Development of trainer AI learning media based on Android application to improve beginner tennis groundstroke skills

Desarrollo de medios de aprendizaje trainer IA basado en aplicación Android para mejorar las habilidades de golpe de fondo en tenis para principiantes

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Abstract

Introduction: The field tennis lecture process carried out so far is still conventional, so it is less effective in improving student learning outcomes. So that learning media is needed that is more effective and can trigger an improvement in student learning results.
Objective: This research is part of development research that has purpose to develop IA learning media based on android application to improve the groundstroke ability of beginner tennis players of FIK UNM students.
Methodology: This research focuses on the implementation stage with an experimental research design with a twogroup pre-test and post-test design. The participants in this study were 151 people, which consists of 5 limited feasibility test subjects, 26 wide feasibility test subjects, 60 experimental group subjects and 60 control group subjects. The instrument in this study used feasibility questionnaire and the Dyer Tennis Test Revision. Independent sample t test is a data analysis technique used in this study.
Results: The research results showed that the average value of the experimental group data was 17.67 and the average control group data was 15.47 so that the average difference was 2.2.
Discussion: The results of the effectiveness test on the results show that there are differences in the results of the groundstroke ability of the experimental group and the control group. Where the experimental group has higher progress compared to the control group.
Conclusions: It can be concluded that the android-based IA trainer media has an effect on improving students' groundstroke skills.

Keywords

Development; learning media; groundstroke; field tennis.

Resumen

Introducción: El proceso de clases de tenis de campo llevado a cabo hasta ahora sigue siendo convencional, por lo que resulta menos eficaz para mejorar los resultados de aprendizaje de los alumnos. Por eso se necesitan medios de aprendizaje que sean más eficaces y puedan provocar una mejora en los resultados de aprendizaje de los alumnos.
Objetivo: Esta investigación es parte de la investigación de desarrollo que tiene como objetivo desarrollar medios de aprendizaje en forma de medios de aprendizaje entrenador IA basado en aplicaciones android para mejorar las habilidades de golpe de fondo de los jugadores de tenis novatos FIK estudiantes de la UNM.
Metodología: Esta investigación se centra en la fase de aplicación con un diseño de investigación experimental con un diseño de preprueba y posprueba en dos grupos. Los participantes en este estudio fueron 151 personas, que consisten en 5 sujetos de prueba de viabilidad limitada, 26 sujetos de prueba de viabilidad amplia, 60 sujetos del grupo experimental y 60 sujetos del grupo de control. El instrumento utilizado en este estudio fue el cuestionario de viabilidad y la revisión del test de tenis de Dyer. La prueba t de muestras independientes es una técnica de análisis de datos utilizada en este estudio.Resultados: Los resultados de la investigación mostraron que el valor medio de los datos del grupo experimental fue de 17,67 y el del grupo de control de 15,47, de modo que la diferencia media fue de 2,2.
Discusión: Los resultados de la prueba de eficacia sobre los resultados muestran que hay diferencias en los resultados de la habilidad de golpeo de fondo del grupo experimental y el grupo de control. Donde el grupo experimental tiene un mayor progreso en comparación con el grupo de control.
Conclusiones: Por lo tanto, se puede concluir que los medios de entrenamiento de IA basados en android tienen un efecto en la mejora de las habilidades de golpe de fondo de los estudiantes.

Palabras clave

Desarrollo; aprendizaje de medios; golpe de fondo; tenis de campo.

Introduction

Advances in Science and Technology (IPTEK) pose unique problems for education graduates in designing teaching materials that can improve the standard of education (Syafruddin, 2023). Many educational institutions are currently taking advantage of advances in science and technology to create interactive learning materials that can be accessed through computers or Android smartphones. According to (Abdulrahaman et al., 2020; Manca, 2020; Van Den Beemt et al., 2020), existing research, studies, and literature support the idea that media is an effective instrument for improving the learning process. Utilizing diverse teaching resources in a captivating way can help students overcome learning challenges, allowing them to acquire knowledge more easily, not limited by physical space and time limitations. The implementation of learning includes a multimedia component in the form of an Android application to reduce student boredom during learning. Makassar State University College, located in Makassar City, South Sulawesi, is an Education Personnel Education Institution (LPTK) that specializes in producing quality graduates in the field of sports education. The Faculty of Sports Sciences is one of the parts of the State University of Makassar which aims to produce high-skilled graduates who are able to develop national sports that are ready to face global problems.

Field tennis is a compulsory course in the sports department at Makassar State University. Students are taught the theory and practice of playing tennis to develop their skills. In teaching groundstroke techniques in tennis, it is best to use effective and innovative learning materials. The materials should allow students to learn independently, without being limited by time and location. Mastering the groundstroke technique is very important for beginner tennis players, as it is complex yet fundamental (Ngatman et al., 2022). By providing opportunities to practice repeatedly, students can better understand these techniques, especially given the limited duration of on-campus learning sessions. The main role of media in the learning process is as a tool that facilitates the creation of learning scenarios, thereby facilitating the teaching and learning process and helping students understand the message conveyed (Kustyarini et al., 2020). Similarly, the teaching methods applied are still traditional, relying on textbooks, whiteboards, and power point slides, which does not facilitate the success of independent learning for students. One of the potential learning media to overcome the problem of lack of student enthusiasm in bringing books to college.

Based on the author's observations as a lecturer in the field tennis course, there are various obstacles faced in the lecture process such as, only a small number of students have experience playing tennis before starting college, the majority of students lack knowledge about the rules of the game and basic tennis strokes, most of the new students are seen holding tennis rackets and balls and based on measurements Tennis groundstroke ability, only a small percentage of students show proficiency in these skills. Needs analysis was also carried out in the form of distributing questionnaires through google forms to students who had carried out the field tennis course program which received a response from 79 students by showing: (1). 1.3% very easy, 25.3% easy, 50.6% difficult, 22.8% very difficult to understand and practice Groundstroke forehand. (3) 0% very easy, 13.9% easy, 53.2% difficult, 32.9% very difficult to understand and practice groundstroke backhand. (4) 0% is very unnecessary, 3% is not necessary, 41.8% is necessary, 54% is very necessary for an android application-based IA trainer learning media that can be used independently without space and time limitations to improve skills forehand and backhand groundstroke

This shows that the current shortcomings or limitations of court tennis lectures lie in the need to introduce new teaching methods so that students can optimize the development of their groundstroke techniques. Researchers are motivated to produce field tennis learning media based on Android applications to improve the groundstroke skills of beginner tennis players of FIK UNM students. IA Trainer learning media based on the Android Application is an educational product that offers the benefits of presenting factual scenarios through audio visuals accompanied by text, Slowmotion Groundstroke Movements, and practical evaluation of learning in Android applications. This makes it easier for novice tennis players to understand and absorb information through visual, auditory, and textual means.

Method

This research is a development research with ADDIE approach. The analysis stage has been carried out and presented in the introduction section of this study. Following up on the needs of learning media for groundstoke material, researchers developed a design in the form of Android-based IA trainer learning materials. In previous research, the development stage showed that the products developed had very good feasibility scores.

Participants

The total subjects in this study were 151 subjects consisting of 5 limited feasibility test subjects, 26 wide feasibility test subjects, 60 experimental group subjects and 60 control group subjects. All subjects are beginner tennis students of the FIK UNM. The technique of determining the effectiveness test sample was carried out by purposive sampling with consideration of several criteria such as 1) the sample had programmed field tennis courses, 2) in good health, 3) willing to take part in the research process, 4) aged 18 to 21 years, 5) present at the time the research was carried out. Purposive sampling is a technique for determining subjects in research based on criteria that are in accordance with the research objectives (Campbell et al., 2020).

Procedure

The draft product that has been prepared is then carried out limited feasibility testing and feasibility testing in a wide scope. Product feasibility testing is carried out to determine the feasibility of the product before it is implemented to users. Feasibility testing was carried out by giving a product assessment sheet to the feasibility test subject. After getting an assessment and revision, the researcher revised the product. After revising the product, it was implemented to the test subjects to test the effectiveness of the product. Effectiveness testing was carried out by applying the learning media to the experimental group 12 times. While the control group did not use the developed learning media. Before and after being treated, the experimental group and control group tested their initial (pretest) and final (posttest) abilities by conducting the Dyer Tennis Test Revision.

The Dyer Tennis Test Revision procedure begins with a warm-up. Before doing the test, the research subjects started with 15 minutes of dynamic warm-up followed by 5 minutes of warm-up techniques to rally with a partner. After completing the warm-up, the research subjects took turns doing the test. The research subject starts the test by placing themselves on the hitting boundary line, which is 20 ft from the target (wall / board). The ball reserve is placed next to the back of the research subject. The test begins by serving from behind the hitting boundary line (all types of serves are allowed). When the ball touches the target, the stopwatch starts. If the research subject loses the ball during the first rally, it can be continued using another ball. Every initial hit is required to serve from behind the boundary line. The research subject rallied with the target for 30 seconds.

The test was conducted twice a round during the lecture. The score calculation on the Dyer Tennis Test Revision is carried out with the following conditions: 1) one point is counted every time the ball is hit and enters the target (above the 3 ft net line); 2) balls that touch the target line still get points; 3) rallies that do not start with a serve will not count points; 4) balls hit by research subjects in front of the boundary line do not get points; 5) balls that do not enter the target or outside the target line do not get points (Alim & Nurfadhila, 2021).

Instrument

The instruments used in this study were product assessment instruments and Dyer tennis test revision. The product assessment instrument consists of 16 statement items and is used for feasibility testing. The rating scale uses a linkert scale: (1) very unsuitable, (2) not suitable, (3) quite suitable, (4) suitable, (5) very suitable. The validity of the instrument was 0.786 and the reliability was 897. Dyer tennis test revision is a test of shot accuracy skills with the subject of beginner tennis players at the college level. The equipment and supplies needed in the implementation of this test include: (1) a wall or board that has a flat or smooth surface with a height of 20 ft (6.096 m) and a width of 20 ft (6.096 m); (2) Meter to measure the target used in the test; (3) tape or chalk to mark the target (height: 20ft, width: 20ft, and the distance between the height of the target and the floor: 3 ft (0.914 m)) and the distance between the place to hit the ball and the target is 20 ft (6.096 m); (4) ball baskets and tennis balls; (5) tennis rackets,

(6) stopwatches, and (7) score sheets and pencils / ballpoints to record test results. The validity value of the Dyer tennis test revision is 0.975 and the reliability is 0.90.

Data analisis

The data analysis of this study used the percentage formula for the feasibility test. While the effectiveness test uses t-test Independent Sample test which has previously been done prerequisite test (normality and homogeneity test). This was necessary because in the effectiveness test researchers used twogroup pre-test and post-test design. All data analysis used the SPSS version 29 application.

About products

Conceptual learning design is a framework that describes systematic procedures in organizing learning to achieve specific learning objectives and serves as a guide in planning and implementing the learning process. Learning materials are made interestingly in android applications, so that they can organize students in learning activities, encourage students to be able to learn more focused and optimal, direct discussions, and students can ask questions and collect assignments as learning evaluations through learning media trainer IA based on android applications. Trainer IA learning media based on android applications is one of the educational products that has the advantage of being able to show complicated real events through audio visual accompanied by text, Slowmotion Groundstroke Movement and can evaluate learning practically in android applications making it easier for beginner tennis players to see, hear and read clearly and can be done repeatedly.

Figure 1. Application overview

Sub Material Page View Initial View Menu View

Results

The results of the study will show the results of feasibility testing in a limited scope, feasibility testing in a broad scope, and implementation results or effectiveness testing. Further explanation will be presented in each sub-chapter below:

Limited feasibility test results

Limited feasibility testing was conducted on five experts, namely material experts, lecturers, and information and technology experts. The feasibility test results show that the product developed is good and very feasible. The description of the assessment results by experts can be seen in table 1. In this small scope feasibility testing, the experts provided input, (1) including improvements to the movements in the application in detail need to be done, (2) the description of each movement needs to be explained in more detail, (3) the order of sub menú in the application needs to be rearranged, and (4) the addition of quizzes in the application needs to be given.

Table 1. Limited feasibility test results

Subject	Total score	Maximum Score	Percentage	Description
1	73	80	91%	Very worthy
2	71	80	89%	Very worthy
3	72	80	90%	Very worthy

4	72	80	90%	Very worthy
5	73	80	91%	Very worthy
Total/Average	361	400	90%	Very worthy

Wide feasibility test results

Feasibility testing in a broad scope was carried out after the researchers made improvements to the experts' input on feasibility testing in a small scope. Feasibility testing in a broad scope is carried out to users, in this case students. The results of feasibility testing in a broad scope show that the product developed is very feasible and can be implemented. The description of the results of feasibility testing in a broad scope can be seen in table 2.

Table 2. Wide feasibility test results

Subject	Total score	Maximum Score	Percentage	Description
1	73	80	91%	very worthy
2	71	80	89%	very worthy
3	72	80	90%	very worthy
4	72	80	90%	very worthy
5	73	80	91%	very worthy
6	70	80	88%	very worthy
7	74	80	93%	very worthy
8	71	80	89%	very worthy
9	73	80	91%	very worthy
10	74	80	93%	very worthy
11	72	80	90%	very worthy
12	70	80	88%	very worthy
13	71	80	89%	very worthy
14	71	80	89%	very worthy
15	70	80	88%	very worthy
16	72	80	90%	very worthy
17	75	80	94%	very worthy
18	73	80	91%	very worthy
19	74	80	93%	very worthy
20	70	80	88%	very worthy
21	74	80	93%	very worthy
22	74	80	93%	very worthy
23	71	80	89%	very worthy
24	76	80	95%	very worthy
25	72	80	90%	very worthy
26	73	80	91%	very worthy
Total/Average	1881	2080	90%	very worthy

Implementation or effectiveness test results

The data presented in this study is the groundstroke ability of students obtained through pretest and posttest data which aims to find out the progress of students' groundstroke ability after being given an android application-based IA trainer learning media. To test the hypothesis, it was carried out using the T-Test, which first went through a normality and homogeneity test of the data.

Descriptive Analysis

This descriptive analysis aims to describe the results of students' groundstroke skills before and after being given treatment in the form of an android application-based IA trainer learning media.

Table 3. Descriptive Testing

	Mean	Median	Std. Deviation	Range	Max.	Min.
Pre-Test Experiment	13,55	14	2,190	10	18	8
Post-Test Experiment	17,67	18	2,176	9	22	13
Pre-Test Control	13,63	13,50	2,186	10	18	8
Post-Test Control	15,47	15	1,926	8	19	11

Based on the descriptive test results of the groundstroke pre-test and groundstroke post-test data, the mean, median, standard deviation, range, lowest value, and highest value in each group are known. The description results in the experimental group and control group experienced an increase in post-test results. as for the increase in the mean, median, maximum value and minimum value. While the standard deviation and range values in the experimental and control groups experienced a decrease.

Result of Normality Test and Homogeneity Test

Testing for normality and homogeneity needs to be done, before the independent sample t test is conducted. The normalcy test results can be viewed in table 4 and the homogeneity test in table 5.

Table 4. Normality Test

	N	Sig.	Result
Pre-Test Experiment	60	0,225	Normal
Post-test Experiment	60	0,158	Normal
Pre-Test Control	60	0,170	Normal
Pre-Test Control	60	0,102	Normal

The normality test results of the pre-test and post-test data of the two groups showed that the Sig. value for the pre-test and post-test data group of experiment were 0.225 and 0.158, respectively. The normality test results of the pre-test and post-test data of the control group obtained Sig. values of 0.170 and 0.102. Because the Sig. value of each data > 0.05, it is concluded that the experimental group and control group data are distributed normally.

Table 5. Homogeneity Test Result

	N	Sig.	Result
Pre-Test	60	0,878	Homogen
Post-Test	60	0,270	Homogen

Table 2 above is the result of homogeneity testing, it is known that the sign value in the pre-test was 0.878 and the post-test was 0.270. This means that the grade is more than 0.05, so we should assume that the pre-test data has a homogeneous grade. Likewise, the data on the post-test.

Resulto f Hypothesis Test

After the pre-requisite test is completed, hypothesis testing can then be used. The test can be done with an independent sample t-test to determine the effect of IA trainer learning media in developing students' groundstroke skills.

Table 6. Hypotesis test

	N	Mean	Mean Difference	Sig.
Experimental Group	60	17,67	2,2	0,001
Control Group	60	15,47		

According to table 6 results of the hypothesis test, the average value of the experimental group's post-test data was 17.67 and the average of the control group's post-test data was 15.47. From this data, it can be seen that the difference in the mean value of both is 2.2, where the largest mean is in the group of experiments. That way, we could conclude that students' groundstroke skills have improved better with the use of IA trainer media.

Discussion

This research is part of the research on the development of learning media for field tennis courses. This tool aims to improve the groundstroke skills of beginner tennis players FIK UNM students. The development of this learning media was initiated to answer the challenges faced by beginner tennis players at the FIK UNM. These players have difficulty improving their groundstroke skills due to the lack of suitable learning resources. The creation of IA trainer learning media based on Android applications is

through a systematic research and development process, which involves various stages. Floating research is systematic research, so it is good for creating and authenticating teaching materials. (Rahardjanto & Husamah, 2022). Based on this understanding, a series of research and development procedures are carried out in a continuous cycle. At each stage, the results of the previous process are consulted and utilized consistently, which ultimately results in the creation of new educational products.

The analysis shows that the media learning of IA trainers based on android applications is very feasible to improve the groundstroke skills of beginner tennis players among FIK UNM students. This product shows excellent quality and is very acceptable to use. Based on the validation and feasibility tests, it is clear that this learning media was developed specifically to improve the learning process of students in FIK UNM. Students can use this educational media as a tool to help the learning process, so that they can increase motivation, grow interest in learning, understand the material offered easily, and practice it directly easily (Bikalawan et al., 2024). Facilitate the process for teachers to disseminate information with maximum effectiveness and efficiency. The use of video media has been proven to increase students' motivation to attend lectures or courses, as shown by research conducted by (Barut Tugtekin & Dursun, 2022; Galatsopoulou et al., 2022; Noetel et al., 2021).

The analyzed results also indicate that the learning media of IA trainers based on android applications had an effect on improving students' goundstroke skills. This can be viewed from the mean score of the post-test groundstroke ability which was better compared to the pre-test score of groundstroke ability. This is because the content of the learning media developed is able to present the implementation of groundstroke techniques in audio visual and with slowmotion movements. In addition to presenting audiovisual media, this application also provides evaluation materials to measure student progress in performing groundstroke techniques.

This android-based IA trainer learning media has an important role in improving the groundstroke ability of court tennis players because it is able to provide a better understanding of game techniques and strategies. By using media such as instructional videos or match analysis, players can see examples of precise movements, correct body positions, and how to set the timing of the punch in real time. This allows them to visualize how effective groundstroke techniques are performed by professional players or coaches. In addition, audio-visual media allows players to repeat the show over and over again, so they can analyze any errors or shortcomings in their own techniques, as well as learn how to correct them in more detail and focus (Tuma, 2020).

Audio visual media does provide many benefits in general learning and sports learning including increased motivation (Amiq et al., 2024). The use of learning media can make it easier for teachers and students to understand the material provided (Midoglu et al., 2024; Putri & Wahjuni, 2024). Understanding material in the learning process is very important to increase student knowledge (Sutoro & Nurhidayah, 2023). Increased student knowledge will have an impact on the ability of students to implement the material obtained (Lastya et al., 2025). Good and appropriate implementation will certainly make students achieve achievements in the learning that is followed (Nelson et al., 2025; Ping, 2025). That way the expected learning outcomes can be met and students do not need to repeat the material. Therefore, learning media is very necessary in supporting the success of students in understanding the material provided.

The rapid advancement of technology has made educators make new breakthroughs in developing learning media in digital form (Ahliana et al., 2025; Mat Sanusi et al., 2025; Selviana & Andriani, 2025). Learning media in digital form provides many benefits from increasing motivation and flexibility of space and time in use (Zhao & Ji, 2025). However, the development of digital learning media also has disadvantages, including the budget required in media development media (Kusuma, 2025). Digital media development requires a lot of funds, but not all agencies have sufficient budget to develop media in digital form. In addition, learning media in digital form requires students to have a good enough tool or internet connection. While not all students have sufficient conditions to have tools and have internet access internet (Vivi Sutinalvi et al., 2024). So it needs comprehensive assessment and collaboration from the government in its development (Ifliadi et al., 2024).

The media developed in this study is clearly able to make it easier for students to understand learning in field tennis courses. Digital media development on other materials needs to be developed to make it

easier for students to understand the material. In addition, understanding the ability of students in financial terms is also needed in the further development process. This is done so that all layers of students can use the developed media.

Conclusions

Based on the results of the study, it is known that college' groundstroke skills have improved after being treated. This can be seen from the results of the effectiveness test which shows that there are changes in the pre-test and post-test results of students' groundstroke skills. Therefore, it was concluded that the IA trainer learning media based on android applications to improve the groundstroke skills of beginner tennis players of FIK UNM students.

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