

Development of the Twelve Games in the Water Model to Enhance Floating Skills in Children Aged 5-6 Years

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ABSTRACT

Background: Floating in water is a fundamental skill essential for swimming proficiency, especially for young children in their early developmental stage, which is characterized by rapid growth. **Objective:** This study aims to develop and validate various game models designed specifically to enhance water buoyancy skills in children aged 5 to 6 years. **Method:** The research employed the Research and Development (R&D) approach based on the ADDIE framework (Analysis, Design, Development, Implementation, and Evaluation). Ten children actively participating in early swimming exercises were selected as subjects. The study involved collaboration with experts in swimming, game design, and early childhood education to ensure the models' appropriateness and effectiveness. Validity of the water game models was assessed through expert judgment and consultation. **Results:** Testing the game models on the sample group yielded success rates between 66% and 96%, demonstrating significant improvement in floating skills. **Conclusion:** The developed water play models offer valuable tools for early childhood coaches to stimulate and improve buoyancy skills. A total of twelve distinct water play models were created, providing a comprehensive resource to support young children in learning to float effectively in water.

Keywords: Early childhood, floating in water, swimming, water play model

ABSTRAK

Latar Belakang: Mengambang di air merupakan keterampilan dasar yang penting untuk kemahiran berenang, terutama bagi anak-anak usia dini, yang ditandai dengan pertumbuhan yang pesat. **Tujuan:** Penelitian ini bertujuan untuk mengembangkan dan memvalidasi berbagai model permainan yang dirancang khusus untuk meningkatkan keterampilan daya apung air pada anak usia 5 hingga 6 tahun. **Metode:** Penelitian ini menggunakan pendekatan Penelitian dan Pengembangan (R&D) berdasarkan kerangka kerja ADDIE (Analisis, Desain, Pengembangan, Implementasi, dan Evaluasi). Sepuluh anak yang berpartisipasi aktif dalam latihan renang dini dipilih sebagai subjek. Penelitian ini melibatkan kolaborasi dengan para ahli di bidang renang, desain permainan, dan pendidikan anak usia dini untuk memastikan kesesuaian dan efektivitas model. Validitas model permainan air dinilai melalui penilaian ahli dan konsultasi. **Hasil:** Pengujian model permainan pada kelompok sampel menghasilkan tingkat keberhasilan antara 66% dan 96%, menunjukkan peningkatan yang signifikan dalam keterampilan mengapung. **Kesimpulan:** Model permainan air yang dikembangkan menawarkan alat yang berharga bagi pelatih anak usia dini untuk merangsang dan meningkatkan keterampilan daya apung. Sebanyak dua belas model permainan air yang berbeda telah dibuat, menyediakan sumber daya yang komprehensif untuk mendukung anak-anak usia dini dalam belajar mengapung secara efektif di air.

Kata Kunci: Berenang, mengapung di air, model permainan air, usia dini.

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Introduction

Swimming is a fundamental activity that involves movement within water, typically performed without the use of artificial aids or equipment. As both a recreational activity and a competitive sport, swimming offers numerous health benefits and is widely enjoyed by people of all ages, including children, adults, and the elderly (Endrawan, 2023). The versatility of swimming as a sport and activity makes it accessible and beneficial for individuals across different life stages (Kurniati, 2017). Notably, children can be introduced to swimming at a very young age; even babies as young as a few months old can begin to learn basic water safety and floating skills (Hasmarita, 2020). This early exposure helps promote water confidence and ensures a foundational understanding of water safety from childhood.

Water games, which are defined as activities involving playful interaction with water within a set of rules to achieve specific objectives, serve as a critical component in early childhood development and swimming education (Pranata, 2023; Jin, *et.al.*, 2020). For children, play is not only a source of entertainment but also a vital means of stimulating physical and cognitive growth (Bargecarslain, *et.al* 2021). Through engaging in water-based play activities, children can develop motor skills such as walking, running, diving, jumping, and even controlled falling into water, thus fostering their physical development in a natural and enjoyable way (Ginting, 2020; Tucker & Innngvergassten, 2021). Water games offer an excellent environment for unconscious learning, allowing children to interact with water without feeling pressured, which promotes both confidence and skill development (Pangestu, *et.all.*, 2024).

Among the essential skills required for proficient swimming is floating, which serves as the foundation for more complex water movements (Hooft, *et.al* 2021). Floating not only helps in conserving energy but also allows swimmers to maintain stability and safety in water (Erbaugh, 1986). According to Subagyo (2015), floating in water is a fundamental skill that involves mimicking objects that naturally float. It made individuals to change their position efficiently and safely in water environments (Nalumenya, *et.al.*, 2024). Developing this skill is crucial, especially for beginners and young children, as it lays the groundwork for effective swimming techniques and water safety (D'Amico, *et.al.*, 2023).

Early childhood is considered a vital period of growth, often referred to as the "golden age" for human development (Dakal, 2021). During this phase, children have a remarkable capacity for learning and rapid development in cognitive, motor, and social domains (Nur, 2020; Nurhalisa, *et.al.*, 2024). The opinion of Zaman (2020) states echoes this view, emphasizing that early childhood is a critical stage in human growth, making it ideal for implementing educational and developmental interventions. Providing children with stimulating activities grounded in play during this period is essential, as it fosters a joyful and positive learning environment that promotes overall development.

Despite the importance of water skills, previous research indicates a gap in the variety of water game models specifically aimed at improving floating abilities. Sunandarti (2017) conducted a descriptive study on buoyant force mechanics in swimming, focusing primarily on observational data and emphasizing the need for diverse water activities to enhance buoyancy. However, the research highlights a limited variety of water games designed to stimulate floating skills, suggesting the need for developing engaging, progressive water game models that range from simple to challenging to facilitate skill acquisition and maintain children's motivation. Similarly, Nur Sita Utami (2014) explored water introduction techniques for kindergarten students, concentrating on cognitive, affective, and psychomotor development, but also identified a shortage of varied water activities to improve floating abilities.

Until now, there has been a lack of comprehensive research on water play models specifically aimed at enhancing buoyancy skills in young children. Recognizing this gap, the current study proposes to develop and evaluate a water play model designed to improve buoyancy skills, particularly floating, by leveraging the natural appeal and educational potential of water-based play activities. The aim is to demonstrate that water play methods can significantly improve buoyancy skills in young children, ultimately providing valuable insights for coaches, teachers, and caregivers in early childhood aquatic education. By addressing the identified gaps in existing research, this study seeks to contribute to the development of more engaging and effective water learning activities that promote safety, confidence, and skill mastery in young learners.

Material and Method

Participants

The subject of this study is children aged 5-6 years who participate in early swimming training.

The population of this study is the world swimming school in East Bekasi. The sample in this study consists of ten children aged 5-6 years who have participated in training at the world swimming school in East Bekasi. Sampling was based on the criteria of children aged 5-6 years who have been swimming for at least 1 year.

Procedure

In the first stage of the analysis, the author conducted observations, analyzed, and interviewed coaches at the Swimming School Dunia Berenang Bekasi Timur. Next, in the second stage of design, the author created 15 water game models, which were either new games or modified versions of existing ones. In the third stage of development, the author validated these 15 water game models through expert judgment, and it was determined that 12 of them were suitable for implementation. In the fourth stage of Implementation, the author then carried out field application with 12 water game models that had been deemed suitable by the three expert assessments. Lastly, in the fifth stage of Evaluations, the author sought advice from the expert assessments to evaluate the created and implemented water games.

Data Collection

The first data collection was carried out using interviews with coaches at the Swimming School of the World Swimming School in East Bekasi. The initial data collection was conducted through interviews with coaches at the Swimming School Dunia Berenang Bekasi Timur. Subsequently, the researcher developed a floating exercise model in water for young children as follows: Arm position, head position, Body position, Leg position, and Coordination.

Data Analysis

Data processing involved designing water play models based on needs analysis, validating and revising these models with experts, then implementing them in practice with children. Children's buoyancy skills were assessed before and after using performance scores, and the data were analyzed to evaluate the effectiveness of the models, showing significant improvement in their floating abilities.

Table 1 Instrument for Front Float Ability

Movement Phase (Front Float)	Indicator	Assessment
Arm Position	1. Move your arm still and straight forward. 2. Move your arm still and straight forward while forming it like a pencil. 3. Move your arm still and straight forward while forming it like the number eleven.	1. Value 5 = Arms are still and straight forward with the arms forming a pencil-like position (Pencil Arm). 2. Value 4 = Still and straight forward position with the arms forming an eleven-like shape (Eleven Arm). 3. Value 3 = If the arm position moves and bends, it is not straight forward. 4. Value 2 = Both arms are at the sides of the body and not straight forward. 5. Value 1 = Both arms are bent and at the sides of the body, not straight forward.
Head Position	The head should be facing downwards, looking at the floor (Face Down).	1. Value 5 = Head facing downwards in the water and eyes open, looking at the floor. (Face Down)

		2. Value 4 = Head facing downwards in the water and eyes closed, not looking at the floor. 3. Value 3 = Head facing forward and eyes open. 4. Value 2 = If the head is facing forward and eyes are closed. 5. Value 1 = Head facing upwards and eyes open.
Body Position	The body should remain still and straight, parallel to the water	1. Value 5 = Body position is still and straight, parallel to the water surface (streamline position). 2. Value 4 = Body position is still and slightly arched upwards, parallel to the water surface. 3. Value 3 = Body position is still and forms a V shape, not parallel to the water surface. 4. Value 2 = Body position is moving and not parallel to the water surface. 5. Value 1 = Body position is moving and sinking.
Leg Position	The legs should be still, with toes pointed straight back.	1. Value 5 = Legs are still with toes pointing straight back, parallel to the water surface. 2. Value 4 = Legs are still with toes pointing straight forward, parallel to the water surface. 3. Value 3 = Legs are still and bent, not parallel to the water surface. 4. Value 2 = Legs are still and crossed, not parallel to the water surface. 5. Value 1 = Legs are still and spread as wide as possible to the right and left, not parallel to the water surface.

Coordination	1. Move your arms straight forward with your head looking down at the floor surface, keeping your body parallel in the water and your legs straight with toes pointing backward. 2. Extend your arms forward, forming a pencil-like shape, with your head looking down towards the floor, your body parallel in the water, and your legs straight with toes pointing backward. 3. Extend your arm straight forward to form the number eleven, with your head looking down towards the floor surface, your body parallel in the water, and your legs straight with toes pointing backward.	1. Value 5 = Straightening the arm forward, forming a pencil-like shape, with the head looking down towards the floor surface, the body parallel to the water surface, and the legs straight with toes pointing backward. 2. Value 4 = Straightening the arm forward, forming a shape like the number eleven, with the head looking down towards the floor surface, the body parallel to the water surface, and the legs straight with toes pointing backward. 3. Value 3 = The arm movement is not straight, and it is bent forward, with the head looking forward (not down towards the floor surface), the body not parallel to the water surface, and the legs not straight, with toes bent. 4. Value 2 = The movement of the arms is positioned beside the body and not straight forward, with the head looking forward and not downward towards the floor surface. The body position is not parallel to the water surface, and the legs are not straight with the toes bent. 5. Value 1 = The movement of the arms is positioned beside the body and not straight forward, with the head looking upward and not downward towards the floor surface. The body position is not parallel to the water surface, and the
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legs are not straight with the toes bent.

Tabel 2 Instrument for Back Float Ability

Movement Phase (Back Float)	Indicator	Assessment
Arm Position	1. Move your arms still and straight upwards parallel to the position of your head. 2. Move your arms still and straight upwards parallel to the position of your head, forming a pencil shape (pencil arm). 3. Move your arms still and straight upwards parallel to the position of your head, forming the number eleven (eleven arm). 4. Keep your arms still and straight parallel to the upper part of your body (hand by your side). 5. Spread your arms as wide as possible to the right and left (starfish).	1. Value 5 = Both arms are straight and opened as wide as possible to the right and left (Starfish). 2. Value 4 = Arms are straight and raised parallel to the head, forming a pencil shape (Pencil Arm). 3. Value 3 = Arms are straight and raised parallel to the head, forming the number eleven (Eleven Arm). 4. Value 2 = Both arms are straight and parallel to the upper legs. 5. Value 1 = Arms are moving and not straight, bent to the right and left.
Head Position	Looking upwards with the head facing upwards towards the sky (Face Up).	1. Value 5 = The head is facing upwards with eyes open. (Face Up) 2. Value 4 = The head is facing upwards with eyes closed. 3. Value 3 = The head is excessively tilted upwards with eyes closed. 4. Value 2 = The head is facing forward with eyes closed. 5. Value 1 = The head is facing downwards with eyes closed.
Body Position	The body movement is still and aligned with the surface of the water (streamline position).	1. Value 5 = Body position is still and straight, parallel to the water surface (streamline position). 2. Value 4 = Body position is still and slightly curved with the water surface.

		- Value 3 = Body position is still and forms a V shape. - Value 2 = Body position is moving and not parallel to the water surface. - Value 1 = Body position is moving and sinking.
Leg Position	- Keep the leg still with the toes pointing straight ahead. - Keep the leg still and open it as wide as possible to the right and left.	- Value 5 = Legs are stationary and spread as wide as possible to the right and left. - Value 4 = Legs are stationary and straight, with toes pointing forward. - Value 3 = Legs are stationary and straight, but not parallel to the water surface. - Value 2 = Legs are moving, with toes not straight forward. - Value 1 = Legs are moving and bent, not parallel to the water surface.
Coordination	- Raise your arms straight up with your head looking towards the sky, body parallel in the water, and legs straight with toes pointing forward. - Raise your arm straight up, forming a pencil-like shape, with your head looking towards the sky, body parallel in the water, and legs straight with toes pointing forward. - Raise your arms straight up to form the shape of the number eleven, with your head looking towards the sky, your body parallel to the water, and your legs straight with toes pointing forward. - Extend your arms as wide as possible to the right and left, with your head facing upwards, your body parallel to the water, and your legs spread out to the right	- Value 5 = The arms remain still, extended as wide as possible to the right and left, with the head looking upwards. The body remains parallel to the water surface, and the legs are spread out to the right and left. - Value 4 = The arms remain still, extended straight upwards like a pencil, with the head looking upwards. The body remains parallel to the water surface, and the legs are straight, with toes pointing forward. - Value 3 = The arms move straight upwards, forming an "11" shape, with the head looking forward. The body bends slightly, not parallel to the water surface, and the legs are bent upwards.

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- and left, toes pointing straight ahead.
4. Value 2 = The arms move still, positioned beside the body, with the head looking downwards. The body moves and bends, not parallel to the water surface, and the legs are bent upwards.
5. Value 1 = The arm movement is positioned beside the body with the head looking downwards, the body is not parallel to the water surface, and the legs are bent upwards.
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Result

The results of the model development in this research have produced a product in the form of the Water Play Model to Improve Floating Ability in Early Childhood at the Swimming School Dunia Berenang Bekasi, which is presented in the form of a Water Play Model guidebook. This book presents 15 play models and the procedures for implementing the Water Play Model to Improve Floating Ability in Water, which can be applied at the Swimming School Dunia Berenang Bekasi. It is hoped that this book can serve as a reference and guide for swimming coaches to stimulate and enhance floating ability in water.

a. Analysis of Needs

The results of the needs analysis in this study were obtained from data collected through interviews with the coach of the World Swimming School in Bekasi, as well as direct observations. This was done to determine the ability to float in water among the research subjects and the research location. Such information is crucial in understanding the importance of water play models in enhancing buoyancy skills among young children, as developed by the researcher. The following are the findings from the needs analysis conducted by the researcher:

Table 3. Result of Need Analysis

No	Question Items	Findings
1.	What methods has the coach been using to teach swimming skills in water so far?	The World Swimming Coach conducts excellent floating ability training for children, from the beginning to the end. These World Swimming coaches have brilliant ideas to provide various teaching methods so that children can float in water comfortably.
2.	What challenges has the coach faced in teaching swimming skills in water?	For that challenge, it is still often found that children, when floating, are not yet parallel to the water surface. Therefore, it is necessary to thoroughly assess the child's ability to determine whether they are in the floating phase or not. To prevent trauma in water environments, it is crucial to provide various water

	play methods specifically aimed at stimulating floating abilities.
3. What facilities and equipment are provided for teaching swimming skills in water?	During the floating learning phase in water, several tools such as noodles, kickboards, and stick toys are needed for instructional purposes. These tools are essential for creating different variations in floating lessons.
4. Has water games ever been implemented in teaching swimming skills in water?	Until now, swimming in the world has been implemented, but it is still limited and needs to be expanded further to deepen the various methods of floating in water through playful techniques. And if anyone is interested in applying water games to enhance floating abilities in the world of swimming, we greatly appreciate it, as this is very important for the continuous learning process in aquatic environments.
5. s water Play necessary for teaching swimming skills in water?	Floating in water is essential as it serves as the foundation or initial basis for the learning process in water. Water games to stimulate the ability to float are highly necessary, as they can influence the child's self-confidence in aquatic environments.
6. What is the coach's opinion on whether water games make the atmosphere more enjoyable or not?	It becomes more enjoyable and lightens the atmosphere when games and supportive facilities are present during the learning process. This keeps the child engaged and prevents boredom, creating a sense of joy and happiness in the water environment.

b. Initial Draft Model

An evaluation with experts was conducted to assess the initial product and provide feedback on the development of the water play model. Subsequently, revisions will be made. In this study, validation with experts was carried out to obtain input on the design of the water play model to enhance buoyancy skills in young children. The initial design was tested by three experts: a swimming expert, a play expert, and an early childhood expert.

c. Final Draft Model

After validation by experts and product revisions in terms of rules, game illustrations, gameplay, and determining the winners, the final outcome of the water game model consists of 12 water games ready to be implemented for early childhood, specifically 5-6 years old. The following represents the final results of the water game development conducted at Swimming School Dunia Berenang Bekasi.

1) Model eligibility

This research involves experts in validating or assessing the feasibility of the products created. Expert judgment is conducted to obtain input on the design of water play models to

enhance buoyancy skills in young children. After validation, evaluation, and model revisions with the experts, there are a total of 12 water play models deemed suitable for implementation with young children, especially those aged 5-6 years, to improve their ability to float in water

2) Model Effectiveness

Based on the feasibility test results of the water play model to improve buoyancy skills in young children, there are a total of 12 water games deemed suitable for implementation. The revisions, as suggested by experts, are as follows.

a) Swimmer Expert

Swimming experts advise organizing games from easy to difficult levels. They also recommend adding equipment.

b) Game Expert

Game experts provide suggestions to improve the position of the floating image upside down, increase the number of tools used in gameplay, and provide spacing in the image descriptions. Game experts also advise shortening and clarifying the gameplay instructions for easy understanding.

c) Early Childhood Expert

Early childhood experts provide advice on how to play in a concise and clear manner for easy understanding. They improve explanations for both general and specific goals, and add information about the tools used. Early childhood experts also suggest creating boundaries for the start and finish in game illustrations, and adjusting the positions in game images.

The implementation or direct execution of research activities in the field, carried out by the researcher, took place at the Swimming School Dunia Berenang Bekasi, with a sample size of 10 children. This research was conducted to the best of the researcher's abilities. The researcher implemented the model in 4 meetings. The researcher applied 12 variations of water play models that had been designed and validated by experts for application to young children, specifically those aged 5-6 years, at the Swimming School Dunia Berenang Bekasi. Despite this research, there are still shortcomings that the researcher acknowledges and will be evaluated for improvement in the future. The following is the assessment result of a child's ability to float in water after participating in a water play model.

Table 4 Result of A Child's Ability Front Float in Water

No	Arm Score	Head Score	Body Score	Leg Score	Coordination Score	Total Score
1.	5	4	5	4	5	23/25x100% = 92 %
2.	5	5	5	5	5	25/25x100% = 100 %
3.	5	4	4	4	4	21/25x100% = 84 %
4.	5	3	3	3	3	17/25x100% = 68 %
5.	4	4	4	3	4	23/25x100% = 92 %
6.	5	4	5	4	5	23/25x100% = 92 %
7.	4	4	3	4	4	19/25x100% = 76 %
8.	5	4	4	4	5	22/25x100% = 88 %
9.	5	4	4	4	5	22/25x100% = 88 %
10.	4	5	3	4	5	21/25x100% = 84 %
						216/250x100%= 86 %

Table 5 Result of A Child's Ability Back Float in Water

No	Arm Score	Head Score	Body Score	Leg Score	Coordination Score	Total Score
1.	3	4	3	4	3	17/25x100% = 68 %
2.	4	5	5	4	5	23/25x100% = 92 %
3.	5	4	5	4	5	23/25x100% = 92 %
4.	5	4	5	5	5	24/25x100% = 96 %
5.	5	5	5	4	5	24/25x100% = 96 %

6.	4	5	5	4	4	22/25x100% = 88 %
7.	3	4	3	3	3	16/25/100% = 64 %
8.	4	4	3	3	4	18/25x100% = 72 %
9.	5	4	5	5	5	24/25x100% = 96 %
10.	5	4	4	3	4	20/25x100% = 80 %
						216/250x100%= 86 %

Discussion

The development and validation of the water play model designed to enhance buoyancy in young children, specifically those aged 5-6 years, demonstrate promising results regarding its suitability for implementation in swimming education. After undergoing a thorough process of validation, revision, and evaluation, 12 variations of the water play model were deemed appropriate for application in educational settings such as the Dunia Berenang Bekasi Swimming School. This rigorous process aligns with prior research emphasizing the importance of iterative validation to enhance the efficacy and safety of instructional models (Goldstein & Flake, 2016).

The core aim of these water play models was to improve buoyancy, a critical skill for ensuring safety and fostering confidence during swimming activities (Mancheno, 2024). The field implementation confirmed high enthusiasm and engagement among children, which suggests that the models are not only effective but also engaging, reducing boredom—a common issue in repetitive swimming drills (Rahmawati et al., 2020). This observational outcome supports findings by Löhmus, et al. (2018), who emphasized that playful learning approaches promote higher motivation and enjoyment among young learners.

However, some limitations must be acknowledged. First, the evaluation of children's swimming abilities was conducted through subjective assessment sheets focusing on front and back float techniques. While the results show encouraging improvement—68% to 100% for front float and 64% to 96% for back float—the use of qualitative assessment tools may introduce observer bias (Sari & Prabowo, 2022). Precise measurement instruments, such as video analysis or sensor-based assessments, could provide more reliable data in future studies (Sinclair & Roscoe, 2023).

Furthermore, the sample size and contextual setting—limited to a single swimming school—pose challenges for generalizability. Earlier studies, such as those by Taufik and Utami (2017), indicated that results obtained from specific regions might not translate directly across different populations with varying socio-economic backgrounds and learning environments. Additionally, the current study primarily focuses on buoyancy skills, which represents just one aspect of swimming competence. Future research could explore other elements such as stroke technique, breathing control, and endurance (Sundan, 2025).

Compared to previous research, which often utilized traditional instructor-led methods (Papadimitriou & Loupos, 2021), the current model emphasizes playful, child-centered activities as a means to enhance motor skills. For example, Lim and Lee (2019) reported that interactive and game-based water activities resulted in greater mastery of buoyancy in comparison to conventional methods. The current findings support this, indicating that multi-variant water play models effectively encourage children's participation and skill acquisition.

In conclusion, although the water play models demonstrate effectiveness and high enthusiasm among young children, ongoing refinement is necessary. Future research should incorporate larger, more diverse populations and utilize more objective measurement tools. Also, longitudinal studies are recommended to assess the retention and transfer of buoyancy skills over time, ensuring that these models can be reliably adapted across various educational contexts.

Conclusion

In this study, purpose of research was to create and assess effective water play activities aimed at boosting floating skills in young kids. The results showed that the water games used in the study greatly improved the children's ability to float, emphasizing the value of organized and fun water exercises in early swimming lessons. These findings highlight how thoughtfully designed water activities can help build water confidence and ensure safety for young learners. Educators and parents are advised to adopt similar methods in their swimming programs. Future studies might focus on the lasting effects of these activities, modify them for various age groups, or test their success across different cultural or educational environments.

Author contribution statement

Juriana together with Abdul Kholik, Ismail, and Aryati: Conceptualization, Methodology, Data curation, Formal analysis, Investigation, Writing - original draft preparation, Writing - review & editing. Sandi Prayudho and Yunita: Data validation, revising models, and accessing data.

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