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Effectiveness of Digital Table Tennis Teaching Materials in Improving Students' Cognitive Ability

Samsuddin Siregar *[1], Rosmaini Hasibuan[2], Mahmuddin[3],
[1] Program Study Physical Education Health and Recreation, Faculty of Sport Science, Universitas Negeri Medan, Medan, Indonesia
[2,3] Program Study of Sport Science, Faculty of Sport Science, Universitas Negeri Medan, Medan, Indonesia

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Abstract

This research is a research activity testing the effectiveness of table tennis digital teaching materials, which previously this product has gone through a development process (expert judgment, small-scale field tests and large-scale field tests). This study aims to obtain teaching material products that are effectively used by students in learning table tennis. The method used in this research is the experimental method. The subjects involved in this study were 30 experimental groups and 30 control groups. The subjects of this study were students who were taking table tennis courses at the Physical Health and Recreation Education Study Program, Medan State University. The data analysis technique used in this study is the feasibility percentage technique. Based on the results of data analysis, it can be described that the results of the research can be seen from the results of the pretest, the two groups have almost the same percentage of learning outcomes. where the experimental group's pretest results were 41.92% while the control group was 42.50% with a difference of 0.88%. Based on this percentage, it can be categorized that student learning outcomes in the cognitive aspect have not been completed. Furthermore, the results of the post-test of the two groups experienced an increase from the results of the pre-test, where the experimental group achieved a completeness percentage of 92.2% while the control group was 82.1%, this percentage can be categorized as complete classically, but in the post-test results the percentage of the experimental group was higher than with the percentage of the control group. Based on this research data, it can be concluded that the digital materials developed in this study are suitable for use by educators as teaching materials in table tennis lectures.

*Corresponding email: samsuddinsiregar@unimed.ac.id
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INTRODUCTION

Teaching materials are one of the important tools that a teacher must have in carrying out his duties as a teacher. There are many important roles of teaching materials in the implementation of learning, including teaching materials that can be used as a tool to create a more efficient and effective learning process and can be a source of learning for students in learning something both individually and in groups. Then through teaching materials, the learning process can be developed into a student center learning context, in the sense that the role of students will be more active, the teacher can act as a facilitator and the teacher is no longer the only source of information for students (Suciati, 2018). To achieve the important role of teaching materials, as described above, the teaching materials to be designed must be in accordance with aspects of learning needs; student characteristics, learning environment, available facilities and infrastructure, available learning media, and teaching materials (Andi Prastowo, 2011). Through teaching materials developed, students can be directed to become active learners because they can read or study the material in the teaching materials first before participating in class learning (Awal Akbar Jamaluddin, 2018). Thus, when discussing material in class, students are prepared with sufficient information and knowledge so that the available study time is no longer used by educators to explain material at length, but is more used for discussions and discussing certain materials that have not yet been studied. understood by students.

Medan State University is one of the tertiary institutions in Indonesia which has the goal of producing qualified prospective educators. The teachers who are scattered in schools in North Sumatra Province, are mostly graduates of Medan State University. The high level of absorption of Medan State University graduates in various schools is an indicator that in terms of quality Medan State University graduates are able to compete in the world of educational employment. This condition must be improved and this is a potential challenge for Medan State University so that in the future its graduates will be more qualified and productive (Siregar et al., 2022). One of the efforts that can be made by Medan State University is that this campus must be able to ensure that the lecture process and education management are in accordance with the times, both in terms of facilities and infrastructure, learning media, teaching materials provided by educators, access to information facilities, the quality of educational service organizations. professional one. So far the learning process carried out by educators at Medan State University has been going well. However, there are a number of things that are not optimal, including teaching materials used as learning resources that still use printed teaching materials. In January 2023 a survey was carried out on 100 students, the purpose of this survey was to find out the level of interest and the most preferred by students in 2 (two) types of teaching material sources, namely print and non-print (digital). The students surveyed were students who had experienced the learning process with printed and digital learning resources. Based on the results of this survey, 90% of students prefer digital teaching materials compared to printed materials, on the grounds that digital teaching materials are easier to access, more time and place effective than printed books, having to buy books at bookstores or borrowing library books takes time. long. The survey results show that 5% of students prefer printed teaching materials due to eye health

considerations. They are worried that continuing to read with digital teaching materials will interfere with their eye function (Samsuddin Siregar, 2020). The results of this survey prove how much digital teaching materials are needed to meet students' interests in the lecture process, so that students increase their reading power, if their reading power is high, student knowledge will develop, this knowledge will have a positive impact on students' analytical abilities, so that various problems arise. problems faced by students can be solved scientifically.

The current learning process, using printed teaching materials is not so much in demand by students, we can see this phenomenon based on students' reading interest in printed books in gramedia and libraries that are decreasing day by day (Kurniasih, 2021). It is the same with the textbooks, modules, printed teaching materials provided by educators who are not very interested in students reading them. Students prefer to find information related to their college assignments via Android mobile phones or laptops, in this way students can do it at any time and at any time (Papale & Hooks, 2018). This condition is characteristic of 21st century learning, along with technological developments that make the accessibility of learning resources needed by students to become completely digital (Pedeste et al., 2023). As mentioned (Karaca-Atik et al., 2023) Partnership for 21st Century Skills} there are 5 (five) influences of technological developments in the 21st century on learning, namely:

1) Instructor/teacher/mentor/facilitator activities,
2) Online learning design,
3) Data as a source of learning (big data),
4) Online learning strategies,
5) And the performance of students.

The development of teaching materials is an attempt to compile teaching materials that can be used to support learning. A teacher in developing teaching materials is certainly not careless in making them, but must fulfill the principles as the basis for preparing teaching materials. According to (E. Kososih, 2021) there are 3 (three) aspects to the principles of developing teaching materials, namely:

1) The principle of relevance (relatedness). Learning materials should be relevant or have something to do with the basic competencies and desired indicators.
2) The principle of consistency. If there are four types of basic competencies that must be mastered by students, then the teaching materials that must be taught must also include four types.
3) The principle of adequacy, meaning that the material taught should be sufficient enough to help students master the basic competencies being taught. Material should not be too little and not too much.
4) Learning activities that give results must go through various kinds of activities, both physical and psychological activities
5) Motivation An effort that is realized by the teacher to generate enthusiasm from students who can support learning activities. The implications of this principle in learning can be done by the teacher by giving advice, providing reinforcement such as giving praise or in the form of gifts, so that by giving motivation it will accelerate the achievement of learning objectives.
6) Individuality The learning process or presentation of material partially takes into account the individual differences of students so that they can facilitate the achievement of learning objectives. Learning that only pays attention to one target level will fail to meet the needs of all students. Therefore a teacher needs to understand the background, emotions,

and abilities of individuals and adjust learning materials and learning assignments according to these aspects.

7) The learning environment should not only focus on the classroom, because experience has shown that giving only class material makes students bored and tiring, therefore the environment is used as a learning resource. In this way what students get is not only limited to what the teacher conveys, but also learns from research and observations of an object in the surrounding environment.
8) Concentration Being a necessity for students to concentrate on the learning given by the teacher, it should be the teacher's task to try to encourage students to concentrate.

Table tennis is a sport that has many benefits for the players. In order for this sport to provide benefits, this sport must be carried out based on the principles of exercise, namely good, correct, measurable and regular (Siregar et al., 2022). If the four principles above can be practiced, then there are 6 (six) benefits that can be obtained (Purwanto & Suharjana, 2017), namely: Playing tennis can train coordination, Train reflexes, Burn calories, Strengthen friendships, Prevent dementia, Train body balance, Improve body muscle strength, and reduce the risk of injury. With the many benefits of this sport, it is only natural that this sport is fast developing and attracts a lot of interest from people. But to learn this sport is not as easy as turning the palm of the hand, players need to practice seriously so they can play this sport (Mc.Afee Richard, 2009). To learn this technique and so that players become proficient quickly, of course, they must go through a good, correct, measurable, and regular learning process (Mc. Afee Richard, 2009). For this reason, students must be equipped with various skills, both physical skills, techniques and also presentation skills. Based on the curriculum of this course, the content of the material taught to students is 10 (ten) materials, namely concepts, local and national history and equipment of table tennis, basic footwork movement patterns, aims and forms of training, basic service and drive movement patterns and forms training, basic movement patterns of push strokes and forms of training, basic movement patterns of blocks and chops and forms of practice, basic motion patterns of spin strokes and forms of training, rules for table tennis games and matches, forms of physical training and table tennis techniques, table tennis refereeing, and Modification. This material is material that students must achieve in one semester, so that through this achievement students can be sure that if they become health sports physical education teachers they can teach table tennis at school well to their students. According to Nugraheni, D., & Winarni, D. S., 2019: 1 good teaching materials are teaching materials that meet qualification standards. For this reason, teaching materials must be developed based on the objectives described above. If teaching materials can be prepared and implemented properly, then the teaching materials will provide benefits to educators and students. Benefits for students include:

a) If you provide good teaching materials, then learning activities become more interesting.
b) Opportunities for learning must be arranged independently and reduced dependence on the presence of the teacher.
c) Obtain convenience in learning each required competency mastered.

(Cahyadi, 2019) In addition to useful teaching materials for students as described above, teaching materials can also provide benefits for educators, including:

1) Obtain teaching materials that are in accordance with the demands of the

curriculum and in accordance with the learning needs of students,
2) No longer depending on textbooks which are sometimes difficult to obtain,
3) Enrich because it is developed using various references,
4) Adding to the repertoire of teacher knowledge and experience in writing teaching materials,
5) Build effective learning communication between teachers and students because students will feel more confident in their teachers,
6) Add a credit score if it is collected into a book and published

The development of table tennis teaching materials is adapted to its nature, namely as a product, process, and scientific attitude, so that it is expected that scientific attitudes will also be patterned in students. To develop HOTs in teaching table tennis, educators must master the material being taught and the learning strategies. (Lastuti, 2018) The characteristics of HOTS (Higher Order of Thinking Skill) learning are: Focusing on questions, Analyzing/assessing arguments and data, Defining concepts, Determining conclusions, Using logical analysis, Processing and applying information, Using information to solve problems. To find out whether the level of thinking ability is low or high, (Anderson, L.W., and Krathwohl, 2001) describes it as follows: (C1) remembering, (C2) understanding, and (C3) applying, (C4) skills to analyze (analyzing), (C5) evaluating (evaluating), and (C6) creating / creating (creating). Thus, it can be seen that the indicators for measuring higher order thinking skills are C4-C6 or analyze, evaluate, and create. When we do analysis, evaluation, or create, then we are doing higher order thinking activities or HOTS.

The rapid development of information technology leads students to become more familiar with the internet, have an android and all the needs and information they want to know, students are more comfortable doing it digitally, via an android phone (Smeureanu & Isăilă, 2017). So this situation must be addressed by educators wisely, through various learning innovations so that students have enthusiasm in learning. One of the researchers' innovations on the above problems is to develop digital-based table tennis teaching materials and Higher Order Thinking Skills (HOTs) for the student level.

Digital teaching materials developed in research are learning resources in the form of teaching materials that have an attractive value for students. Teaching materials will be prepared with systemic principles so that it makes it easier for students to understand the contents of teaching materials. Apart from that, these digital teaching materials can be used both offline and online so that communication is formed between educators and students and these teaching materials can be accessed via electronic devices (smartphones, Android) and computers so that these teaching materials can be accessed anywhere. (Taufiqy et al., 2016) digital teaching materials emphasize process skills and also active learning methods. Thus, teaching materials are increasingly important. Teaching materials will facilitate students to be able to study independently or conventionally.

METHODS

Please provide This research is research and development to produce digital teaching material products (applications), using a development model (Borg, W.R. & Gall, 2007) which consists of ten steps.

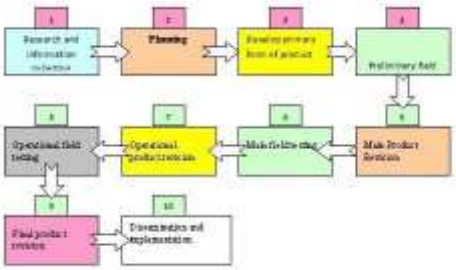

Figure 1. Stages of the Borg and Gall Development Model

This research was conducted at the State University of Medan, the College of Sport and Health and the Indonesian Community Development University. The reason for choosing this location is because these locations both have sports and health physical education study programs. The subjects in this study were health and recreation physical education students. The number of subjects who will be involved in the product effectiveness test is 60 people. The tools used to collect data and information in this study are questionnaires, interviews and tests. Questionnaires and interviews were used to collect information on the feasibility of the product being developed, namely HOTs-based digital teaching materials obtained through validator tests, small-scale product field tests and large-scale product field tests. Then the test is carried out to capture information on cognitive learning outcomes and student skills, the test is carried out after completing the effectiveness test. data from the results of this test are the learning outcomes of the control group and the treatment group (experimental group) (Prof.Dr.Sugiono, 2007).

Figure 2. Systemic Teaching Materials

The image above has the contents of the main menu or basic layout showing: Graduate Study Program Achievements, Course Learning Outcomes, Course Descriptions, Course Objectives, Materials, Assessments, and Learning Resources. Then in the storyboard the core material describes two menus, namely the nature of table tennis and the rules for table tennis equipment. This teaching material has 6 (six) elements of activity, namely pre-test, exploration, collaboration, demonstration, elaboration and real action. Initial tests are often known as pre-tests, this type of test is carried out with the aim of knowing how far the material or subject matter to be taught has been mastered by students. This test is carried out before the material or lesson material is given to students. Exploration is also called exploring or searching, is the act of searching or exploring with the aim of finding something; for example unknown areas, including outer space (space exploration), petroleum (petroleum exploration), natural gas, coal, minerals, caves, water, or information. Collaboration is the process of working together to generate ideas or ideas and solve problems together towards a shared vision. In an interdependent organization, collaboration is key to creative thinking. Collaboration is important for achieving the best results when solving complex problems. Demonstrations to demonstrate items, events, rules and sequences of carrying out activities, either directly or through the use of teaching media that are relevant to the subject matter or material being presented. Elaboration activities are learning activities that provide opportunities for students to develop ideas, ideas, and creations in expressing cognitive conceptions through various means both orally and in writing so that high self-confidence arises about their abilities and existence. Real Action is also

a form of student understanding of the topics studied in the activities of utilizing/implementing the knowledge gained.

RESULT

This research is a scientific activity to reveal the effectiveness of HOTs-based digital teaching materials in increasing the level of student understanding in table tennis course material. Implementation of learning digital materials by integrating various table tennis text materials, video tutorials, interactive questions into an application. To enter the front page of this application, http://belajartenismeja.com/.

The following is a display of one of the contents of the teaching material after opening the application.

Figure 3 . Partial Display of Teaching Material Contents

Previously, this teaching material was the result of a research development process through expert tests, small-scale and large-scale field tests. After going through this process, the developed teaching materials are feasible to use both empirically. However, in order for this teaching material to be empirically feasible, it is necessary to test its effectiveness. The goal is to ensure that the developed teaching materials can be used empirically by users. The method used in the effectiveness test is the experimental method. This method is a method to see a comparison of the effect of the teaching materials developed with the teaching materials used so far. Through this method it will be known which teaching materials are more effectively used by students to increase their level of understanding. The effectiveness test involved 30 students in the experimental group and 30 students in the control group. The experimental group is a learning group that uses new teaching materials and the control group is a learning group that uses conventional teaching materials. The research was conducted for 1 semester or (4 months).

The description of the effectiveness test results data comes from student cognitive test data. Cognitive tests are multiple choice questions whose purpose is to measure the level of student knowledge of table tennis subject matter. These multiple choice questions contain questions that contain HOTs and cover all table tennis material. The experimental design uses the One Group Pretest-Posttest Design, for more details can be seen in the image below.

Figure 4. Desain Experiment *One Group Pretest-Posttest*

The five steps above are the stages of implementing the effectiveness test carried out in this study, the five steps are carried out systematically and sequentially. Setting group is an activity of grouping experimental group and control group, group setting is done by purposive sampling technique. The second step is the initial test, this test is carried out before learning table tennis is carried out. The purpose of this test is to determine the initial ability level of

students in understanding table tennis material. The third step is treatment learning, this stage is the stage of implementing table tennis lectures, in this stage there are 2 (two) learning situations, namely learning using HOTs-based digital teaching materials as the main learning resource used by students and learning using conventional teaching materials. In the third stage this was carried out for 12 meetings. After the implementation of learning is carried out, then a final test (Post Test) is carried out, the aim of which is to obtain data on student learning outcomes after obtaining table tennis learning. The data obtained through this test is then analyzed. The results are depicted in the graph below.

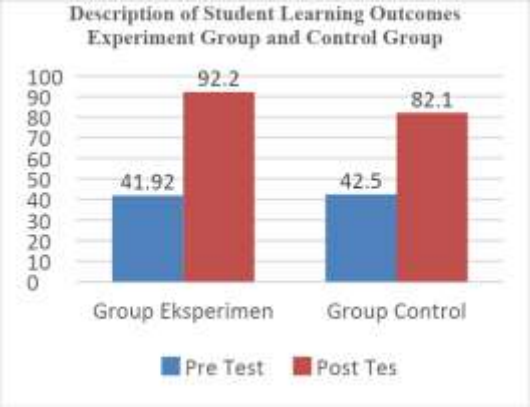

Figure 5. Product Effectiveness Test Results Diagram

The graph above is an illustration of the learning outcomes of the cognitive aspects of table tennis for students in the experimental group and the control group. As previously explained, the experimental group consisted of students who studied table tennis using HOTs-based digital teaching materials and the control group consisted of students who carried out table tennis learning using conventional teaching materials. Based on the graph above, it can be generalized that the pre-test results of the two groups have almost the same percentage of learning outcomes. where the experimental group's pretest results were 41.92% while the control group was 42.50% with a difference of 0.88%. Based on this percentage, it can be categorized that student learning outcomes in the cognitive aspect have not been completed. Furthermore, the results of the post-test of the two groups experienced an increase from the results of the pre-test, where the experimental group achieved a completeness percentage of 92.2% while the control group 82.1%, this percentage can be categorized as classically completed.

DISCUSSION

The learning outcomes of the cognitive aspects of the experimental group experienced a better improvement compared to the learning outcomes of the control group. Based on the results of this study, it is certainly inseparable from the learning process activities that are passed, namely the activeness of students and lecturers. As explained (Harvianto, 2021) learning that is packaged in an interactive, educative process will have an impact on good learning outcomes. Table tennis learning through the application of teaching materials has influenced student learning outcomes. Better teaching materials are ensured to produce good learning processes and outcomes (Latifah & Utami, 2019). In this study, HOTs-based digital teaching materials used by lecturers in table tennis learning empirically have a good effect on the learning process, student learning styles and thinking styles make it easier for students to master the material. Digital teaching materials in this study can be accessed by students through smartphone, android and laptop media that are connected to the internet network, so that where and when students can access them and students more often access and read material in digital teaching materials.

CONCLUSION

Based on the results of the research and discussion described above, it can be said that the conclusions in this study were that the teaching materials used by the experimental group and the control group were equally usable and provided benefits to students. It's just that if you look at the percentage of achievement of cognitive learning outcomes, students who use digital teaching materials are higher than students who use conventional teaching materials. Thus educators who want to teach table tennis material, choosing digital-based teaching materials is the best step today.

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