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Development of Virtual Hologram Audio Visualizer Box Technology to Improve Physical Fitness

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Abstract

Study purpose. Develop virtual hologram box technology in improving the physical fitness of junior high school students

Materials and methods. Study adopted the research and development of Borg and Gall which is divided into planning, development and implementation stages. Subjects of this study consisted of junior high school students in grade VII with a sample size of 24 students, small-scale trials were taken with 8 students and for large-scale trials were taken with 16 students, in sampling the researcher used proportional random sampling. Instrument used in this study was a product trial questionnaire, using a Likert scale which was then assessed by experts and observers of the virtual hologram box technology media

Results. Validation results showed an average value of 84% with a very good category, the results of small-scale group trials showed an average gain from experts and observers of 77.5% with a good category and the results of large-scale group trials showed an average gain percentage from experts and observers of 81% with a very good category and the product can be used without experiencing any problems.

Conclusions. Findings of this trial emphasize that the integration of interactive technology such as virtual hologram box can be a solution to enrich conventional and limited physical fitness teaching methods. The use of this technology allows students to be more actively involved in the learning process, and helps teachers in delivering materials in a more interesting and innovative way. For future research, the development of hologram technology should be able to visualize 3D animation, and can be tested at a higher level.

Keywords: Physical Fitness, Technology, Learning Media

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Introduction

Physical education is one of the subjects that is an important part of education as a whole, with a focus on physical activity and the formation of a healthy lifestyle, in order to support physical, mental, social and emotional growth and development in a harmonious, balanced and balanced manner, physical education plays an important role in facilitating the physical fitness of students (Lovita et al., 2023), Apart from that, physical fitness is one of the benchmarks for public health. People who have high levels of fitness can carry out daily activities much better. In children up to adolescence, the level of physical fitness is one of the indicators to help carry out various daily activities. Based on research results (Dartini et al., 2017) shows that the level of physical fitness of students is in the very good category (0%), good (1,68%), currently (47,90%), not enough (37,82%) and very little (12,61%). And similar research shows a moderate category 45,83%, not enough 37,50%, good 8,33%, very little 8,33%. Based on the article above, it explains that the level of physical fitness in students is not yet included in the good category. Meanwhile, the role of physical fitness in students can help learning objectives be achieved easily. (Hartono, 2014), apart from that, physical fitness is a component that needs to be developed in students. With good physical fitness, a person will be helped to carry out good, regular and planned activities (Rohendi et al., 2020; Zafar, 2012), according to (Giriwijoyo, 2007) physical fitness or physical fitness is a condition of health level possessed by a person as a basis for achieving success in the tasks or activities carried out. Physical fitness is an activity carried out for a long duration, and does not experience excessive fatigue (Kristiyandaru et al., 2020).

Physical fitness has various components, according to (E.Rink et al., 2010) Health related physical fitness consists of cardiorespiratory, muscle strength, muscle endurance, flexibility and body composition, while physical fitness or fitness related to motor skills is coordination, balance, reaction speed, speed, power and agility (Winarno, 2006). A good level of physical fitness will describe several characteristics, being able to carry out daily activities spontaneously or sudden tasks, having motor skills in carrying out tasks by minimizing the level of fatal errors so that they can be overcome by themselves, having good heart and lung endurance (cardiovascular), so that they can carry out tiring activities, having agile and fast body movements, by having these components the body is helped for various motor activities that allow for agile and fast movements, having the power to control and regulate body movements well and perfectly. Therefore, physical fitness is one aspect that needs to be developed and improved for everyone.

Involvement of digital technology is one of the media that needs to be developed in physical education learning, because this subject is part of the national education program, which aims to develop and maintain physical fitness, be able to perform various movement skills, have critical thinking skills, be able to develop social skills, and be able to maintain a healthy lifestyle and be equipped with physical activity learning experiences (Muhajir, 2017). Use of technology in learning aims to help teachers in carrying out teaching and learning activities, in addition, the function of technology in learning is to help, facilitate and can build meaning that is easy to understand for students. Specifically, technology has a role to form collaborative communication with teachers, students and learning resources such as online technology applications that can be used for telecommunications, namely, skype, facebook, zoom and google meet, providing a complex, comfortable and realistic problem-solving environment such as software devices that can be used as projects, can explain concepts that are difficult to understand and understand, by utilizing various technologies in education abstract / complex concepts can be explained quickly / slowly, precisely, and in detail, making it easier to get tools / objects that are difficult to find in the school environment / residential environment, showing various objects that are too large and / or too small, displaying various

movements that are too slow and too fast, technology is a solution in learning, both online and offline.

Digital technology today, has become an inseparable part of human life, the rapid development of digital technology, has resulted in the use of conventional and traditional media being abandoned. The sectors that are currently feeling the impact of the development of digital technology are education, transportation and health. The education sector is one of the parts that requires digital technology in the learning process. One of the educational technologies currently used is online classes, online collaboration and even sending assignments online (Hew & Cheung, 2013). In addition, the use of appropriate technology in the field of education can be used as a medium and method that will influence learning outcomes (Bower, 2019).

Holograms are a technology that can be used as a medium for learning., (Schnackenberg & Savenye, 1997) based on research conducted by (Burdea & Coiffet, 2003; Soepriyanto et al., 2019) Hologram technology can help facilitate understanding and motivate learning because the text and images displayed give a real impression, thus helping teachers convey learning materials, while in research (Arifudin et al., 2019) By using 3D hologram technology, learning activities can be motivated and learning can be made easier to understand.

Thus, in this modern era, physical education must continue to adapt and integrate technology as part of learning. This aims to create creative, innovative, and fun activities, so that it not only improves students' physical fitness but also supports their success in undergoing other learning activities with a more prime and fresh physical condition (Rohmah & Muhammad, 2021; Syahlan et al., 2024).

Materials and methods

Study participants.

Subjects in this study consisted of junior high school students in grade VII with a sample size of 24 students, small-scale trials were taken with a sample size of 8 students and for large-scale trials, a sample size of 16 students was taken, while the sampling technique used proportional random sampling (Sugiono, 2014).

Study organization.

Method in this study was adopted from Borg and Gall's research and development (Borg & Gall, 1989) which is divided into planning, development and implementation stages. In the planning stage, the researcher conducted a needs analysis by identifying indicators of audio visualizer virtual hologram box technology to increase freshness. In the development stage, the researcher designed and created virtual hologram box technology media that is in accordance with the characteristics of junior high school students. In the implementation stage, the researcher conducted expert validation, small-scale and large-scale trials. The instrument used in this study was a product trial questionnaire, using a Likert scale which was then assessed by experts and observers of virtual hologram box technology. Instrument indicators for validity testing and product trials are as follows table 1.

Table 1. Indikator Instrument

Indicator
Virtual hologram box runs smoothly, receives, and displays results according to the command
Buttons can run according to the command
Convenience of the virtual hologram box for users
Hardware design of the virtual hologram box
Software design of the virtual hologram box
Clarity of instructions in delivering learning materials

Appearance of the media is attractive and in accordance with student characteristics
Accuracy of media selection for physical fitness learning
Ability of the media to create a sense of joy for students in physical fitness learning
Placement of illustrations and image/video captions does not interfere with understanding

Statistical analysis.

Data analysis conducted in this study was to reduce the results of expert assessments of the model which were then analyzed using quantitative descriptive percentage analysis.

Results.

Validation results of the audio visualizer hologram virtual box technology to improve physical fitness in junior high school students will be presented as follows table 2:

Table 2. Product Validation

Indikator	Expert 1	Expert 2	Expert 3
Virtual hologram box runs smoothly, receives, and displays results according to the command	4	4	3
Buttons can run according to the command	3	4	4
Convenience of the virtual hologram box for users	3	3	4
Hardware design of the virtual hologram box	3	3	4
Software design of the virtual hologram box	3	3	4
Clarity of instructions in delivering learning materials	3	3	4
Appearance of the media is attractive and in accordance with student characteristics	4	4	3
Accuracy of media selection for physical fitness learning	3	3	3
Ability of the media to create a sense of joy for students in physical fitness learning	3	3	3
Placement of illustrations and image/video captions does not interfere with understanding	3	4	3
Score	32	34	35
Maximum Score	40	40	40
Percentage	80	85	87.5
Average Persentage		84	

Validation of virtual hologram audio visualizer box technology based on assessments from experts consisting of physical fitness experts, physical education lecturers and technology experts. The results shown based on the assessment of physical fitness experts were 80% with a very good category and worthy of being tested, according to physical education lecturer experts 85% with a very good category and worthy of being tested, while according to technology experts showed results of 87.5% with a very good category, while the average validation obtained from the three experts was 84% with a very good category and worthy of being tested on a real scale.

Product trial was conducted in two stages, the first stage was a small-scale group trial and the second stage was a large-scale group trial. The limited group trial was conducted with the research subjects consisting of 8 students in grade VII of junior high school. While in the large-scale group trial the researcher involved 16 students with the same criteria. Small scale group trial procedure and the large-scale group trial were carried out in one place at different times, in its implementation the small and large-scale group trials were carried out by applying virtual hologram box technology, then the experts and observers who were physical education teachers made observations and assessed the product during the limited-scale group trial and the large-scale group trial. The following table 3 are the results of the trial based on the assessment of experts and observers.

Table 3. Limited Scale Group Product Trial

Indicator	Expert 1	Expert 2	Expert 3	Observer 1	Observer 2
Virtual hologram box runs smoothly, receives, and displays results according to the command	3	3	3	3	3
Buttons can run according to the command	3	2	3	3	3
Convenience of the virtual hologram box for users	4	3	3	4	3
Hardware design of the virtual hologram box	4	3	4	3	3
Software design of the virtual hologram box	3	3	3	4	3
Clarity of instructions in delivering learning materials	3	3	4	3	4
Appearance of the media is attractive and in accordance with student characteristics	3	3	3	3	3
Accuracy of media selection for physical fitness learning	3	3	3	3	3
Ability of the media to create a sense of joy for students in physical fitness learning	3	3	3	3	2
Placement of illustrations and image/video captions does not interfere with understanding	3	4	2	3	3
Score	32	30	31	32	30
Maximum Score	40	40	40	40	40
Percentage	80	75	77	80	75
Average	3.2	3	3.1	3.2	3
Average Percentage			77.5		

Results of the small scale group trial showed an average gain from experts and observers of 77.5% with a good category. The assessment explains that the product can be used well, but with improvements, after getting assessments and suggestions from experts and observers,

researchers made improvements to the virtual hologram box technology, improvements consisting of software, hardware and animated displays. After improvements were made to the product, researchers then conducted a large-scale trial, the following table 4 are the results of the large-scale product trial assessment.

Table 4. Large Scale Product Trials

Indicator	Expert 1	Expert 2	Expert 3	Observer 1	Observer 2
Virtual hologram box runs smoothly, receives, and displays results according to the command	3	3	3	3	4
Buttons can run according to the command	3	4	3	3	3
Convenience of the virtual hologram box for users	3	3	3	3	3
Hardware design of the virtual hologram box	3	4	3	4	3
Software design of the virtual hologram box	3	3	4	3	3
Clarity of instructions in delivering learning materials	4	3	3	3	4
Appearance of the media is attractive and in accordance with student characteristics	3	3	3	3	3
Accuracy of media selection for physical fitness learning	3	4	3	3	3
Ability of the media to create a sense of joy for students in physical fitness learning	4	4	4	3	3
Placement of illustrations and image/video captions does not interfere with understanding	3	3	4	3	3
Score	32	34	33	31	32
Maximum Score	40	40	40	40	40
Percentage	80	85	82	77	80
Average	3.3	3.5	3.4	3.4	3.5
Average Percentage			81		

Results of the large group trial showed an average percentage of 81% from experts and observers with a very good category and the product can be used without experiencing any problems. The physical fitness material in the physical education system as a whole has limited delivery that can be integrated with existing technological developments, the decline in various levels of physical fitness and the form of learning models that are not varied in physical fitness material are parts that need to be improved, with the presence of virtual hologram box technology, presenting a technology that can help teachers in delivering physical fitness material and provide experience to students in doing physical activities.

Discussion

Discussion of the results of the product trial conducted through two stages, namely small-scale group trials and large-scale group trials, showed that virtual hologram box technology has significant potential in improving physical fitness learning in junior high schools. In the small-scale group trial stage, this product received a rating of 77.5% with a good category, indicating that although this product can be used, improvements are still needed in the software, hardware, and animation display aspects to improve the user experience. After improvements were made, the large-scale group trial received a rating of 81% with a very good category, indicating that this product is more ready for widespread use without significant obstacles. The implications of these findings indicate that interactive visual-based technology, such as virtual hologram boxes, can be a solution to overcome challenges in delivering physical fitness materials that have been limited by conventional methods. Based on literature in the last 10 years, research shows that the integration of technology in physical education can increase student motivation and help deeper understanding of concepts (Chen et al., 2013; Mitchell et al., 2015). This study supports these findings by showing that the use of innovative technologies in physical education not only improves the quality of teaching but also provides a more interactive learning experience for students. Furthermore, the results of this trial are also relevant to studies that state that more innovative variations in learning models are needed to maintain student engagement in physical activity, especially in the digital era (Wang & Chen, 2020). Technologies such as virtual hologram boxes allow for visual and interactive delivery of material, which can increase student participation levels in physical fitness learning, in line with findings from research on the importance of innovation in physical education curricula. (Dobbins et al., 2013).

Contribution of this research to the field of physical education studies is very significant. By integrating cutting-edge technology such as virtual holograms into teaching, this research answers the need for more varied and interesting learning models, in accordance with technological developments and the needs of today's digital generation. The use of holograms in physical education learning can be considered a major thing in the way physical education is taught, bridging the gap between theory and practice that is often difficult to explain traditionally.

Study also contributes to the understanding that technology-based teaching not only facilitates the teaching of abstract concepts in physical fitness but also encourages students to think critically about their own bodies and how to maintain their physical health. In previous literature, augmented reality and virtual reality technologies have been shown to be effective in increasing student engagement in a variety of subjects, including science and art, but have rarely been applied specifically in physical education (Bower et al., 2016). The results of this study strengthen the argument that similar technology can be applied effectively in the field of physical fitness.

From a pedagogical perspective, these findings support the literature suggesting that student-centered, technology-based learning approaches can help students become more physically active and take more responsibility for their own health (Giblin et al., 2014). Hologram technology, in this case, allows direct interaction with learning content, which can strengthen students' understanding of the importance of physical fitness in everyday life. In practice, this study also shows that virtual hologram box technology can be easily adapted to various levels of education, not only in junior high schools, but also in higher education. This provides room for further research on how this technology can be applied in a broader context. The involvement of experts and observers in the assessment of this product also provides validity to the results of the study, indicating that this product can be well received by practitioners in the field. Conclusion, this study makes an important contribution to advancing physical education by offering technological solutions that can increase student engagement

and understanding. Thus, this study not only adds to the literature on technology in physical education, but also provides practical implications that can be applied in various other educational contexts. These results lead us to a deeper understanding of the importance of technology integration in learning to support the development of students' physical fitness in the digital era.

Conclusions

Based on the results of the trials conducted in two stages, namely small-scale group trials and large-scale group trials, virtual hologram box technology has proven to have significant potential in improving the quality of physical fitness learning. In the small-scale group trial, an average rating of 77.5% indicates that this product is good, although it requires improvements in several aspects such as software, hardware, and animation. After improvements were made, the large-scale group trial received an average rating of 81% with a very good category, indicating that this product is ready for wider use without significant obstacles.

Findings from this trial emphasize that the integration of interactive technology such as virtual hologram boxes can be a solution to enrich conventional and limited physical fitness teaching methods. The use of this technology allows students to be more actively involved in the learning process, and helps teachers deliver material in a more interesting and innovative way. Thus, this study not only adds to the literature on the use of technology in physical education, but also provides a practical contribution to the development of learning methods that are more varied, relevant, and in accordance with the needs of education in the digital era. For future research, the development of hologram technology should be able to visualize 3D animations, and can be tested at a higher level.

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