Developing Robotic Cricket Batting Test Technology with Camera Sensor and Grid System

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Abstract—The purpose of this study is to discuss the response of students/athletes to strokes and the effect of measuring instruments on Straight Drive strokes and to produce new products through the development process. This research method is research and development type. Research and development produces products that have effectiveness in accordance with the use of the product. The instrument used in this study is a digital-based cricket skill test instrument in Indonesia in the form of an observation sheet that has been tested for the validity of media experts and evaluation experts. Research procedure develop using 4D model. The results of the trial showed that students from both schools on average had very good ball hitting skills, this data was then synchronized to find out whether there was an effect of student responses on students' abilities. The results show that there is a 53.4% effect of the students' positive response on their hitting ability.

Keywords—development, cricket sport, Grid system

1 Introduction

Education is part of the process of increasing everyone's competence, moving from not knowing to knowing, and changing the integrity of society [1][2]. Education, in all its aspects, has developed into a number of different fields of study [3][4]. One of them is sports education, sports education is quite unique because its main focus is on skills and knowledge, which are supporting factors. This is certainly different from other fields of education that require strengthening in terms of knowledge. However, like other fields, the study of sports education also requires technology to help carry out its activities.

Talking about technology today, the world itself is getting faster even in the field of education. Technology in education can be said to be the key to the development of thinking patterns and the success of students because with educational technology, students can learn about the outside world and are the spearhead in developing better human resources [5-7]. We can feel the technology in the field of education with the development of every learning device and learning [8-10]. The existence of technological developments 5.0 becomes a reference for all fields to continue to develop in the sector

of utilizing innovation both in learning, sports, and other fields [11-13]. So that it can be said that technological developments make every field must have an innovation such as in the field of sports which has an innovation of digital-based measuring instruments.

One example of the application of technology in the field of sports is necessary sports skills test kit. This test tool measures how a person's skills in playing sports. The measurement is digital-based, whose object of study is a sport that is considered to be still developing in Indonesia, and that sport is cricket. The game of cricket has also seen many technological influences in various aspects in modern times [14]. The development of sports technology is one of the main reasons behind this increase [15]. Cricket research would not be the same without the help and importance of technology and innovative approaches [16].

Cricket is one of the most popular sports in the Commonwealth of Nations. Cricket is a form of sport that is played with teams made up of two different teams, where each team consists of eleven players [17][18]. Cricket is a small ball game that is hit using a blade-shaped bat with a cylindrical handle [19][20]. This cricket game is played with one of the players hitting the ball, then another player runs to the end of the stup in the direction of the first bat, after that, returns if the ball has not been obtained by the opposing team [21][22]. Therefore the game of cricket is played with two teams, a guard and a player.

This research is basically a complement to the previous research that discusses a similar topic, but there are some minor differences. Research conducted by Bishop et al., (2021)describes the ability of soccer players compared to cricket athletes [23]. Jowitt et al., (2020) investigating the microsensors in the bowler [24]. Jayalath, (2021)there have been many technological evolutions in the game such as Hawk-eye to see if the ball has been hit by a batsman or used for the leg before wicket (LBW), lighted wickets to ensure an accurate run out, Snicko uses to see if the bat has hit the ball before moving towards goalkeepers or goalkeepers or cordon slips and Duckworth Lewis Stern (DLS) are used to calculate match totals if the weather is not favorable. The study described primarily concerns cricket, but the researchers focused on determining the impact of the developed tool on students' ball hitting abilities.

The importance of this research is to find out how technology influences sports learning, especially cricket. One of them is a digital-based measuring device that plays a role in measuring the strength of the strokes made by cricket players. This research is in line with the research conducted [25][26] about the game of cricket. Previous research did not discuss in detail about the measurement and response to games carried out especially in schools. Meanwhile, the research we conducted discussed the response to technology development for sports learning in cricket. The purpose of this study is to discuss the response of students/athletes to strokes and the effect of measuring instruments on straight drive strokes.

2 Method

This research method is a type of research and development (Research and development) which aims to produce new products through the development process. Research

and development produces products that have effectiveness in accordance with the use of these products in a particular field, one of which is in the field of cricket [27][28]. Research like this will focus more on producing and developing products that are suitable for use and can help the learning process. The model in this research and development uses a 4D model. This model is used because in product development it does not take a relatively long time, each stage is more structured and suitable for the development of cricket learning materials [29]. The development of an android-based cricket batting test tool using a sensor camera that is ready in a 4D model is first tested, and in its development involves experts to validate and provide criticism and suggestions. This development model consists of 4 stages of development, namely define, design, develop, and disseminate.

The participants in this study was obtained from two schools with a sample of 40 active students, so the total participant used was 80 students with 38 male students and 42 female students. The sampling used purposive sampling known as judgmental, selective, or subjective sampling and is one way to achieve a manageable amount of data [30][31]. Therefore, the researcher chose a purposive sampling technique which establishes certain considerations and criteria that must be met by the sample used in this study. Research procedure developing an android-based cricket batting test tool using a sensor camera with a grid system using a 4D model there are 4 stages: Define, Design, Development, Disseminate.

The instrument used in this study is a digital-based cricket skill test instrument in Indonesia in the form of an observation sheet, where the instrument was adopted from research Mardela & Irawan (2017). Where the observation sheet used is the response which is measured by the student's response to the results of the stroke consisting of the cricket batting test indicator, the cricket batting test indicator, forward attacking bating and backward attacking bating with a question item of 25 items, 20 items are valid with a cronbach alpha of 0.843. Then for the response of the tool to a straight drive with indicators of measurement accuracy and strength measured on the instrument adopted from the study Arif (2020) with 30 question items, 25 items are valid with a cronbach alpha of 0.854. Both of these instruments use a Likert scale, where the scale consists of 5 points with 1 (very bad), 2 (not good), 3 (fairly good), 4 (good), 5 (very good). Through the expert judgment process where the process is to see how the instrument measures data accurately, by compiling predetermined questions.

Communicate the instrument to experts (expert judgment) to be refined so that it can be used in data collection. then tested the readability of the instrument items and the tools used and tested on the sample. Then the two observation sheets are said to be reliable or feasible to use. Furthermore, there are the results of the validity test of learning media experts adopted from research Arus et al (2019) with a validity result of 70% (good enough) with indicators namely material indicators, tool aspect indicators, and usage aspect indicators. Then the validity of sports learning evaluation experts in this study adopted from research Risaliani (2015) with psychomotor, cognitive and affective indicators, where the results obtained validity with 80% (good). then tested the readability of the instrument items and the tools used and tested on the sample. Then the two observation sheets are said to be reliable or feasible to use. Furthermore, there are the results of the validity test of learning media experts adopted from research Arus

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As for the response instrument grid and the validity of media experts and evaluation experts on developing an android-based cricket batting test tool using the sensor camera used in this study, namely as follows:

Table 1. Questionnaire instrument grid student responses to the results of the batting consist of cricket batting test indicators

Indicator	No Item	Amount
forward attacking bating	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13	13
Backward attacking bating	14,15,16,17,18,19,20,21,22,23,24,25	12

(Mardela & Irawan, 2017)

Table 2. Questionnaire instrument gridtool response to straight drive

Indicator	No Item	Amount
measurement accuracy	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15	15
measured power	16,17,18,19,20,21,22,23,24,25,26,27,28,29,30	15

(Arif, 2020)

Table 3. Grid of the validity of sports learning media experts

Indicator	No Item	Amount
Theory	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 1, 17, 18	18
Tool Aspect	19, 20, 21, 22, 23, 24, 25, 26, 27	9
Aspects of Use	28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39	12

(Flow et al., 2019)

Table 4. Sports learning evaluation expert validity grid

Indicator	No Item	Amount
Psychomotor	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 1, 17, 18	18
Cognitive	19, 20, 21, 22, 23, 24, 25, 26, 27	9
Affective	28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39	12

(Risaliani, 2015)

3 Result and discussion

3.1 Result

This research method is a type of research and development (Research and development) which aims to produce new products through the development process. Research

and development produces products that have effectiveness in accordance with the use of these products in a particular field, one of which is in the field of cricket. Research like this will focus more on producing and developing products that are suitable for use and can help the learning process. The model in this research and development uses a 4D model. This model is used because in product development it does not take a relatively long time, each stage is more structured and suitable for the development of cricket learning materials. The development of an android-based cricket batting test tool using a sensor camera that is ready in a 4D model is first tested, and in its development involves experts to validate and provide criticism and suggestions. This development model consists of 4 stages of development, namely define, design, develop, and disseminate (Thiagarajan, et al, 1974).

The results of data collection in this study consisted of the results of product validation by the validator, the results of descriptive statistical tests for response questionnaires and observations, hypothesis testing consisting of simple linear regression tests. The results of product validation can be seen in Table 5:

Table 5. Product Validation Results

Validation	Stage I	Stage II	Category
Media Expert	140	154	Very worth it
Evaluation Expert	135	152	Very worth it

Table 5 shows the results of product validation by two expert validators, namely the validator for the media and the validator for the material. The validation was carried out in two stages. For media expert validation, a final score of 154 was obtained, which means that the media used was feasible. Furthermore, for expert validation of the learning evaluation, a final score of 152 was obtained which also means that the material in this product is feasible.

After the product is declared eligible, then next the product is tested by doing learning using this product. When doing the poison ball game, the researcher made observations for the psychomotor abilities of students by using the observation sheet. The statistical results for student observations can be seen in Table 6:

Table 6. Student Response Descriptive Statistics Results

School	interval	Category	Frequency	Percentage	mean	Max	Min
A	30.00 – 52.50	Very Not Good	0	0%	105	118	80
	52.51 – 75.00	Not good	0	0%			
	75.01 – 97.50	Well	12	40%			
	97.51 – 120.00	Very good	18	60%			
B	30.00 – 52.50	Very Not Good	0	0%	107	115	85
	52.51 – 75.00	Not good	0	0%			
	75.01 – 97.50	Well	17	56.67%			
	97.51 – 120.00	Very good	13	43.33%			

Based on the results of descriptive statistics on student responses to the product made, the average value for each school is 105 and 107 which shows that both schools on average have a very good response to the product developed. Then for 30 students from each school only did not have a bad response, it can be concluded that students have a positive response to the product. Then the descriptive statistics for the observations can be seen in Table 7.

Table 7. Student Observation Descriptive Statistics Results

School	interval	Category	Frequency	Percentage	mean	Max	Min
A	25.00 – 43.75	Very Not Good	0	0%	83.5	95	75
	43.76 – 62.50	Not good	3	10%			
	62.51 – 81.25	Well	10	33.33%			
	81.26 – 100.00	Very good	17	56.67%			
B	25.00 – 43.75	Very Not Good	0	0%	82	92	78
	43.76 – 62.50	Not good	2	6.67%			
	62.51 – 81.25	Well	17	56.67%			
	81.26 – 100.00	Very good	11	36.67%			

From Table 7, the average score for each school is 83.5 and 82, which shows that school A students have very good ball hitting skills and school B has very good hitting skills. In addition, for school A, there are 3 students who have poor hitting skills, while for school B there are only 2 students. Then to find out whether there is an effect of student responses on students' ball hitting abilities, the researchers conducted an assumption test first, the results of which can be seen in Table 8.

Table 8. Assumption test results

Variable	Assumption Test	Sig	Distributed
Student Response	Normality Test	0.053	Normal
Observation		0.200	
Student Response* Observation	Linearity Test	0.167	Linear

Table 8 shows the results of the assumption test from the data obtained, the normality test obtained a significance value above 0.05 which means the data is normally distributed. While the results of the linearity test obtained a significance above 0.05 which indicates the data is linear. Then to find out whether there is an effect on student responses to the observations made, a simple linear regression test can be used which can be seen in Table 9.

Table 9. Linear Regression Test and coefficient determinant Results

UnstandardizedCoefficients		Standardized Coefficients	T	Sig.	R	R Square
B	***Std. Error***	***Beta***				
45,716	6.042		8.110	0.000	0.730	0.534
0.026	0.057	0.021	0.212	0.024		

The results from Table 9 show that there is an effect of student responses to the observations made, this is evidenced by a significance value below 0.05. Then the magnitude of the effect is 50.3%.

3.2 Discussion

This research is a development research carried out in several stages, namely, the analysis stage, the researcher analyzes by observing the situation which is supported by supporting literature [32][33]. The next stage is to design the product so that it becomes a prototype, when it is finished, product validation is carried out. Product validation is divided into two, namely media validation and learning evaluation, the results of the final validation score obtained are 154 and 152 which indicate the product is very feasible to use. The next stage is a product trial, at this stage a student response questionnaire is distributed in two different schools, the results show that there is a positive response from students. Then for the last stage, the implementation is done by developing the response data by adding an observation instrument for the ability to hit the student's cricket ball. The results of the trial showed that students from both schools on average had very good ball hitting skills, this data was then synchronized by looking for whether there was an effect of student responses on students' abilities. The results show that there is a 53.4% effect of the positive response of students on their hitting ability.

The existence of assistive devices in the game of cricket is able to assist in the process of hitting tests in playing cricket. This tool is used by using the sensor from the android camera to see how fast the shots are going in the game of cricket. The development of this batting test tool is to find out how strong the batting is done by cricket players during batting practice. So that the purpose of making this sensor tool can be more helpful in practicing strokes in cricket games.

The research is aimed at developing and testing the products that have been made. The experiment was carried out by measuring student responses regarding the use of a robotic-based cricket batting test tool using a sensor camera with a grid system. This student response is useful for knowing the extent of student responses and reactions to the products used, so that they can be used as reflection material and references in designing products and learning in the future [34]. The results obtained also indicate a positive response to the product, so that the development carried out has met the needs of the problems analyzed.

Furthermore, this study does not only measure students' impressions, but also the impact of using this tool on students' motor skills, namely the ability to hit (batting). Observations were made to determine the motor skills of students at two different schools, the results showed that students from both schools on average had very good abilities [35][36]. Then what makes this ability need to be measured?. The reason is is quite simple because this ability is the basis of the game of cricket, of course, if the body position is not optimal it will cause a stroke that is not optimal or more severe can cause injury to players [37][38]. Therefore, observation is needed to see how the initial abilities of students,

In terms of practicality, the technology or product developed is already digital based so that the results can be seen instantly. Based on research from Astalini et al., (2021) stated that the use of this technology is very necessary in supporting learning. Analog or traditional technology that used to be used is considered irrelevant to the current situation that demands an instant result. The technology used in the product includes camera sensors placed to identify the student's position when hitting, a laptop as an input receiver, and also a series of systems that have been created. Although in terms of the tools used are quite a lot, their use is not too complicated and difficult compared to analog-based technology, which must first translate the results.

This research is a development research that is inspired by previous research that discusses a similar topic. Research from Vistro et al., (2019) examines the same thing but the technology it develops focuses on data engines [39]. Then the research from Psarianos et al., (2022) also conducted a study to find out between variables, but focused more on the health of players and observations made on all basic skills of playing cricket [40]. Meanwhile, research from Javed et al., (2019) examined audiovisual technology in improving players' thinking skills[41]. Self-conducted research focuses on developing tools or products up to the implementation stage, there are still some obstacles and shortcomings from this study such as the lack of student knowledge of this game and the sample used would be better if using samples from 3 different levels such as junior high school, high school, and high school. So based on this, the developer suggests that the sample used is more varied and the variables used can be more diverse.

4 Result and discussion

Based on the results of the study it was stated that the developed tool was feasible to be used and validated by media experts and evaluation experts. In addition, this research is also a developmental study inspired by previous research, so further research is needed on the implementation of the use of a modified tool to see the effectiveness of the exercise when using an android-based cricret punch test tool using a sensor camera with a network system. so that with the help of this tool you can improve your cricket game even better.

5 References

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