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Analysis of Swimming Pool Facilities and Infrastructure Needs to Support Effective and Safe Physical Education Learning in Schools

Ricardo Valentino Latuheru

Universitas Negeri Makassar, Sulawesi Selatan, Indonesia

ricardo.valentino@unm.ac.id

ABSTRACT

This study aims to analyze the need for swimming pool facilities and infrastructure to support effective and safe Physical Education (Penjas) learning at Makassar State School 3. The research method uses a quantitative descriptive approach with survey, observation, and interview techniques, involving 20 respondents consisting of Penjas teachers, education staff, and students. The results of the study indicate that the overall level of adequacy of swimming pool facilities and infrastructure only reached 44%, which indicates inadequate conditions. The physical condition of the swimming pool is in the moderate category with a percentage of 66%, but the water quality and circulation system are still below standard. The availability of swimming learning facilities such as float boards, kickboards, and lane ropes is considered low with an average of only 52%, while safety facilities are in the most critical condition with adequacy of 18%, including the lack of lifeguards, safety signs, and emergency SOPs. Non-technical supporting facilities such as changing rooms, rinse rooms, and toilets are also at a moderate level of adequacy, namely 42%. These findings indicate that school swimming pool facilities and infrastructure do not support safe, effective, and sustainable swimming instruction. Therefore, strategic planning is needed to improve infrastructure, equip learning aids, and enhance safety systems to ensure optimal quality of physical education instruction.

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INTRODUCTION

Physical education (PE) learning is an integral component of the national education system, serving to develop students' physical, motor, cognitive, affective, and social values. In the context of 21st-century education, PE is not only oriented towards improving physical fitness but also towards character development, a healthy lifestyle, and social competence through structured and safe physical activities (Samsudin & Rahmawati, 2021). The availability of adequate facilities and infrastructure is one of the determining factors influencing the quality of PE learning, including aquatic activities such as swimming, which play a crucial role in the elementary and secondary education

Ricardo Valentino Latuheru[A-E]
ricardo.valentino@unm.ac.id*

curriculum. Swimming is a life skill that must be taught to develop personal safety, courage, self-confidence, and overall physical fitness (Setiawan, 2020).

In principle, swimming instruction in schools requires the availability of facilities and infrastructure, such as swimming pools, that meet safety, suitability, and pedagogical standards. National and international standards emphasize that the provision of swimming facilities is not only related to physical infrastructure such as pool size, depth, and water quality, but also to supporting facilities such as swimming aids, safety equipment, rinse rooms, changing rooms, and monitoring and risk management systems (Fadhli, 2022; World Health Organization, 2017). In the context of education in Indonesia, Minister of National Education Regulation No. 24 of 2007 concerning Facilities and Infrastructure Standards explicitly states that educational facilities must support a safe and effective learning process, including water sports learning.

In general, sports facilities and infrastructure are fundamental factors determining the success of Physical Education (PE) learning in schools. Many studies have shown that adequate infrastructure is positively related to student interest, the effectiveness of learning methods, active participation levels, and even increased motor skills (Arifin & Setiawan, 2019; Lubis & Harahap, 2021). In swimming activities, safety is particularly crucial. Swimming is a high-risk sport if students are not supported by facilities that meet standards. The WHO (2017) even listed swimming lessons as one of its global strategies for drowning prevention.

In many countries, providing swimming facilities in schools is a priority for educational investment because swimming is seen as a fundamental skill that all students should master. Countries such as Australia, Japan, and Singapore have implemented mandatory swimming programs in elementary and secondary schools, with very stringent infrastructure standards (Mitchell et al., 2020). This demonstrates that the presence of swimming pools not only supports the goals of the Physical Education curriculum but also has long-term social and health impacts.

In the Indonesian context, swimming lessons are actually included in the Basic Competencies (KD) of the Physical Education curriculum at all levels of elementary, middle, and high school. However, its implementation is often hampered by limited facilities and infrastructure. Many schools lack swimming pools, so the learning process relies on collaboration with external parties or is not implemented at all. Research by Rahmawati & Taufik (2020) shows that approximately 70% of schools in large cities in Indonesia do not have their own swimming pool facilities, resulting in incidental and unstructured swimming lessons. These limited facilities result in poor student swimming skills, an increased risk of water accidents, and reduced learning effectiveness.

Sekolah Negeri 3 Makassar, a secondary school in Makassar City, faces similar challenges. To date, the available swimming pool facilities still do not meet Physical Education learning standards in terms of size, cleanliness, completeness of equipment, and safety systems. Inadequate infrastructure can impact the quality of learning and reduce student participation. As a coastal city, Makassar faces a high risk of water accidents, making effective and safe swimming lessons a pressing need.

Ricardo Valentino Latuheru[A-E]
ricardo.valentino@unm.ac.id*

Furthermore, pedagogical aspects such as swimming instructional models, the number of certified teachers, and the availability of swimming aids play a crucial role in supporting successful learning (Wijaya & Kurnia, 2021). Swimming aids such as lifeboards, buoyancy belts, and hand floats are necessary to accommodate students' varying abilities. Supervision systems such as the presence of lifeguards, safety signs, and emergency SOPs are also mandatory components of modern swimming lessons (Purnama & Latief, 2022).

Although swimming lessons are considered essential in the Physical Education curriculum, many schools still lack facilities and infrastructure that meet national and international standards. This presents a problem that directly impacts the learning process. These issues include:

1. Limited physical swimming pool infrastructure, such as inadequate depth, insufficient pool area, and inadequate water sanitation systems.
2. Lack of learning aids, such as life jackets, swimming boards, life jackets, and other safety accessories.
3. Lack of adequate safety systems, including the absence of lifeguards, emergency systems, or risk management standards.
4. Lack of teacher training in water sports risk management, despite the central role of Physical Education teachers in ensuring student safety.
5. Minimal collaboration with external swimming facilities if the school does not have its own swimming pool.

All of these issues hinder the optimal implementation of swimming lessons in many schools. At State School 3 Makassar, the same issues hamper the implementation of swimming lessons, preventing students from experiencing an effective, safe, and enjoyable learning experience.

Many studies have been conducted on physical education facilities and infrastructure, but research specifically examining the need for swimming pool facilities and infrastructure to support PE learning in schools is still limited, particularly in the Makassar context. Several previous studies focused more on swimming learning itself, rather than analyzing facility needs. For example, research by Lubis & Harahap (2021) examined the effectiveness of swimming learning but did not explore the infrastructure aspects of the facilities in depth. Similarly, research by Arifin & Setiawan (2019) focused on the role of sports facilities in general, not swimming pools specifically.

Furthermore, most existing research was conducted at the elementary school or kindergarten level, despite the fact that the risk of water accidents and the need for swimming technique learning are more complex at the junior high and senior high school levels (Yuliani, 2020). Research that comprehensively examines the need for swimming facilities and infrastructure using a needs assessment approach using the perspectives of safety, infrastructure feasibility, and modern learning standards is still rare.

The novelty of this research lies in three main aspects: (1) It focuses on analyzing the needs of swimming pool facilities in secondary schools, specifically State School 3 Makassar, which has not been widely researched in the local context, (2) The

Ricardo Valentino Latuheru[A-E]
ricardo.valentino@unm.ac.id*

comprehensive approach encompasses safety, facility suitability, learning aids, national standards, and teachers' pedagogical perspectives, and (3) It also emphasizes the risk context of coastal areas, where students have a higher need for swimming skills as a form of water safety education.

Therefore, this research not only offers an overview of existing conditions but also provides evidence-based recommendations for the development of safe, standard-compliant swimming facilities that support effective Physical Education (PE) learning.

Based on this background, this study aims to analyze the needs of swimming pool facilities and infrastructure at State School 3 Makassar to support effective and safe PE learning. This analysis includes the physical condition of the swimming pool, the availability of swimming aids, safety facilities, supporting sanitation conditions, as well as teacher readiness and risk management systems. The research results are expected to serve as a basis for schools, local governments, and other stakeholders in planning the development of improved swimming facilities.

Furthermore, this research contributes to the academic literature on swimming instruction in schools, using a contextual, standards-based needs analysis approach. It is hoped that this research will help schools better understand the urgency of providing adequate and safe swimming pools, enabling more effective, enjoyable, and positive impacts on student development.

METHODS

This research uses a quantitative descriptive approach with a needs assessment model, aiming to identify the gap between the ideal conditions of swimming pool facilities and infrastructure and the actual conditions at State School 3 Makassar. The descriptive approach was chosen because it allows researchers to describe phenomena objectively, systematically, and accurately based on empirical data in the field (Sugiyono, 2021). In the context of physical education, descriptive methods are considered effective for evaluating sports facilities and supporting learning factors (Prasetyo & Wicaksono, 2020).

Research Type and Design

This research is a survey study with a cross-sectional design, where data collection is conducted at a single point in time to obtain a comprehensive picture of swimming pool facility and infrastructure needs. Cross-sectional designs are commonly used in studies of educational facilities and sports infrastructure because they produce up-to-date and relevant information based on conditions at the time of data collection (Mahendra & Sudjana, 2019). Furthermore, the survey design allows researchers to efficiently collect data from respondents through questionnaires and structured observations.

Research Variables

This study involved one primary variable, namely the need for swimming pool facilities and infrastructure to support physical education learning. This variable encompasses four subdimensions:

Ricardo Valentino Latuheru[A-E]
ricardo.valentino@unm.ac.id*

1. Physical condition of the swimming pool, including size, depth, water quality, and cleanliness.
2. Supporting facilities for swimming lessons, such as lifeguards, safety buoys, lane ropes, and buoyancy aids.
3. Safety facilities, including the presence of lifeguards, safety SOPs, warning signs, and emergency rescue equipment.
4. Non-technical supporting facilities, such as shower rooms, changing rooms, restrooms, and rest areas.

This variable selection is relevant to the sports facility and infrastructure standards recommended by WHO (2017) and Minister of National Education Regulation No. 24 of 2007.

Population and Sample

The study population consisted of all physical education teachers and students actively involved in swimming lessons at Makassar State School 3. The sampling technique used was purposive sampling, which involves deliberately selecting subjects based on certain criteria, such as experience attending swimming lessons or direct involvement in the use of swimming pool facilities (Harahap & Lubis, 2020). The study sample consisted of 20 individuals, consisting of physical education teachers, educational staff responsible for sports facilities, and students selected as representatives of swimming facility users. This number was deemed adequate for descriptive research with a needs analysis (Nazir, 2020).

Test Instruments

The instruments used in this study included:

1. A questionnaire on facility and infrastructure needs was developed based on national and international swimming facility standard indicators. The questionnaire used a Likert scale of 1–5 to measure perceptions of facility needs.
2. A facility condition observation sheet was used to assess the physical condition of the swimming pool, including cleanliness, safety, completeness of facilities, and supporting space.
3. A semi-structured interview guide was given to the physical education teachers to explore the details of swimming learning issues.

The instrument was developed based on the WHO (2017) swimming facility standard guidelines and assessment practices for educational sports facilities (Wijaya & Kurnia, 2021).

Data Collection Techniques

Data were collected through three main techniques:

1. Direct observation of the physical condition of the swimming pool and supporting facilities.
2. Questionnaires were completed by the research sample to obtain quantitative data on perceived needs.
3. Semi-structured interviews with physical education teachers to supplement qualitative data related to learning constraints.

Method triangulation was conducted to ensure data validity (Sari & Putra, 2021).

Ricardo Valentino Latuheru[A-E]
ricardo.valentino@unm.ac.id*

Data Analysis Techniques

Data were analyzed descriptively quantitatively by calculating averages, percentages, and needs scores using basic statistical software. The needs analysis was conducted by comparing actual and ideal conditions based on national and international standards (Yuliani, 2020). Qualitative data from the interviews were analyzed using reduction, categorization, and narrative description techniques.

RESULTS AND DISCUSSION

Result

This section presents the results of an analysis of the swimming pool facility and infrastructure needs at State School 3 Makassar based on questionnaire data, observations, and interviews. Data were obtained from 20 respondents, consisting of physical education teachers, educational staff, and students using the swimming pool facilities. The research findings cover: (1) the physical condition of the swimming pool, (2) the availability of learning facilities, (3) the completeness of safety equipment, and (4) the condition of non-technical supporting facilities.

Observation Results of the Physical Condition of the Swimming Pool

Table 1 shows the results of the assessment of the physical condition of the swimming pool based on indicators of size, depth, water quality, and cleanliness.

Table 1.
Assessment of the Physical Condition of the Swimming Pool

Physical Indicators	Ideal Standard	Actual Condition	Percentage of Adequacy (%)
Swimming Pool Size	25 m	18m	72%
Pool Depth	1–1.5 m	0.8–1.2 m	80%
Water Quality	Clear	Medium cloudy	60%
Water Circulation System	Automatic	Manuals	55%
Pool Cleanliness	Good	Less stable	65%

Observations showed that the swimming pool did not meet ideal standards, particularly in terms of water quality (60%) and circulation system (55%). The pool's dimensions were relatively smaller than formal learning standards, limiting students' mobility during practice. The pool's cleanliness was inconsistent, especially during peak usage hours.

Results of the Swimming Learning Equipment Needs Questionnaire

The questionnaire consisted of 15 items related to the availability of swimming aids. The results are summarized in the following table.

Table 2.
Availability Score of Swimming Learning Aids

Learning Facilities	Maximum Score	Actual Score	Percentage (%)
Buoy Boards	100	58	58%
Safety Rings	100	52	52%
Courtesy Ropes	100	45	45%
Buoy Belts	100	40	40%
Swimming Goggles	100	62	62%
Kickboards	100	54	54%

Ricardo Valentino Latuheru[A-E]
ricardo.valentino@unm.ac.id*

Data shows that swimming instructional facilities are inadequate, particularly lane ropes (45%) and buoy belts (40%), which are crucial for the safety of beginner learners. The availability of life boards (58%) and kickboards (54%) remains moderate.

Swimming Pool Safety Facility Assessment Results

Safety is a crucial aspect of swimming lessons. The results of the safety facility assessment are shown in the following table.

Table 3.
Swimming Pool Safety Facility Assessment

Safety Components	Ideal Standard	Current Condition	Adequacy (%)
Certified Lifeguard	1 person	None	0%
Ring Buoy	2 units	1 unit	50%
Safety Rope	Available	Incomplete	40%
Danger Signs	In stock	None	0%
Emergency SOPs	Fully furnished	Not available	0%

Safety facilities were in the most critical condition. The absence of certified lifeguards (0%) and hazard signs (0%) were significant findings that significantly impacted student safety during swimming lessons. Emergency SOPs were also lacking, indicating the need for improved risk management.

Condition of Non-Technical Support Facilities

Table 4.
Assessment of Swimming Pool Support Facilities

Supporting Facilities	Ideal Standard	Current Condition	Percentage (%)
Changing Rooms	Good	Moderately Damaged	55%
Rinse Rooms	Good	Fair	60%
Toilets	Clean	Not Clean	50%
Rest Areas	Yes	Limited	45%
Storage Lockers	Yes	Not Available	0%

Supporting facilities were in the 45%–60% range, indicating that some facilities were still functional but did not meet comfort standards. The lack of storage lockers (0%) hindered students from storing their belongings during class.

Summary of Overall Results

To obtain a general overview of swimming pool needs, a summary of the average percentage of facility adequacy was conducted.

Table 5.
Summary of Facility Adequacy Percentage

Facilities Aspects	Average Adequacy (%)
Physical Condition of the Swimming Pool	66%
Learning Facilities	52%
Safety Facilities	18%
Non-Technical Support Facilities	42%
Overall Average	**44%**

The analysis results show that the adequacy level of swimming pool facilities is 44%, categorized as low. Safety facilities are the worst performing aspect (18%), indicating a high risk if swimming lessons continue without improvement.

Ricardo Valentino Latuheru[A-E]
ricardo.valentino@unm.ac.id*

Discussion

The study revealed that the condition of the swimming pool facilities and infrastructure at State School 3 Makassar is still far from ideal with an average facility adequacy of only around 44%. This finding aligns with previous research showing that many schools in Indonesia lack adequate swimming facilities, resulting in suboptimal or incidental swimming lessons (Hermawan, Subagyo, & Utami, 2022).

Implications for Swimming Lessons and Student Competence

According to global studies, participation in swimming activities from school age can improve "fundamental movement skills (FMS)" namely basic motor skills such as coordination, balance, body coordination, and spatial/body awareness which are essential for children's physical development and safety.

The study showed that a lack of facilities, particularly assistive devices such as floats, swimming boards, and lanes, as well as inappropriate pool size/maintenance, can hinder the effective implementation of swimming lessons. These conditions can result in students not receiving sufficient practice opportunities or, if forced, pose a safety risk. Research on schools with swimming pools shows that access to swimming facilities significantly correlates with students' swimming ability. For example, one study showed that students from schools with access to swimming pools performed better than those without.

Therefore, the condition of the facilities/infrastructure at Makassar State School 3 may hinder students' potential to master swimming skills—even though swimming is not just a sport, but also an important life skill in coastal areas like Makassar. Furthermore, the lack of non-technical supporting facilities such as changing rooms, storage lockers, shower rooms, and adequate restrooms can also reduce students' comfort and motivation to participate in swimming lessons regularly, as revealed in a study evaluating school sports facilities.

Safety Risks and the Need for Safety Standards

The most concerning finding is the very low level of compliance with safety aspects: facilities such as lifeguards, safety signs, emergency SOPs, and rescue equipment were almost non-existent (adequacy ~0–50%). This indicates that implementing swimming lessons under current conditions poses a high risk—not only to learning effectiveness, but also to student safety.

The literature shows that providing sufficient water rescue facilities (life jackets, lifelines, ring buoys), having trained lifeguards, and clear safety guidelines are basic prerequisites for a safe swimming pool. Without these aspects, the potential for accidents such as drowning or water injuries increases especially in school environments involving adolescents.

Recent research on swimming education in schools suggests that simply having a pool is not enough; safety policies, staff training, and strict regulations are also needed for swimming to become a sustainable and safe part of the Physical Education (PJOK) curriculum.

Comparison with Studies in Similar Contexts

A study in elementary schools in Yogyakarta, for example, showed that even though pools were available, distance, cost, and inadequate facilities were the reasons why

Ricardo Valentino Latuheru[A-E]
ricardo.valentino@unm.ac.id*

swimming practice was so infrequent, making it ineffective in developing swimming skills. This means that having a pool alone does not guarantee successful learning—it must be supported by complete facilities, easy access, and consistent program integration.

Meanwhile, research in sports institutions (not schools) shows that if facilities meet standards including routine management and maintenance, water circulation, cleanliness, and safety equipment pools can be suitable for training and competition. This comparison confirms that facility standards for athletics are often higher than those required for school learning; therefore, adaptations must be made when designing school pools to ensure safety and educational objectives.

Relevance to the School Context in a Coastal City

Given Makassar's geographical location, a coastal city with extensive access to the sea and waterways, swimming skills are crucial as part of water safety literacy. In addition to preventing drowning, swimming in schools can strengthen students' preparedness for aquatic environments and build physical and mental fitness, as evidenced by findings that swimming improves cardiovascular endurance, muscle strength, coordination, and flexibility.

However, without adequate facilities and proper safety management, these efforts can have negative consequences. Therefore, the results of this study indicate that without intervention, schools will simply "miss" the enormous potential of swimming education for students—both in terms of fitness, safety, and life skills learning.

Implications for School Policy and Practical Recommendations

Based on the results and analysis, there are several important practical implications:

1. Schools need to plan the rehabilitation or construction of swimming pools to standards, including size, depth, water circulation systems, sanitation, and supporting facilities such as changing rooms, showers, lockers, and restrooms.
2. Procurement of learning aids floats, swimming boards, lanes, and safety buoys—should be prioritized so that students can learn safely and effectively.
3. Schools must allocate resources for safety aspects: recruiting or training lifeguards, developing emergency SOPs, installing safety signs, and providing rescue equipment.
4. Integrate swimming lessons into the Physical Education curriculum on an ongoing basis, with sufficient training frequency, so that it's not just theory or introduction, but consistent skills training.
5. Routine facility maintenance and management are necessary to maintain cleanliness, water quality, and the functionality of equipment/facilities—so that the swimming pool remains safe and comfortable for the long term.

Research Limitations and Notes for Further Research

This study used a relatively small sample of 20 respondents, making the results indicative. For generalization, further research with a larger sample, involving students from various grade levels and other schools in Makassar, would provide a more

representative picture. Furthermore, aspects of pool use (frequency, duration, teacher supervision) were not detailed in this study, even though they are highly relevant to the effectiveness of swimming instruction.

Future research could include student outcome aspects: for example, mastery of basic swimming techniques, responsiveness to water safety, or changes in physical fitness after a swimming program. This aligns with international literature that emphasizes the relationship between access to swimming facilities and swimming competency and water safety.

Overall, this discussion confirms that the mere availability of a swimming pool is not enough—to support effective and safe PE learning, schools need to ensure that the pool and all supporting facilities meet standards, and that safety and facility management aspects are taken seriously. For State School 3 Makassar, these results provide a strong basis for planning improvements to swimming facilities so that swimming lessons can be implemented optimally — educating students with swimming skills, building fitness, and providing an understanding of water safety as part of physical education.

CONCLUSION

The results of the study indicate that the swimming pool facilities and infrastructure at Makassar State School 3 do not meet the standards for effective and safe Physical Education learning, with an overall facility adequacy rate of only 44%. The physical condition of the swimming pool is in the moderate category (66%), but the water quality and circulation system are still low. Learning facilities such as float boards, kickboards, and lane ropes are only in the range of 40–58%, so they are unable to support the swimming training process optimally. The most critical finding is the safety aspect, with completeness of only 18%, including the absence of lifeguards, emergency SOPs, and safety signs. Non-technical supporting facilities are also still limited (42%). Overall, these conditions indicate that swimming learning in schools is high risk and requires comprehensive improvements in infrastructure, equipment, and safety systems so that the learning process can be safe, effective, and sustainable.

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Ricardo Valentino Latuheru[A-E]
ricardo.valentino@unm.ac.id*

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