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Media Referee Smart Card For Extracurricular Basketball Participants in Senior High School, Vocational High School, and Madrasah Aliyah at Jepara

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Abstract

This study to develop referee Smart Card learning media as a means of learning basketball referee signals for extracurricular participants at the high school, vocational high school, and madrasah Aliyah levels. This research uses the Research and Development (R&D) method by adapting the Borg and Gall development model which consists of ten steps, namely (1) Initial information gathering, (2) Planning, (3) Initial Product manufacturing, (4) Expert validation, (5) Initial product revision, (6) Small scale trial, (7) Small scale product revision (8) Large scale trial (9) Final product (10) Mass production. The result of material and media expert validation showed that the product obtained an average assessment of 89,5% with Very Good criteria. Small scale trials were carried out Senior High School 1 Nalumsari and obtained an average score of 85,4% in the Good category. The large scale trial was conducted at Senior High School 1 Pecangaan, Vocational High School 3 Jepara , and Madrasah Aliyah 1 Jepara with the average assessment results of 96%, 91%, and 90% respectively, so that the total overall average reached 92% with the Very good category. Based on these results, it can be concluded that the Referee Smart Card media is feasible and effective to use as a medium for learning basketball referee signals in extracurricular activities. This media is expected to be able to improve participants' understanding visually, practically, and interactively.

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INTRODUCTION

Basketball is a sport that involves two teams, each consisting of five players, with the main goal of scoring as many points as possible (Saputri, 2021). The smoothness and fairness of a basketball game is largely determined by the role of the referee (Prakasa et al., 2019). The sport of basketball has an attitude of sportsmanship that is seen in respecting referees, opponents, and the result of the game (Disiplin & Sportivitas, 2024). The development of a character building based basketball learning model that emphasizes the values of honesty, responsibility, and courage has shown its effectiveness (Mulyono, 2013).the application of values such as trust, behavioral norms, and cooperation in basketball training activities is proven to be able to increase students social capital, which in turn plays a role in strengthening their character building (Social et al., 2024). Changes to the result of the basketball game are made in an effort to perfect the existing rules. The rules in basketball serve as ethical guidelines for all playes in the sport (Varmada & Rachman, 2016). In the realm of education, especially in extracurricular basketball activities at school, understanding referee signals plays an important role in supporting the character building of students. The effectiveness of learning is an indicator of the success of educational interaction in achieving learning objectives (Rekreasi, 2020). Every extracurricular participant is required to master the understanding of referee signals in basketball games (Meikahani & Suherman, 2022). Visual media tends to be easier to use in learning Physical Education and Health, for example to present pictures of a series of movements or illustrations of learning tools that are not physically available (Mumtahabah, 2018). Media is also called learning media because it has information related to learning that can be conveyed effectively (Udiana & Iyakrus, 2023). Visually appealing learning media can help students understand and retain the material better (Sudjana, N., & Rivai, 2013), while interactive media can increase learning motivation and accelerate concept understanding (Heinich, R., Molenda, M., Russell, J. D., & Smaldino, 2005). Media that integrates visual and interactive elements can improve students' and comprehension (Mayer, 2009). However, despite the proven advantages of visual interactive media, students in real world settings still face difficulties in mastering certain concepts such as referee signals in basketball. Based on preliminary observations at Senior High School 1 Nalumsari, many basketball extracurricular participants still had difficulty recognizing and understanding referee signals correctly. This lack of understanding often leads to confusion during training or matches, which affects the smoothness and fairness of the game. In addition, learning about referee signals is usually done verbally or using printed

handouts, which are considerated less engaging by students. This highlighs the need for innovative and visual based media that can make it easier for students to learn referee signals effectively (Kuswanto, 2016). Learning media is a tool used to support and improve the effectiveness of the teaching and learning process (Sumarsono & Anisa, 2019).

Observation at Senior High School 1 Nalumsari indicate that extracurricular basketball activities do not include special lessons on referee signals, despite the importance of understanding these signals for smooth match conduct. Therefore, the Referee Smart Card media was developed as an innovative tool to facilitate participants' learning of referee signals. Media functions as a means to convey massages effectively to recipiens (Purnawan & Hidayati, 2021).

The main focus of this research is to develop and test the effectiveness of Smart Cards in improving the understanding of referee signals in extracurricular basketball participant. This study also aims to measure participants acceptance and response to the use of media in learning refereeing (D'Angelo et al., 2018).

METHODS

This research is a study that uses the research and development (R&D) method using the Borg & Gall model which involves several stages of development, namely: (1) data collection, (2) planning, (3) making initial products, (4) expert validation, (5) product revision, (6) small scale trial, (7) product revision, (8) large scale trial, (9) final product, (10) mass production. In this study, development activities were only carried out up to stage nine (Mahlianurrahman, 2020)

Participants

This study was attended by female basketball extracurricular participants at Senior High School 1 Nalumsari, Senor High School 1 Pecangaan, Vocational High School, and Madrasah Aliyah 1 Jepara. The technique used was purposive sampling technique, involving a total of 57 participants. 12 participants for the small scale and 45 participant in the large scale test. The small scale test was conducted on May 14, while the large scale test was conducted on May 16 to 18, 2025.

Materials and Apparatus

The research data included participant questionnaire measured participants responses to the feasibility of the media, while the validation sheet was used by material and media experts to content and design.

Procedures

The research uses descriptive analysis techniques in the form of percentages. The results of the analysis are used as a reference to improve the development research conducted (Pambudi & Suharjana, 2018). Likert scale was used at the product validation stage for expert validators using four rating: strongly disagree (score 1),

disagree (score 2), agree (score 3), strongly agree (score 4). Validation was analyzed by calculating the average score and percentage of each feasibility aspect. The percentage of answer results using the formula:

$$P = \frac{Number\ of\ scores\ obtained}{Number\ of\ maximal\ scores} x\ 100\%$$

P = Precentage of eligibility score obtained

Yes and No answer to the participants questionnaire statements were used to obtain data which was analyzed in percentage form using the formula.

$$P = \frac{X}{N} x\ 100\%$$

Description:
X = Number of "Yes"
Y = Number of Respondents

The percentage result obtained are categorized in the commonly used feasibility criteria.

Table 1. category of feasibility percentage

Percentage (%)	Eligibility	Meaning
85 - 100	Very Feasible	Excellent
70 - 84	Feasible	Good
50 - 69	Fairly Feasible	Fair
< 50	Not Feasible	Poor

RESULT

1. Product Design

The product design developed is Referee Smart Card learning media, this is a a set of 45 cards measuring 7 x 10 cm. Card categories are divided by color that distinguishes the type of signals. Green for match signals, purple for scoring, blue for substitution and time out, red for violation, gray for players back number, orange for type of foul, and pink for special foul. The card consists of two sides. The front features the name of the signal and an illustration of the referee's signal movement. The back contains a description with a demonstration video barcode.

2. Phase 1 Validation

The material expert used is a licensed A referee who in recent years has taken part in refereeing duties for the IBL (Indonesia Basketball Lague) event. He is also the management of PERBASI Jepara Regency.

Table 2. Data on Material Expert Validation Result Stage 1

Assesment Aspects	Presentation	Eligibility
Material	85%	VeryFeasible
Language	75%	Feasible
Presentation	90%	Very Feasible
Average	83, 3%	Feasible

The percentage of material experts obtained 85%, 75%, and 90% respectively. The average percentage is 83,3%, categorized as suitable for use.

Table 3. Revision of Material Expert Stage 1

No	Material Addition

1	Number Of Player: No 00 dan 0
2	Subtitutions and Time Out: Media Time Out
3	Type Of Foul: Foul On Act Of Shootin anf Foul Not On The Act Of Shooting

b. Media Expert Validation

Media experts are lecturer of S1 Learning Media at the Family Welfare Education Study Program, Faculty of Engineering, State Univercity of Semarang. product design developed is Referee Smart Card learning media, this is a a set of 45 cards measuring 7 x 10 cm. Card categories are divided by color that distinguishes

Table 4. Media Expert Validation Results Stage 1

Assesment aspects	Percentage	Eligibility
Design	83%	Feasible
Learning	85%	Very Feasible
Media Use	94%	Very Feasible
Average	87, 3%	Very Feasible

Based on the table, the aspects of design, learning, and use, each obtained a percentage of 83%, 85%, and 94% with an average of 87,3, which is a very feasible category.

Table 5. Revision of Media Expert Stage 1

Subjek	Awal	Akhir
Font Size	4 mm 	7 mm 
Printing Paper	Karton 	Ivory 

Table 6. Handbook Improvements

Subject	Beginning	End
Print Paper	HVS	Cover: Ivory Content: CTS
Paper Size	A4	A6

3. Stage 2 Validation

a. Product Revision Based on Suggestions from Material Experts

Table 7. Data from the 2nd Stage Material Expert Validation Results

Aspect	Percentage	Feasibility
Material	88%	Very Feasible
Language	88%	Very Feasible
Presentation	90%	Very Feasible
Average	88,6%	Very Feasible

The average percentage of material expert validation is 88,6%, so it is categorized as very feasible.

b. Produk Revision Based on Media Expert Suggestion

Table 8. Data from the 2nd Stage Media Expert Validation Results

Assesment Aspects	Percentage	Eligibility
Design	88%	Very Feasible
Learning	90%	Very Feasible
Media Use	94%	Very Feasible
Average	90,6%	Very Feasible

The average percentage of media expert validation is 90,6, categorized as very feasible.

Table 9. Overall Expert Validation Data

Ahli	Material	Media Use
Nama Ahli	Muh Daviq Nur, M.Pd.	Godham Eko Saputro, S.Sn, M.Ds.
(%)	88,6 %	90,6%
Ket	Sangat Baik	Sangat Baik

The result of the questionnaire of material and media expert validators obtained an average of 89,6% with a very good category. The results of the assessment from the experts will be the basis for determining the feasibility of the product before entering the large scale trial stade.

4. Small Scale Trial

The small scale trial was conducted to asses the feasibility of Referee Smart Card media before the large scale trial. This activity involved 12 female basketball extracurricular students of Senior High School 1 Nalumsari who were divided into three groups. Participants were given time to see and understand the contents of the card, discuss the meaning of the signal, and practice it with the group. Each group presented the results of their discussion, while other groups could ask question as a form of discussion. The activity was closed by filling out a questionnaire to find out the participants responses to the media.

The results of the small scale trial assessment are a reference for making improvements to the Referee Smart Card product. The improvements that have been made are consulted first with experts before proceeding to the large scale trial stage. This stage is obtained from the percentage of respondents answers based on the questionnaire they filled out.

Assessment of media feasibility as follows:

Table 10. Persentage of Media Feasibility Assessment

Aspect	Percentage	Feasibility
Originality	88%	Very Feasible
Excellence	79%	Very Feasible
Usability	79%	Very Feasible
Safety & Comfort	75%	Very Feasible
Completeness	83%	Very Feasible
Average	81%	Very Feasible

The result of the data feasibility percentage is 81%, including in the feasible category. This value indicates that the Referee Smart Card media learning media has met the initial feasibility criteria and can be tested on a wider scale.

5. Product Revision

From the results of the small scale test, participants stated that some of the signal images were not clear enough to show specific hand movements. In response to this feedback, the researchers

held discussions with media experts. The media expert stated that the visualization of the movements in the pictures was representative, but additional dynamic understanding was needed. The expert suggested optimizing the use of the barcode video guide that was available on the back of the card as a visual learning support.

With these considerations, the researcher did not make changes to the image design, but emphasized the importance of utilizing the video barcode feature during the learning process so that participants can understand the movements thoroughly.

6. Large Scale Trial

The large scale trial involved 45 participants from extracurricular high school basketball in Jepara who won 1st, 2nd, and 3rd place at POPDA 2024. The trial was conducted on Friday, Saturday, and Sunday, each involving 15 participants. In general, the stages of large scale trial activities are similar to the implementation on a small scale.

a. Large Scale Trial at Senior High School 1 Pecangaan

The first trial was conducted at Senior High School 1 Pecangaan. After using the media, participants gave an assessment of the Referee Smart Card media based on five aspect, namely originality, excellence, usefulness, safety and comfort, and completeness. The assessment results showed that the media received a positive response and was considered capable of producing an understanding of referee signals in an interesting way.

Table 11. Percentage of Media Feasibility Assessment

Aspect	Percentage	Feasibility
Originality	98%	Very Feasible
Excellence	97%	Very Feasible
Usability	95%	Very Feasible
Safety & Comfort	95%	Very Feasible
Completeness	97%	Very Feasible
Average	96%	Very Feasible

The result of the feasibility percentage is 96%, including in the very feasible category.

b. Large Scale Trial at Vocational High School 3 Jepara

Participants gave an assessment based on 5 predetermined aspect. The results of large scale trials in both schools show the Referee Smart Card media is considered feasible and effective as a means of learning referee signals in extracurricular basketball activities.

Table 12. Percentage of Media Feasibility Assessment

Aspect	Percentage	Feasibility
Originality	93%	Very Feasible
Excellence	87%	Very Feasible
Usability	92%	Very Feasible
Safety & Comfort	93%	Very Feasible
Completeness	92%	Very Feasible
Average	96%	Very Feasible

Obtained a feasibility percentage of 91%, which is included in the very feasible category.

c. Large Scale Trial at Madrasah Aliyah 1 Jepara

The final trial was conducted at Madrasah Aliyah 1 Jepara. The results of the media feasibility assessment from this school showed a positive response. The participants stated that this media helped them understand referee signals in a more modern and fun way. A feasibility percentage of 91% was obtained, which is included in the very feasible category.

Table 13. Percentage of Media Feasibility Assesment

Aspect	Percentage	Feasibility
Originality	93%	Very Feasible
Excellence	88%	Very Feasible
Usability	90%	Very Feasible
Safety & Comfort	98%	Very Feasible
Completeness	90%	Very Feasible
Average	96%	Very Feasible

The percentage of media feasibility obtained is 90%, including the very feasible category. Large scale trial in the three schools obtained the results that the Referee Smart Card media was considered feasible, useful, and effective in supporting the learning of basketball referee signals for extracurricular participants.

Table 13. Percentage of Overall Large Scale Scale Trial

School Name			
Assessment aspect	**1 st School**	**2nd School**	**3rd School**
Originality	98%	93%	93%
Excellence	97%	87%	88%
Usability	95%	92%	90%
Safety & Comfort	95%	93%	98%
Completeness	97%	92%	90%
Average	96%	91%	90%
Total Average		**92%**	

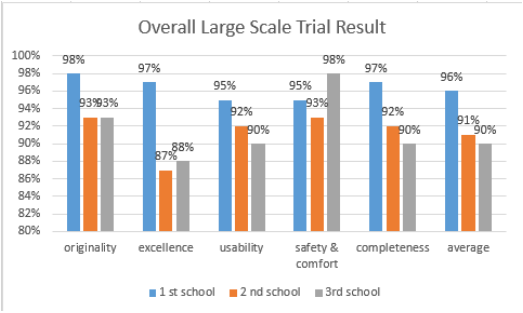

Fig 1. Graphic of Large Scale Trial Results

Based on the assessment of five aspects, namely originality, excellence, usefulness, safety and comfort, and completeness, an average assessment of 96% was obtained at Senior High School 1 Pecangaan, 91% at Vocational High School 3 Jepara, and 90% at Madrasah Aliyah 1 Jepara. Thus, the total average assessment of the three schools is 92%, indicating that the Referee Smart Card media is very feasible to use as an innovative learning media in extracurricular basketball activities.

7. Product Revision

Product revisions at this stage, based on expert review, concluded that there were no product revisions after being consulted by experts. Mndksnkd

DISCUSSION

Referee Smart Card is a product designed and developed by the researcher himself. Originality is an absolute requirement to produce significant scientific contributions. Thus, this media has opportunity to be published or presented in scientific forums because of its uniqueness (Șuteu, 2022). The Referee Smart Card has never been used in the context of basketball, thus showing a real research gap, in line with efforts to introduce innovative media to basketball referees and strengthen the value of novelty in scientific research (Șuteu, 2022). Originality includes the application of a method or idea in a different context or environment than before (Ngwenya & Rakesh, 2023). Referee Smart Card is designed with a concise, colorful visual display, and uses clear illustrations of referee signal movements. The uniqueness of this design differentiates it from conventional media such as textbooks or static posters. Media with visual displays that are easy to use and interactive tend to be more attractive to students because they can improve concentration and provide a more comfortable learning experience (Salehudin et al., 2020). The main innovation of this media is the use of barcodes linked to the learning videos, thus making it more interactive and flexible. Systematic research in Indonesia shows that the use of modules equipped with barcodes can increase student participation and learning effectiveness (Romana et al., 2024).

Attractively designed learning media can increase students interest and motivation to engage in the learning process (Oktaviani, 2019). The result showed that the application of multimedia in learning can help students better understand the material and make the learning process easier and more enjoyabl (Titin et al., 2023). Interactive learning media can create a more interesting and enjoyable learning atmosphere, while providing a deeper learning experience for students (Suhenda et al., 2024).

Independent learning can improve student learning outcomes, especially if supported by appropriate and efficient learning media (Nurrita, 2018).

Referee Smart Card media provides visual guidance and clear explanations for each signal, helping players understand the meaning and meaning of basketball game signals (Officiating, n.d.). With a deeper understanding, players can reduce errors during play and avoid misinterpreting referee decisions, resulting in better overall performance (*FIBA RULES*, n.d.).

Good ergonomic principles in learning tools and facilities can be comfortable, reduce fatigue, and help users stay focused while learning (Studi et al., 2006). Thus, the Referee Smart Card design that pays attention to size, visual contrast, material strength, and ease of access via barcode has met ergonomic standards to support user comfort and safety (Kanellopoulou & Kermanidis, 2019). Studies in the field of modern multimedia show that the use of

multimodal inputs such as text, images, and audio/video usually produces more effective results than the use of a single mode (Li et al., 2022). Thus, the elements in the referee smart card make it a complete and effective learning medium.

CONCLUSION

Referee Smart Card media is suitable for use as a learning aid for basketball referee signals in extracurricular activities. This media helps improve participants understanding, train movements directly, and foster interest in learning through visual displays and technological support.

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