and hands-on intervention approach is consistent with the review by Tollan et al. (2023), which highlights that effective early intervention systems emphasize structured, developmentally appropriate, and experience-based activities to support optimal learning and developmental outcomes in children with disabilities.

Psychomotor aspects showed positive development, especially fine motor skills through playing marbles and gross motor skills through playing the dragon snake game. Rhythmic and repetitive activities strengthen sensorimotor integration, consistent with Putri et al. (2023) on the effectiveness of collage activities for training fine motor coordination. The intentional adaptation of games based on students' functional characteristics is closely related to the importance of early identification and assessment of children with special needs, which serves as a foundation for selecting appropriate stimulation and learning strategies, as emphasized by Irvan (2020). Adapting the game to students' needs also aligns with the principles of adaptive inclusive learning, as explained by Ebersöhn et al. (2022), in which learning environments are designed to respond flexibly to learner diversity. Furthermore, the clear, observable activity structure supports the development of social-emotional skills and self-regulation, aligning with the concept of visible learning, which helps students understand learning goals and activity stages (Hattie et al., 2022). This approach is consistent with early intervention frameworks, which highlight that structured, developmentally appropriate, and engaging activities can optimize motor and psychosocial outcomes for children with developmental challenges (Tollan et al., 2023).

Tabel 2. First Aid Dragon Snake Game Observation

Observation Findings	Description
Teamwork	Students can follow the rhythm of the song and move in a compact line.
Quick response	When the song stops, students can name the first aid actions from the question cards.
Courage	Children who were initially passive began to dare to speak and answer.
Cognitive	The ability to identify vulnerable body parts increases.



Figure 2. Implementation of the Snake and Dragon Game for Students with Disabilities

Improvements in social interaction and the ability to follow instructions were also evident. Students became better able to wait their turn, work collaboratively, and respond more quickly to instructions. These findings align with Gulo et al.'s (2025) report on improved communication and cooperative behavior through educational games. The safe social space provided by group games like Snake and Dragon encourages students' courage in making quick decisions, in line with Irwadi et al.

(2025). Group-based learning, which provides opportunities to practice these social skills, is also seen as a crucial component of the SEL framework by Hattie et al. (2022), who emphasize that direct interaction and collaborative activities improve emotional regulation and social relationships.

Interviews with teachers reinforced observational findings that students experienced increased courage and independence in treating minor injuries. The homeroom teacher reported that after participating in educational games, students responded more quickly to instructions and were no longer hesitant to use first aid equipment. The teacher stated, *"They are more courageous now. When I asked what a band-aid was for, they immediately answered and even showed me how to apply it. Before, they were still confused."* (Teacher, interview, September 26, 2025). This statement is consistent with Nastiti et al. (2024), who found that game-based first aid learning can increase children's preparedness and reduce anxiety about first aid procedures.

Furthermore, teachers also assessed that traditional games help strengthen motor coordination and response. In a marble ball session, for example, a teacher mentioned that the game made students more focused and motivated. She explained, *"When playing marble ball, they try to pick up the ball while remembering the first aid quiz. So, their motor skills are working, and their minds are also being trained."* (Teacher, interview, September 26, 2025). This aligns with a meta-analysis by Abadi and Nugroho (2024), which showed that traditional games consistently improve children's basic motor skills. The students themselves responded positively to the activities. One student interviewed said that playing made the first aid material easier to understand. He said*, "Playing snake and dragon is fun, ma'am. If I get a wound card, I know how to use a band-aid or gauze."* (Student, interview, September 26, 2025). This finding supports Arfanda et al. (2023), who found that traditional games improve concentration and physical engagement, which, in turn, affects task comprehension.

Teachers also observed significant social development. During play, students began to exhibit cooperative behavior, such as waiting their turn, working together, and supporting their peers. A teacher described, *"They now often say 'let us do it together' or 'you were okay before.' The spirit of cooperation emerges naturally when they play."* (Teacher, interview, October 1, 2025). This finding aligns with Saefullah et al. (2024), who stated that traditional games can foster healthy social interactions among children.

Overall, this program strengthens the evidence that traditional games modified for first-aid education can improve cognitive, psychomotor, and social-emotional competencies in students with special needs. This approach is not only culturally inclusive but also aligns with the principles of responsive pedagogy and cultural sustainability (Gay, 2020). Modifying game rules to suit students' needs and creating supportive learning spaces are essential for developing inclusive learning, as recommended by Ebersöhn et al. (2022). These results also align with the principles of visible learning (Hattie et al., 2022), which emphasize the importance of concrete, collaborative, and continuous experiences in supporting the development of children with diverse needs profiles. Importantly, the successful implementation of these principles was closely linked to teachers' active involvement as partners in the empowerment process, rather than as mere recipients of the program.

Beyond the improvements observed among students, this community service program also strengthened partner capacity, particularly that of teachers, as key actors in inclusive first-aid education. Through their active engagement in the planning, implementation, and reflection stages of the Participatory Action Research (PAR) process, teachers gradually shifted from passive recipients of activities to co-facilitators of learning. During the mentoring process, teachers adapted game rules, simplified instructions, and mediated student interactions based on students' functional abilities, demonstrating increased pedagogical agency. This shift reflects a core principle of community empowerment, in which partners develop the competence and confidence to address contextual challenges independently within their institutions.

CONCLUSION

The implementation of this community service program demonstrates that integrating traditional games into inclusive first-aid education effectively enhances students' ability to recognize minor injuries, identify and select appropriate first-aid tools, and perform basic responses such as simple wound care during simulated situations. Throughout the learning activities, students showed improved behavioral readiness, strengthened fine and gross motor coordination, and increased social engagement, indicating that the use of *bola bekel* and *ular naga* creates an accessible, contextual, and enjoyable learning environment for children with special needs. These findings confirm that traditional games function as effective pedagogical media for delivering health and first-aid competencies through embodied, multimodal, and culturally relevant instruction. From a practical perspective, this program offers inclusive schools a feasible, low-cost model for integrating first-aid education into routine learning activities, while empowering teachers to facilitate game-based health instruction independently. Program sustainability can be supported by incorporating this approach into school health programs and teacher development initiatives, as well as through collaboration with relevant health and education stakeholders to expand implementation and strengthen inclusive first-aid education across diverse school contexts.

DECLARATION OF GENERATIVE AI

The authors declare that no generative AI or AI-assisted technologies were used in the writing process of this manuscript.

CONFLICTING INTEREST STATEMENT

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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