



Development of PKM Center Mobile Learning Applications Based on Android

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Received: July 28, 2023

Revised: September 11, 2023

Accepted: October 25, 2023

Published: October 31, 2023

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DOI: [10.29303/jppipa.v9i10.4817](https://doi.org/10.29303/jppipa.v9i10.4817)

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Abstract: Higher education institutions currently use digital technology in carrying out their activities, both academic and non-academic. This makes digital technology increasingly popular in the Education sector, especially Mobile Apps. Because of its ease of use, mobile device-based educational applications are currently very popular and widely accessible. To answer the challenges due to digitalization, the Faculty of Education conducted research "Development of the Android-based PKM Center Mobile Learning Application, Faculty of Education, Surabaya State University". The development model used in this study is a procedural model that adapts the Borg and Gall R&D model. This research aims to developing the Android-based PKM Center Mobile Learning application and to find out the effectiveness of developing the Android-based PKM Center Mobile Learning application. The expected results of this research will be in the form of an Android-based PKM Center Mobile Learning application. Based on the results of the trials in this study it can be seen that the development of the Android-based PKM Center Mobile Learning Application at the Faculty of Education, State University of Surabaya has been successfully carried out. The PKM Center Mobile Learning application is effective in helping students meet their needs related to community service activities.

Keywords: Android; Educational management; System information

Introduction

The increasing use of digital technologies resulting in the replacement of face-to-face meetings with digital interactions (hereinafter referred to as digitization) leads to transformations that challenge higher education institutions (HEIs) and provide them with opportunities (Marquez-Ramos, 2021). Digitalization of business, economy and society actualizes the issue of the effective response of higher education institutions to new challenges and opportunities (Bencsik, 2020; Saeedi & Visvizi, 2021; Babkin et al., 2021; Savina & Stepanov, 2020). To meet the new requirements, higher education institutions are devoting great attention to digitizing their services, including teaching services (Limani et al., 2019; Alhubaishy & Aljuhani, 2021). Digital technologies are becoming more popular in education because of the profitability they gain through scalability (Sprenger & Schwaninger, 2021). This advantage is especially

relevant in the context of reducing funding for the education system, the need to ensure the economic efficiency of universities (Frolova & Rogach, 2021).

Higher education institutions currently use digital technology a lot in carrying out their activities, both academic and non-academic. This makes digital technology increasingly popular in the education sector, especially mobile apps. Mobile apps shape and reproduce norms, values and beliefs; create new practices; and is a productive form of power and authority (Andalibi, 2021). The fact that a large portion of the world's population owns a smartphone indicates the rapid growth rate achieved throughout the digital revolution (Abraham, 2020). Currently, mobile devices, portable devices, and internet access such as smartphones or tablets have become part of everyday modern human life. They are used for various activities, including educational and learning activities (Soparno & Tarjana, 2021). Due to its ease of use, educational

How to Cite:

Haq, M. S. (2023). Development of PKM Center Mobile Learning Applications Based on Android. *Jurnal Penelitian Pendidikan IPA*, 9(10), 8422-8429. <https://doi.org/10.29303/jppipa.v9i10.4817>

applications based on mobile devices are currently very popular and widely accessible (Bolatli & Kizil, 2021). Mobile devices, laptops, and tablet computers are portable and lightweight devices. Therefore, the use of this technology has recently increased both in classroom and outside the classroom (Gökçearslan et al., 2017). In addition, mobile applications and Internet connectivity which are considered as part of mobile technology offer an extra dimension of learning by directing students to unexplored ideas and knowledge when interacting with other users on social networking sites such as Facebook and Twitter which are accessed via smartphones and tablets (Thedpitaka & Somphong, 2021).

Based on the explanation above, it can be said that digitization has occurred in tertiary institutions since many years ago, and research has also proven that almost all activities that occur in tertiary institutions have used digitization methods, both academic and non-academic. This can also be interpreted that in the daily activities carried out in tertiary institutions, digital media has a very important role, especially digital mobile. The Faculty of Education, State University of Surabaya is one of the faculties that plays a large role in Community Service (PKM) activities. However, the current situation is that the Faculty of Education does not yet have a facility that can be used by students as well as educators and education staff to be able to more easily access all information related to Community Service activities. To answer the challenges due to digitalization and to meet deficiencies related to facilities that can be used to access PKM information, the Faculty of Education conducted research "Development of the Android-based PKM Center Mobile Learning Application, Faculty of Education, Surabaya State University". This research aims to developing the Android-based PKM Center Mobile Learning application, and to determine the effectiveness of developing the Android-based PKM Center Mobile Learning application. The research urgency of developing the Android-Based PKM Center Mobile Learning Application is as follows: Facilitate students in accessing information related to Student Creativity Program (PKM) activities, and make it easier for students to prepare PKM activity proposals, because the PKM Center Mobile Learning Application is equipped with a menu that provides examples of PKM proposals.

Method

This study applies research and development methods (Research and Development). According to (Borg & Gall, 1983), educational research and development is a process used to develop and validate educational products, meaning that educational

development research (R&D) is a process used to develop and validate educational products. The results of development research are not only the development of an existing product but also to find knowledge or answers to practical problems. As for R & D research aims to find, develop and validate a product, thus R & D research is longitudinal. According to (Borg & Gall, 1983), R & D research in education includes ten steps as can be seen in Figure 1.

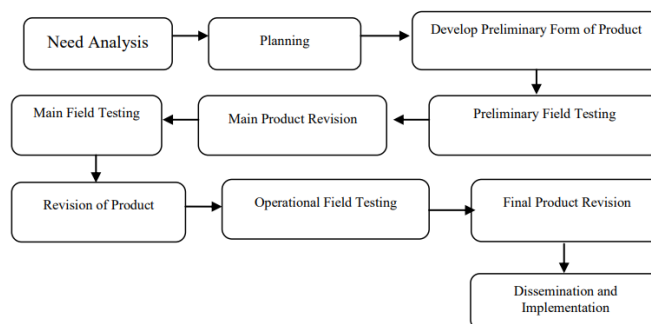


Figure 1. Stages of Borg & Gall (1983) R&D Research

The development model used in this study is a procedural model that adapts the Borg and Gall R&D model, a modification from Sukmanata, and an adaptation from McKenny, including the stages of preliminary study, development, and testing. Therefore, the development procedure in this study is just following these stages.

The development procedures carried out in this development are:

1. Before researchers develop a program, first define the problem, namely how to develop an Android-based PKM Center Mobile Learning application.
2. Describe the design of the Android-based PKM Center Mobile Learning Application to facilitate administrative management, namely identifying what information is needed, when, where, in what form and so on.
3. Developing a prototype design for the Android-based PKM Center Mobile Learning Application as a model to be developed.
4. Performing the preparation (design) of the Android-based PKM Center Mobile Learning application.
5. Implementation of the program, which consists of several activities, including: a) Testing the results of the Android-based PKM Center Mobile Learning application by several random samples, to provide input. b) Improved trial results. c) After the trial was deemed sufficient, the Android-based PKM Center Mobile Learning application was then developed. Then the application is implemented on a cellphone to be used by the general public.

6. Program evaluation and follow-up, after the program has been tested, it evaluates the program by providing input for further program development.

Result and Discussion

Result

Need Analysis

Needs analysis is the first stage that must be carried out in the development model used in this research, namely, the Borg and Gall research and development model. At this stage the researcher analysed from various sources and identified a problem that still had no solution, that is, many students wanted to participate in research and community service activities but they lacked relevant and credible sources to start with. Based on these problems, the researcher then analysed again, what methods can be used to provide students with sources of information that are flexible but also easy to access. Then the researchers came to the conclusion to conduct research and development of the PKM Center Mobile Learning Application with the hope that it could also increase student creativity.

Planning

After determining what solutions are in accordance with the problems being faced, the researcher then begins to plan how to realize these goals, which enters the second stage, namely planning. At this stage the researcher plans everything related to this research, starting from the human resources needed, the experts needed, the budget that needs to be prepared, to the materials related to the development of the PKM Center Mobile Learning Application. Everything is arranged in systematic detail with the aim that no steps are missed and goals can be achieved effectively and efficiently.

Develop Preliminary Form of the Product

After careful planning, the next stage is carried out, namely the application development process. at this stage the application is being made little by little until it becomes an application that suits your needs, namely the PKM Center Mobile Learning Application. The results of this development stage can be seen in figures 2, 3, and 4. An explanation of each menu contained in the application can be seen in table 1.

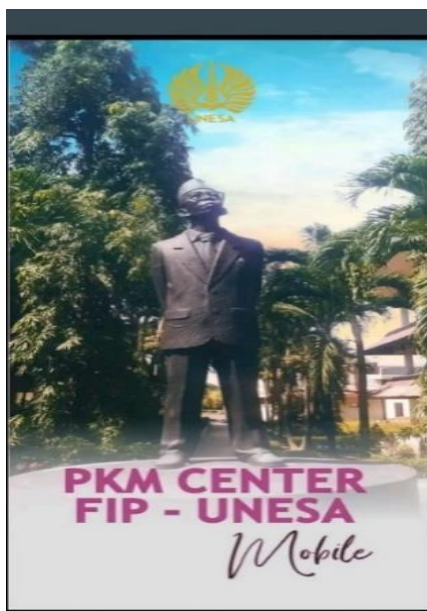


Figure 2. Front page of PKM centre mobile learning application

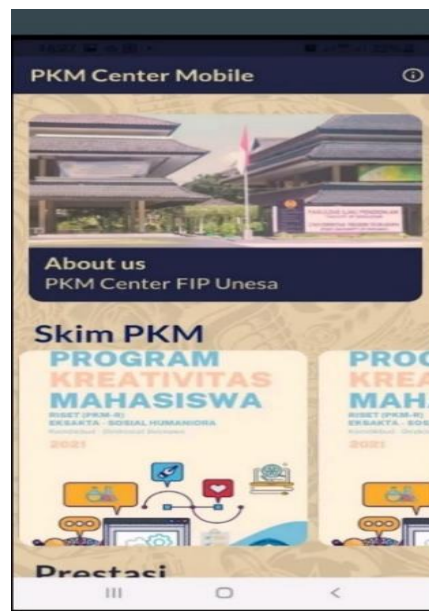


Figure 3. Home page of PKM centre mobile learning application



Figure 4. Menu page of PKM centre mobile learning application

Table 1. Explanation of Each Menu

Menu	Description
Upload PKM	"Upload PKM" is a menu provided for students to upload research proposals to be submitted.
Agenda PKM	"Agenda PKM" is a menu that contains information related to the ongoing PKM. For example, if there is a new announcement from the administrator, faculty, or department, it will be uploaded in the menu.
Guidelines PKM	"Guidelines PKM" is a menu that contains information related to the Pkm implementation guidelines and also proposal writing guidelines.
Proposal's Examples	"Proposal Examples" is a menu provided so that students can find examples of previous proposals that have passed and been funded, so that students no longer need to have trouble finding credible examples.

Main Field Testing

After the application has been developed or created, the next stage is to test the application using a limited sample. In this study the trials were carried out using the same category standards at each trial stage, but the number of samples used was different. In this limited trial the number of samples used was 5 people from the Faculty of Education, Surabaya State University. The instruments used in the trials in this study were as follows.

Table 2. Test Questionnaire Instrument

Category	Total Question
Functional	5 items
Design	5 items
Ease to access	5 items
Suitability of needs	5 items
Total	20 items

The results of the limited trial of the Android-Based PKM Center Mobile Learning Application are as follows.

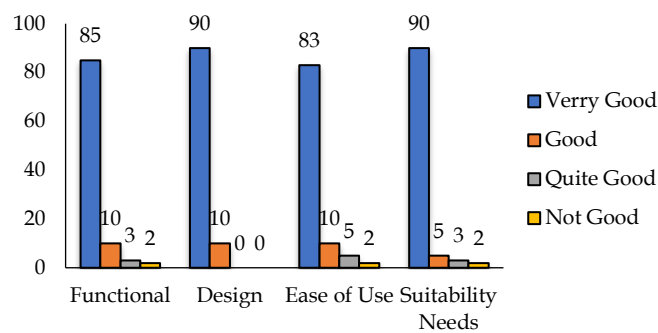


Figure 5. Main field-testing result

Main Product Revision

The results of the limited trials have shown that the PKM Center Mobile Learning Application is in great demand by users and has also achieved a good percentage level in each category. However, it is still too early to be complacent. Because the results of these trials also found that there are still many deficiencies that need to be corrected. So, at this stage revisions or improvements need to be made. Based on the results of the trial improvements will be more focused on ease of access to the PKM Center Mobile Learning Application. Many of the users also give poor ratings in this category, therefore the main improvement that will be made at this stage is the ease of access to the PKM Center Mobile Learning Application.

Preliminary Field Testing

Preliminary field testing is the second testing phase using more samples than before. In this trial the instrument used remained the same and was tested on

15 sample people and 2 experts. The results of the second trial in this study are as follows.

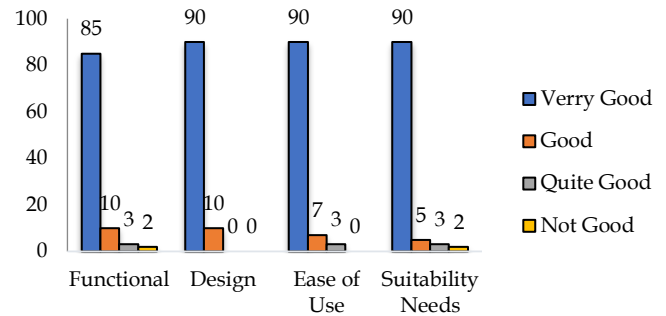


Figure 6. Preliminary field-testing result

Revision of Product

Based on the results of the second trial, it can be seen that all categories on average have received a good percentage, but not the results of the assessment by experts. Several points were underlined by the expert so that improvements could be made, namely, the use of an inaccurate writing font. This makes the appearance less attractive and irregular when viewed. Then choose the colours used and the icons that are still monotonous. So that at this second revision stage the researcher will focus more on improving the application in terms of appearance to make it more attractive according to input and also directions from experts.

Operational Field Testing

Operational field testing is the final trial stage before the product is officially implemented or deployed. At this stage the samples used will also be more numerous and more varied, meaning from various backgrounds, not only students of the Faculty of Education, State University of Surabaya. However, as previously explained, the reference instrument used was the same as that used in the two previous trial stages. The results of this last trial are as follows.

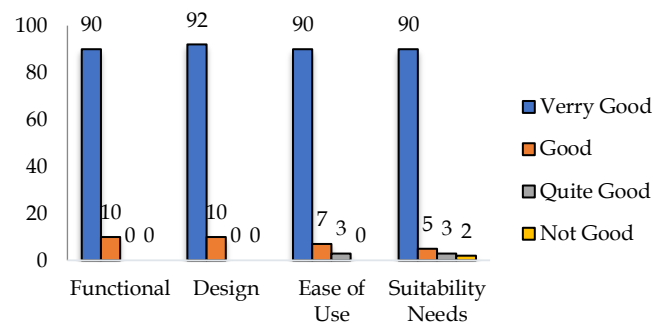


Figure 7. Operational field-testing result

Final Product Revision

After the product has been tested for the last time, the product is still given one more revision stage to ensure that the product is really ready to be implemented or officially distributed. It also provides one more opportunity if at the final trial stage deficiencies or obstacles are found that need to be addressed or repaired. In the results of the last trial the PKM Center Mobile Learning application has obtained a very good average percentage in each category tested. Even in the functional category, which in the previous two trial stages received the least percentage, in the last trial stage it has been able to equalize with the other categories. This also means that the PKM Center Mobile Learning Application is ready to be officially deployed for use. Therefore, at this final revision stage, the researcher will only ensure the perfection of the PKM Center Mobile Learning application before it is officially disseminated.

Dissemination or Implementation

The distribution or implementation stage is the final stage of the research and development model developed by Borg and Gall. After the product is confirmed as feasible for implementation, it is at this stage that the product will be officially distributed or implemented. The PKM Center Mobile Learning application, which has been confirmed and re-checked at the last revision stage, will begin distribution at this stage. The distribution of the PKM Center Mobile Learning Application is carried out through Google's official Android-based application distribution platform, namely through the Google PlayStore. Users can directly enter the PlayStore platform found on their respective smartphones and then just type "PKM Center FIP" in the search field, then the application will appear and the user just has to install it, so the Pkm Center Mobile Learning Application is ready to use.

Discussion

Digital technology is increasingly favoured by many people in the 21st century. Technology is a part of everyday life, and especially for higher efficiency and better productivity (Singh, 2021). The importance of facilitating adequate means and infrastructure for the development of digital technology innovation has been repeatedly recognized (Fink et al., 2020). One of the innovations that are currently being carried out the most is the integration of digital technology in the learning process in every educational institution. The use of technology in education is growing rapidly and the range of digital technology that is routinely used by children is very wide (Madanipour & Cohrssen, 2020). Even very young children are taking part in the digital and virtual world; virtual spaces and digital platforms;

use applications on digital screens; and playing games on computers and tablets (Magnusson, 2021). This renewal is often referred to as digital learning. Digital learning is an innovation that is expected to increase the effectiveness of the learning process.

Therefore, many educational institutions are competing to develop digital-based learning media. In fact, high expectations for digital learning are often reflected in the use of new policies and curricula (Calderon & Tannehill, 2020), one of which is by developing android-based applications that are used to facilitate students in the learning process. Where android itself is very popular with smartphone users in recent years. The increasing development of Android-based information technology has resulted in the number and level of mobile phone users growing rapidly (Zhang et al., 2022). In 2019, more than 5 billion people worldwide use mobile devices, and it is estimated that about half use smartphones (Ju-Choel, 2020). Therefore, by utilizing this phenomenon the development of Android-based learning applications is expected to increase the effectiveness of the learning process.

The Faculty of Education has a similar problem, namely the absence of learning media that facilitates students to take part in Community Service activities, while student interest is high. To overcome this problem the Faculty of Education came up with a solution which is developing an Android Based PKM Center Mobile Learning Application to facilitate students who are interested in participating in this Community Service activity.

The Android-Based PKM Center Mobile Learning Application Development carried out by the Faculty of Education, Surabaya State University can be said to have been successful. Based on the data obtained from the results of the last trial conducted, it can be seen that each category tested was above 80%, this means that each category can be said to be very feasible. The functional category gets a percentage rate of 90%, meaning that the Android-Based PKM Center Mobile Learning Application is developed according to its function, or with the Android-Based PKM Center Mobile Learning Application Most of the user's goals can be achieved effectively and efficiently. Then there is the design category, this category has also obtained a high percentage of 92%. This can be interpreted that the design or appearance of the Android-Based PKM Center Mobile Learning Application has been able to attract the attention of users, or users of the Android-Based PKM Center Mobile Learning Application feel that the appearance is good, even though in the previous two trial stages this category received a lot of many revisions. Even the experts also provide some criticism and

suggestions in this category. However, in the last trial the researcher was able to complete all of these criticisms and suggestions by making good revisions.

The third category is ease of use, this category initially had many shortcomings at the beginning of development, but researchers made good improvements so that at the next trial stage there were no obstacles or deficiencies of value in the category. And in the last trial it got a percentage of 90%, which means that the Android-Based PKM Center Mobile Learning Application is easy for users to access. Finally, there is the category suitable of needs. In this category the researcher did not experience any significant problems, so that at the last trial stage this category got a percentage of as much as 90%. This can be interpreted that the Android-based PKM Center Mobile Learning application can indeed answer user needs, or it can also be interpreted that with the Android-based PKM Center Mobile Learning application, most user needs can be fulfilled with the Android-based PKM Center Mobile Learning application.

Based on the results that have been described, it can be seen that the development of the Android-based PKM Center Mobile Learning Application has been successfully carried out and is proven to be able to meet the needs of users, namely students of the Faculty of Education, Surabaya State University. This is proven by the results of trials in the functional and suitable of needs category, where most users say that the Android-based PKM Center Mobile Learning application is in accordance with its function and is able to meet their needs. The effectiveness of Android-based application development is also supported by several previous studies, such as research conducted by Trabelsi (2020) with the title "Android-Based Mobile Apps for Hands-On Education". This research aims to demonstrate how mobile devices can be used to develop new educational activities and tools and learning approaches that seek to benefit from the prevalence of mobile devices in student communities. And the results of his research show that the Android-based learning activities discussed have a positive impact on students' direct firewall skills and on student performance in terms of achieving course learning outcomes.

In addition, a comparative analysis of various Android applications related to the applications discussed emphasizes their significance, especially for academic environments (Trabelsi, 2020). Research conducted by Zulfiani et al. (2021) also proved that the development of an android-based application called the Android version of science education-adaptive learning system (ScEd-ALS) proved effective in improving student learning outcomes, even ScEd-ALS was proven to be the most effective medium compared to with aural

media and writing/reading. Relevant research results were also proven by Bani et al. (2021) who examined the effect of developing the Android-based Harmonic Oscillation Pocket Book in improving students' cognitive learning outcomes. The results of his research show that the Android-based Harmonic Oscillation Pocket Book has proven effective in improving students' cognitive learning outcomes, and students show a tendency to respond positively to the software. Besides being effective for student learning processes and outcomes, research conducted by Pahuriray (2021) also proves that the development of Android-based applications has also proven effective in facilitating transaction activities at the student office, making it easier for students to communicate and find out about school events, and increasing the effectiveness of school administration activities.

Not only in the education sector, has android development also proven effective in other sectors of human life, for example, health. In 2019 the world was attacked by the Covid-19 Pandemic. The development of an android application that is enabled to detect COVID-19 infection from a chest CT scan using the deep learning algorithm performed by Agus has proven to be very efficient and accurate. The results of his research show that the neural network that was trained to detect COVID-19 in his research was tested with an F1 score, and each category, namely accuracy and sensitivity, both achieved scores of 99.58% and 99.69%, which are better than most of the outcomes in the COVID diagnosis domain from CT scans (Verma et al., 2022). Relevant research results were also shown by Agus who researched the InStrat COVID-19 tutorial application which was developed to provide accurate and regularly updated information about COVID-19 to frontline health workers and epidemic response workers in 25 states of Nigeria. The results showed that 65 (50%) participants reported that the app increased their understanding of COVID-19, while 69 (53%) stated that they had applied the knowledge and skills learned at work. Overall, the functionality and usability of the application is satisfactory (Otu et al., 2021). Some of the results of this research confirm that Android-based application development will never be a wrong investment. Because in addition to the times that are getting faster and the level of smartphone use is increasing, Android-based applications will be able to continue to be updated according to the needs of their users. This will save a lot of money, manpower and other resources.

Conclusion

The development of mobile applications is not something new anymore. Along with the high number of enthusiasts and smartphone users, many educational institutions are competing to develop android-based applications, as well as the Faculty of Education, Surabaya State University, which has problems that are often experienced by using traditional systems, namely the lack of the latest information needed by students. Therefore, the Faculty of Education, State University of Surabaya brought a solution by developing the Android-Based PKM Center Mobile Learning Application which aims to facilitate students who are interested in learning to do community service (PKM). Based on the results of the trials in this study it can be seen that the development of the Android-based PKM Center Mobile Learning Application at the Faculty of Education, State University of Surabaya has been successfully carried out. The PKM Center Mobile Learning application has also been proven to be able to meet the needs of its users very effectively. This is evidenced by the scores obtained in each of the categories tested, namely functional, design, ease of use, and suitable of use. Where the average trial results on the PKM Center Mobile Learning Application reach 90%. Therefore, it can be concluded that the PKM Center Mobile Learning application is effective in helping students meet their needs related to community service activities. The results of the study show that the development of the Android-based PKM Center Mobile Learning Application can affect the scientific management of education, especially to improve the quality of students in the tertiary environment. However, the development of the Android-Based PKM Center Mobile Learning Application also still requires continuous improvement to be able to continue to improve product performance and also as an effort to adapt it to the needs of its users. The Android-based PKM Center Mobile Learning Application also needs regular monitoring and evaluation so that managers can keep up to date with the needs of PKM Center Mobile Learning Application users.

Acknowledgments

Thank you to all parties who have contributed to completing this research. Surabaya State University which has given permission and a place to conduct research.

Funding

This research received no external funding.

Conflicts of Interest

The authors declare no conflicts of interest.

References

- Abraham, A. (2020). Impact of Digital Media on Society. *International Journal of Creative Research Thoughts (IJCRT)*, 8(5), 2742-274. Retrieved from <https://www.researchgate.net/publication/347444440>
- Alhubaishy, A., & Aljuhani, A. (2021). The Challenges of Instructors' and Students' Attitudes in Digital Transformation: A Case Study of Saudi Universities. *Education and Information Technologies*, 26, 4647-4662. <https://doi.org/10.1007/s10639-021-10491-6>
- Andalibi, N. (2021). Symbolic Annihilation through Design: Pregnancy Loss in Pregnancy-Related Mobile Apps. *New Media & Society*, 23(3), 613-631. <https://doi.org/10.1177/1461444820984473>
- Babkin, A., Tashenova, L., Mamrayeva, D., & Andreeva, T. (2021). A Structural Functional Model for Managing the Digital Potential of a Strategic Innovatively Active Industrial Cluster. *International Journal of Technology*, 12(7), 1359-1368. <https://doi.org/10.14716/ijtech.v12i7.5350>
- Bani, M., & Masruddin, M. (2021). Development of An Android-Based Harmonic Oscillation Pocket Book for Senior High School Students. *Journal of Technology and Science Education*, 11(1), 93-103. <http://dx.doi.org/10.3926/jotse.1051>
- Bencsik, A. (2020). Challenges of Management in the Digital Economy. *International Journal of Technology*, 11(6), 1275-1285. <https://doi.org/10.14716/ijtech.v11i6.4461>
- Bolatli, G., & Kizil, H. (2021). The Effect of Mobile Learning on Student Success and Anxiety in Teaching Genital System Anatomy. *Anat Sci Educ*, 1-11. <https://doi.org/10.1002/ase.2059>
- Borg, W. R., & Gall, M. D. (1983). *Educational Research: An Introduction*. New York: Longman.
- Caldeira, C., Chen, Y., Chan, L., Pham, V., Chen, Y., & Zheng, K. (2018). Mobile Apps for Mood Tracking: an Analysis of Features and User Reviews. *AMIA Annual Symposium Proceedings*, 495-504. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/29854114/>
- Calderon, A., & Tannehill, D. (2020). Enacting A New Curriculum Models-Based Framework Supported by Digital Technology within A Learning Community. *European Physical Education Review*, 27(3), 1-20. <https://doi.org/10.1177/1356336X20962126>
- Choi, J-C. (2020). User Familiarity and Satisfaction with Food Delivery Mobile Apps. *SAGE Open*, 10(4), 1-10. <https://doi.org/10.1177/2158244020970563>

- Fink, L., Shao, J., Lichtenstein, Y., & Haefliger, S. (2020). The Ownership of Digital Infrastructure: Exploring the Deployment of Software Libraries in A Digital Innovation Cluster. *Journal of Information Technology*, 35(3), 251-269. <https://doi.org/10.1177/0268396220936705>
- Frolova, E. V., & Rogach, O. V. (2021). Digitalization of Higher Education: Advantages and Disadvantages in Student Assessments. *European Journal of Contemporary Education*, 10(3), 616-625. <https://doi.org/10.13187/ejced.2021.3.616>
- Gökçeşlan, Ş., Solmaz, E., & Kukul, V. (2017). Mobile Learning Readiness Scale: An Adaptation Study. *Educ Technol Theor Pract*, 7, 143-147. <https://doi.org/10.17943/etku.288492>
- Limani, Y., Hajrizi, E., Stapleton, L., & Retkoceri, M. (2019). Digital Transformation Readiness in Higher Education Institutions (HEI): The Case of Kosovo. *IFAC-PapersOnLine*, 52(25), 52-57. <https://doi.org/10.1016/j.ifacol.2019.12.445>
- Madanipour, P., & Cohrsen, C. (2020). Augmented Reality as a Form of Digital Technology in Early Childhood Education. *Australasian Journal of Early Childhood*, 45(1), 5-13. <https://doi.org/10.1177/1836939119885311>
- Magnusson, L. O. (2021). Digital Technology and the Subjects of Literacy and Mathematics in the Preschool Atelier. *Contemporary Issues in Early Childhood*, 1-13. <https://doi.org/10.1177/1463949120983485>
- Marquez-Ramos, L. (2021). Does Digitalization in Higher Education Help to Bridge the Gap between Academia and Industry? An Application to COVID-19. *Industry and Higher Education*, 35(6), 630-637. <https://doi.org/10.1177/0950422221989190>
- Otu, A., Okuzu, O., Effah, E., Ebenso, B., Ameh, S., Nihalani, N., & Walle, Y. (2021). Training Health Workers at Scale in Nigeria to Fight COVID-19 Using the InStrat COVID-19 Tutorial App: An E-Health Interventional Study. *Therapeutic Advances in Infectious Disease*, 8, 1-13. <https://doi.org/10.1177/204993612111040704>
- Pahuriray, A. V. (2021). School Android Based E-Services. *Globus An International Journal of Management & IT: A Refereed Research Journal*, 12(2), 40-45. <https://doi.org/10.46360/globus.mgt.120211006>
- Saeedi, K., & Visvizi, A. (2021). Software Development Methodologies, HEIs, and the Digital Economy. *Education sciences*, 11(2). <https://doi.org/10.3390/educsci11020073>
- Savina, M. V., & Stepanov, A. (2020). Features of the Formation of the Production Potential of Enterprises in the Era of Digitalization. *Social'naya Politika i Sociologiya*, 19.1(134), 13-20.
- Singh, M. N. (2021). Inroad of Digital Technology in Education: Age of Digital Classroom. *Higher Education for the Future*, 8(1), 20-30. <https://doi.org/10.1177/2347631120980272>
- Soparno, D., & Tarjana, S. (2021). Students' Perceptions towards Using Mobile Application in Learning Speaking. *International Online Journal of Education and Teaching (IOJET)*, 8(3), 1385-1400. Retrieved from <https://iojet.org/index.php/IOJET/article/view/786/674>
- Sprenger, D., & Schwaninger, A. (2021). Technology Acceptance of Four Digital Learning Technologies (Classroom Response System, Classroom Chat, E-Lectures, and Mobile Virtual Reality) After Three Months' Usage. *International journal of educational technology in higher education*, 18(1), 8. <https://doi.org/10.1186/s41239-021-00243-4>
- Thepditaka, A., & Somphong, M. (2021). Exploring Thai EFL Learners' Attitudes toward the Use of Mobile Applications for Language Learning. *LEARN Journal: Language Education and Acquisition Research Network*, 14(1), 370-398. Retrieved from <https://files.eric.ed.gov/fulltext/EJ1284570.pdf>
- Trabelsi, Z. (2020). Android-Based Mobile Apps for Hands-On Education. In: Tatnall, A. (eds). *Encyclopedia of Education and Information Technologies*. Springer, Cham., pp. 52-65. <https://doi.org/10.1007/s10639-015-9439-8>
- Verma, A., Amin, S. B., Naeem, M., & Saha, M. (2022). Detecting COVID-19 from Chest Computed Tomography Scans Using AI-driven Android Application. *Computers in Biology and Medicine*, 143, 1-15. <https://doi.org/10.1016/j.combiomed.2022.105298>
- Zhang, T., Su, Z., Cheng, J., Xue, F., & Liu, S. (2022). Machine Vision-Based Testing Action Recognition Method for Robotic Testing of Mobile Application. *International Journal of Distributed Sensor Networks*, 18(8), 1-13. <https://doi.org/10.1177/15501329221115375>
- Zulfiani, Z., Suwarna, I. P., & Miranto, S. (2021). Improving Students' Academic Achievement Using the ScEd-ALS Android-Based. *International Journal of Instruction*, 14(2), 735-756. <https://doi.org/10.29333/iji.2021.14241a>