

## Developing Learning Media for an Online Learning-Based Big Ball Game at Class XI Vocational High School Students: Feasibility and Efficacy

### Desarrollo de medios de aprendizaje para un gran juego de pelota basado en el aprendizaje en línea para estudiantes de secundaria vocacional de clase XI: viabilidad y eficacia

\*Amran, \*Wawan Sundawan Suherman, \*Ali Satia Graha, \*Rizqie Auliana, \*Ardi Riyana, \*Ari Tri Astuti, \*Desy Yunita Utami, \*\*Kukuh Wahyudin Pratama, \*\*Azhar Ramadhana Sonjaya, \*\*Asep Angga Permadi, \*\*Z. Arifin, \*\*\*Manil Karakauki, \*\*\*Syed Kamaruzaman Syed Ali, \*\*\*\* Reza Adityas Trisnadi, \*\*\*\*\*Asmuddin, \*\*\*\*\*Danarstuti Utami  
\*Yogyakarta State University (Indonesia), \*\*Garut University (Indonesia), \*\*\*University of Malaya (Malaysia), \*\*\*\*Sultan Agung Islamic University Semarang (Indonesia), \*\*\*\*\*Halu Oleo University (Indonesia), \*\*\*\*\*Universitas PGRI Yogyakarta (Indonesia)

**Abstract.** This research aims to develop educational media, ascertain its feasibility, and evaluate the effectiveness of an online learning-based large ball game educational media in enhancing students' knowledge. This study employs a Research and Development (R&D) approach using a 4-D model. The research steps encompass the following: (1) Definition, (2) Design, (3) Development, and (4) Dissemination. Product validation is undertaken by two subject matter experts, two media experts, and two learning experts. The subjects involved in the small-scale trial include 25 11th-grade students from Perkebunan 52 Vocational High School in Yogyakarta, whereas the participants in the small-scale test consist of 135 11th-grade students from four classes in State Vocational High School 2 Depok-Sleman and State Vocational High School 6 Yogyakarta. The subjects for the effectiveness test comprise 136 11th-grade students from four classes in Vocational High School 5 Yogyakarta and Vocational High School S Bokpri 1 Yogyakarta. The collected data were analyzed utilizing Aiken's validity index, descriptive statistics, and the Paired Sample T-Test. The research findings indicate the following: (1) The learning media developed, grounded in online learning-based large ball game methodology, facilitates students in the online learning process. (2) The product's feasibility, as evaluated by two subject matter experts, falls within the "Highly Feasible" category. (3) The effectiveness test demonstrates an average pre-test score of 57.62 and a post-test score of 81.18. Utilizing the Paired Sample T-Test, the calculated t-value for students' learning outcomes in both the pre-test and post-test is -23.104, accompanied by a significance probability of Sig. (2-tailed) 0.000, which is less than the threshold of 0.05. This result signifies the rejection of the null hypothesis (H<sub>0</sub>). This implies that there exists a substantial impact resulting from the utilization of online learning-based large ball game educational media on students' learning outcomes. Consequently, it can be inferred that this product is well-suited and viable for deployment as an educational tool for large ball games.

**Keywords:** Media development, large ball game, online learning, vocational school

**Resumen.** Esta investigación tiene como objetivo producir un medio de aprendizaje, determinar su viabilidad y evaluar la eficacia de los medios de aprendizaje de juegos de pelota grandes basados en el aprendizaje en línea para mejorar el conocimiento de los estudiantes. Este estudio adopta un enfoque de investigación y desarrollo (I+D) con un modelo 4-D. Los pasos de la investigación consisten en: (1) Definición, (2) Diseño, (3) Desarrollo y (4) Difusión. La validación del producto la llevan a cabo dos expertos en la materia, dos expertos en medios y dos expertos en aprendizaje. Los sujetos de prueba a pequeña escala comprenden 25 estudiantes de 11° grado de la escuela secundaria vocacional Perkebunan 52 en Yogyakarta, mientras que los sujetos de prueba a pequeña escala consisten de 135 estudiantes de 11° grado de cuatro clases en la Escuela secundaria vocacional estatal 2 Depok-sleman y la Escuela secundaria vocacional estatal Escuela Secundaria 6 Yogyakarta. Los sujetos de la prueba de eficacia consisten en 136 estudiantes de 11° grado de cuatro clases en la Escuela Secundaria Vocacional 5 Yogyakarta y la Escuela Secundaria Vocacional S Bokpri 1 Yogyakarta. Los datos obtenidos se analizaron mediante el índice de validez de Aiken, estadística descriptiva y prueba T para muestras pareadas. Los hallazgos de la investigación indican que: (1) Los medios de aprendizaje producidos, basados en el juego de pelota grande basado en el aprendizaje en línea, ayudan a los estudiantes en el proceso de aprendizaje en línea. (2) El nivel de factibilidad del producto, basado en la evaluación de dos expertos en la materia, cae dentro de la categoría "Altamente factible". (3) La prueba de eficacia muestra una puntuación media previa a la prueba de 57,62 y una puntuación posterior a la prueba de 81,18. Basado en la prueba T de muestras pareadas, el valor t obtenido para los resultados de aprendizaje de los estudiantes de la prueba previa y posterior es -23.104, con una probabilidad significativa de Sig. (2 colas) 0,000 > 0,05, lo que indica que se rechaza la hipótesis nula (H<sub>0</sub>). Esto significa que hay una influencia significativa del uso de medios de aprendizaje de juegos de pelota grandes basados en el aprendizaje en línea en los resultados de aprendizaje de los estudiantes. Por lo tanto, se puede concluir que este producto es adecuado y factible para su uso como medio de aprendizaje para juegos de pelota grandes.

**Palabras clave:** desarrollo de medios, juego de pelota grande, aprendizaje en línea, escuela vocacional

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Amran Amran

amran0001fik.2022@student.uny.ac.id

## Introduction

The proliferation of the internet and technology has instigated transformations in both education and society (Goat et al., 2019; Kogoya et al., 2023). The significance of computer technology is pivotal for the progression and refinement of educational media (Wihartanti & Wibawa, 2017).. Moreover, Allen & Seaman (2017) ascertained that around six million students had enrolled in at least one online higher education course in 2015, a substantial increase from 1.6 million in 2002. The influence of technology is noteworthy, as educational technology facilitates the fusion of technology and student learning within the framework of physical education (Bodsworth & Goodyear, 2017). The integration of technology into

teaching and learning endeavors can be achieved through online learning methods (Rojabi, 2020; Yumiana et al., 2023). The educational process within schools necessitates modernization by exploring diverse and efficient learning mediums, thereby augmenting the efficacy of online learning. The abrupt shift to online classes has presented a challenging scenario across various sectors, education included (Almonacid-fierro et al., 2021; Nugroho et al., 2022). The utilization of media in the form of electronic devices, particularly Android smartphones, is pervasive within the realm of online education (Maulana et al., 2019). This assertion is substantiated by Clayton & Murphy (2016), who posit that Android smartphones are extensively possessed by students and function as valuable tools within the pedagogical process for school-aged

children engaged in online classes (Gomez et al., 2022; Salafi et al., 2022). Education is accessible to all individuals irrespective of gender, age, or prior educational background (Poon, 2013).

Learning media represents a deliberate endeavor on the part of educators to aid students in learning in accordance with their individual needs and interests. Learning media comprises a collection of materials strategically devised to serve as intermediaries between teachers and students, thereby facilitating a more effective and efficient dissemination of subject matter (Saputro et al., 2018). Learning media comprises systematically organized materials, whether written or not, designed to cultivate an environment or ambiance conducive to student learning (Sukendro, 2017; Adji et al., 2022). The primary objective of learning media is to amplify individuals' competencies not only in reading, listening, observing, and analyzing but also in generating media across diverse formats (Cakmak & Tuzel, 2015; Hardianto et al., 2022).

Online learning is an educational modality conducted via the internet system, employing online platforms interconnected within the internet network for instructional purposes (Mahnun, 2018; Hastuti et al., 2021). Internet serves as a fundamental resource for online learning (Purwitasari et al., 2019; Nopembri et al., 2022). Moreover, Sari et al. (2021) explain that online learning is a technology-based educational approach in which learning materials are electronically disseminated to students, enabling remote access via computer networks. The successful implementation of online learning necessitates support from mobile devices such as smartphones, tablets, and laptops, which can be utilized to access the learning materials (Gikas & Grant, 2013; Nasrulloh et al., 2022). Utilizing internet technology enables access to learning materials and fosters learning interactions among students or with instructors at any time and from any location. This concept extends to the realm of online learning media for large ball games in the field of physical education. The underpinnings for the utilization of such learning media, as outlined by Daryanto (2016:12-16), encompass philosophical, psychological, technological, and empirical foundations. An additional criterion for the development of learning media involves the factor of action, encompassing aspects such as (a) accessibility, (b) cost, (c) interactivity, (d) organization, and (e) novelty (Prastya, 2016). The advancement of technology has introduced challenges in implementing online learning for the domain of large ball game education in Indonesia. This challenge primarily stems from the limited utilization of online learning media within vocational schools for the instruction of subjects related to large ball games. The crafted online learning media empowers students to engage in independent learning with the aid of instructional guides, encompassing materials, images, and videos directly linked to YouTube, complemented by elucidations of the learning content. This provision facilitates students' comprehension of the learning materials and fosters self-directed learning. It is imperative

to take into account both the educational process and the circumstances of the teaching staff in order to establish a conducive classroom environment (Zambrano et al., 2022; Sutapa et al., 2021).

Technology is becoming increasingly popular in physical education teaching and learning processes (Wallace et al., 2022; Sukendro et al., 2021). The realm of education is intricately interwoven with technology, and one domain significantly influenced by technological progress is physical education (Rodríguez et al., 2021; Yudhistira et al., 2021). The advent of online physical education introduces a distinct array of challenges to the digital sphere, underscoring the importance for physical education educators, involved in imparting this learning experience, to cultivate expertise in online pedagogy and adeptly employ supportive technology (Goat et al., 2019; Nasrulloh et al., 2021). Online learning for large ball games entails education delivered via the internet, wherein students and teachers are geographically, temporally, and spatially apart, engaging in remote learning through online means (Griffiths et al., 2022; Ilham et al., 2021). The adoption of online learning has the potential to achieve educational objectives by harnessing information technology to streamline the execution of the learning process within the educational domain (Yuliani et al., 2020:6; Kristiyanto et al., 2020). The creation of online learning-based media for large ball games encompasses the utilization of technology-based platforms, which include computer-based technology as well as a blend of online web-based platforms offering accessible materials, images, and audio-visual content to students online, irrespective of their location and time. This media development has the potential to facilitate students in their online learning journey, rendering their participation in online learning for large ball games more seamless.

Drawing from the observation carried out concerning online learning for the game of big ball at Vocational High School of Plantation 52 Yogyakarta, a total of 25 students participated in the observation process. Out of these 25 students, 24 respondents, accounting for 96% of the total, identified WhatsApp as the most suitable platform. The analysis of students' requirements regarding online learning media for the game of big ball indicated that 73.1% of the students responded affirmatively, deeming the development of online learning-based media as "very necessary. Referring to previous studies on physical education during the COVID-19 pandemic, in terms of the use of learning app media and the age of teachers, the highest percentage of app usage in secondary schools was WhatsApp at 63.6%, followed by 21.4% using Google Forms, 28.6% using Google Classroom, 63.6% using WhatsApp, 21.4% using the school's e-learning platform, and 3.6% using Schoology (Huda et al., 2020). Furthermore, the teaching and learning process at the secondary school level during the COVID-19 pandemic was categorized as "very low" by 8%, "low" by 46%, "moderate" by 15%, "high" by 26%, and "very high" by

5% based on the average score, which was 79.59. The teaching and learning process for Physical Education in upper secondary schools was categorized as "low" (Nopiyanto et al., 2020). The online learning implementation for the game of big ball has not been fully optimized, necessitating improved adaptation by both students and teachers to the online learning process (Hambali et al., 2021; Listyarini et al., 2021).

Drawing from the findings of Fajar's (2021) research on the effectiveness of online learning, the study revealed that utilizing platforms such as Zoom and WhatsApp proves efficacious solely for theoretical subjects; however, their effectiveness diminishes notably when applied to practical and field-oriented subjects within the online learning context. Furthermore, Setiawan's (2021) study on the efficacy of online sports learning unveiled that 40.6% of students perceived their grasp of online sports learning as constrained. Concerning the utilization of online learning media, 49.0% of students indicated encountering challenges when navigating the media during online learning sessions. Moreover, the investigation identified that 69.3% of teachers frequently employed assignments as a pedagogical approach within the context of online learning, with 28.6% opting for online presentations. Conversely, 45.3% of students exhibited lower confidence in comprehending assignments and exams conducted in the online format, and 50.0% of students displayed a lack of enthusiasm towards online sports learning, consequently significantly affecting their interest. Drawing from the research findings and ensuing discussions, the conclusion that emerges is that online learning exhibits a deficiency in effectiveness. According to Sumardiansyah's (2022) study, a survey on students' interest in participating in online physical education learning at SMP Kartika XX-2 Makassar showed that student interest was categorized as "very high" for 5.0% (2 students), "high" for 22.5% (9 students), "moderate" for 45.0% (18 students), "low" for 17.5% (7 students), and "very low" for 10.0% (4 students). Taking frequency into account, the majority of students demonstrated a "moderate" level of interest in engaging with online physical education learning. Marla's (2022) study on the challenges of online physical education learning in Vocational High Schools in Karawang Regency indicated that the challenges were categorized as "very low" for 30% (18 teachers), "low" for 1.7% (1 teacher), "high" for 61.7% (37 teachers), and "very high" for 6.7% (4 teachers). It can be concluded that the challenges of online

physical education learning are still highly prevalent.

The research undertaken by Purkonudin (2022) delineates the procedure of online learning within the realm of physical education, sports, and health within a private Vocational High School. The study underscores that numerous challenges persist within the online learning process for physical education, sports, and health that require attention. Correspondingly, Takdir (2022) examines the repercussions of online media through interview outcomes, contending that the challenges stemming from online physical education learning present a less favorable scenario. This phenomenon arises due to students' restricted comprehension of the subject matter when it is conveyed via online media; consequently, they encounter heightened challenges in grasping the material compared to their engagement in direct field practice. Moreover, the investigation underscores that self-regulation strategies in online learning yield students who exhibit a tendency toward passivity yet demonstrate commendable self-discipline (Purnomo et al., 2022). In our study, we utilized online learning-based media to evaluate the feasibility and effectiveness of developing online learning materials for large ball game activities among 11th-grade students in Vocational High Schools. The subsequent sections of this paper are structured as follows: Section 2 reviews all the materials and methods, Section 3 presents the results, Section 4 discusses the findings of this study, and finally, Section 5 concludes the results while also suggesting potential directions for future research.

## Materials and methods

The study adopted a research and development (R&D) approach. Research and development constitutes a form of inquiry directed towards generating a distinct product and assessing its efficacy (Sugiyono, 2019:297). This resonates with the assertion articulated by Sukmadinata (2017:169). The research and development process encompasses stages aimed at enhancing extant products through the creation of novel ones, and it operates within a framework of accountability.. Thiagarajan, as cited in Winarni (2018:256), states that the 4-D development model is used in the development process of online learning-based media for large ball game activities. The model consists of several stages: (1) Define, (2) Design, (3) Develop, and (4) Disseminate.

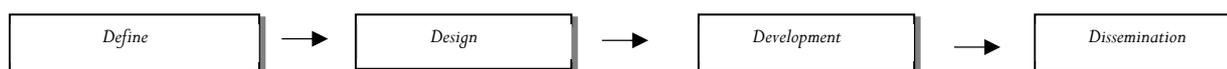


Figure 1. Procedure for Developing a 4-D Model

The participants in this study encompassed two subject matter experts, two media experts, and two learning experts. A small-scale test was conducted, involving 25 students from Class XI at Vocational High School 52

Yogyakarta. The large-scale test enlisted the participation of 138 students from Vocational High School 6 Yogyakarta and Vocational High School 2 Depok Sleman. The effectiveness test incorporated 140 students from

Vocational High School 5 Yogyakarta and Vocational High School 1 Bopkri Yogyakarta. Data collection techniques in this research included; (1) Observation: Used to gather information on the implementation of online learning for the subject of Physical Education, Sports, and Health, specifically the topic of large ball game activities. (2) Questionnaire: Used for assessment purposes, including: (a) Validation tests conducted by subject matter experts, media experts, and learning experts. (b) Feasibility tests conducted on a small and large scale. (3) Test: Conducted to measure the effectiveness of online learning media by administering multiple-choice questions to the students.

The data analysis within this study encompasses the utilization of Content Validity to ascertain the degree of validity of the created online learning media. Each datum from the expert validation questionnaire will undergo analysis through Aiken's V validity test. The reliability test is employed to evaluate the coherence or constancy of the measurement outcomes produced by an instrument when it is employed as a measuring tool for an entity or respondent. In order to assess the reliability of the validation instruments by subject matter experts, media experts, and learning experts, the Cronbach's Alpha formula will be applied (Sugiyono, 2019:365). The data derived from the feasibility testing phase will undergo analysis through descriptive statistical methods, as elucidated by Sugiyono (2017:147). Descriptive statistical analysis is employed to examine the collected data in their original form, with no intention of drawing overarching conclusions or generalizations. This descriptive approach serves to elucidate and characterize the data pertaining to the developed product, which is the online learning media designed for large ball game activities. The quantitative data obtained from the feasibility assessment of the online learning media will be transformed into a 5-point scale utilizing a designated conversion reference (Sukardjo, 2012; Nofia & Isroan, 2016). Table 1 serves the purpose of categorizing scores into distinct feasibility levels, utilizing predetermined score intervals. This categorization aims to offer a comprehensive evaluation of the degree to which an object or subject is deemed feasible or less feasible, as determined by the attained scores during the evaluation process. Consequently, Table 1 establishes a structured and unbiased framework for classifying feasibility through pre-established score intervals, rendering the comprehension and communication of evaluation outcomes more accessible.

Table 1.

Criteria for Assessment of Due Diligence on Small Scale and Large Scale

No	Score Intervals	Category
1	$X > Mi + 1.8 Sbi$	Very good
2	$Mi + 0.6 Sbi < X \leq Mi + 1.8 Sbi$	good
3	$Mi - 0.6 Sbi < X \leq Mi + 0.6 Sbi$	Middle
4	$Mi - 1.8 Sbi < X \leq Mi - 0.6 Sbi$	Bad
5	$X \leq Mi - 1.8 Sbi$	Very bad

The values falling above the range of  $Mi + 1.8 Sbi = 5$  indicate that the subject or object being assessed is highly feasible or fully meets the expected criteria. Values falling within the range of  $Mi + 0.6 Sbi$  to  $Mi + 1.8 Sbi = 4$

indicate that the subject or object being assessed is feasible or meets the expected criteria. Values falling within the range of  $Mi - 0.6 Sbi$  to  $Mi + 0.6 Sbi = 3$  indicate that the subject or object being assessed is moderately feasible or moderately meets the expected criteria. Values falling within the range of  $Mi - 1.8 Sbi$  to  $Mi - 0.6 Sbi = 2$  indicate that the subject or object being assessed is less feasible or does not fully meet the expected criteria.  $Mi - 1.8 Sbi = 1$  indicates that the subject or object being assessed is highly infeasible or does not meet the expected criteria at all.

## Results

The research findings are sequentially presented, encompassing (1) expert validation analysis outcomes concerning content, (2) expert validation analysis outcomes relating to media, and (3) expert validation analysis outcomes pertaining to learning. Moreover, the paper includes the (4) outcomes of the analysis for expert instrument reliability testing, (5) outcomes and analysis of small-scale pilot testing, (6) outcomes and analysis of large-scale pilot testing, (7) results of the normality test, (8) outcomes of the data homogeneity test, and (9) results of the Paired Sample T-Test.

Table 2.

Validation Results on Learning Media Materials

No	Aspect	Validators		$\sum S$	V	Category
		1	2			
1	Material Relevance	25	23	38	0.950	Very Good
2	Material Accuracy	25	23	38	0.950	Very Good
3	Material Substance	36	36	56	0.875	Very Good
4	Language	9	10	15	0.937	Very Good
5	Evaluation	19	18	29	0.95	Very Good
6	Learning Strategy	14	15	23	0.958	Very Good
Total		128	125	199	0.921	Very Good

The table illustrates the evaluation outcomes of diverse facets within a given text or material. These facets encompass material relevance, material accuracy, material substance, language, evaluation, and learning strategies. The figures in the 'Validator' column denote the ratings or scores assigned by validators for each individual facet, spanning from 9 to 36. The  $\sum S$  column shows the total score obtained for each aspect. These scores are calculated by summing up the validator scores for each aspect. The V column reflects the average value calculated based on the validator scores for each aspect, ranging from 10 to 36. The table category indicates the assessment for each aspect, with the result being "Highly Suitable."

The data presented in Table 2 represent the results of expert validation for each aspect, exhibiting Aiken's coefficients ranging from 0.89 to 1.00 for every interval score. Consequently, drawing from the data provided in the table, the assessed text or material in its entirety can be classified as 'Highly Suitable,' with an average validator score of 0.921. Furthermore, each individual aspect garners a 'Highly Suitable' rating in accordance with the scores assigned by the validators.

Table 3.

Validation Results on All Aspects of Media

No	Aspect	Validators		$\Sigma S$	V	Category
		1	2			
1	Language	9	10	15	0.937	Very Good
2	Effect on learning strategy	29	33	48	0.857	Very Good
3	Software engineering	14	14	22	0.916	Very Good
4	Visual display	27	29	44	0.916	Very Good
5	Media accuracy	17	19	28	0.875	Very Good
6	Media use	25	25	40	1	Very Good
	Total	121	130	197	0.916	Very Good

Table 3 presents the results of expert validation on various aspects evaluated related to media. The Validator column indicates the scores given by the validators for each aspect, ranging from 9 to 33. The  $\Sigma s$  column shows the total score obtained for each aspect. The V column reflects the average value calculated based on the validator scores for each aspect, ranging from 0.857 to 1. The assessment category for each aspect in the table is rated as "Highly Suitable." The total score obtained from all aspects,  $\Sigma s$ , is 197, and the average score (V) is 0.916. Based on the provided information, the expert validation results for all assessed aspects related to media show Aiken's coefficients ranging from 0.85 to 1.00 for each interval score. This range signifies that the media adheres to elevated standards concerning language proficiency, influence on learning strategies, software engineering, visual presentation, media accuracy, and media application. The comprehensive appraisal of the media merits the classification of 'Highly Suitable.'

Table 4.

Validation Results on All Aspects of Learning Experts

No	Aspect	Validators		$\Sigma S$	V	Category
		1	2			
1	Language	19	18	29	0.91	Very Good
2	Learning Design	34	35	55	0.982	Very Good
3	Material Substance	29	29	46	0.958	Very Good
4	Visual Display	24	23	37	0.925	Very Good
5	Effects on Learning Strategies	30	30	48	0.1	Very Good
	Total	136	135	215	0.959	Very Good

Table 4 represents the results of validation by learning experts on various aspects evaluated using the Aiken's V validity test. The Validator column indicates the scores given by the learning experts for each aspect, ranging from 18 to 35. The  $\Sigma s$  column shows the total score obtained for each aspect. The V column reflects the average value calculated based on the validator scores for each aspect, ranging from 0.91 to 0.982. The assessment category for all aspects in the table is rated as "Highly Suitable." The total score obtained from all aspects,  $\Sigma s$ , is 215, and the average score (V) is 0.959. Based on the provided information, the results of expert validation for all assessed aspects—language, learning design, material substance, visual presentation, and impact on learning strategies—have met rigorous standards according to the opinions of learning experts. This signifies that the evaluated learning materials have attained a notably high level of quality. These outcomes instill confidence in the effectiveness and alignment of the learning materials with the intended educational requirements.

Table 5.

Analysis Results on the Reliability Test of the Expert Instrument

No	Reliability Test	N of Items	N	Valid	Cronbach's Alpha
1	Material	2	27	100%	0.747
2	Media	2	27	100%	0.722
3	Learning	2	28	100%	0.861

Table 5 describes the results of reliability testing for all expert validation questionnaire instruments on all indicators for each instrument aspect. The questionnaire reliability values are as follows: the content expert validation questionnaire with 27 indicators has a reliability value of 0.747, the media expert validation questionnaire with 27 indicators has a reliability value of 0.722, and the learning expert validation questionnaire with 28 indicators has a reliability value of 0.861. The reliability testing results for all indicators using the Cronbach's Alpha technique indicate that the Cronbach's Alpha value is greater than 0.6. Therefore, it can be concluded that all question indicators in each aspect of this research instrument are reliable.

Table 6.

Data from Small-Scale Pilot Testing

No	Evaluated Aspect	Score	Category
1	Ease of Use	19,52	Good
2	Appearance	15,92	Good
3	Learning Aspect	35,72	Good
4	Evaluation Aspect	16,52	Good
5	Benefit Aspect	16,48	Good

Table 6 presents the outcomes of a small-scale pilot test, wherein diverse assessed aspects exhibit commendable performance. This pilot test on a reduced scale was executed with 25 students from Class XI of the 52nd Agricultural Vocational High School in Yogyakarta. The ease of use aspect achieved a score of 19.52 and is classified as "Good," implying that the tested product or service is notably user-friendly. Similarly, the appearance aspect garnered a score of 15.92 and is also categorized as "Good," signaling that the product or service possesses commendable visual quality. Moreover, the learning aspect secured a score of 35.72 and falls under the "Good" category, suggesting that the product or service effectively aids the learning process. The evaluation aspect achieved a score of 16.52 and is classified as "Good," signifying that the product or service incorporates sufficient evaluation methodologies. Lastly, the benefit aspect achieved a score of 16.48, falling within the "Good" category, which suggests that users can attain noteworthy advantages from the tested product or service. Overall, the outcomes of this pilot test affirm that the product or service fulfills expectations across all evaluated dimensions.

Table 7.

Data from Large-Scale Pilot Testing

No	Evaluated Aspect	Score	Category
1	Ease of Use	21,56	Very Good
2	Appearance	17,56	Very Good
3	Learning Aspect	38,65	Very Good
4	Evaluation Aspect	16,83	Very Good
5	Benefit Aspect	16,90	Very Good

Table 7 portrays data derived from an extensive pilot test, encompassing diverse evaluated facets. The feasibility testing phase engaged a total of 138 students. The aspect of ease of use garnered a score of 21.56, highlighting the pronounced user-friendliness of the tested product or service. Additionally, the appearance aspect achieved a score of 17.56, attesting to the product or service's exceptional quality in terms of visual presentation. The learning aspect garnered a score of 38.65, thus illustrating the product or service's pronounced efficacy in facilitating the learning process. The evaluation aspect acquired a score of 16.83, underscoring the presence of a highly effective evaluation methodology within the product or service. Finally, the benefit aspect achieved a score of 16.90, signifying substantial advantages that users can derive from the tested product or service.

The outcomes of the extensive pilot testing reveal that the tested product or service excels comprehensively in all assessed dimensions, engendering a high degree of satisfaction. It showcases exceptional performance concerning user-friendliness, appealing aesthetics, effective learning reinforcement, robust evaluation methodologies, and substantial advantages for its users..

Table 8. Results of the One-Sample Kolmogorov-Smirnov Test

One-Sample Kolmogorov-Smirnov Test		
	Unstandardized Residual	
N	137	
Normal Parameters <sup>a,b</sup>	Mean	.0000000
	Std. Deviation	10.32466312
Most Extreme Differences	Absolute	.069
	Positive	.059
	Negative	-.069
Test Statistic	.069	
Asymp. Sig. (2-tailed)	.200 <sup>c,d</sup>	

a. Test distribution is Normal.  
 b. Calculated from data.  
 c. Lilliefors Significance Correction.  
 d. This is a lower bound of the true significance.

The results of the normality test conducted using the

Table 11. Data Results from the Paired Samples Test

		Paired Samples Test							
		Paired Differences			95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	Pre Trest	-23.562	11.937	1.020	-25.579	-21.545	-23.104	136	.000
	Post Test								

Drawing upon the data presented in Table 11, it becomes evident that the computed t-value for the pre-test and post-test learning outcomes stands at -23.104, accompanied by a probability of Sig. (2-tailed) amounting to 0.000. As the probability of Sig. (2-tailed) falls below the threshold of 0.05, the null hypothesis (H0) is refuted. Consequently, it is established that the utilization of online learning-based instructional media for large ball games significantly impacts student learning outcomes. Drawing from the analysis conducted employing SPSS version 25 and

Kolmogorov-Smirnov test, as shown in the SPSS output above, indicate that the Asymp. Sig. (2-tailed) value is 0.200. Based on the interpretation criteria mentioned, it can be concluded that the Asymp. Sig. value > 0.05, indicating that all the pre-test and post-test data in this study follow a normal distribution.

Table 9. Data on the results of the Test of Homogeneity of Variances

Test of Homogeneity of Variances					
		Levene Statistic	df1	df2	Sig.
Post Test	Based on Mean	.880	4	132	.478
	Based on Median	.836	4	132	.505
	Based on Median and with adjusted df	.836	4	120.617	.505
	Based on trimm	.887	4	132	.474

Drawing from the data presented in Table 9, an observation emerges wherein the acquired significance value surpasses 0.05, notably amounting to 0.478. This observation permits the conclusion that the variances within the pre-test and post-test data of this study exhibit homogeneity.

Table 10. Data on the Mean Value of the pretest and post-test

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre-Trest	57.62	137	11.848	1.012
	Post-Test	81.18	137	11.871	1.014

Derived from the paired samples statistics output, a comprehensive overview of descriptive statistics is revealed for both the pre-test and post-test data. It becomes evident that the pre-test's mean value stands at 57.62, while the post-test records 81.18, each drawing from a sample size of 137 students. The standard deviation for the pre-test learning outcomes is 11.848, and for the post-test, it is 11.871. Furthermore, the standard error of the mean for the pre-test is calculated as 1.012, and for the post-test, it equals 1.014.

the paired samples test, a conclusive inference can be drawn: the instructional media centered around online learning for large ball games exerts a notable impact on students' learning outcomes within the domain of large ball games, proving effective in enhancing students' comprehension.

## Discussion

Engaging in learning through online media can offer

experiences closely tied to technology and the realm of online classes (Diciano et al., 2021). The creation of instructional media for large ball games, grounded in online learning methodologies, has demonstrated a constructive impact on the process of online education. This instructional media has been meticulously crafted to amalgamate components of large ball games with captivating online attributes, including videos, animations, and user interactions. Throughout its development, researchers have engaged subject matter experts, media specialists, and learning authorities in the validation process of the product. Utilizing online learning media as a method to alleviate the workload of educators can enhance instructional efficiency, engage students, and empower teachers to concur with students' interpretations (Purnama, 2016). Through the evaluation undertaken by six experts, encompassing subject matter experts, media specialists, and learning authorities, it has been ascertained that the instructional media exhibits a significant degree of compatibility within the classification of "Highly Suitable." This indicates that the content presented in the instructional media is in alignment with the curriculum and pertinent learning materials. Moreover, the evaluation conducted by media experts has also rendered positive assessments of elements such as design, information presentation, and navigation within this instructional media. The incorporation of media into the learning process is pivotal for achieving and implementing effective learning outcomes. Students exhibit a profound interest in the application of distinct online media employed by educators, as well as in the usability of online learning methodologies (Apriyanto & S, 2021).

The development of online learning-based instructional media for large ball games has been founded upon the feasibility test outcomes from a small-scale study, as illustrated in Figure 2. The small-scale test encompassed the collection of feedback from students who served as users of the online learning-based instructional media during the product trial phase. This preliminary test highlighted the instructional media's capacity to aid students in comprehending and mastering the concepts of large ball games. Students offered positive feedback regarding their interaction with this instructional medium, citing its content clarity, interactive activities, and overall learning satisfaction. The evaluation encompasses five aspects. The first pertains to the usability of the media, involving five indicators. It garnered an average score of 19.52, resulting in a rating of 'Suitable.' The second aspect concerns media design, comprising four indicators, with an average score of 15.92, also attaining a 'Suitable' rating. The third aspect relates to the learning dimension of the media, involving nine indicators. The learning aspect achieved an average score of 35.72, and similarly received a 'Suitable' rating. The fourth aspect pertains to the evaluative facet of the learning process, comprising four indicators. It achieved an average score of 16.52, warranting a rating of 'Suitable.' The concluding aspect centers on the media's benefits,

encompassing four indicators and garnering an average score of 16.48, also receiving a 'Suitable' rating. The online learning-based large ball game instructional media has the potential to furnish technical and innovative solutions, thereby enhancing the teaching of physical education. Additionally, it contributes to the technological design landscape, allowing for limitless integration within physical education. This is particularly significant given the ongoing global shift towards distance and e-learning (Almusawi et al., 2021).

Within the expansive trial, the online-based large ball game learning media garnered favorable responses from students. They observed this instructional medium to be more captivating and enjoyable when juxtaposed with conventional pedagogical approaches. Motoredjo (2022) discovered that the integration of online-based learning media can bolster student motivation and foster active participation in the learning process. This is consistent with the outcomes of the present study, wherein students offered favorable feedback regarding their utilization of the online-based large ball game learning media, an engagement that heightened their learning interest and involvement (Amran, 2021). This suggests that the incorporation of this instructional media has the potential to amplify student motivation and cultivate a greater interest in the learning process. The comprehensive feasibility trial in Figure 3, presented above, illustrates the overall assessment results of the five aspects employed in the large-scale feasibility trial involving 138 students from Class XI at Vocational High School 2 Depok Sleman and Vocational High School 6 Yogyakarta, comprising two classes from each school. The ease of media usage aspect achieved an average score of 21.56, falling under the classification of 'Very Good.' Similarly, the media design aspect acquired an average score of 17.56, also classified as 'Very Good.' The learning aspect embedded within the media content garnered an average score of 38.65, achieving a 'Very Good' classification. The assessment of the learning aspect yielded an average score of 16.83, also classified as 'Very Good.' Similarly, the aspect of media benefits garnered an average score of 16.90, earning a 'Very Good' classification as well. The creation of online-based learning media for large ball games stands as one of the initiatives aimed at tackling the challenges encountered in online learning (Rizky et al., 2013).

Online learning is a system that enables students to engage in more extensive, diverse, and versatile learning experiences. The system's provided facilities allow learning to take place anytime and anywhere, overcoming constraints posed by distance, space, and time (Susanti, 2020: 96-97). Learning materials encompass a broader range of formats, encompassing not only verbal content but also visual, audio, and kinesthetic elements (Yuliani, 2020: 3). The implementation of online learning systems constitutes one of the strategies that can be employed to address challenges and facilitate students' access to educational resources (Anugrahana, 2020). Online learning

encompasses a spectrum of approaches, including e-learning, internet-based learning, distributed learning, networked learning, virtual learning, computer-assisted learning, web-based learning, and distance learning (Gusty, 2020: 50). The positive impacts of digital technology media on Physical Education classes are well-acknowledged, leading to enhanced student learning capabilities and motivation (Modra et al., 2021). Students engaged in remote and virtual learning exhibit varying degrees of involvement, and leisure activities assume a restorative function in terms of promoting learning well-being (Gerais et al., 2022). Educators hold a pivotal role in the accomplishment of successful online learning endeavors. As outlined by Almonacid-fierro et al. (2021), challenges stemming from the reflective process and students' self-directed learning in training encompass restricted interaction with students within educational institutions, the adoption of online media as a pedagogical strategy, and the adverse influence on motivation levels attributable to virtual instruction. These contemplations warrant consideration during the preliminary training phase, recognizing the significance of incorporating professional practice to shape the pedagogical ethos of aspiring Physical Education educators. Educators are anticipated to possess the capability to formulate instructional activities and construct online learning materials utilizing suitable devices or media in alignment with the subject matter to be conveyed. In doing so, teachers are encouraged to devise inventive, pioneering, and recreational pedagogical approaches that foster active student participation within the online learning environment.

Online learning facilitates the shift towards self-directed learning. The practice of teaching and learning in the online realm can yield a favorable influence on the development of relationships (Murtagh et al., 2023). Within the domain of physical education, the utilization of online learning resources tailored for major ball games imparts novel experiences to students, affording them the chance to engage with more interactive and pleasurable learning materials. A majority of educators express a positive stance regarding the utilization of technology, particularly its application within educational institutions. These educators underscore the advantages and potential considerations associated with its implementation (Wort et al., 2021). Employing online media for delivering physical education lessons holds the capacity to facilitate the cultivation of various skills among students. This encompasses problem-solving abilities, interpersonal communication, leadership aptitude, creativity, and more. By involving students directly with pertinent content, which, in turn, fosters enduring engagement in physical activities, online media contributes to encouraging lifelong active participation (Goad et al., 2021). The utilization of technology in educational media constitutes a compelling catalyst for enhancing physical education (Marttinen et al., 2019). As highlighted by de Guadalupe et al. (2021), online education is regarded as an optimal medium; however, its hasty

implementation gives rise to skepticism regarding its efficacy. The integration of technology is tasked not only with fulfilling its requisite functions but also with serving as pedagogical mediation that enriches the instructional process and adjusts learning assessments to the prevailing circumstances (Almonacid-fierro et al., 2021). Mobile-assisted learning systems offer additional value by affording learners the opportunity to engage in flipped classroom learning at any time and from any location. The integration of technology into learning can be perceived as a pivotal factor that steers students toward self-directed learning (Wang, 2016).

As indicated by Sumaryoto & Nopembri (2016:1) in the student book for physical education, sports, and health published by the Ministry of Education and Culture, the category of major ball games encompasses three distinct sports branches: (1) soccer, (2) volleyball, and (3) basketball. Drawing from Arifin's perspective (2016:2), soccer, basketball, and volleyball stand as notable examples of major ball games due to their utilization of larger-sized balls and their characteristic group play dynamics. These major ball games serve as pivotal avenues for fostering attributes such as autonomy, respect, prosociality, and enjoyment among students who engage in these sporting activities (Alcayne et al., 2021). Consequently, the creation of online learning resources tailored for major ball games significantly enhances the realm of online education within this domain.

The paired samples t-test data presented in Table 26 reveal that the computed t-value for the pre-test and post-test learning outcomes is -23.104, accompanied by a two-tailed significance probability (Sig.) of 0.000. Given that the two-tailed significance probability (Sig.) is less than 0.05, the null hypothesis (H<sub>0</sub>) is thereby rejected. Consequently, this indicates a substantial impact of employing online learning media for major ball games on student learning outcomes. Through analysis using SPSS version 25 and the paired samples t-test, it is deduced that online learning media for big ball games exert a significant impact on students' learning outcomes in the domain of big ball games, thus proving efficacious in advancing students' knowledge. Online-based learning media have the capacity to augment students' comprehension of concepts and learning achievements (Pranata, 2022). This finding corroborates the outcomes of the present study, wherein students utilizing online learning media for big ball games manifest a noteworthy enhancement in their learning outcomes subsequent to engagement with this learning medium. Furthermore, the findings of this study are in alignment with Amran et al. (2021), who characterize online physical education and health education as efficacious in terms of knowledge acquisition, leading to favorable learning outcomes. Students express heightened satisfaction with online classes, both in theoretical and practical (sports) contexts (Almonacid-fierro et al., 2021). Learning facilitated by digital tools exhibits greater engagement, enhanced appeal, and convenient accessibility for students

seeking to acquire learning materials (Aguirre-cardona et al., 2021).

Building upon prior research, the discoveries of this study offer a significant contribution to the realm of online learning media and education. Despite certain challenges and impediments, especially those pertaining to internet connectivity, online learning has demonstrated successful implementation (Qomarrullah et al., 2023). While this study offers robust evidence concerning the feasibility and efficacy of online learning media in the context of big ball games for enriching students' knowledge, divergent outcomes emerge from prior research. Wasan et al. (2022) contend that the implementation of big ball games in online learning encounters difficulties stemming from environmental conditions. Moreover, many educators still grapple with the utilization of diverse online learning applications to facilitate physical education instruction (Bayu et al., 2020). Challenges inherent in conducting online learning encompass assignments and practical physical education lessons (Gandasari & Jipido, 2022). Furthermore, students encounter challenges in engaging with the subject due to the predominant use of video content in online learning (Kurniawan, 2022). Guretno et al. (2022) noted a decrease in students' learning outcomes, leading to the assessment of ineffectiveness in online learning materials. Additionally, certain students experience difficulties in grasping the content while utilizing online learning media (Takdir et al., 2022).

The development of online learning media further grants teachers the freedom to design learning materials in alignment with the learning objectives. The furnished learning materials direct the learning process towards pertinent information. Accessing the developed learning media does not necessitate specific software or a Gmail account; the media are conveniently accessible at any time and location for students. In accordance with Gerais et al. (2022), two intrinsic trends and one extrinsic trend surface as pivotal factors that enhance the utilization of this learning media: 1) the instruction of concepts, 2) confidence in digital technology as a medium for involvement in Physical Education, and 3) pedagogical time for planning. They contend that online education in physical education does not provide equivalent benefits to face-to-face education, and delivering physical education through an online environment constitutes a paramount professional challenge (de Guadalupe et al., 2021). The majority of teachers employ flipped classroom methodologies and conduct online classes, leading to increased complexity and challenges in the evaluation process. The cultivation of technological skills empowers both students and teachers to execute the learning process effectively (González Rivas et al., 2021). The development of online learning media can offer an engaging and effective alternative within the learning process, especially in the realm of online education. These learning media can serve as tools for teachers or instructors to facilitate teaching and involve students in active and interactive learning.

## Conclusions

This research endeavors to rectify the identified shortcomings by concentrating on learning media within the realm of physical education that incorporate relevant technology. The culmination of this research and development effort is an online learning-based instructional media for large ball games, specifically tailored to Grade XI students in a Vocational High School, to align with their requisites in the online learning milieu. The research and development outcomes highlight the media's substantial contribution to the enhancement of students' knowledge, as evidenced by the results. Hence, a definitive conclusion can be drawn that the utilization of online learning-based instructional media for large ball games exerts a significant influence on students' learning outcomes. Furthermore, the devised media effectively enhances students' knowledge acquisition in the study of subjects related to large ball games. Additional research is necessary to bolster these findings and to tackle the current limitations. Consequently, this study provides a robust groundwork for subsequent advancements in the realm of innovative and efficacious online learning media. Furthermore, the research suggests involving a more extensive sample size and conducting further studies to augment the effectiveness of this instructional media across diverse learning contexts.

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## Conflict of interest

We know of no conflict of interest associated with this publication, and there has been no significant financial support for this work that could have influenced its outcome. As the corresponding author, I confirm that the manuscript has been read and approved for submission by all the named authors.

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