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Cricket Batting Test Robotic-Based Equipment Using Sensor Cameras with Grid System

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ABSTRAK

Perkembangan teknologi di era 5.0 sangat pesat, termasuk di bidang pendidikan dan olahraga. Salah satu contoh pemanfaatan teknologi dalam pendidikan olahraga adalah alat tes keterampilan olahraga. Penelitian ini bertujuan untuk mengembangkan dan menguji peralatan robotik batting test berbasis robotic menggunakan kamera sensor dengan sistem grid. Eksperimen dilakukan dengan mengukur respon siswa terkait penggunaan alat tes batting berbasis robot dengan menggunakan sensor kamera dengan sistem grid. Respon siswa ini berguna untuk mengetahui sejauh mana respon dan reaksi siswa terhadap produk yang digunakan, sehingga dapat dijadikan sebagai bahan refleksi dan referensi dalam mendesain produk. Metode penelitian yang digunakan dalam penelitian ini adalah Research and Development. Instrumen yang digunakan dalam penelitian ini adalah instrumen tes berupa lembar observasi. Validasi produk terbagi menjadi dua yaitu validasi media dan evaluasi pembelajaran, hasil penilaian akhir yang diperoleh adalah 160 dan 162 yang menandakan produk sangat layak untuk digunakan. Disinkronkan dengan mencari apakah ada pengaruh respon siswa terhadap kemampuan siswa. Hasilnya menunjukkan 53,4% pengaruh respon positif siswa terhadap kemampuan objek. Berdasarkan hasil penelitian dinyatakan bahwa alat yang dikembangkan layak untuk digunakan dan divalidasi oleh ahli alih media dan ahli evaluasi. Selain itu penelitian ini juga merupakan penelitian pengembangan yang terinspirasi dari penelitian sebelumnya, sehingga diperlukan penelitian lebih lanjut tentang implementasi penggunaan alat yang telah dimodifikasi untuk melihat keefektifan latihan saat menggunakan alat tes pukulan kriket berbasis android menggunakan kamera sensor dengan sistem grid.

ABSTRACT

Technology development in the 5.0 era has been rapid, including in education and sports. One example of technology in sports education is a sports skills test kit. This study aims to develop and test the cricket batting test robotic-based equipment using sensor cameras with the grid system. The experiment was carried out by measuring student responses regarding using a robotic-based batting test tool using a camera sensor 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. The research method used in this study is Research and Development. The instrument used in this study is a test instrument in the form of an observation sheet. Product validation is divided into two, media validation and learning evaluation. The final assessment results are 160 and 162, indicating that the product is very suitable for use. They are synchronized by looking for whether there is an effect of student responses on student abilities. The results show 53,4% of the effect of students' positive responses on the object's ability. Based on the study's results, it was stated that the development of the tool was feasible to use and validated by media transfer and evaluation experts. In addition, this research is also developing research inspired by previous research. Further research is needed on implementing modified tools to see the effectiveness of training using an Android-based cricket batting test tool using a sensor camera with a grid system.

1. INTRODUCTION

Education can be defined as knowledge transfer, value transformation, and personality formation, including all of its components (Rahmi et al., 2019; Roviati, 2021). Education is also an activity with specific goals or objectives to fully develop the potential of humans as individuals and as a society (Ardhiyah & Radia, 2020; Novitasari et al., 2019; Nurkholis, 2013). Technological advancements in the current digital era impact the education sector (Abdulatif, 2021; Amuntai et al., 2022; Nurrita, 2018; Putri, 2021), where developments in education have always been a challenge that continues to change and develop with the times and technology. Technology development in the 5.0 era has been rapid, including in education and sports. Superior in today's digital era, which necessitates the development of all digital-

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based systems and the use of technology (Rusmono & Alghazali, 2019; Salsabila et al., 2020; Solihatin, 2017). So that, in the future, improved technology can change students' mindsets and behaviors for the better (Arnawati, 2021; Budiarti et al., 2022; Faisal et al., 2020), resulting in the development of quality human resources (Cahyana et al., 2017; Ernawati et al., 2022; Primayana, 2019). As a result, current technological applications, such as digital-based technology in education, sports, and other fields, must be improved. One example of technology in sports education is a sports skills test kit (Bangun, 2016; Syakur et al., 2017). This test tool assesses a person's ability to play sports. The measurement is digital, and the subject of study is Cricket, a sport still considered to be developing in Indonesia. In modern times, the game of Cricket has also seen many technological influences in various aspects (DC, 2022). One of the primary reasons for this increase is the advancement of sports technology (Jayalath, 2021). Cricket research is the same with the assistance and significance of cutting-edge technologies and approaches (Noorbhai & Noakes, 2015). The research relevant to this study who conducted to determine the microsensor in the bowler (Jowitt et al., 2020). Then, there have been many technological advancements in games, such as Hawk-eye to see if the ball has been hit by the batsman or used for the leg before wickets, lighted wickets to ensure accurate run-out, Snicko to see if the batsman has hit the ball before it moves towards the goalkeeper or goalkeeper or a cordon slip, and Duckworth Lewis Stern to calculate the total for the match if the weather is not (Jayalath, 2021). The described research is primarily about Cricket, but the researchers concentrated on the impact of the developed tool on students' ball-hitting ability. This research aims to determine the benefits of digital-based measuring instrument technology for Cricket. This study is consistent with previous studies on Cricket (Allen, 2021; Naha, 2021; Powis & Velija, 2020). Previous research should have detailed student responses to punches and the effect of digital-based measuring devices, which is what our study does in Cricket. This study aims to discuss how students or athletes react to strokes and how digital-based measuring instruments affect straight-drive strokes.

2. METHODS

The research method used in this research is Research and Development. Research and development is a method used to produce certain products and test their effectiveness of these products (Sugiyono., 2013). This study is to determine the response of students or athletes to punches and the effect of digital-based measuring instruments on straight strokes. This development research follows the research model for the development of the 4D learning model. The 4D model was chosen because the advantages of this development model are the basis for carrying out development, and the stages of implementation are divided in detail and systematically. This study's research and development procedure uses the 4D learning model developed by Thiagarajan, Semmel, and Semmel (1974). The process has four steps: define, design, develop, and disseminate (Siswanto et al., 2019). The define stage of this research needs analysis.

They start from the observations of researchers. Based on the results of observations that have been made, it turns out that the school does not have a Robot-Based Cricket Bat using a Sensor Camera with a Grid System. Researchers surveyed to find out why schools did not have these tools. The survey results show the unavailability of special tools to train cricket strokes, so they do not use them in the training process. In the design phase of developing a Robot-Based Cricket bat using a Sensor Camera with a Grid System, the first thing the researcher did was the researcher first designed the shape of the tool to be developed, and the researcher made an instrument for data collection. In the Development stage at this stage, instruments and products that have been produced from the previous process will be validated by validators or experts. In this development research, two experts have been involved: material experts and media experts, who will be responsible for the instrument and product validation process. The material expert validator in this development research is carried out by showing the tools that have been made, accompanied by an attachment in the form of a questionnaire. During this validation process, researchers and material experts discussed the quality and effectiveness of the developed tools. The evaluation provided by the material expert is in the form of assessments and suggestions in oral and written form, aiming to improve the quality and effectiveness of the developed tools. Media experts gave the media expert validators in this development research in the form of assessments and suggestions in an oral and written form aimed at improving the quality and effectiveness of the developed tools. In addition, experts also explain and provide input to researchers on which parts need to be improved. In the disseminate stage, Product distribution is carried out in schools. Implementation is carried out in two stages, the tool's use and the filling out of the instrument or questionnaire. The population in this study was obtained from two schools with a total of 40 active students, so the number of samples used was 80 students, with 38 male students and 42 female students. Sampling using purposive sampling is selective or subjective

sampling and is one way to achieve a manageable amount of data (Campbell et al., 2020; Cole, 2020; Lenaini, 2021). Therefore, the researcher chose a purposive sampling technique that establishes certain considerations and criteria that the sample in this study must meet. The instrument used in this study was a test instrument 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 in which the student's response to the stroke results is measured consisting of the cricket batting test indicator, the forward attacking batting, and backward attacking batting indicators with 25 question items, 20 valid items 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 with 30 question items, 25 items are valid with a Cronbach alpha of 0.854 (Arif et al., 2020).

Both of these instruments use a Likert scale, where the scale consists of 5 points with 1 (very bad), 2 (not good), 3 (quite good), 4 (good), and 5 (very good). Through the expert judgment process, the process is to see how the instrument accurately measures the data by compiling the questions that have been determined. Then communicate the instrument to experts (expert judgment) to be refined so it can be used in data collection. Then, the readability of the instrument items and the tools used were 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 with a validity result of 70% (good enough) with indicators, namely material indicators, tool aspect indicators, and usage aspect indicators (Arús-Pous et al., 2019). As for the response instrument grid and the validity of media experts and evaluation experts in developing an Android-based cricket batting test tool using the sensor camera used in this study, they are as shown in Table 1, Table 2, Table 3, dan Table 4.

Table 1. Questionnaire Instrument Grid Student Responses to the Results of the Batting Bonsist of Cricket Batting Test Indicators

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

(Mardela & Irawan, 2017)

Table 2. Questionnaire Instrument Grid Tool Response to Straight Drive

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

(Arif et al., 2020)

Table 3. Grid of the Validity of Sports Learning Media Experts

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

Table 4. Sports Learning Evaluation Expert Validity Grid

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

Research procedure Developing an android-based cricket batting test tool using a sensor camera with a grid system using a 4D model has four stages: Define, Design, Development, and Disseminate.

3. RESULT AND DISCUSSION

Results

The results of data collection in this study consisted of the results of product validation by the validator, descriptive statistical tests for response questionnaires and observations, and

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	145	160	Very worth it
Evaluation Expert	140	162	Very worth it

Table 5 shows the results of product validation by two expert validators: 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 160 was obtained, which means the media used was feasible. Furthermore, for expert validation of the learning evaluation, a final score of 162 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 learning using this product. When doing the poison ball game, the researcher made observations of 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%	106	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%	108	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 106 and 108, which shows that both schools have a very good response to the product developed. Then 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%	82.5	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%	81	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 82.5 and 81, which shows that school A students have very good ball-hitting skills and school B has very good hitting skills. In addition, there are three students with poor hitting skills for school A, while for school B, there are only two students. Then, to find out whether student responses affect 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, meaning the data is normally distributed. While the results of the linearity test obtained a significance above 0.05, indicating the data is linear. Then, a simple linear regression test can be used to determine whether there is an effect on student responses to the observations made, which can be seen in Table 9.

Table 9. Linear Regression Test and Coefficient Determinant Results

Unstandardized Coefficients		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 53.4%.

Discussion

This research is development research carried out in several stages, the analysis stage, the researcher analyzes by observing the situation supported by supporting literature (Amin et al., 2022; Muslim et al., 2021). The next stage is to design the product to become a prototype. When it is finished, product validation is carried out. Product validation is divided into two, media validation and learning evaluation. The results of the final validation score obtained are 160 and 162, indicating that the product is feasible. The next stage is a product trial. At this stage, a student response questionnaire is distributed in two schools, and the results show 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 trial results 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 a 53.4% effect of students' positive response on their hitting ability. The research aims to develop and test the products that have been made. The experiment was carried out by measuring student responses regarding using 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 (Astalini, Darmaji, Kurniawan, et al., 2021). The results also indicate a positive response to the product so that the development has met the needs of the problems analyzed.

Furthermore, this study does measure not only 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 (Soomro et al., 2018; Stritih-Peljhan & Virant-Doberlet, 2021). Then what makes this ability need to be measured? The reason is quite simple 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 (Montowska et al., 2019; Padli et al., 2022). 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 previous research stated that using this technology is necessary for supporting learning (Astalini, Darmaji, Kurniawan*, et al., 2021). Analog or traditional technology that used to be used is considered irrelevant to the current situation that demands an instant result. The technology in the product includes camera sensors placed to identify the student's position when hitting, a laptop as an input receiver, and a series of systems that have been created. Although the tools used are quite a lot, their use is simple compared to analog-based technology, which must first translate the results.

This research is development research inspired by previous research that discusses a similar topic. Previous research examines the same thing, but the technology it develops focuses on data engines (Vistro et al., 2019). Then the research 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 (Psarianos et al., 2022). Meanwhile, research examined audiovisual technology in improving players' thinking skills (Javed et al., 2019). Self-conducted research focuses on developing tools or products up to the implementation stage. There are still some obstacles and shortcomings in 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. CONCLUSION

Based on the study's results, it was stated that the development of the tool was feasible to use and validated by media transfer and evaluation experts. In addition, this research is also developing research inspired by previous research, so further research is needed on the implementation of the use of modified tools to see the effectiveness of training when using an Android-based cricket batting test tool using a sensor camera with a grid system.

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