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Unlocking the future of swimming education: A breakthrough in pull buoy development as an innovative learning medium

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ABSTRACT

The effectiveness of the learning process in swimming greatly depends on innovative learning media. This research aims to develop and produce a pull buoy as an effective swimming learning medium. This research uses the ADDIE model for Research and Development (R&D) research. The study was conducted at Tadulako University with the collaboration of swimming material experts, instructional design experts, and learning media experts. The research involved 40 students enrolled in swimming learning courses, and data were collected through observation and questionnaires. The assessment by learning design and learning media experts revealed that the developed Pull Buoy achieved high-quality learning standards. Furthermore, both small group and large group evaluations demonstrated feasibility and outstanding performance. The research offers valuable insights and recommendations for future researchers to refine and expand the Pull Buoy's development, suggesting customization of its colour combinations and sizes to suit different age groups of users and advocating for a larger pool of subjects to yield more comprehensive results and insights into the learning medium's impact.

Keywords: Pull Buoy; ADDIE Design; Learning Media; Swimming

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INTRODUCTION

One of the learning achievements of swimming courses is helping students to be skilled in swimming. Swimming is one sport that is favored by some people in Indonesia, from children to adults, both in urban and rural areas (Ginting et al., 2020; Köroğlu & Yiğiter, 2016). Swimming is a sport that involves water. It is a branch of water sports that demands complex muscle performance (Nasrullah et al., 2022; Priana, 2019). The benefits learning to swim are very beneficial for health and keeping the body fit (Dorofieieva et al., 2019; Lu & Ye, 2019; Susanto, 2015). Learning to swim is useful for maintaining, improving, and balancing the health of one's physical and spiritual systems and at the same time increasing a sense of togetherness and competitiveness between people or individuals (Charmas & Gromisz, 2019; Lee & Oh, 2015). Swimming has been taught in schools and colleges and has become a compulsory lesson at all levels of education (Dhani et al., 2022; Subagyo et al., 2020; Tsai & Hsu, 2022). The swimming

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course in the Physical Health and Recreation Education Study Program at Tadulako University is a course that combines theory and practice carried out on an ongoing basis with in-depth material deepening and gradual practice. In the implementation of swimming lectures, of course, there are differences between the learning process and expectations from the ultimate results of the lecture.

Success in learning is determined by several factors, including students, lecturers, learning methods, learning media, environment, and learning atmosphere (Firdausi, 2018; Ozcan, 2021). In swimming learning, there are problems that need to be addressed, such as limited supporting equipment and a lack of innovation in the learning media. Previous research has identified the importance of using effective and innovative learning media to improve student learning outcomes (Bagchehi et al., 2021; Kang & Chen, 2016; Kolb, 2015). Equipment that is usually used in the form of a swimming board with a limited number. Lecturers have not innovated learning media, which can later be used as supporting equipment for students in the learning process. Lecturers are required to innovate in utilizing media to create conducive learning (Andriani et al., 2019; Chandran et al., 2020; Dewi et al., 2020). Nevertheless, there are still deficiencies in this research regarding the creation of inexpensive educational tools suitable for student practicums in swimming education (Ediyani et al., 2020; Elida et al., 2012). For students, the chief obstacle is the economic factor where many students are still in the category of families with low incomes, so buying supporting equipment is very burdensome.

The research's urgency is rooted in the necessity of finding a successful solution for bettering swimming learning. In previous research, the use of learning media has been shown to improve students' interest, motivation, and learning outcomes in swimming lessons (Aprianto et al., 2022; Puspitarini & Hanif, 2019; Yuliansih et al., 2021). However, there is still a need to develop suitable learning media to overcome the limited equipment and economic constraints faced by students (Inayati et al., 2018; Moshtari & Safarpour, 2023). Therefore, this research made a new contribution by developing pull buoys as an effective and cost-effective swimming learning medium so as to improve student's learning experiences.

The use of media in the learning process must involve students, so as to make learning meaningful. The development of the learning media is very important for teachers because excellent teachers can make the learning atmosphere conducive for students (Azizah & Syarifah, 2021; Tsai & Hsu, 2022). The learning media that can be offered can be in the form of pull buoys, where students can make them simply and the money spent is more economical and the availability of tools for making them is easy to obtain. The advantages of this pull buoy are expected to make it easier for students to learn to swim efficiently and make it easier for lecturers to transfer their knowledge to students. In such conditions, something can achieve properly the learning objectives.

The purpose of this research is to develop pull buoys as an innovative and economical swimming learning medium using ADDIE design. In previous studies, the positive effects of learning media in swimming lessons, such as increased students' interest, engagement, and learning outcomes, have been assessed (Salim, Ibrahim, & Muslim, 2020; Risniawati et al., 2020; Siswati et al., 2022). However, there is still a need for research that focuses on developing learning media that suit the needs of students' practicum and swimming learning (Sin & Hudayani, 2020; Susena et al., 2021). Thus, this study aims to fill this knowledge gap and contribute to improving swimming learning through the development of pull buoys as an effective, cost-effective, and relevant learning medium to meet students' needs in the learning process (Armen & Rahmadani, 2019; Ramli & Ahmad, 2022; Duijn et al., 2021).

METHOD

This study used the ADDIE model, which is a development of Research and Development (Branch & Dousay, 2015; González, 2022; Ifani et al., 2020). The ADDIE model is a teaching model used by many educators and trainers to develop education and training programs within the curriculum (Spatioti et al., 2022). The ADDIE model can streamline learning in the classroom (Rahmandhani & Utami, 2022). One of these models has been developed for other experts and novices (Aprilianingsih & Asril, 2022), the steps of this research are as follows: a) Analyze; this stage consists of learning analysis, instructional goal analysis, data analysis, needs analysis, and analysis of currently available resources. This stage consists of internal evaluation efforts, external evaluation, and the redesign of the resulting system. b) Design, c) Develop, d) Implement, e) Evaluate (Evaluation) (Sani et al., 2018; Szabo, 2022).

This research was conducted at Tadulako University by involving one learning design expert, and one learning media expert. The research subjects were 41 students who were taking swimming learning courses. The instruments used were observation and questionnaire. The questionnaire sheet was used to collect data on the results of reviews from design experts, media experts, and students. And finally, the data was analyzed descriptively qualitative and descriptive quantitative. Qualitative data researchers used a questionnaire to get the results of the validator's product to determine the effectiveness of the pull buoy development. For qualitative data, researchers used interviews with lecturers to obtain information about the condition of swimming learning process and the utilization of pull buoys in the classroom. The data collected through the implementation of formative evaluation is grouped into four parts, namely: (1) first stage evaluation data in the form of learning design experts. (2) second evaluation data in the form of learning media expert test data, and (3) third stage evaluation data in the form of data from small group trials and large group trials.

It carried the final product validation out after it completed the pull buoy media improvement. Analysis of product design test findings by experts, such as learning module experts, learning device experts, and small group tests using test subjects who are students. Lawshe suggested using the Content Validity Ratio (CVR) when checking validity, researchers can prove the content validity of an item using CVR (Srirahayu & Arty, 2018). The researcher conducted content validity to ensure whether the content of the questionnaire was appropriate for the research objectives (Crocker, 2015). Using the questionnaire sheet, students' ratings in small groups and large groups were recorded.

RESULTS AND DISCUSSION

The research results are being reevaluated for their validity. The discussion of research results can be explained as the researcher's original thoughts to provide explanations and interpretations of the research results that have been analyzed in order to answer questions in this research. The research can see the distribution of respondents based on gender in the table below.

Table 1. Gender of Respondents

Gender	Respondent	Percentage
Male	32	80%
Female	8	20%
Total	40	100%

Based on the table above, we can see that most of the respondents were male, namely 80% (32 students) and 20% (8 students) were female. The total number of male and female respondents was 40 students. After knowing the gender of the respondents, it is necessary to know about the age of the respondents in this study, as for the distribution of respondents based on age, we can see in the following table.

Table 2. Gender of Respondents

Age	Respondent	Percentage
< 18 Years	10	25%
≥ 18 years	30	75%
Total	40	100%

The average age of respondents in this study was 18 years, 2 months, rounded up to 18 years. Based on the table above, we can see that most respondents are more or equal to the average age, namely 75% (30 students) and 25% (10 students) are less than the average age. The pull buoy development design has followed the five steps of the ADDIE model, including:

1. Analysis

The analysis step is the initial step or the first step of the ADDIE model. In this step, three important things are done, namely (1) analyzing the competencies that students must master, (2) analyzing student characteristics related to the knowledge, attitudes, and skills possessed by students, and (3) analyzing materials that are relevant to the achievement of competencies expected to be possessed by students. In this last stage, the researcher carried an evaluation out to find out the weaknesses and make revisions as needed.

2. Design

In this step, three activities are carried out, namely (1) selection of materials that are relevant to the characteristics of students and the demands of the expected competencies, (2) learning strategies, and (3) forms and methods of assessment and evaluation. The research organized the structure and design of the application in this step. Then, the learning strategy applied for each step is determined so that the pull buoy is easy for students to learn and use (Kim et al., 2020). How to measure the achievement of learning objectives after students learn the material in each step is also determined. As a first step, the researcher conducted an evaluation at the end of this step.

3. Development

The implementation plan can guide this process (Cornelius & Wilson, 2021). Development is the third step of the ADDIE model. Activities in developing pull buoys. Searching and collecting relevant data sources to enrich the material, making the required videos and dubbing, typing, editing, and making manuals are part of this step. The researcher conducted pull buoy media validation in this step. The validators involved are swimming material experts, learning design experts, and learning media experts. Analysis and revision of the pull buoy development research model was carried out after the first validator gave his assessment results, and so on until the analysis and revision of the third validator's assessment results.

4. Implementation

Students tested and used the prototype development product. Under the time limit, the researcher implemented the pull buoy in small groups. After implementation, a

small group of 8 second semester students of PJKR Study Program were asked to assess the development product and then a large group trial was conducted with 40 students.

a. Small Group Trial

The researcher conducted small group trials on 8 students who did swimming practicum with pull buoys according to instructions. The results of the small group assessment with a total score of all aspects were 366 and the total percentage was 91.5% in the feasible category. Of the four aspects assessed, the highest score in the learning aspect was 95% with a very good category. The lowest score for effectiveness and efficiency was 87.5% with a very good category, while the implementation and material aspects were 93.75% and 95% respectively, with very good categories.

b. Large Group Trial

The researcher conducted the field trial on 40 Swim Learning students. Some of the aspects assessed in the field trial were implementation ability, sustainability, suitability of the environment, and attractiveness of props. The results of the overall field test assessment with a total percentage of 94.5% are in the very good category. The order of the percentage of the highest to lowest assessment aspects, namely: 95% attractiveness aspect with a very good category, 93.5% continuity aspect with a very good category, the ability to be implemented and the aspect of suitability for the environment obtained the same percentage of 92.5% with a very good category.

5. Evaluation

There are two kinds of evaluation, namely formative evaluation and summative evaluation. This research only carries out formative evaluation which aims to validate the development product and revise according to the input or suggestions given. In accordance with the development of the ADDIE model, it has carried out formative evaluation in stages at each step of the ADDIE model. The ADDIE model provides an opportunity for researchers to be able to evaluate and revise the developed media (Rahmandhani & Utami, 2022).

Learning media as physical equipment to present learning to learners (Reiser & Dempsey, 2018). This definition emphasizes that any physical equipment used to present learning, whether package books, visual equipment, audio, computers, or other equipment, is classified as learning media. The product resulting from this research and development is pull buoy media. The learning media developed include shapes, materials, and ways of making. Another product is a guidebook for making pull buoys.

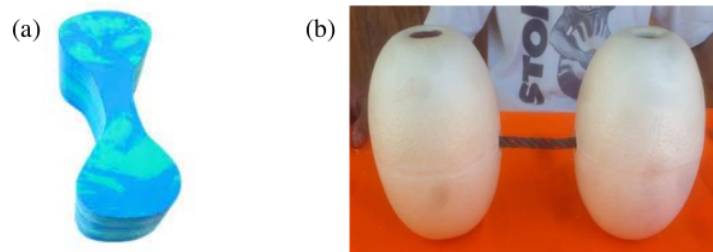


Figure 1. Pull Bouy Shape Difference (a) Original Product and (b) Development Product (Research Documentation, 2023)

The feasibility test results in this study revealed several important findings. Firstly, according to the assessment from the Learning Design Expert, the development of pull buoys received a score of 83% with a valid category, indicating that the product is well-qualified and does not require any major revisions. The media was adjusted according

to student needs and received positive feedback from experts. Minor changes were suggested, focusing on enhancing comfort, security, and safety when using the pull buoy, along with the recommendation to use striking colors. Secondly, the assessment from the Learning Media Experts also showed a high-quality score of 83% with a valid or agreed category. This suggests that the pull buoy is a reliable learning medium, meeting the requirements for effective swimming instruction. While some suggestions were provided, such as adjusting the rope and size of the trawl buoy to suit students, overall, no major revisions were needed.

Additionally, based on trials conducted with small groups of students, the pull buoy received an average rating of 3.61 in the good category, indicating its effectiveness in meeting the learning objectives. Some minor improvements were suggested through qualitative feedback, but the overall response from the students was positive. The development of pull buoy media is a product that has been produced from this research and can be used in swimming classes as well as an alternative for delivering swimming learning materials to students by lecturers (Gusmida & Islami, 2017; Papadimitriou & Loupos, 2021). Related suggestions that can be submitted to the need for product utilization is this pull buoy product can be used as a medium for learning to swim for both male and female students. The product can be used to help improve swimming techniques and physics, product utilization should still refer to swimming learning objectives, for further research in order to further develop sizes, bright colors, tutorials for use, and other companion equipment.

Pull Buoy is often used to assist in swimming training, Pull Buoy is a swimming equipment that is a kind of buoyancy aid that is often used for training students (Chen et al., 2023; Ginting et al., 2020). The use of pull buoy aids greatly helps buoyancy so that it can streamline and make it easier to master basic swimming techniques, thus attention to learning to swim can be centered on leg movement techniques and arm movements (Rizkiyansyah & Mulyana, 2019). This Pull Buoy development research is designed and modified for student courses that emphasize totality in participation and swimming experiences both in lectures and outside lectures. Short-term time implications, at least Pull Buoy is directed to make it easier for students to learn so that students have good skills in practicing swimming.

Based on the above thoughts, it is necessary to shift the paradigm of teaching swimming from methods to teaching models. A model is a plan or pattern used to create innovative work for long-term learning, design learning materials, and direct teaching anywhere and anytime. The model is a lesson that includes a thorough consideration of learning theory, long-term goals, context, content, classroom management, related strategies, process proofing, and learning assessment (Borich, 2017).

The Pull Buoy development model is designed with the aim of engaging all students and encouraging them to actively participate as swimmers, allowing for more individualised learning time. As a learning medium, the Pull Buoy possesses unique characteristics, including easy availability and simplicity in its construction, making it safe for use by anyone and convenient to carry anywhere. This aligns with experts' views on learning media, as they function as tools to deliver messages from sender to recipient, stimulating students' thoughts, feelings, attention, and interests, thus enhancing the effectiveness and efficiency of the learning process (Johnes et al., 2017; Kintu et al., 2017). The development of the pull buoy utilised easily obtainable materials, namely a pair of trawl buoys and rope or nylon.

In conclusion, the research has been successful, and based on the field data results, it indicates the potential for further development of the Pull Buoy as a learning medium

in swimming lessons. This application model is the first of its kind, offering both advantages and limitations. The advantages include ease of fabrication, safety in usage, availability of materials, especially in coastal areas where trawl buoys are abundant due to the fishing industry, affordability of raw materials, and suitability for use by all age groups. However, the Pull Buoy also has some limitations or weaknesses that need to be addressed. Firstly, the length of the connecting rope between the buoys must be adjusted to each swimmer's limb circumference, requiring customization during production. Secondly, the white colour of the trawl buoy may not be eye-catching enough, and other colours could be considered to enhance its attractiveness. Lastly, for students living inland, obtaining the raw materials for constructing the Pull Buoy, especially the trawl buoy, may pose some challenges.

Overall, the research demonstrates the potential benefits of using the Pull Buoy as a learning medium in swimming courses. However, to maximise its effectiveness and address the identified limitations, further refinement and customization of the Pull Buoy design are recommended. By doing so, it can become a valuable and accessible tool to enhance swimming learning experiences for students, regardless of their location or age group.

CONCLUSION

The research focuses on the development of an innovative learning medium called the Pull Buoy, which is constructed using trawl buoys and ropes for swimming learning courses. Utilising the ADDIE design, this cost-effective approach aims to enhance the effectiveness of swimming education. The study's primary contribution lies in providing a practical and economical learning medium that caters to the specific needs of students during their swimming learning process.

Furthermore, the research offers valuable insights and recommendations for future researchers to refine and expand the Pull buoy's development. It suggests customising the Pull Buoy's colour combinations and sizes to suit the different age groups of users, making it more adaptable and beneficial for a wider range of learners. Additionally, the study advocates for a larger pool of subjects in future research to yield more comprehensive results and insights into the learning medium's impact.

Despite its promising findings, the research acknowledges certain limitations, particularly concerning the constrained research funds and the less representative research location. To overcome these limitations, it emphasises the significance of securing adequate funding for future research endeavours to accommodate a more diverse and robust pool of respondents. Additionally, selecting more representative research locations will further enhance the generalizability of the findings. By addressing these limitations, future researchers can strengthen the validity and applicability of the Pull Buoy as an effective and accessible learning medium in swimming courses. Overall, this research not only contributes to the field of swimming education but also inspires educators to creatively utilise resources in their surroundings to develop engaging and budget-friendly learning tools for their students.

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CONFLICT OF INTEREST

The authors state no conflict of interest.

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