

Android-Based Forehand Drive Instrument Design for Table Tennis Course

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Abstract. This research aims to develop an Android-based forehand drive system for table tennis courses that was developed as a guide for students and sports teachers in teaching table tennis. The resulting product is an Android-based forehand drive instrument for table tennis courses and a user guidebook. The research use ADDIE method. Data collection in this study was carried out using a questionnaire as a tool to collect data. This questionnaire was used to collect perspectives and assessments from experts in the fields of content/material, media, design, individual trials, small group trials, and field trials. The results of the small group trial stated that the assessments of all six students gave a perfect score with a total score of 50 and a percentage of 100% with the criteria of "Very Good". The conclusion of this study is that this Android-based table tennis forehand drive learning application is suitable for use in learning table tennis games. Based on research findings and discussions, the development of this learning media has shown very good results. The developed learning media product is intended for students by combining appropriate content with interactive learning media.

Keywords: Basic Movement, Virtual Reality, Physical Education

1 Introduction

Table tennis ranks among Indonesia's most beloved sports, enjoyed nationwide from bustling cities to remote villages. This enthusiasm has fueled the proliferation of regional Ping Pong Associations (PTM) and its status as a top extracurricular in schools. Frequent competitions at local, national, and international levels underscore robust public engagement and participation. The sport appeals across ages and genders due to its accessibility: beginners grasp the basics quickly, while it offers both casual recreation and intense competition. This versatility sustains its widespread popularity and cultural footprint. [1], [2]

Table tennis is played in singles or doubles formats, using a paddle (or racket), a lightweight celluloid ball, and a rectangular table split by a 15.25 cm net. The core objective? Hit the ball over the net onto your opponent's side-ideally in spots tough to return-forcing errors and scoring points. Mastery hinges on precision, control, and strategic shot placement. Every player must reliably direct the ball to precise targets, blending spin, speed, and angles to out maneuver foes [3], [4]

To achieve proficiency in ball striking, athletes must master basic technical skills. Among these techniques, the forehand drive is considered one of the most essential attacking strokes and serves as the foundation for offensive play. Mastery of the forehand drive is particularly important for beginner athletes. The effectiveness of skill development is closely linked to the quality of training programs. Well-planned and systematic training contributes significantly to performance improvement, while the success of training also depends on the interaction between the coach's competence and the athlete's abilities [5], [6]

In addition to training programs, evaluation plays a crucial role in athlete development. Training processes without proper evaluation limit the ability of coaches to identify errors, monitor progress, and measure training effectiveness. In practice, evaluations are often conducted informally and without standardized instruments, particularly for assessing forehand and backhand drive techniques. As a result, the absence of valid assessment tools leads to less optimal training outcomes [7], [8].

Assessment is a process of making decisions based on data obtained through measurement, using both test and non-test methods. It goes beyond simple measurement by assigning value and meaning to performance based on predetermined criteria. The primary purpose of assessment is to provide feedback for coaches and athletes, support decision-making in training, and report achievement levels. Effective assessment enables coaches to understand athletes' skill levels and design appropriate interventions to enhance performance [9], [10].

This development-oriented research aims to formulate clear performance indicators for forehand drive techniques in early-age table tennis, develop valid and reliable assessment instruments for both forehand and backhand drive techniques, and evaluate the effectiveness of these instruments in supporting athlete development. Assessment instruments are essential tools for collecting data related to competency mastery, particularly in the psychomotor domain, which is commonly measured through performance-based tests [11]

A high-quality assessment instrument must meet several criteria, including relevance to assessment objectives, balanced measurement of multiple dimensions, efficiency, objectivity, consistency, fairness, specificity, appropriate difficulty level, and the ability to differentiate individual skill levels. Among these criteria, validity and reliability are fundamental requirements. Validity indicates the extent to which an instrument accurately measures what it is intended to measure, while reliability refers to the consistency of measurement results over time. An instrument may be reliable without being valid, but a valid instrument must also demonstrate reliability [12], [13]

The instrument developed in this study adopts an Android-based platform to assess forehand drive techniques, replacing traditional paper-based assessment methods. Android technology was selected due to its relevance in the current digital era and its widespread accessibility. Advances in science and technology have significantly influenced sports performance and educational practices, and the integration of digital tools is increasingly important in supporting effective learning and assessment [14], [15].

The rapid growth of information technology has also transformed higher education, including classroom management and learning systems. The use of diverse digital media presents both opportunities and challenges for educators. Interactive and varied learning media can enhance student engagement and participation; however, educators are required to possess adequate digital literacy and pedagogical competence to effectively integrate technology into learning [16], [17].

In the digital era, mobile applications have become widely used as learning tools. Android-based learning applications offer flexibility and accessibility, allowing students to learn independently anytime and anywhere. In table tennis education, such applications have the potential to support skill acquisition and conceptual understanding.

However, field observations indicate that table tennis learning still relies heavily on conventional learning resources, such as printed modules, textbooks, and video tutorials from open platforms that may not always meet instructional standards. This highlights the urgent need for the development of Android-based learning and assessment instruments that are valid, reliable, and pedagogically appropriate. Android-based learning media provide an innovative solution to improve learning effectiveness and support the development of students' technical skills. Interactive multimedia features such as animations, videos, color variations, and quizzes can enhance understanding, motivation, and learning outcomes, making them highly suitable for table tennis skill development.

2 Methods

The research used in this study is development research using the ADDIE model (Analysis, Design, Development, Implementation, Evaluation) [18], [19]. Data collection in this study was carried out using a questionnaire as a tool for collecting data. This questionnaire was used to collect perspectives and assessments from experts in the fields of content/material, media, design, individual trials, small group trials, and field trials. With the aim of obtaining comprehensive results. [19]

The data collection instruments used in this study consisted of a questionnaire, including responses or statements, used to collect data from reviews by content/material experts, media experts, design experts, field practitioners, individual trials, and small group trials. The sample selection technique used was purposive sampling. In this technique, researchers select samples based on certain criteria deemed relevant to the research objectives.

This research uses two different analytical approaches: qualitative and quantitative. Qualitative analysis is used to gain an in-depth understanding of the data by emphasizing narrative and thematic descriptions. Meanwhile, quantitative analysis uses numerical data to measure relationships between variables or to understand statistical data distributions. Quantitative analysis involves applying specific formulas to generate presentation. This allows for a more structured and measurable presentation of data. The percentage formula is used to describe the proportion of data as a percentage of the total, while the overall subject percentage formula helps calculate each subject's contribution to the overall sample. By combining these two analytical techniques and applying relevant formulas, this research can provide a comprehensive and in-depth understanding of the phenomenon under study.

The percentage score results obtained from the research are interpreted or described into classifications to determine the value of the resulting product, as shown in Table 1 below:

Table 1. Conversion of PAP Achievement Level with a 5-point Scale

Achievement Level (%)	Qualification	Information
90-100	Very good	No Need to Revise
80-89	Good	No Need to Revise
65-79	Enough	Revised
55-64	Not enough	Revised
0-54	Very less	Revised

3 Results and Discussion

The data analysis involved validity evaluation by four groups of experts: content/material experts, media experts, design experts, and field practitioners. Each expert group had its own objectives in testing the resulting product. The validity test by the content/material experts aimed to ensure the suitability of the described learning material with the curriculum or semester learning plan. Meanwhile, the design experts evaluated the structure and layout between elements to ensure they could be well understood by users. The media experts assessed the visual presentation and readability of the elements to ensure the appropriateness of the presentation. The field practitioners assessed how this learning media was applied directly to students. It is hoped that through the collaboration of these expert groups, the instruments used can be considered valid and provide reliable results in research. Based on the results of the validation test by the four expert groups: content/material experts, media experts, design experts, and field practitioners, the following data were obtained:

Table 2. Expert Validation Test Results

Member	Presentation	Qualification
Content Expert	94%	Very good
Media Member	90%	Very good
Design Expert	93%	Very good
Field Practitioner	94%	Very good
Rate-Rate	90%	Very good

Evaluation of the Android-based table tennis learning application shows good results. Very good from all four experts. The content/material expert gave a score of 94%, the media expert gave a perfect score with a score of 90%, the design expert gave a score of 93%, and the field practitioner also gave a score of 94%. The overall average score of this assessment is 90% which is included in the very good category. This shows that this application has very high quality in terms of content, media, design, and practicality in the field so it is expected to be an effective and interactive learning tool for students. The next stage is a small group trial at this stage the instrument is filled in by respondents. A total of 6 students consisted of two students with high learning achievement, two students with average learning achievement, and two students with low learning achievement. The results of the small group trial are as follows:

Table 3. Small-Scale Trial Results

Answer	Total Score	Presentation	Criteria
1	50	90%	Very good
2	50	90%	Very good
3	50	90%	Very good
4	50	90%	Very good
5	50	90%	Very good
6	50	90%	Very good
Rate-Rate	50	90%	Very good

Based on the data above, it can be concluded that all six students received a perfect score, with a total score of 50 and a percentage of 90%, representing the "Very Good" criteria. This strongly indicates that the table tennis learning media is suitable for use in teaching table tennis.

The resulting product is an application file that can be used on Android smartphones. This product has been validated by content/materials experts, media experts, design experts, and field practitioners, ensuring that it meets the various predetermined criteria. Here's a preview of the application:

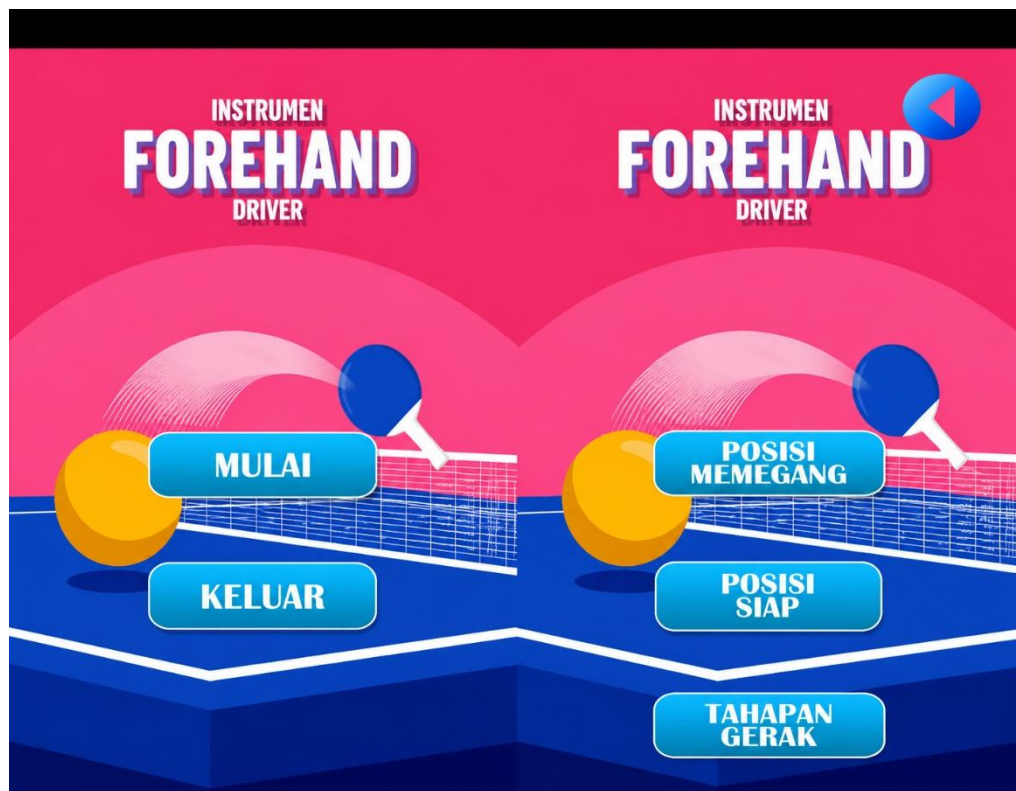


Figure 1. Android-Based Application Products

Based on the assessment of content/material experts, the product developed received the qualification "Very Good" so that from the content/material side there is no need for revision. The assessment by media experts received the qualification "Very Good" so that from the media

side there is no need for revision. The assessment by design experts received the qualification "Very Good" so that from the design side there is no need for revision. The assessment by field practitioners received the qualification "Very Good" so that there was no need for revision. However, to make this product better, revisions were made based on input, criticism, and suggestions from content/material, media, design, and field practitioner experts. Meanwhile, the results of individual trials stated that the table tennis game learning media received a positive response with the criteria "Very Good". The results of small group trials stated that the assessments of all six students gave perfect scores with a total score of 50 and a percentage of 100% with the criteria "Very Good". From these results, Android-based table tennis learning media is considered very effective. and suitable for use by students in the Physical Education, Health and Recreation study program, the TP course. Table Tennis Game. This learning media can support educators in the teaching process to make it more interesting and increase student participation. In addition, the application and use of Android technology has been widely adopted and provides significant benefits. Android-based learning media can also have a positive impact on students.

This is in accordance with the statement which states that the implementation of learning via Android-based smartphones and tablets can have a positive impact on cognitive, metacognitive, affective, and socio-cultural dimensions. The use of Android-based learning media also has a significant influence on learning outcomes. The use of technology as a learning medium also increases students' learning motivation, because with easy access and practical use, students become more motivated to participate in the learning process.

Thus, this learning media not only helps the teaching and learning process, but also improves the quality and overall learning outcomes of students. Learning media acts as a tool that can increase the effectiveness of the teaching and learning process with the aim of improving the quality and achievement of learning outcomes. Learning media is not just a tool to help in the teaching and learning process, but also becomes a significant driver in improving the quality and achievement of overall student learning outcomes. By utilizing learning media, teachers can create a more interesting and interactive learning environment, facilitating deeper understanding for students.

4 Conclusion

This study concludes that the developed Android-based table tennis learning application is feasible and appropriate for instructional use. Expert evaluations showed high quality in terms of content, media, design, and practicality, with an overall score of 90%, classified as *Very Good*. Validation by content experts, media experts, design experts, and field practitioners confirmed that the application meets instructional and technical requirements. User testing results further indicated that the application is easy to use and effectively supports the learning process. The final product, distributed as an Android (.apk) application, provides practical and accessible learning media for table tennis instruction. These findings indicate that the application is a valid and practical learning tool with strong potential for implementation in sports education contexts.

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