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The android-based instrument for performance assessment of football

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ABSTRACT

The android-based performance assessment instrument in football learning is the result of developing a football learning assessment instrument that adapts to the digital era. This study aims to test the validity and practicality of an android-based performance assessment instrument in football learning. The research method used was a validation test by media and soccer material experts and a practicality test by a football course lecturer. Application testing is carried out based on predetermined criteria. After being assessed by the validator and meeting the valid criteria, this application is tested (implemented) by the subject or user. The data collection instruments were field notes, expert validation sheets, and questionnaires. The media feasibility test of the assessment referred to the User Experience Questionnaire (UEQ) standard. Data analysis was conducted to determine the applicant's eligibility and validity category based on the assessments of media experts and soccer learning evaluation experts. The results showed that the developed application was acceptable, with an average score of 3.67 from media experts and 3.83 from material experts so the total average of the expert test is 3.75 with very valid criteria. The product developed is an application of an android-based performance instrument for soccer learning that follows the assessment rubric in the PJOK curriculum and is practically used by PJOK educators as an evaluation tool for PJOK football material.

Keywords: performance appraisal, football, validity, practicality

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INTRODUCTION

The world experienced shocks in all sectors during the COVID-19 pandemic. The education sector was one of the affected sectors, which resulted in a massive change in the learning paradigm (Muktiani et al., 2022). On March 17, 2020, the Indonesian government issued Circular Number 36962/MPK.A/HK/2020, through the Minister of Education and Culture, concerning online learning and working from home in the context of preventing the spread of COVID-19. The implication is that the preparation for learning, the learning process, and the evaluation of learning is carried out online. Online learning certainly requires technology to support the creation of the three learning processes above.

The COVID-19 pandemic increasingly forces all educational actors (students, teachers, and stakeholders) to utilize technology. The existence and use of digital technology are certainly a savior for the world of education in this critical period (Javaid et al., 2020); Seale et al., 2021). Digital technology, or information technology, as the leading force in post-pandemic education reform, can become a new technology in supporting the learning process in all educational units. The technology in question is mobile phones, smart boards, tablets, laptops, and virtual laboratories, which have been proven effective in educating Generation Z at a low cost (Keengwe & Bhargava, 2014). Technology in education makes it easy for teachers to provide knowledge and makes it easy for students to acquire knowledge (King & Nagasubramani, 2018).

Technological developments in education have reached mobile learning (mobile learning), involving educators, media, peers, experts, and the wider world (Bernacki et al., 2020). Students are freer to interact and be fully involved in learning when students can take advantage of the technology provided by educational institutions (Attallah & Ilagure, 2018). The use of technology in education must be monitored and evaluated to reduce the negative impact of applying technology in learning (Alhumaid, 2019).

The use of technology in education covers all levels and subjects. Therefore, the application of technology in higher education physical education needs to be considered because it is an essential component of the higher education system and national health plan (Ding et al., 2020). For educational actors and institutions, this is very important to fulfill the need to create digital pedagogies for physical education (Koekoek & van Hilvoorde, 2018). Creating digital pedagogy (technology) in physical education can pave the way for learning and teaching by enhancing active experiences to help students develop the skills, attitudes, and knowledge needed for lifelong activities. Still, some educators have difficulty finding ways to integrate technology into learning (Yu et al., 2018).

The use of technology in education is usually used as a learning medium, but what is most important in learning is an evaluation that can provide concrete data on the development of students. The use of technology in learning can be an inspiration for teachers to develop better learning tools. The analysis found that the evaluation of learning technology uses focused on eight themes: learning outcomes, affective elements, behaviors, design, technology elements, pedagogy, presence, and institutional environment (Lai & Bower, 2019).

The system for assessing student performance on football material challenges physical education educators. Decision-making or evaluating performance cannot be forgotten when assessing sports actions (García-Ceberino et al., 2020). The football material contains complex sub-materials about the performance of basic soccer skills. The practical skills taught in football learning courses include (1) passing control, (2) dribbling, (3) shooting (Lubis et al., 2020) (4) heading (Ardha et al., 2018). Therefore, developing an instrument of digital-based football skill performance assessment is necessary. The development of technology applied in universities, especially the Faculty of Sports and Health (FOK), Universitas Pendidikan Ganesha (Undiksha) integrates computational technology and motion assessment in mobile applications so that they can be used anywhere and anytime (Yu et al., 2018). Assessment is a systematic activity to obtain information by measuring students' knowledge, attitudes, and skills (Ardli et al., 2017). While the performance assessment is an active test that begins with students practicing and assessing, it is based on an assessment guide for measuring progress and student learning outcomes (Adiguzel, 2011). Performance assessment requires examinees or students to display skills based on knowledge and according to the specified competence (Putri et al., 2019).

Several researchers, namely Supriyono (2018), who developed a web-based skills assessment application, have researched the preparation of skills assessment instruments. Web-based instruments make it easier for educators to process student skill data but are inefficient when entering data in the field. The football scoring instrument from Supriadi and Mesnan (2022) is more efficient in data collection and processing of student skills because it is based on Android on the teacher's smartphone. However, it still does not cover all aspects of football skills. This android-based football skill performance assessment instrument was adopted from the David Lee/Australian Soccer Federation test and the test developed by Bobby Charlton and Nurhasan. Android is a complete, open, and accessible platform (Khotimah et al., 2022). Complete means designers can take a comprehensive approach when developing the Android platform. The operating system is secure, provides many tools for building software, and enables opportunities for application development. Open means that the Android platform is provided under an open license (open source) so developers can develop applications freely. Free means there are no licensing or royalty fees to develop on the Android platform, no membership fees, and no testing fees required. Android applications can be distributed and traded in any form. The purpose of the resulting product is to make it easier for football coaches to identify the individual skills of football players carrying out the initial selection at SSB or football clubs. Meanwhile, current researchers want to focus on performance instruments used in the lecture process at universities.

METHOD

This research tests the validity and practicality of the football skills performance instrument. Material and media experts will carry validity and practicality tests before being conducted on subjects or users. This study tested the validity of the product by using a validity test research design. Application testing is carried out based on predetermined criteria. The validator's assessment results are used as material for product revision. After being assessed by the validator and meeting the valid criteria, this application is tested (implemented) by the subject or user. The data collection instruments were field notes, expert validation sheets, and questionnaires. In the media feasibility test, the assessment refers to the User Experience Questionnaire (UEQ) standard (Laugwitz et al., 2009; Rauschenberger et al., 2013).

The subjects of this research are a media expert, a material expert, and five physical educators as practitioners. Media experts rated the instrument's attractiveness, convenience, and appearance. Material experts assess the suitability of material content with scientific knowledge and developments in football performance. The physical education teacher as a practitioner who directly applies this instrument assesses the effectiveness and efficiency of the instrument.

Data analysis was conducted to determine the application's eligibility (validity) category based on the assessment of media experts and soccer learning evaluation experts. The practicality of the application is also measured based on a questionnaire given to lecturers teaching soccer learning courses.

FINDING AND DISCUSSION

Finding

The football learning performance assessment instrument is intended to be a medium for lecturers in football learning courses at the Health and Recreation Physical Education Study Program Faculty of Sports and Health Ganesha University of Education, as well as a solution to problems, particularly those related to effectiveness in the process of evaluating football learning. This instrument has undergone needs analysis and design-making stages, which contain validity and practice tests that media and soccer material experts assess.

The Football Learning Performance Assessment Instrument is a mobile application that runs on the Android platform. This application is developed with the Flutter framework, DART programming language, and MySQL database. The integration between databases and applications uses Web Services. The prototype of the product developed is simple and clear, and it contains several sections, such as the login page, student list menu, and learning evaluation as shown in Figure 1.

Physical educators who want to access this application must have a username and password. A username and password can be obtained from the system administrator. Use a username and password to prevent unauthorized users from accessing this system. After logging in, there are several menus in the application. Student data menu to view student data that can be assessed. A new assessment menu to provide assessments to students and an assessment history menu to view assessments that have been carried out. Meanwhile, the menu about the application contains a description of application development. At the bottom is a profile menu for profile settings, changing rods, and profile photos.

After logging in, educators must change the password according to the desired character (Figure 2). Steps that educators must take include entering the old password provided by the administrator. Next, the educator enters a new password and confirms the password according to the desired password.

Educators use this page if they want to make a new assessment (Figure 3). First, the teacher gives the name of the assessment, the date of the start of the assessment, and the class being assessed. When finished, click “next assessment”. After making a new assessment, educators can assess according to the rubric that has been determined. Educators can slide the slider to the right and left. When finished, click Save and Done.

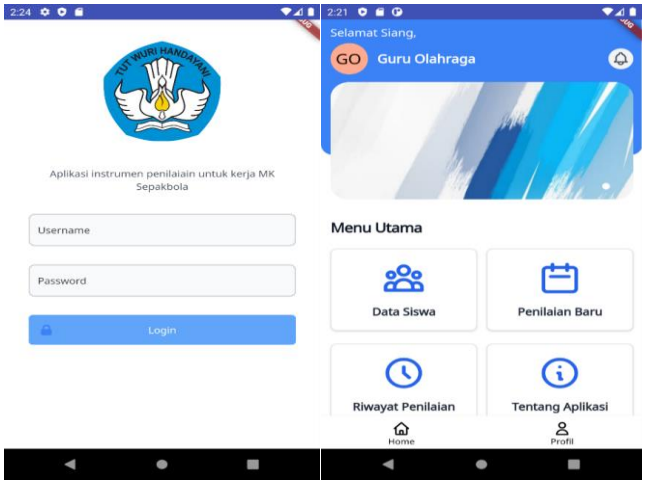

Figure 1. Login Page and Dashboard Page

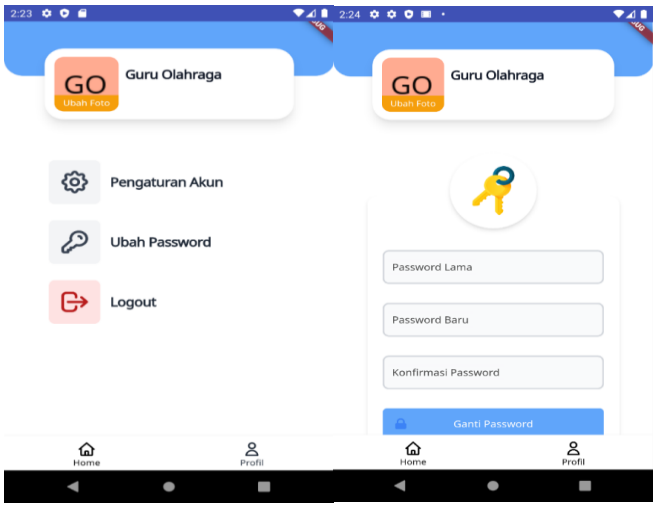

Figure 2. Profile Settings menu and Change Password

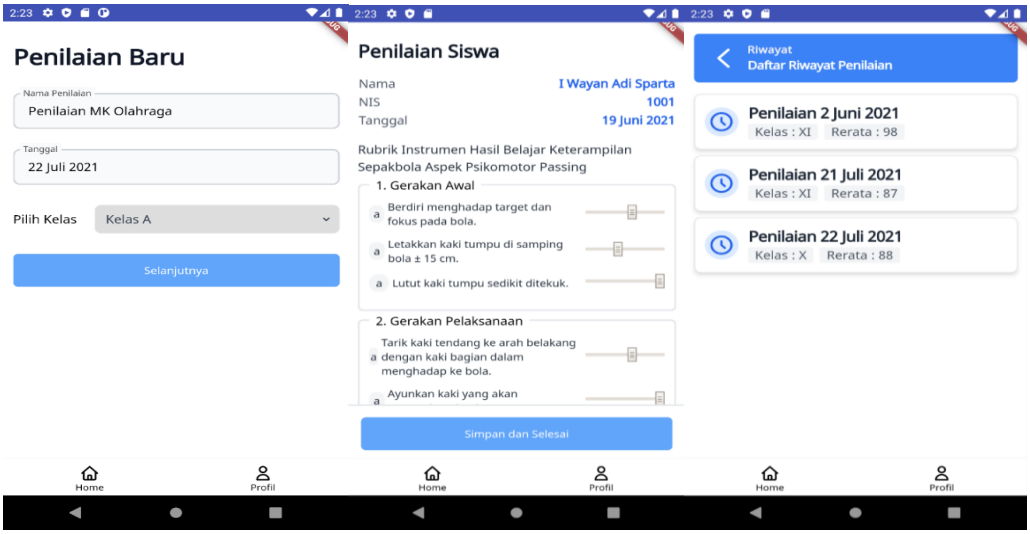

Figure 3. Assessment Start Page and Assessment Rubric

This application is validated after the researcher produces a product in the form of a prototype. Media experts and material experts carried out validation by providing assessments and suggestions on applying performance instruments in football learning by filling out a

questionnaire/validation assessment sheet. The summary of the results of the assessment of this application by the expert is presented in Table 1.

Table 1. Summary of application validity test results

Media Expert Total Score	26
Material Expert Total Score	46
Average Total Score	36
Criteria	Very Valid

Based on the results of assessments from media experts and material experts, as shown in Table 1, the developed application is classified as "very feasible" and "very valid," indicating that it is ready for small-group testing.

The questionnaire response scores of practitioners who are also FOK Undiksha lecturers, as many as four of whom teach football courses, demonstrate the applicability of the developed application. Overall, respondents gave an upbeat assessment of this application. The summary of the assessment of this application from practitioners is presented in Table 2.

Table 2. Summary of application practicality test results

	Score
Practitioner 1	72
Practitioner 2	67
Practitioner 3	61
Practitioner 4	67
Average	66.75
Criteria	Very Practical

It was concluded that the results of the questionnaire analysis of practitioners' responses to the use of this application were very practical. As a result, lecturers and practitioners can easily use the performance assessment instrument for football courses to determine the performance value of students and/or soccer athletes.

Discussion

The development of Industry 4.0 necessitates that education for 21st-century skills considers the management of learning in the social aspect and virtual learning via educational actors' devices (Handoyono & Rabiman, 2020). Based on survey results, more than half of Indonesia's population uses the internet, with 143.26 million people (54.66%) using the internet every day, 44.16% using smartphones or tablets, 4.49% using computers/laptops, and 39.28% using both devices (APJII, 2017). To support industry era 4.0, the smartphone can be used for mobile learning in learning (Nachiketa et al., 2013).

Mobile learning, as a combination of cloud computing and e-learning, is a source that can be accessed anywhere, facilitating information search and interaction, so it supports effective learning without space and time limitations (Quinn, 2020). Technically, mobile learning is personal learning that connects students to the internet using gadgets (Gharibpoor et al., 2013). By utilizing cell phones, students will find it easier and more flexible to access learning media without being limited by space or time. The use of mobile learning demonstrates ways of learning that influence learning processes and products through interaction with other psychological constructs, provides new opportunities to influence learning processes or outcomes directly, and provides opportunities to collect previously unobtainable data that enhance understanding and modeling of learning processes (Bernacki et al., 2020).

The Android operating system is very popular with the community because it is user-friendly and easy to use (Prasad, 2016). In Indonesia, In Indonesia, Android users accounted for 93.22 percent, IOS users accounted for 5.52%, and Windows users accounted for 0.12% (Globalstat, 2019). Smartphones are used as measuring instruments in various scenarios to collect data systematically (González-Pérez et al., 2022). The android-based performance instrument

application for soccer learning that was developed is designed to be a medium that can help educators or lecturers of FOK Undiksha football courses in conducting the evaluation process, especially the psychomotor aspect. The existence of performance instruments in the form of applications operationalized on each smartphone user makes the evaluation process more effective, efficient, and transparent. In this digital era, evaluation media must be developed to present a compelling and accountable learning process. Learning evaluation determines students' position and readiness level, helps educators provide guidance, and provides student progress reports (Adib, 2014).

Learning uses media, methods, and techniques as intermediaries for communication between teachers and students so that communication and interactions between teachers and students are more effective in teaching education in schools (Kuswanto, 2020). The media developed in this study is an android-based application that sports teachers and practitioners can use to evaluate the performance of playing football. The quality of the evaluation media developed in this study was evaluated based on or guided by these two aspects, namely the validity and practical aspects. The results of the media expert test show that the developed application has obtained an average score of 3.67. The results of the material expert test by soccer learning material experts show that this application obtains an average score of 3.83 so the total average validation score is 3.75, which is included in the "very valid" category. This means that this application can show the quality of the basic movements of playing football for students and football athletes to determine the number of quality and talented football players (McCalman et al., 2022).

Applications declared valid are then tested by four respondents or lecturers of FOK Undiksha who teach football courses to determine their practicality. The results of this limited trial indicate that this application obtained an average score of 3.71, which belongs to the very practical category. This means that lecturers can already use this application to assess the basic skills of playing football and football practitioners to assess the basic skills of soccer athletes. The practicality of this application refers to the habits of football lecturers and practitioners who use Android-based smartphones daily so that, when assessing performance, lecturers and or practitioners will quickly enter values and get data about the skills of students and or soccer athletes.

Android-based instruments have the advantage of being used by physical education teachers because they can be operated through physical education teachers' smartphones. Refiater et al. (2020) found that testing instruments operated via Android smartphones was more effective than instruments operated via the web or observation notes. Instruments that integrate with an Android smartphone must be applications installed on the smartphone.

One of the most recent applications that assist physical education teachers and sports practitioners, particularly in football, in obtaining accurate data and processing and presenting massive amounts of football performance data is an Android-based instrument. Android-based instruments were developed through navigation and modernization to ensure rapid information linkage and distribution. Android-based instruments allow physical education teachers and sports practitioners to learn about the quality and provide material for reflection on learning and training programs prepared by sports teachers or coaches. Therefore, it can improve physical education and football training oriented toward students and facilitate quality learning programs. The product resulting from this research certainly has advantages and disadvantages. The advantages of this product include: (1) facilitating and accelerating the process of evaluating learning by lecturers; and (2) providing fast and accurate results to students. The shortcomings of the learning media are (1) the absence of assessment for aspects of students' attitudes or affections; and (2) the absence of assessment for aspects of student knowledge.

Android-based assessment instruments make it easy for users, especially teachers and practitioners (Handayani & Lestari, 2019). Android applications are needed because they make it easier for users to work anywhere and anytime, especially regarding information. Android devices save space and time, making them more accessible and flexible (Nikodemus, 2013). Android is always connected to the internet, so all Android-powered smartphones need an active internet connection.

Based on the evaluation results by experts and the limited trial activities that have been carried out, the application developed is in line with research conducted by Supriyono (2018), entitled "The Development of Web-Based Football Skills Test Application". The developed media has met the valid and practical criteria, making it appropriate for use by football coaches in identifying the skills of their athletes. This football performance assessment instrument in physical education should not emphasize skills and stages in fundamental football skills but should consider aspects of physical fitness and cognitive skill development (Rodríguez-Arce et al., 2019). In addition, it is necessary to pay attention to students' anthropometry and body mass index to determine their nutritional needs to maintain sports performance (Mashuri, 2022; Mashuri, Gunarto, et al., 2022; Mashuri, Mappaompo, et al., 2022).

The android-based instrument for football learning performance assessment needs to be made more complex by combining it with other soccer instruments such as 1) The Tactical Score System in Soccer (FUT-SAT) (Costa et al., 2011), which allows for assessing the tactical knowledge demonstrated by students in real game situations, based on ten principles, such as tactical principles defined in football is penetration, offensive range, mobility, space, offensive array, delay, defensive coverage, balance, concentration, and defensive array (Teoldo et al., 2009). This instrument should not be applied to students under the age of 12-13 years, because they have not yet developed the abstract thinking to be able to understand these principles (del Campo et al., 2010); 2) Game Performance Evaluation Tool, GPET, in a particular version for soccer (García López, Luis González Víllora, Sixto Gutiérrez, D. Serra, J. Gutiérrez Díaz del Campo, David Serra Olivares, 2013), which analyses decisions made by students in games based on tactical issues in attack (holding possession, advancing towards opponent goals, and achieving goals) as well as analyze the components of motor skills in execution. Other soccer-specific instruments are: 2) an Instrument for the Codification and Recording of Playing Actions in Football (SOF-1) (Anguera et al., 2003); 4) an Observation System applied to the Attacking Phase in Soccer (SoccerEye) (Barreira et al., 2012); and 5) the Foul Phase Technical and Tactical Action Observation Instrument in Soccer (Ortega-Toro et al., 2019).

CONCLUSION

Based on the results of data analysis and discussion, it can be concluded that the product developed is in the form of an android-based performance instrument application for soccer learning following the assessment rubric in the PJOK curriculum and is very practically used by PJOK educators as an evaluation tool for PJOK learning football material. Android-based performance instrument application for soccer learning is helpful for physical education teachers to obtain student value data through the performance of basic soccer skills through smartphones in the form of raw data and recapitulation of soccer skills performance data. The subsequent development of an android-based performance instrument application for soccer learning is the addition of features for assessing the cognitive and physical fitness of students and determining the body mass index of students.

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REFERENCES

Adib, D. A. (2014). Pengembangan instrumen penilaian otentik keterampilan dasar bermain sepakbola. *Seminar Nasional Evaluasi Pendidikan*, 121–128. https://conf.unnes.ac.id/index.php/snep/II/paper/view/261/155

Adiguzel, T. (2011). Use of audio modification in science vocabulary assessment. *Eurasia Journal of Mathematics, Science and Technology Education*, *7*(4), 215–225.

https://doi.org/10.12973/ejmste/75210

Alhumaid, K. (2019). Four ways technology has negatively changed education. *Journal of Educational and Social Research*, *9*(4), 10–20. https://doi.org/10.36941/jesr-2019-0002

Anguera, M. T., Blanco-Villaseñor, A., Losada, J. L., Ardá, T., Camerino, O., Castellano, J., & Hernández-Mendo, A. (2003). Instrumento de codificación y registro de la acción de juego en fútbol-SOF-1 (Instrument for coding and recording football action-SOF-1). *Rev. Digit. Alto Rendimiento Fútbol [Electronic Version]*.

APJII. (2017). Infografis penetrasi & perilaku pengguna internet Indonesia. *Asosiasi Penyelenggara Jasa Internet Indonesia*. https://apjii.or.id/content/read/39/342/Hasil-Survei-Penetrasi-dan-Perilaku-Pengguna-Internet%02Indonesia-2017.

Ardha, M. A. Al, Yang, C.-B., Adhe, K. R., Putra, K., Khory, F., & Harianto, T. (2018). Physical education curriculum for early childhood: Developing students' manipulative skills in soccer. *1st International Conference on Education Innovation (ICEI)*, *173*(Icei 2017), 226–229. https://doi.org/10.2991/icei-17.2018.59

Ardli, I., Abdullah, A. G., Mudalifah, S., & Ana, A. (2017). Perangkat penilaian kinerja untuk pembelajaran teknik pemeliharaan ikan. *Innovation of Vocational Technology Education*, *8*(2), 147–166. https://doi.org/10.17509/invotec.v8i2.6128

Attallah, B., & Ilagure, Z. (2018). Wearable technology: Facilitating or complexing education? *International Journal of Information and Education Technology*, *8*(6), 433–436. https://doi.org/10.18178/ijiet.2018.8.6.1077

Barreira, D., Garganta, J., Prudente, J., & Anguera, M. T. (2012). Validação de sistema de observação e análise tática em Futebol: SoccerEye. *Revista Portuguesa de Ciências Do Desporto*, *12*(3), 32–57. https://doi.org/10.5628/rpcd.12.03.32

Bernacki, M. L., Greene, J. A., & Crompton, H. (2020). Mobile technology, learning, and achievement: Advances in understanding and measuring the role of mobile technology in education. *Contemporary Educational Psychology*, *60*, 101827. https://doi.org/10.1016/j.cedpsych.2019.101827

Costa, I. T., Garganta, J., Greco, P. J., Mesquita, I., & Maia, J. (2011). System of tactical assessment in Soccer (FUT-SAT): Development and preliminary validation. *Motricidade*, *7*(1).

del Campo, D. G. D., Vicedo, J. C. P., Villora, S. G., & Jordan, O. R. C. (2010). The relative age effect in youth soccer players from Spain. *Journal of Sports Science and Medicine*, *9*(2), 190–198.

Ding, Y., Ding, Y., Li, Y., & Cheng, L. (2020). Application of internet of things and virtual reality technology in college physical education. *IEEE Access*, *8*, 96065–96074. https://doi.org/10.1109/ACCESS.2020.2992283

García-Ceberino, J. M., Antúnez, A., Ibáñez, S. J., & Feu, S. (2020). Design and validate the instrument for measuring learning and performance in football. *International Journal of Environmental Research and Public Health*, *17*(13), 1–22. https://doi.org/10.3390/ijerph17134629

García López, Luis González Víllora, Sixto Gutiérrez, D. Serra, J. Gutiérrez Díaz del Campo, David Serra Olivares, J. (2013). Development and validation of the game performance evaluation tool (GPET) in Soccer. *SPORT TK-Revista EuroAmericana de Ciencias Del Deporte*, *2*(1), 89–99. https://revistas.um.es/sportk/article/download/185791/153701/

Gharibpoor, M., Sargazi, S., & Aref, M. (2013). Efficiency evaluation of e-learning compared to traditional education in human resource development (Case study: Small and medium enterprises in Shiraz). *7th Intenational Conference on E-Commerce in Developing Countries: With Focus on e-Security, ECDC*. https://doi.org/10.1109/ECDC.2013.6556736

Globalstat, S. (2019). Mobile operating system market share Indonesia. *Statcounter.Com*. http://gs.statcounter.com/os-market-share/mobile/indonesia

González-Pérez, A., Matey-Sanz, M., Granell, C., & Casteleyn, S. (2022). Using mobile devices as scientific measurement instruments: Reliable android task scheduling. *Pervasive and Mobile Computing*, *18*(April). https://doi.org/10.1016/j.pmcj.2022.101550

Handayani, F., & Lestari, W. (2019). Journal of educational research and evaluation need analysis

in the development of HOTS-oriented study project assessment instrument in android-based science learning. *Journal of Educational Research and Evaluation*, *8*(1), 57–64. https://doi.org/10.15294/jere.v8i1.31799

Handoyono, N. A., & Rabiman, R. (2020). Development of android-based learning application in EFI materials for vocational schools. *Journal of Physics: Conference Series*, *1456*(1). https://doi.org/10.1088/1742-6596/1456/1/012050

Javaid, M., Haleem, A., Vaishya, R., Bahl, S., Suman, R., & Vaish, A. (2020). Industry 4.0 technologies and their applications in fighting COVID-19 pandemic. *Diabetes and Metabolic Syndrome: Clinical Research and Reviews*, *14*(4), 419–422. https://doi.org/10.1016/j.dsx.2020.04.032

Keengwe, J., & Bhargava, M. (2014). Mobile learning and integration of mobile technologies in education. *Education and Information Technologies*, *19*(4), 737–746. https://doi.org/10.1007/s10639-013-9250-3

Khotimah, D. A., Su'ad, Santoso, & Pratama, H. (2022). The effectiveness of android-based science learning model to increase student learning outcomes. *ASIAN PENDIDIKAN*, *2*(1), 33–41. https://doi.org/10.53797/aspen.v2i1.5.2022

Koekoek, J., & van Hilvoorde, I. (2018). Next generation PE: Thoughtful integration of digital technologies. In *Digital Technology in Physical Education* (pp. 1–16). Routledge. https://doi.org/10.4324/9780203704011

Kuswanto, J. (2020). Media pembelajaran berbasis android mata pelajaran desain grafis kelas X. *Edutic - Scientific Journal of Informatics Education*, *6*(2), 78–84. https://doi.org/10.21107/edutic.v6i2.7073

Lai, J. W. M., & Bower, M. (2019). How is the use of technology in education evaluated? A systematic review. *Computers and Education*, *133*(May 2018), 27–42. https://doi.org/10.1016/j.compedu.2019.01.010

Laugwitz, B., Schubert, U., Ilmberger, W., Held, T., Tamn, N., & Schrepp, M. (2009). Subjektive benutzerzufriedenheit quantitativ erfassen: Erfahrungen mit dem user experience Questionnaire UEQ. In *Tagungsband UP09* (pp. 220–225). Fraunhofer Verlag. https://dl.gi.de/handle/20.500.12116/5496;jsessionid=BFB973004FAB9120F3972EEB65B0C5B8

Lubis, A. E., Raharjo, F. M., & Nugroho, A. (2020). A model of basic skill test for talent scouting soccer athlete candidates. *Advances in Health Sciences Research*, *23*(UnICoSS 2019), 79–86. https://doi.org/10.2991/ahsr.k.200305.025

Mashuri, H. (2022). Pentingnya penghitungan status gizi dan kebutuhan kalori peserta didik dalam mata pelajaran pendidikan jasmani, olahraga, dan kesehatan. *Seminar Nasional Sains, Kesehatan, Dan Pembelajaran*.

Mashuri, H., Gunarto, P., & Adi, I. P. P. (2022). Pengukuran kebutuhan gizi atlet federasi panjat tebing Indonesia kabupaten Buleleng. *Seminar Nasional Pengabdian Kepada Masyarakat 4*.

Mashuri, H., Mappaompo, M. A., & Purwanto, D. (2022). Analysis of energy requirements and nutritional needs of rock-climbing athletes. *Journal Sport Area*, *7*(3), 437–445. https://doi.org/10.25299/sportarea.2022.vol7(3).10886

McCalman, W., Crowley-McHattan, Z. J., Fransen, J., & Bennet, K. J. M. (2022). Skill assessments in youth soccer: A scoping review. *Journal of Sports Sciences*, *40*(6), 667–695. https://doi.org/10.1080/02640414.2021.2013617

Muktiani, N. R., Soegiyanto, Siswantoyo, Rahayu, S., & Hermawan, H. A. (2022). Augmented reality mobile app-based multimedia learning of Pencak Silat to enhance the junior high school students learning outcomes. *Cakrawala Pendidikan*, *41*(2), 553–568. https://doi.org/10.21831/cp.v41i2.49217

Nachiketa, K., Rahatekar, A., Dhotre, A., & Saoji, S. a. (2013). Developing an android-based learning application for mobile devices. *International Journal of Advances In Computer Science and Cloud Computing*, *1*(1), 239. https://doi.org/10.1145/2261605.2261641

Nikodemus. (2013). *Step-by-step menjadi programmer android*. CV. Andi Offset.

Ortega-Toro, E., García-Angulo, A., Giménez-Egido, J. M., García-Angulo, F. J., & Palao, J. M.

(2019). Design, validation, and reliability of an observation instrument for technical and tactical actions of the offense phase in soccer. *Frontiers in Psychology*, *10*(JAN), 1–9. https://doi.org/10.3389/fpsyg.2019.00022

Prasad, S. (2016). A study on: Attitude of Indian customers towards smartphones of android and windows version. *Journal of Accounting & Marketing*, *5*(2). https://doi.org/10.4172/2168-9601.1000167

Putri, O. D., Nevrita, N., & Hindrasti, N. E. K. (2019). Pengembangan instrumen penilaian keterampilan berpikir kritis siswa sma pada materi sistem pencernaan. *BIOEDUKASI (Jurnal Pendidikan Biologi)*, *10*(1), 14. https://doi.org/10.24127/bioedukasi.v10i1.2004

Quinn, C. (2020). mLearning: Mobile, Wireless, In-Your_Pocket Learning. *Line ZIne*, *July*. https://www.researchgate.net/publication/343083598_mLearning_Mobile_Wireless_In-Your-_Pocket_Learning

Raja, R., & Nagasubramani, P. C. (2018). Impact of modern technology in education. *Journal of Applied and Advanced Research*, *3*(1), S33–S35. https://doi.org/10.21839/jaar.2018.v3is1.165

Rauschenberger, M., Schrepp, M., Perez-Cota, M., Olschner, S., & Thomaschewski, J. (2013). Efficient measurement of the user experience of interactive products. How to use the user experience questionnaire (UEQ). Example: Spanish language version. *International Journal of Interactive Multimedia and Artificial Intelligence*, *2*(1), 39. https://doi.org/10.9781/ijimai.2013.215

Refiater, U., Tangkudung, J., Hernawan, H., & Dlish, F. (2020). Development model for android-based bullet-bulleted obraine styles. *Proceedings of the 5th International Seminar of Public Health and Education*, 577–585. https://doi.org/10.4108/eai.22-7-2020.2300322

Rodríguez-Arce, J., Flores-Núñez, L. I., Portillo-Rodríguez, O., & Hernández-López, S. E. (2019). Assessing the performance of soccer goalkeepers based on their cognitive and motor skills. *International Journal of Performance Analysis in Sport*, *19*(5), 655–671. https://doi.org/10.1080/24748668.2019.1647042

Rozi, F., Rahma Safitri, S., Latifah, I., & Wulandari, D. (2021). Tiga aspek dalam pembelajaran pendidikan jasmani pada masa pandemi Covid-19. *Jurnal Kependidikan: Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran Dan Pembelajaran*, *7*(1), 239. https://doi.org/10.33394/jk.v7i1.3220

Seale, J., Colwell, C., Coughlan, T., Heiman, T., Kaspi-Tsahor, D., & Olenik-Shemesh, D. (2021). 'Dreaming in color': disabled higher education students' perspectives on improving design practices that would enable them to benefit from their use of technologies. In *Education and Information Technologies*, *26*(2). https://doi.org/10.1007/s10639-020-10329-7

Supriadi, A., & Mesnan. (2022). Development of application-based football learning. *Kinestetik: Jurnal Ilmiah Pendidikan Jasmani*, *6*(2), 35–39. https://doi.org/10.33369/jk.v6i2.21852

Supriyono, E. (2018). Pengembangan aplikasi tes keterampilan sepakbola berbasis web. *Jurnal Keolahragaan*, *6*(1), 38–47. https://doi.org/10.21831/jk.v6i1.12764

Teoldo, I., Manuel, J., Greco, P. J., Mesquita, I., Universitário, C., Horizonte, D. B., Horizonte, B., Federal, U., & Gerais, D. M. (2009). Princípios Táticos do Jogo de Futebol: conceitos e aplicação Os Princípios Táticos. *Motriz, Rio Claro*, *15*(3), 657–668.

Yu, H., Kulinna, P. H., & Lorenz, K. A. (2018). An integration of mobile applications into physical education programs. *Strategies: A Journal for Physical and Sport Educators*, *31*(3), 13–19. https://doi.org/10.1080/08924562.2018.1442275