

# Volleyball Game Passing Test Design and Validation

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**Abstract** The research is a description of what steps will be made and what will be carried out during the implementation of the passing test. The development of volleyball game skills test tools uses research and development (Research and Development). The development research in this exercise uses the ADDIE research and development model. This study uses ADDIE instructional design model Analysis phase, Design phase, Development phase, Implementation phase and Evaluation Phase. This research has reached the stage of developing a prototype for a test kit. Expert validation assessment indicators are in terms of convenience, usefulness, security, and innovation. The data analysis technique used in the development of this product is qualitative and quantitative data analysis techniques. (1) qualitative data analysis is used to analyze data in the form of suggestions or input from experts. (2) Descriptive analysis in the form of percentages is used to analyze the results of data collection from the initial needs analysis and expert evaluation. The data analysis technique that has been used in the development of a sensor-based volleyball game passing test uses a Likert scale. The result expert validation obtained a percentage of 85% (Very Eligible) from volleyball game experts, obtained a percentage of 85% (Very Eligible) from test and measurement experts and 80% (very feasible) from censorship experts, so that the development of sensor-based testing tools is declared feasible to use.

**Keywords** Designt, Volleyball, Passing Test

## 1. Introduction

Improving the quality of education can be achieved through quality improvement learning and the quality of the assessment system. The basic concept of assessment developed referring to the latest revision in the 2013 Curriculum that was implemented improvements with improvements to the standard content and standards. On standards are designed so that students are able to think critically and analytically according to with international standards which are done by reducing materials that do not relevant and deepening as well as expanding relevant material for students, while the standard of assessment is done by adapting models gradual assessment of international standards. Assessment of learning outcomes more focuses on higher order thinking skills[1]

The success of mastering a concept will only be obtained if students have high-order thinking skills, because the concepts that have been understood will embedded in the memory of students for a long time, so it is very important for students to students to have higher order thinking skills [2]. Results Optimal learning shown by students cannot be separated from their creativity in solving problems. Creativity is an important component of having by students to be able to solve mathematical problems [3]. In improving the quality of education requires improvements in the learning process by using systematic work methods, one of which is the innovation of the assessment system, meaning that in improving the system in learning in schools, some information is needed to describe the systematic results of teachers, schools and educational

institutions that should be professional in carrying out assessments [4]. Evaluation can encourage students to be more active in learning continuously and also encourage teachers to further improve the quality of the learning process and encourage more improve the facilities and quality of student learning. In connection with this, the optimization of the evaluation system has two meanings, the first is an evaluation system that provides optimal information. The second is the benefits achieved from the evaluation. The main benefit of evaluation is to improve the quality of learning and subsequently there will be an increase in the quality of education [5].

Therefore, it is important to develop a test instrument that is able to measure volleyball learning outcomes, especially the passing technique. The test tool developed aims to determine the results of the upper and lower passing tests of volleyball games using the help of sensors so that it is hoped that the test results produced are more valid.

Based on the results of observations in the field, the students of Physical Education, FKIP Unsri, when doing the upper and lower pass tests, experienced problems from both the tester and the tester. This is in the form of tests that are still carried out manually so that more than 2 testers are needed besides that the results obtained are invalid because the count of the passing height is obtained by only estimating the height of the passing obtained, besides that the testi does not know the passing obtained because of the height. the results of the passing are calculated and measured by the tester himself, so these things make the volleyball passing test feel that there must be improvement.

Based on the results of the needs analysis in the field, it was found that the upper and lower pass test equipment for sensor-based volleyball games was needed to be developed, the analysis was seen from several components such as objective analysis, subject state analysis, subject character analysis, environmental analysis, and content analysis. The results of the analysis became the basis for developing a sensor-based upper and lower pass test tool for volleyball games that would be given to research subjects to be a solution in the upper and lower passing tests so that they were more effective and efficient.

Technology in sports is not only used to support and succeed sport activity itself but also used by individuals. Rapid development sports technology makes many researchers vie to develop new innovation. Various studies have found a product that is a measuring tool in every product sports, for example, Hawk eye, where this technology is a computer system complex to visually see the movement of the ball at high speed. Research about sensor is [6]. The results of this study are for the validity of tennis experts, the percentage of assessment is 97.5%. These results indicate that according to tennis experts, this digital-based footwork test instrument has a "Good /

Eligible" category, while the results of expert validation of tests and measurements obtained an assessment percentage of 95%. It can be concluded according to test and measurement experts that this digital-based footwork test instrument has the "Good / Decent" category, and the results of the reliability calculation using the test and retest technique obtained an r value of 0.998, so it can be said that the correlation is "high and significant", it can be concluded that the digital-based footwork test instrument is good to use as a measuring tool to measure footwork. ) in tennis lessons. Research [6] on a digital-based volleyball underhand test instrument model.

Previous research on test development such as [7]. It can be concluded that this bleep test instrument is indispensable in the world of sports, especially sports tests and measurements so as to create easy, effective, efficient exercise tests and measurements, and accurate results and serve as input for coaches in evaluating cardiac endurance capabilities. athletes, further research [8] developed a test and measurement tool for lower passing and upper passing in a computer-based volleyball game that was declared suitable for use,

Other research [9] developed this digital-based footwork test instrument both to be used as a measuring tool to measure footwork in tennis court learning, previous research shows that there is no research that develops a pass test tool sensor-based up and down pass, so this study intends to develop an upper and lower pass test n sensor-based bottom fitting, beside that other research Test scale physical test app small percentages get 54% and large-scale trials 75% of the data it can be concluded that the application of the volleyball branch of physical tests can be applied to the process of evaluating athletes' physical tests. The results of small-scale trials using physical test applications get a percentage of 54% while the results of large-scale trials get a percentage of 75% of the data it can be concluded that the application of the volleyball branch of physical tests can be applied to the process of evaluate athletes' physical tests Test scale physical test app [10]

This study aims to develop a sensor-based upper and lower pass test tool for volleyball games so that it can be a solution to existing problems in conducting a volleyball game passing test.

## 2. Materials and Methods

The development of volleyball game skills test tools uses research and development (Research and Development).

Development is a translation process design specifications into physical form [11]. This matter reinforced by [12] that development requires systematic planning. Research and development methods or Research

and Development are research methods used to produce certain products, and test the effectiveness of these products” Research and development aims to produce new products through the development process. This study uses the ADDIE model development approach (Analysis phase, Design phase, Development phase, Implementation phase and Evaluation Phase). The ADDIE model in designing. The essence of the systems approach is to divide the learning planning process to multiple steps, to set the steps to in logical sequences, then using out-put from each step as input in following step [13].

Based on the results of observations on physical education students when doing the upper and lower passing tests using manual tests, they found that there were difficulties during the test and determining the test results. Based on the problems that arise in the physical education students, this study uses a population and student sample as a sample in this research so that this research can be useful and on target.

This research started in June 2021 until Oktober. This research is only at the stage of developing a test kit. Experts/practitioners who become validators in this study have expertise in their respective scientific fields. The purpose of the inclusion of experts in this study is so that the research results are better and valid so that the research results can be accounted for in the future when they become references for other researchers. The questionnaire given to the expert was open questionnaire and closed questionnaire. An open questionnaire is a questionnaire that gives respondents the opportunity to answer in their own words, while a closed questionnaire is a questionnaire that has been provided the answer so that the respondent just chooses [14]. Collecting qualitative data using an open questionnaire in the form of suggestions and input from the results of expert evaluations.

This research involved 3 experts who were tailored to the needs of research and development of the development of a sensor-based upper and lower pass test tool for volleyball games. Expert validation assessment indicators are in terms of convenience, usefulness, security, and innovation. The data analysis technique used in the development of this product is qualitative and quantitative data analysis techniques. (1) qualitative data analysis is used to analyze data in the form of suggestions or input from experts. (2) Descriptive analysis in the form of percentages is used to analyze the results of data collection from the initial needs analysis and expert evaluation. The data analysis technique that has been used in the development of a sensor-based volleyball game passing test uses a Likert scale, data analysis is a series of observations that was carried out against a variable taken from data to the data retrieved later recorded according to occurrence and compiled as statistical data. This Likert scale serves to analyze the attitudes, opinions and

perceptions of a person regarding social phenomena, this social phenomenon is referred to as a research variable.

### 3. Result

At the beginning of the study, based on these results of step analysis is can be concluded that the subject requires the development of a sensor-based upper and lower pass test tool for volleyball games. The results of the analysis became the basis for developing a sensor-based upper and lower pass test tool for volleyball games that would be given to research subjects to be a solution in the upper and lower passing tests so that they were. This stage has 5 types of analysis that must be surveyed, including analysis objective survey for the development of a new upper and lower pass test kit based on a volleyball sensor, a total of 124 students or 86.18% thought it was very necessary, analysis state of the research subject, it shows that there are 126 students or 87.5% strongly agree with the development of the upper and lower pass test equipment based on sensor-based volleyball, analysis characteristics there are survey results in the form of 120 (83.33%) students strongly agree, analysis environmental safety aspect, there are 134 (93.05%) students strongly agree, and the content analysis results showed that 127 (88.19%) students strongly agree, 15 (10.41%) students agree.

The next step is design of passing test, The following will show the design of the development of the lower and upper pass test equipment for a sensor-based volleyball game. The product design or test kit that has been developed is the creation of a volleyball passing test kit that combines a sensor system and a laser that will send a signal to the arduino mega which will be processed later to display the calculation result data the number of passes displayed in the screen Liquid Crystal Display (LCD).

This tool will work automatically as timer and counter the number of passes made for 30 seconds. Consist of sensors and lasers will receive a signal if the volleyball passes the sensor with a distance that has been set in accordance with the provisions of the passing test in the program. The signal captured by the receptor will then enter and be processed into the Arduino Mega before appearing on the LCD screen.

During the test, the sensor will detect signals captured with marked by a buzzer sound indicating the sample passes correctly if the buzzer does not sound, it means that the sample did not perform the movement correctly, then the passing counter is on the LCD and will not count passing movements that are outside the provisions of the test area. The test will last for 30 seconds if the time is up the buzzer will not beep and the program will not count movements performed in the same time finished, if it will be continued to continue to the next sample then stay pressing stop and reset the time on the choice of passing counter tool.

For the next step to see that this tool can be helpful and effective in the implementation of the eating test, 20

physical education students were tested to see the benefits of this sensor and laser-based passing test.

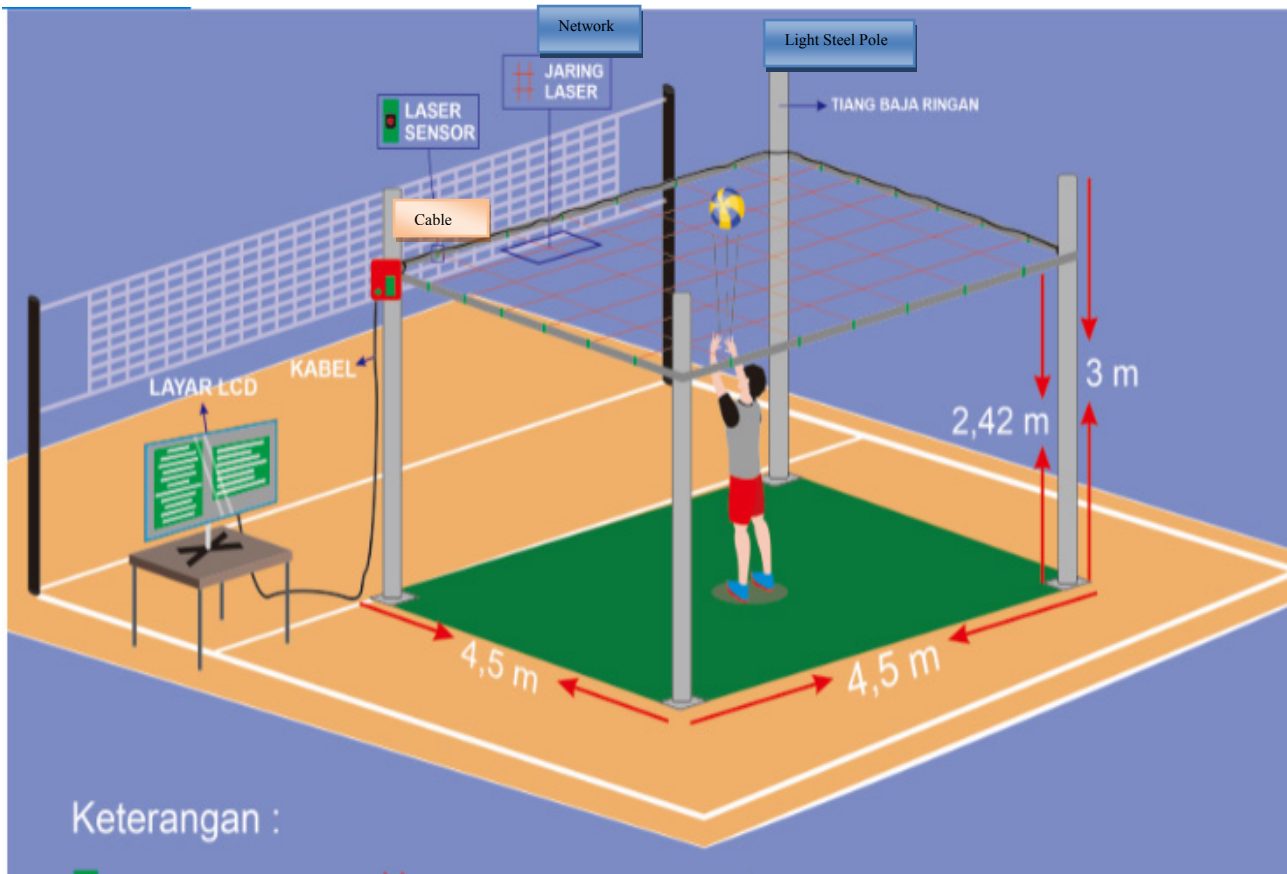
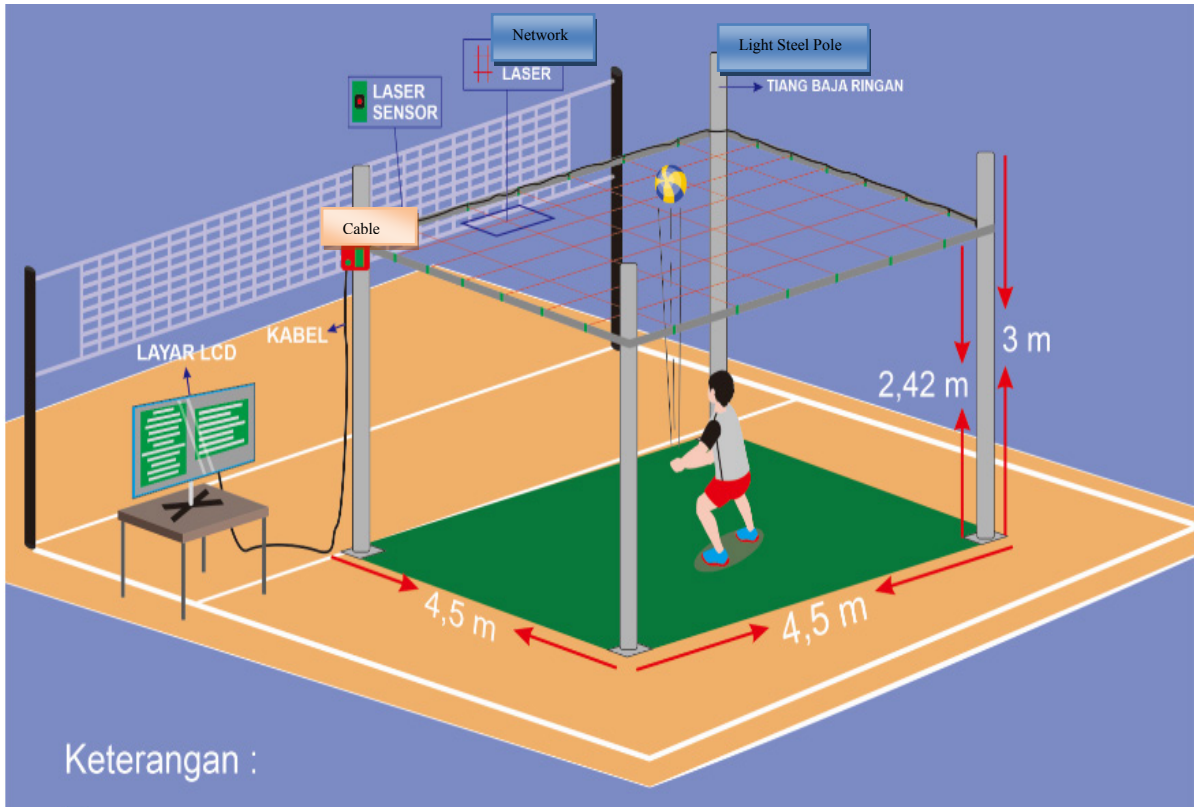


Figure 1. Sensor-Based Volleyball Top Pass Test Equipment Development Design



**Figure 2.** Sensor-Based Volleyball Top Pass Test Equipment Development Design

The component and the fusion of the volleyball passing test

- 2.42 M high steel pole on which to place sensors and lasers and other components
- Steel pole can be lowered and raised so that it is practical
- Laser serves as a light to the sensor
- The light sensor functions as a detector of the intensity of the incoming light
- Rainbow cable serves as a liaison between components
- The push button functions as a reset, calibration, plus and minus button
- Buzzer functions as a sound indicator
- The LCD functions as a display of letters and numbers sent by Arduino
- The switch functions as an on/off switch, connector or circuit breaker
- Arduino Mega functions as the brain or regulator of the input and output of a circuit

System Of The Sensor Passing Test:

- The tester is in place to start the test
- Connect to the power supply of each cable

- Put the laser on the sensor, when it's right, press the blue calibration button to make sure everything is connected or not.
- When all lasers and light sensors are connected, calibration is complete
- Press the green button on the timer to start the test time until the buzzer sounds, the countdown time is 30 seconds, after 30 seconds the buzzer will sound indicating the time is up
- During testing, when the ball is passed on or crosses the line made by the laser to the sensor, the tool will detect "first detection" if the ball comes back again and hits or crosses the line then the tool will detect "ball in" and add 1 point

Expert validation is a stage to see the level of validity of the development of the sensor-based upper and lower pass test equipment. The validator will see in detail each test tool, how the sensor works. Each validator will provide their own assessment and also provide input on the development items of sensor-based up and down pass test tools, so that this tool is feasible to be used to give research test subjects.



Based on the table on the data recapitulation of the results of small group trials on the development of the upper and lower pass tests for sensor-based volleyball games, it is known that the average percentage of small group test results of 20 subjects is 84.75%, so the product is in the feasible category.

### 3.1. Discussion

The result expert validation obtained a percentage of 85% (Very Eligible) from volleyball game experts, obtained a percentage of 85% (Very Eligible) from test and measurement experts and 80% (very feasible) from censorship experts.

[15] Says that volleyball is a game sport played by two opposing groups. Each group has six players. Each group consisting of 6 players is trying to drop the ball in the opponent's area so that they get points. Volleyball games will run well if the supporting factors of the game are mastered well. Must-have factors by a player or athlete in a sport volleyball include physical factors, techniques, tactics and mentality. Regarding physical and technical factors, no regardless of one's motor skills. On basically everyone has the ability to master different motors. Motor skills is an inherent characteristic of someone [16].

The development stage is carried out after the test product design is made so that the product developed is in accordance with the objectives. The tests that will be developed in accordance with the product design are the upper and lower pass tests for volleyball games, the components of the development of the upper and lower passes for ball games are as follows. Research development is research that aims to develop a new products or improve existing products [17].

The first stage is analysis. Based on the results of the needs analysis in the field, it was found that the upper and lower pass test equipment for sensor-based volleyball games was needed to be developed, the analysis was seen from several components such as objective analysis, subject state analysis, subject character analysis, environmental analysis, and content analysis. The results of the analysis became the basis for developing a sensor-based upper and lower pass test tool for volleyball games that would be given to research subjects to be a solution in the upper and lower passing tests so that they were more effective and efficient. This stage includes several steps including making a research schedule, determining expert collaborators and making prototypes of the upper and lower pass test equipment for sensor-based volleyball games. The first step in the design stage is to make a research schedule. Surya Brata [18] explains the terms of the instrument or tool a good measure is valid and reliable, where validity is the ability owned by an instrument for measure it precisely, not only that the assessment instrument used must be reliable,

meaning in using student assessment instruments can find out clearly what aspects are being measured, continued interpretation can be justified answer.

After the schedule has been made, the next step is to determine the expert collaborators who will become the validator of the exercise model. The research determines based on the needs of each research variable so that the resulting product is valid. There are 3 experts involved in this study consisting of experts from volleyball games, experts in sports tests and measurements, and censorship experts. Each expert has the ability based on their respective knowledge that contributes to the improvement of the test product. Furthermore, after determining the expert collaborators, the researchers made a prototype of the upper and lower pass test equipment for sensor-based volleyball games. The training model is made to create an overview in determining the steps for developing the prototype, like research [19] used an electronic circuit based on an ultrasonic sensor and a microcontroller, tool works automatically by pressing the start button on the box marked with a buzzer sound 3 times as a sign that the test will start. When the sample performs a lateral jump for 60 seconds, this tool will automatically calculate the hurdle jump movement marked by a buzzer sound when it enters the point and the buzzer will sound when the time duration is up. The results of the time display and the results of the hurdle jump will be displayed on the LCD located on the surface of the box,

The development of a prototype test tool for the upper and lower pass of a sensor-based volleyball game is the initial stage carried out by researchers in the development process. This study makes the initial design of the developed test.

After the product is made, it is then validated by a predetermined expert. In the process of validating material experts, media experts and physicists, it is carried out by using used content validity according to [20] content validity that is, the validity based on expert opinion that the instrument is feasible to be used as a data collector. Evidence of the validity of is (votent validity) obtained by entering into an agreement from the experts. Product testing by including 20 subjects aims to determine the implementation of the upper and lower pass test equipment for sensor-based volleyball games. With the product trial stage, it will synergize the existing data with the results of the effectiveness test at the next stage. After conducting product validation tests to volleyball, game and media experts, sensors. The next step is product revision based on expert input. Then after repairs are made, it is continued with field tests. Field trials for groups with research subjects (n=20) namely physical education students of class A physical education sriwijaya university by observing the implementation of the upper and lower passing tests of sensor-based volleyball games. Based on the results of group trials of the upper and lower

pass test equipment, sensor-based volleyball games can be carried out by 20 test subjects where the implementation time also involves a volleyball coach to provide input and evaluate group test activities in the field, when the tool is tested the tool functions properly and does not get into significant trouble.

The results of expert validation determine the next step whether the product development is feasible or not. Based on the results of product validation in the form of a test tool for the upper and lower pass, a sensor-based volleyball game is suitable for use and then a revision of the model is carried out according to the advice given by the expert. This revision makes the test product better and more valid so that it could be applied to research subjects, other studies [21] concluded that this digital-based volleyball up-and-down passing ability test tool can be feasible or can be used, From these results, it can be interpreted that the volleyball bottom passing model for beginner athletes of Uniska MAB Banjarmasin students developed by researchers received a positive response and could be applied to beginner athletes of Uniska students [22] Other research on the development of volleyball tests is based on these results, it can be concluded that this microcontroller-based volleyball service test kit is effective of the beginners and professional athletes [23] based on the results of research and development of performance appraisal instruments with a peer rating system model in volleyball games that have been developed have met the validity requirements reliability and practicality, and is expected to be an evaluation tool that can be used [24], it can be concluded that the development of a sensor-based volleyball passing test is feasible based on the results of expert validation, [25] the results of the analysis became the basis for developing a sensor-based upper and lower pass test tool for volleyball games that would be given to research subjects, and this study for the first step to do the development of passing test.

It is hoped that the results of this research can help the world of Indonesian sports or at least become a trigger for the emergence of new, better ideas.

## 4. Conclusions

This research resulted in a design for the development of a sensor-based upper and lower pass test tool for volleyball games. The research design is made by determining the steps according to the selected product development test. This design stage includes the design of the lower and upper passing tests. The result expert validation obtained a percentage of 85% (Very Eligible) from volleyball game experts, obtained a percentage of 85% (Very Eligible) from test and measurement experts and 80% (very feasible) from censorship experts, so that the development of sensor-based testing tools is declared feasible to used.

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