

Development of Android Application-Based Volley Learning Media for Vocational High School Students

Ibrahim¹, Arjasman Sinaga², Ade Ros Riza³, Usman Nasution⁴

¹ Universitas Negeri Medan, Medan, Indonesia; ibrahim@unimed.ac.id

² Universitas Negeri Medan, Medan, Indonesia; nagapm2258@gmail.com

³ Universitas Negeri Medan, Medan, Indonesia; aderosriza@yahoo.com

⁴ Universitas Negeri Medan, Medan, Indonesia; usmanejirizma@gmail.com

ARTICLE INFO

Keywords:

Learning Media;
Volleyball Game;
Android Application Based

Article history:

Received 2023-03-06

Revised 2023-03-21

Accepted 2023-12-31

ABSTRACT

This study seeks to investigate how to develop learning materials for volleyball game material for class XI students. This study employed research and development (R&D) techniques, including large group tests for 30 class XI students and small group tests for 15 class XI students. For this study, questionnaires and questions were handed out to experts and students to gather data. Both qualitative and quantitative data analysis techniques were utilised. The volleyball game material developed in class XI was validated by three experts - two media experts and one material expert. 43% of participants are familiar with needs analysis, whereas the average rating for validation falls within the unfavourable range of 29% to 46%. The small group test has a validity level of 59%, with the validation level suggesting that the average validation value falls between 47% and 64%, making it suitable for the large group testing phase. Validation tests for large groups typically yield results ranging from 83% to 100%, indicating successful development of learning media for volleyball game material in class XI, falling within the very good category, and proving to be efficient and effective. In a recent test, 65% of students in the small group of 15 scored in the "good" category, while 87% of students in the large group of 30 achieved the same. Ranked in the "excellent" category. Hence, it can be inferred that utilising an Android-based application can enhance student learning outcomes in volleyball game content.

This is an open access article under the [CC BY-NC-SA](https://creativecommons.org/licenses/by-nc-sa/4.0/) license.



Corresponding Author:

Ibrahim

Universitas Negeri Medan, Medan, Indonesia; ibrahim@unimed.ac.id

1. INTRODUCTION

The COVID-19 pandemic has had far-reaching consequences in many domains, including education, and has afflicted numerous countries, Indonesia included. The Minister of Education and Culture issued circular letter number 4 of 2020 from the Ministry of Education and Culture (Kemendikbud) that dealt with the execution of education policies during the emergency period of the spread of the COVID-19 virus. One of these policies was implementing online/distance learning, which allowed students to study from the comfort of their homes.

Physical education is one of the disciplines included in junior high school (Destriani, 2021). The study of physical education is integral to the three dimensions, namely cognitive, affective, and psychomotor, which are developed and improved throughout the educational process through specific physical activities (Swadesi & Kanca, 2020). Students must comprehend the notion of motion and motor learning in physical education since it is crucial. One of the physical education subjects that are frequently taught in junior high schools is volleyball (Harahap & Akhmad, 2020). Those who want to play volleyball well need to grasp some fundamental movement strategies used in volleyball games. Volleyball has cognitive content in addition to the fundamental skills, such as rules, infrastructure, history, and other fields (Muharram et al., 2023).

The majority of volleyball sport learning activities take place on the court, but since the pandemic started, teachers have been forced to conduct their lessons online. Schools also conduct offline instruction while adhering to strict health procedure guidelines (Swadesi & Kanca, 2019). Teachers still occasionally rely on the traditional lecture technique of instruction, which involves using books as the main source of student learning, making the pupils bored and less enthusiastic in learning since, especially in sports instruction, kids become lethargic when required to read detailed content (Cahya & November, 2022). Since the epidemic, Sports physical Education and health (hereafter, PJOK) instructors have been expected to use current technology, although not all teachers can do so because they are still unfamiliar with it. According to research by Novianto & Ribowo (2022), online learning creates new issues for both teachers and students. Almost 81% of teachers from the 1980s generation reported having issues with the online learning tools they used. PJOK learning is education that emphasizes doing rather than merely studying theory (Ginting & Helmi, 2020). Hence, PJOK teachers must be innovative and creative in order to present engaging learning materials Encourage students, and facilitate their understanding of the content in both theory and practice (Berutu et al., 2020). such as using educational media, which can include text, video, graphics, and sound. Both theory and practice are being taught in order to help students comprehend the subject matter.

Learning media plays a crucial role in the learning process. Media should be integrated into all learning activities that catch the teacher's eye. Considering the constraints of school resources, educators need to innovate to support students in comprehending the material both in class and during self-study at home (Ardiansyah et al., 2020). Utilising learning media in the educational setting can spark fresh interests, boost student motivation, enhance learning experiences, and even have psychological effects on students (Sismahendra et al., 2020). Educational media serves as a channel for conveying information to students (Pratama et al., 2021). One example is educational media that utilise Android applications. Implementing learning through Android apps can enhance students' understanding of the content (Siregar et al., 2023).

Android is one of the information systems with the most users worldwide at the moment. In Kompas Tekno, 2015, The Verge Daily reported that Google made OS users number 1.4 billion in 2015. From the previous year, when Google announced that the Android operating system had been utilized by one billion active users worldwide, this number rose by 400 million active users. Leuw et al. (in Kasih, Hasibuan, & Priambada, 2020) report: 1) Android is an open-source, Linux-based operating system for smartphones and tablet computers developed by Google and the Open Handset Alliance. Android was developed as an open-source platform for application development as an operating system. The concept of Android application-based learning media, which typically takes the form of an educational application or an application that contains learning materials and materials, is novel in the field of education (Sari, 2021; Zulfahri et al., 2022). These application products can be downloaded from Google Play or the Play Store on Android-powered smartphones and other devices. A learning media product in the form of an application that can be downloaded or installed on an Android-based smartphone is essentially learning media based on Android applications (Ridwan & Anam, 2020; Vai, Slamet, Aspa, Rahmatullah, & Nanda, 2020).

Bahri and Zain in Ahdan (2020) mentioned that learning is implemented in a way that has educational value, and educational value affects how teachers and students interact. The process of putting sports and

health physical education learning into practice is one of them. According to Rosdiani (in Liu, 2021), Sports and Health Physical Education is an instructional cycle that uses proactive, methodically regulated tasks within the general framework structure of the school to create and further develop individuals naturally, neuromuscular, perceptually, psychologically, and mentally (Nurhayat E & Tanziil S, 2021; Pangesti, Nopriansyah, & Fatonah, 2021). Learning can be designed creatively by educators with the use of a variety of learning approaches, which can make instruction more engaging for students and more effective for teachers (Wahyuningtyas & Kurniawan, 2022; Astuti et al., 2022). In keeping with this, a teacher must be imaginative and inventive while presenting the material. Students require a variety of learning media at each meeting, according to the findings of observations made during the learning process that was conducted online through the media zoom by the researchers themselves, who are teaching staff and those in charge of volleyball game courses (Musa et al., 2021; Mostafa, 2022).

There is a lot of learning material involved in the process of implementing sports and health physical education instruction, including volleyball instruction. Sports and Health Physical Education is a method for achieving educational objectives through selected physical activities, games, or sports. One of the many subjects taught in high school is sports and health physical education (SMA). Volleyball is remembered for the Secondary School (SMA) educational program and is a compulsory game that all understudies should learn (Rianto et al., 2022). At the Young Men's Christian Association (YMCA), he teaches physical education. In addition to improving students' knowledge, learning volleyball can improve students' movement skills (Cook et al., 2018). A game that makes use of a large ball is volleyball. Volleyball is a game on a rectangular field 900 cm wide and 1800 cm long, limited by lines 5 cm wide, which is a net 900 cm long, extended solid and moving up to 243 cm (men just), and for ladies 224 cm. Serving, passing, slamming, and blocking are the fundamental volleyball techniques. It is also expected that the game of volleyball will help develop morals like honesty, sportsmanship, perseverance, and responsibility (Tatsiopoulos & Katsanta, 2018).

According to the research mentioned earlier, it is crucial to develop educational apps that incorporate volleyball game content and cater to students with special needs. The educational material being developed will be in the form of a volleyball-themed Android app. The app will offer various features for users to select, including descriptions of basic volleyball techniques, step-by-step sequences with motion images, and videos explaining fundamental volleyball techniques. The study aimed to evaluate the amount of learning material needed for students to grasp volleyball games through Android applications.

2. METHODS

Research and development methods, also referred to as R&D, are techniques used to study the creation of specific products and assess their effectiveness (Sugiyono, 2020). Preparing the test subjects in this study involved conducting the initial test with a small group, followed by the second test with a larger group. In the small group trial, about half of the 15 class XI students participated, all of whom were SMK Negeri 1 Percut Sei Tuan students. These students shared similar characteristics and were at the same stage as the 30 class XI students involved in the large group trial. Based on the development model in use, the development research process outlines the researcher's actions to create a product. This learning model follows a research procedure with eight stages, outlined below:

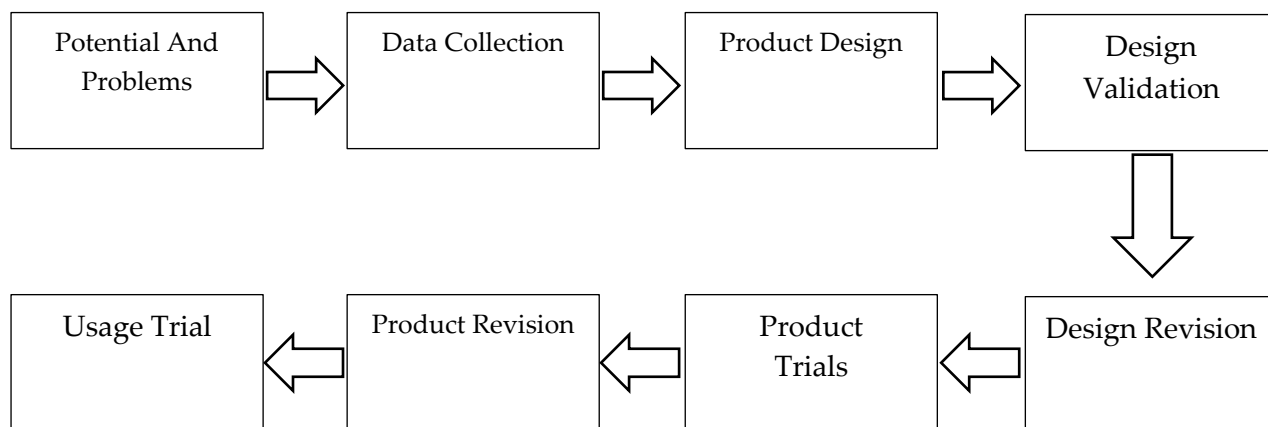


Figure 1. Steps for using the Research and Development Method (R & D)

The study utilised questionnaires and inquiries distributed to students, Android application-based media experts, teachers, and lecturers. A scale in the questionnaire instrument is utilised to assess respondents' views and perceptions of the product being developed. The interviewer needs to fill out a checklist in the designated column. The data collection methods for this study involve observing a school at SMK Negeri 1 Percut Sei Tuan, where the study's subject is located (Nugroho et al., 2022). Next, it's time to analyse the collected data. Analysed data from validation questionnaires filled out by teachers, lecturers, media experts specialising in Android applications, and students using data analysis techniques.

3. FINDINGS AND DISCUSSION

3.1 Findings

Each trial shows a clear increase in the percentage of volleyball game material experts needing 39% for individual trials, 63% for small group trials, and 88% for large group trials. Experts in physical education teaching materials conducted 43% pilot studies, 57% small group trials, and 91% large group trials. Media specialists conducted trials with different group sizes: 53% were individual trials, 59% were small group trials, and 87% were large group trials. You can observe these findings in the images and data presented in the following discussion.



Figure 2. Results of Expert Lecturer Materials in Volleyball Game Courses

Having 39% trial needs 63% small group trials and 88% large group trials, and the percentage results show a clear increase in the percentage of volleyball game material specialists. Trials were

conducted with a need-based approach by 43% of physical education teachers, with 57% using small groups and 91% using large groups. Among media experts, 53% participated in need trials, 59% in small groups, and 87% in big groups. The images and research findings that follow make these outcomes clear.

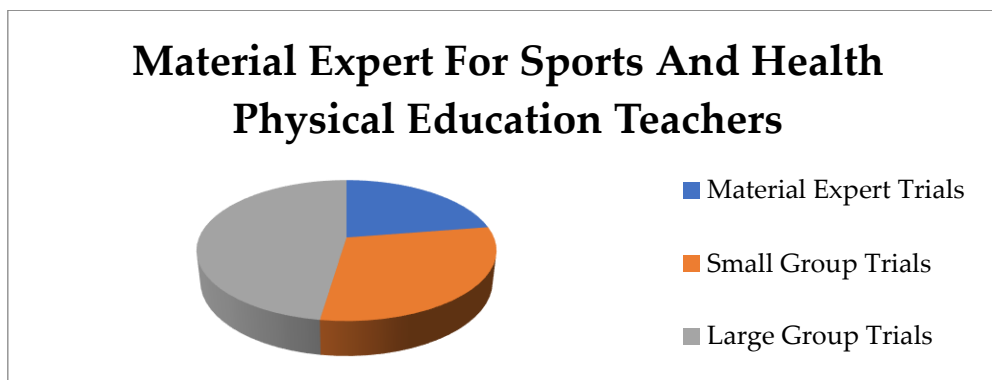


Figure 3. Results of the Material for Sports and Health Physical Education Teachers

The data generated from the validation of material experts for sports and health physical education teachers have a percentage of 43% with a poor category in the needs analysis trial, a percentage of 57% with a fairly good category in the small group trial, and has a percentage of 91% with very good category in large group trials. This percentage was obtained from the results of filling out a questionnaire/questionnaire for material experts for sports and health physical education teachers.

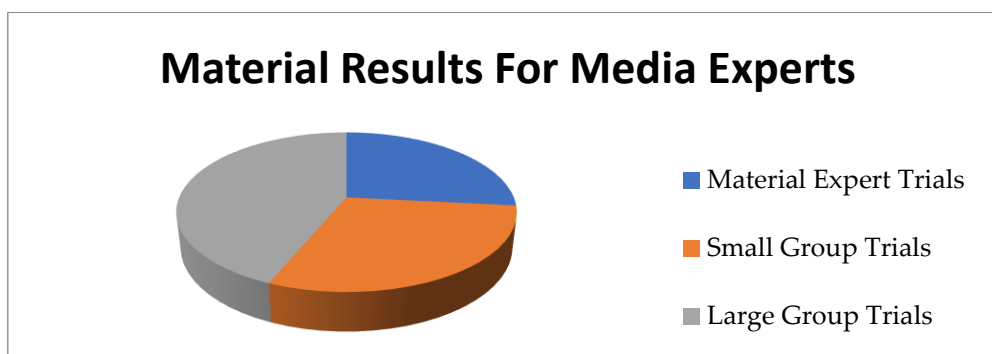


Figure 4. Material Results for Media Experts

The data generated from the validation of media experts have a percentage of 53% in the quite good category in the needs analysis trial, has a percentage of 59% in the fairly good category in the small group trial, and percentage of 87% in the very good category in the trial large group. The percentages and categories obtained from filling out the questionnaire are used for media experts.

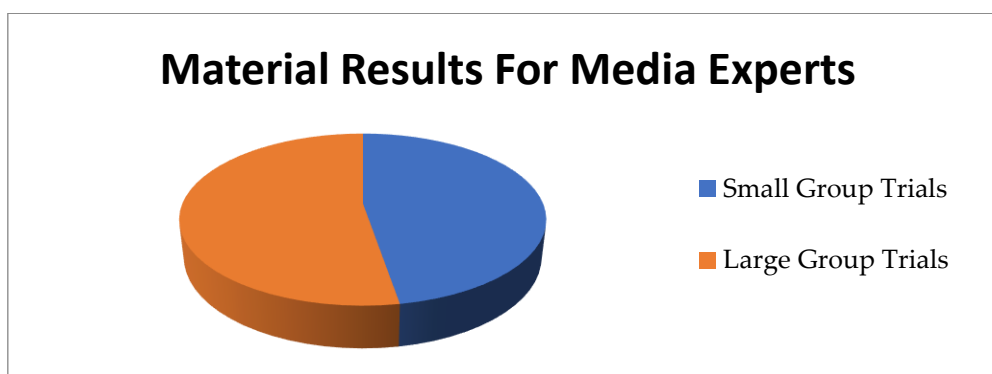


Figure 4. Material Results for Media Experts

At this point, there were 15 students in class XI who scored 65% in the good category during the small group trial for creating learning media for volleyball game material using an android application. Following the trial, students receive an assessment and evaluation tool to gauge their application of the volleyball game content. At this point, 30 class XI students achieved an 87% rating in the excellent category during the large group trial phase for creating educational material for volleyball using an Android application in class XI. Following the trial, students receive an assessment and evaluation tool to evaluate their implementation of the volleyball game.

Discussion

After conducting observations and brief interviews, the findings in the field indicate that in the educational process of volleyball games in schools through distance learning (Pembelajaran Jarak Jauh/PJJ), the utilisation of media or applications for presenting material is infrequent. Typically, the material is conveyed through direct demonstration methods in face-to-face distance learning without incorporating other media. During the covid pandemic, educators need to utilise online learning platforms. An issue arises when students' proficiency in online learning, particularly their grasp of utilising online application features, is not fully optimised, leading to disruptions in physical education instruction (Hasugian et al., 2020).

Learning the Volleyball Game for PJOK Class XI Upward Movement: 1) Prior to executing the basic pass, get into position by standing with your feet wide apart, bending at the knees to support your weight on the front of your foot, holding your arms overhead with your fingers and palms facing forward, and directing the ball in the desired direction. Keeping your heels lifted and your knees and hips straight is the foundational motion for upper passing, which also involves pushing both arms in the same direction as the ball coming together. When you touch a decent ball, it should feel snug around your fingertips. 3) Raise your hips and knees off the ground, keep your arms straight and look at the ball as you complete the basic passing motion.

Preparing for Physical Education and Health Class X (Volleyball Game) Movement in the higher echelons of the organisation: 1) Position yourself for success by maintaining an upright posture, focusing on the ball ahead with both feet, and gripping the ball in front of your body using your left hand. An upward service action involves the right hand swinging forward with the body and the left hand hitting the ball with the right hand while activating or whipping the wrist. The body is moving back somewhat, and the weight is on the rear foot. 3) The weight shifts to the rear foot (right) at the highest point of the service motion, while bouncing the ball. Physical Education Class X lesson plan (Volleyball) Smash: 1) Prior to executing the basic smash actions, warm up by standing with your weight on your front legs and looking straight ahead (net). 2) Employ your left hand to propel the ball upwards and backward approximately one metre in a forceful manner. 3) Perform a prefix motion by taking a minimum of two steps, ensuring that the final step is broad. Deny the movement: push back while raising both legs, then swing both arms forward. Strike: hit the ball using the palm of the hand

and engage the wrist. During the landing motion, step with both ends of your feet while ensuring your knees remain flat. After the final smashing motion, the knees are dropped and bent while the body goes forward, and the arms' weight is released in front of the body with the gaze directed upward.

Teachers struggle to publish high-capacity learning videos on internet platforms. Another challenge arises from the widespread usage of quotas in online learning, limiting some students' access to all the information the teachers offer. Android application-based learning media is a modern concept in education, usually in the form of an educational app or an app with instructional material (Safitri et al., 2019). Smartphones are valuable learning aids for students due to their user-friendly design and wide availability, providing opportunities for new experiences (Fortes et al., 2021). Smarttrees are user-friendly and accessible from anywhere and at any time. Destriani's (2021) study on student interest in e-learning found that students are eager to use a technology that can simplify tasks. Based on the needs analysis completed for this survey, 92.1% of students need an Android application to access educational resources easily. Do higher education institutions or schools need an assessment tool for physical activity to evaluate teaching staff, as suggested by Campillo-Ferrer et al. (2020) and Ali (2020)? Novaliendry et al. (2021) suggest that interactive volleyball games can be included as educational resources in Android-based learning platforms. To enhance students' interest and satisfaction in their studies, it is important to focus on their development (Amorim et al., 2022).

From the explanations and problems that existed in learning during the COVID-19 pandemic, researchers made products to support distance learning. The product that the researchers will make is an Android-based application, where the application is made to increase the effectiveness of distance learning during the Covid-19 pandemic. The application made by researchers is only for volleyball learning (Al-Amien et al., 2021). Products created by researchers can be downloaded so that when students do not have the application packages, they can still be used offline. Media/products created by researchers are application-based and provide various kinds of learning features such as; volleyball game rules, materials and teaching materials on volleyball games, quizzes, and exam questions on volleyball game learning materials.

4. CONCLUSION

Creating educational resources for volleyball game content using Android applications for 11th-grade students at SMK Negeri 1 Percut Sei Tuan is an innovative advancement in physical education. The application contains educational information, video volleyball games, volleyball-related questions, and fundamental technique instructions. The conclusion can be inferred from the trial outcomes and the researcher's analysis. Expert surveys on short and big trials indicated that creating android-based applications is very appropriate for incorporating volleyball game material into physical education learning throughout the new normal time. In the future, the expansion and innovation of android application-based learning in volleyball games in senior high schools are anticipated to increase.

REFERENCES

- Ahdan, S. (2020). Perancangan Learning Media For Basic Techniques Of Volleyball Using Android-Based Augmented Reality Technology. *Inovasi Pembangunan: Jurnal Kelitbangan*, 8(03), 221. <https://doi.org/10.35450/jip.v8i03.207>
- Akhmad, I., Valianto, B., & Bowo, D. (2021). Interactive Media as Optimization of Understanding Basic Football Techniques in Pandemic Period. *4th International Conference on Sports Sciences and Health (ICSSH 2020)*, 66–69. <https://doi.org/10.2991/ahsr.k.210707.017>
- Al-Amien, M. R., Iyakrus, I., & Sumarni, S. (2021). Improvement Learning Outcomes of Sepaktakraw Basic Techniques Using Audiovisual Media During Covid-19 Pandemic in PJOK Students of Sriwijaya University. *Journal of Educational Research and Evaluation*, 10(2), 74–85. <https://doi.org/10.15294/jere.v10i2.52352>

- Ali, W. (2020). Online and Remote Learning in Higher Education Institutes: A Necessity in light of COVID-19 Pandemic. *Higher Education Studies*, 10(3), 16. <https://doi.org/10.5539/hes.v10n3p16>
- Amorim, A. N., Jeon, L., Abel, Y., Albuquerque, E. X. S., Soares, M., Silva, V. C., & Neto, J. R. O. (2022). Escribo play learning games can foster early reading and writing for low-income kindergarten children. *Computers & Education*, 177, 104364.
- Ardiansyah, E., Pratama, H. G., & Sulendro, S. (2020). Pengembangan media pembelajaran berbasis aplikasi tentang isyarat-isyarat wasit bolavoli di SMA Negeri 2 Karang. *Journal of Physical Activity (JPA)*, 1(2), 60–72. <https://doi.org/https://journal.apopi.org/index.php/jpa/article/view/14>
- Astuti, Y., Zulbahri, Z., Erianti, E., Damrah, D., Pitnawati, P., & Rosmawati, R. (2022). Development of interactive learning media for low and overhead passing techniques in volleyball based on android technology using MIT app inventor. *Linguistics and Culture Review*, 6(S3), 213–220. <https://doi.org/10.21744/lingcure.v6nS3.2132>
- Bao, W. (2022). Current Situation and Development of Trend of Chinese Mobile Game Development. *2022 2nd International Conference on Enterprise Management and Economic Development (ICEMED 2022)*, 460–466. <https://doi.org/10.2991/aebmr.k.220603.075>
- Berutu, A. F., Jahro, I. S., & Sitorus, M. (2020). *Analysis of Chemical Practicum Guides for Learning Evaluation Based on the National Education Standards*.
- Cahya, I. Y. D., & Nopembri, S. (2022). The Development of Learning Media Based on Digital Card Learning to Improve High Level of Thinking Skills and Basket Ball Passing Skills of Junior High School Students. *International Journal of Multicultural and Multireligious Understanding*, 9(7), 130–139. <https://doi.org/http://dx.doi.org/10.18415/ijmmu.v9i7.3812>
- Campillo-Ferrer, J. M., Miralles-Martínez, P., & Sánchez-Ibáñez, R. (2020). Gamification in higher education: Impact on student motivation and the acquisition of social and civic key competencies. *Sustainability (Switzerland)*, 12(12). <https://doi.org/10.3390/SU12124822>
- Cook, C. E., Baudouin, O. P. G., Lochrie, M., & Saidi, A. (2018). *CAST: Proximity broadcasting as a mode of news distribution in rural Armenia*.
- Destriani, D. (2021). Analysis of application-based learning media development needs android on volleyball game. *ACTIVE: Journal of Physical Education, Sport, Health and Recreation*, 10(3), 126–130. <https://doi.org/https://doi.org/10.15294/active.v10i3.50146>
- Fernando, J. (2022). Media Pembelajaran Bola Voli Interaktif Berbasis Android. *Jurnal Olahraga Dan Kesehatan Indonesia*, 2(2), 94–99. <https://doi.org/10.55081/joki.v2i2.587>
- Fortes, L. S., Fonseca, F. S., Nakamura, F. Y., Barbosa, B. T., Gantois, P., de Lima-Júnior, D., & Ferreira, M. E. C. (2021). Effects of Mental Fatigue Induced by Social Media Use on Volleyball Decision-Making, Endurance, and Countermovement Jump Performance. *Perceptual and Motor Skills*, 128(6), 2745–2766. <https://doi.org/10.1177/00315125211040596>
- Hamzah, A. (2021). *Metode Penelitian & Pengembangan (Research & Development) Uji Produk Kuantitatif dan Kualitatif Proses dan Hasil Dilengkapi Contoh Proposal Pengembangan Desain Uji Kualitatif dan Kuantitatif*. CV Literasi Nusantara Abadi.
- Harahap, A., & Akhmad, I. (2020). *Development of Interactive Learning Media Basketball Games in Subjects Physical and Sports Health Education*.
- Hasugian, I. A., Situmorang, J., & Saragih, A. H. (2020). *The Effect of Learning Models and Motion Ability on Learning Outcomes of Volleyball Passing Skills for Class VIII Students of Junior High School 6, Academic Year 2019-2020*. <https://doi.org/https://aisteel2020.unimed.ac.id/wp-content/uploads/2020/12/ABS-1.pdf>
- Kasih, I., Hasibuan, B., & PRIAMBADA, G. (2020). Development of polarization of data processing talent scouting test of android based volleyball sports. *Turkish Journal of Physiotherapy and Rehabilitation*, 32(3), 2300–2303.
- Konapure, R. C., & Lobo, L. M. R. J. (2021). Video Content-Based Advertisement Recommendation System using Classification Technique of Machine Learning. *Journal of Physics: Conference Series*, 1854(1), 012025. <https://doi.org/10.1088/1742-6596/1854/1/012025>

- Liu, X.-X. (2021). A systematic review of prevention and intervention strategies for smartphone addiction in students: Applicability during the COVID-19 pandemic. *Journal of Evidence-Based Psychotherapies*, 21(2).
- Meta Natasia Br Ginting, & Bobby Helmi. (2020). Peran Model Pembelajaran Example Nonexample Masa Pandemi Covid-19 Terhadap Peningkatan Hasil Belajar Bola Voli Siswa Kelas VIII Sekolah Menengah Pertama Negeri 2 Medan Tahun Ajaran 2020/2021. *Jurnal Mahasiswa Pendidikan Olahraga*, 1(2), 88–94. <https://doi.org/10.55081/jumper.v1i2.493>
- Mostafa, F. M. Y. (2022). *Development of Deep Neural Networks Framework for Travel User Interest Discovery from Visual Shared Data in Social Networks (Case Study Facebook, Sudan)*. Sudan University of Science & Technology.
- Muharram, N. A., Suharjana, S., Irianto, D. P., Suherman, W. S., Raharjo, S., & Indarto, P. (2023). Development of Tenda IOT174 Volleyball Learning to Improve Cognitive Ability, Fighting Power and Sportivity in College Students. *Physical Education Theory and Methodology*, 23(1), 15–20. <https://doi.org/10.17309/tmfv.2023.1.02>
- Musa, R. M., Abdul Majeed, A. P. P., Suhaimi, M. Z., Abdullah, M. R., Mohd Razman, M. A., Abdelhakim, D., & Abu Osman, N. A. (2021). Identification of high-performance volleyball players from anthropometric variables and psychological readiness: A machine-learning approach. *Proceedings of the Institution of Mechanical Engineers, Part P: Journal of Sports Engineering and Technology*, 1754337121110454. <https://doi.org/10.1177/175433712111045451>
- Novaliendry, D., Huda, A., Sanita, D., Putra, D. A., Nasution, M. D. F., Putra, R. S., & Hidayati, R. N. (2021). Android-Based Network Services Application Learning Media for Vocational High Schools. *International Journal of Interactive Mobile Technologies*, 16(20), p83-100.
- Nugroho, H., Iyakrus, I., Bayu, W. I., Usra, M., Hartati, H., & Syafaruddin, S. (2022). Development of Preparation of Exercise Programs to Improve Physical Fitness Through Applications to Banyuasin III Men's Volleyball Club Athletes. *Kinestetik: Jurnal Ilmiah Pendidikan Jasmani*, 6(2), 349–362. <https://doi.org/10.33369/jk.v6i2.22107>
- Nurhayat E, I., & Tanzil S, M. (2021). PJTV as a Sunda Cultural Socialization Media. *Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences*, 4(1), 806–816. <https://doi.org/10.33258/birci.v4i1.1681>
- Pangesti, K. D., Nopriansyah, M., & Fatonah, H. (2021). Development of Volleyball Learning Media Models for First Middle School Students. *Journal of Physical Education Health and Sport*, 8(2), 35–38. <https://doi.org/https://doi.org/10.15294/jpehs.v8i2.31222>
- Prasetyo, D. E., & Handayani, F. (2020). E-Module for Learning Volley Ball Using Character Based on Adobe Flash Cs6. *Journal of Education Technology*, 4(3), 325. <https://doi.org/10.23887/jet.v4i3.28517>
- Pratama, D. S., Sumarni, S., Safaruddin, S., & Iyakrus, I. (2021). Digital Based Learning Media Development to Increase Baseball Technique for Grade VI Elementary School Students. *Journal of Educational Research and Evaluation*, 10(1), 19–27. <https://doi.org/10.15294/jere.v10i1.48131>
- Rianto, B., Ridha, M. R., & Alsa, I. (2022). Media Pembelajaran Berbasis Multimedia Untuk Mata Pelajaran Pjok Di Sma N 1 Tembilahan. *Jurnal Tekno Kompak*, 16(1), 175–185.
- Ridwan, M., & Anam, M. K. (2020). Optimization of Information Systems Academic Schedule Based on Mobile Application Using WEB Service Bridge. *ICSET 2019: Proceedings of the First International Conference of Science, Engineering and Technology, ICSET 2019, November 23 2019, Jakarta, Indonesia*, 261.
- Safitri, I., Pasaribu, R., Simamora, S. S., & Lubis, K. (2019). The Effectiveness of Android Application as a Student Aid Tool in Understanding Physics Project Assignments. *Jurnal Pendidikan IPA Indonesia*, 8(4), 512–520. <https://doi.org/10.15294/jpii.v8i4.19433>
- Sari, N. R. (2021). Development of Interactive Learning Media For Software Engineering Subject Chapter Process Modeling in Higher Education. *Letters in Information Technology Education (LITE)*, 3(2), 54–59. <https://doi.org/http://dx.doi.org/10.17977/um010v3i22020p54-59>
- Siregar, S., Faridah, E., & Hasibuan, R. (2023). Applications-Based Learning Media to Improve Students'

- Table Tennis Basic Skills: Viewing its Effectiveness. *AL-ISHLAH: Jurnal Pendidikan*, 15(1). <https://doi.org/https://doi.org/10.35445/alishlah.v15i1.2206>
- Sismahendra, W., Rusdiana, A., & Yudiana, Y. (2020). Improved Understanding of Student Concepts and Skills in Volleyball Learning through Mobile Learning. *Pedagogi: Jurnal Ilmu Pendidikan*, 20(2), 99–110. <https://doi.org/10.24036/pedagogi.v20i2.901>
- Swadesi, I. K. I., & Kanca, I. N. (2019). Learning Media Development Physical Education Sport and Health Based Applications. *Proceedings of the 1st International Conference on Education Social Sciences and Humanities (ICESSSHum 2019)*, 830–840. <https://doi.org/10.2991/icesshum-19.2019.130>
- Swadesi, I. K. I., & Kanca, I. N. (2020). The Development of Physical Sports and Health Education Learning Media Based on Android Applications. *Proceedings of the 3rd International Conference on Innovative Research Across Disciplines (ICIRAD 2019)*, 373–378. <https://doi.org/10.2991/assehr.k.200115.061>
- Tatsiopoulou, C., & Katsanta, D.-M. (2018). On ontologies and knowledge associations in gamified Environments. *2018 9th International Conference on Information, Intelligence, Systems and Applications (IISA)*, 1–7.
- Triarisanti, R., & Purnawarman, P. (2019). the Influence of Interest and Motivation on College Students' Language and Art Appreciation Learning Outcomes. *International Journal of Education*, 11(2), 130. <https://doi.org/10.17509/ije.v11i2.14745>
- Vai, A., Slamet, S., Aspa, A. P., Rahmatullah, M. I., & Nanda, F. A. (2020). Development Of Lectora Inspire Based Learning Media For Human Body Anatomy. *Jurnal MensSana*, 5(2), 165–172. <https://doi.org/10.24036/MensSana.050220.09>
- Wahyuningtyas, D., & Kurniawan, A. W. (2022). Pengembangan Media Pembelajaran Video Animasi Teknik Cekikan Judo (Shime Waza) Berbasis Aplikasi Articulate Storyline. *Sport Science and Health*, 4(4), 338–346. <https://doi.org/10.17977/um062v4i42022p338-346>
- Zulbahri, Z., Astuti, Y., Sasmita, W., Pitnawati, P., Erianti, E., Damrah, D., & Rosmawati, R. (2022). effectiveness of developing gymnastics learning media with the application of teileren and global (ganze) a method based on lectora digital. *Linguistics and Culture Review*, 6(S3), 248–263. <https://doi.org/10.21744/lingcure.v6nS3.2133>