

DEVELOPMENT OF LEARNING MEDIA BASED ANDROID TO TEACH BOOSTER COVID 19 VACCINATION FOR EARLY CHILDHOOD

Rafika Bayu Kusumandari

Rafika Bayu Kusumandari, lecturer at Universitas Negeri Semarang, Semarang

Istyarini

Istyarini, lecturer at Universitas Negeri Semarang, Semarang

ABSTRACT

This study aims to develop and test the effectiveness of learning media-based android to prevent the spread of Covid-19 for early childhood. This study uses Research and Development (R&D) method and using a product type development model 4D models (Define, Design, Develop, and Disseminate). The results of this study showed that from the validation process was carried out by media experts shows an average score of 3.9 and material experts an average score of 3.8. Based on the results of the calculation of T test, obtained t count 3.33 so that the result is greater than significant value $\alpha = 0.05$. If the t value is greater than $\alpha = 0.05$ then the hypothesis is accepted. The value of student learning outcomes before using learning media-based android was 50, while the value of student learning outcomes after using learning media-based android was 90. This can be seen from the average initial value before using the learning media based on android For Teaching Covid-19 Booster Vaccine to Early Childhood with a result of 8 and the average value after using learning media based on android For Teaching Covid-19 Booster Vaccine to Early Childhood with a result of 15. It can be concluded that the learning media based on android for Teaching Covid-19 Booster Vaccine to Early Childhood is effective in improving early childhood understanding of the importance of covid 19 booster vaccine.

ARTICLE INFO

Keywords:

Learning Media, Android, Vaccine Covid 9, Early Childhood

Article History:

Received: 14th Mar 2023
Accepted: 29th Apr 2023
Published: 31st May 2023

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1. INTRODUCTION

Corona Virus Disease 2019 or commonly abbreviated as COVID-19 is an infectious disease caused by SARS-CoV-2, a type of coronavirus. People with COVID-19 can experience fever, dry cough and difficulty breathing. COVID-19 infection was first discovered in the city of Wuhan, China, at the end of December 2019. This virus spread quickly and spread to other regions in China and most countries in the world, including Indonesia. This has made several countries implement lockdown policies to prevent its spread. This disaster is the most severe global health crisis since the 1918 influenza pandemic (Cacella, et.al. 2022). The drama of the pandemic has prompted many scientists around the world to design possible vaccination plan for countering COVID-19 (Forni & Mantovani, 2021).

Offering vaccines is one of the efforts that is considered the most effective in dealing with the ongoing COVID-19 pandemic. Vaccines are currently the main mitigation strategy to combat COVID-19 worldwide (Subramanian & Kumar, 2021). Vaccination is the administration of vaccines (antigens) that can stimulate the

formation of immunity (antibodies) of the immune system in the body. Vaccination as a primary prevention effort is very reliable in preventing diseases that can be prevented by vaccination. Actually, the body's immune system against a disease can be formed naturally when a person is infected with a virus or bacteria that causes it. However, Corona virus infection carries a high risk of death and transmission. Therefore, another way is needed to form the immune system, namely vaccination. Vaccination against Covid-19 is carried out after confirmation of its safety and efficacy is in an effort to reduce morbidity and mortality and encourage the formation of herd immunity. In addition, the Covid-19 vaccination aims to protect and strengthen the health system as a whole, as well as maintain productivity and reduce the social and economic impact of society. The COVID-19 vaccination has significantly saved tens of millions of lives globally (Watson, et al. 2022). A COVID-19 vaccine offers 95% efficacy in preventing disease, hospitalization and death (Moghadas, et al, 2022; Andrews, et. Al .2022; Inayat Ali, 2020).

The covid-19 vaccination program in Indonesia encountered various obstacles in its implementation. There are still several groups of people who refuse to be vaccinated against Covid-19. Those who refuse to be vaccinated are not only those who are highly educated, but also the health workers themselves. This is a tricky problem for the government to fight the Covid-19 pandemic. To assist the government to raise awareness of the importance of a booster vaccine for Covid-19, one way is by using a smartphone. Currently the use of smartphones is growing because people need updated information about the COVID pandemic (Iyengar. et all. 2020). For this reason, it is necessary to have educational applications as learning media for booster vaccines, particularly for young children about Covid-19. Besides having a stronger memory, young children have unique patterns of growth physical, cognitive, socio-emotional, creativity, language and special communication according to the stages that children go through (Saurina, 2016). Because of this, they are more disciplined than their parents in implementing health protocols as well as more engaged in learning if technology is used in the classroom. Youngsters nowadays are also highly accustomed to the usage of electronic gadgets. Therefore, incorporating smarphone into schooling would undoubtedly assist in piquing their interest and enhancing their involvement levels (Haleem, et.al. 2022).

Raising awareness amongst the young children expected to be more effective in suppressing the spread of Covid-19 and helping the government to deal with Covid-19. Through smartphone, material about covid-19 can be given to early childhood to provide an understanding of the current conditions. In other words, learning is carried out at home due to the Covid 19 pandemic (Hewi & Asnawati, 2021).

The rapid advancement of information and communication technology (ICT) has an impact on various aspects of life. ICT seems to be a motor in every field, as such it is always the main indicator of progress or lagging behind in a particular field. The use of smartphones, ipads, playbooks, tablet PCs, cellular phone, mobile phone and the like is more widely used today for various reasons rather than PCs (Personal Computers) at home (Kusumandari, et.al. 2019). With the development of technology, educators are expected to be innovative in the learning process by utilizing various interactive learning media. One of them is Android-based learning media. Android operating system was chosen because Android is an open operating system that allows users to add their own applications freely besides the basic applications that come with their cellphones (Kusumandari & Wibawa. 2019).

Setting the android-based covid 19 booster vaccine application as a learning medium potentially helps to accelerate the spread of health message information as an effort to prevent the development and spread of COVID-19, minimize HOAKS information related to the circulating COVID-19 booster vaccine through social media, as well as increasing community participation and empowerment. The development of an android-based educational media application for the covid 19 booster vaccine for early childhood allows the young children learn anytime and anywhere without being limited by distance, space and time. Equipped with interesting games to play, the android-based application is potentially more efficient and effective. Playing is the main activity for children to learn, explore the experiences, and to gain new knowledge (Zaini, 2015). Through playing activities, children master body functions well, coordinate eyes and movements, train children's muscles, make decisions and acquire new skills/abilities (Papalia & Feldman, 2015). In view of the potential of this Android-based educational media, a relevant research is hereby proposed.

2. RESEARCH OBJECTIVES

This study aims to test the effectiveness of Android-based booster vaccine educational media to prevent the spread of Covid-19 for early childhood. Android application-based learning media can be used by teachers to

teach vaccine boosters to fight the COVID-19 pandemic in early childhood. Using approaches such as implementation, testing, and release, The research is expected to be able to build theory inductively from the abstraction of data collected about the Android-based Covid-19 prevention campaign model for children.

3. RESEARCH METHOD

This research was designed with a "Research and Development" approach. Research and development (R&D) consist of creative and systematic work carried out to increase knowledge and design new applications from what is available (Moris, 2017). The "R&D" approach is a process used to develop and validate products for improvement or improvement (Borg & Gall, 1983; Kusumandari & Istyarini, 2022). This research used a product type development model named 4D models (Define, Design, Develop, and Disseminate). During the course of the research, pretest was given before using the media, and posttest was given after media usage to observe see the effectiveness of the use of media to learners' learning outcomes.

This research was conducted in Central Java by taking samples from kindergartens in 4 regencies/cities, namely Semarang City, Kudus Regency, Wonosobo Regency and Cilacap Regency. Children who are the subjects of research are children aged 6-7 years using random sampling. Each district/city took 50 students aged 6-7 years as research samples. Data were collected from experiential backgrounds (natural settings) as direct data sources. (Kusumandari & Istyarini, 2015). Qualitative descriptive analysis was used to analyze data obtained from preliminary studies with survey methods, the process of developing model designs and modeling by experts (Kusumandari & Sukirman, 2017). The reason for using qualitative methods is because there are no empirical results that specifically discuss the development of an android-based Covid-19 prevention campaign model for children (Sugiharto & Kusumandari, 2016).

The data collected in this study consists of two types of data, namely qualitative data and quantitative data. Qualitative data is data regarding the process of developing learning media in the form of criticism and suggestions from material experts, media experts, learning practitioners, and students. Quantitative data is the main research data in the form of learning media assessment data in the form of an android-based educational application "Si Booster" from material experts, media experts, learning practitioners, and students. The instrument used in collecting data for this study is a questionnaire. Questionnaires are research instruments that contain a series of questions or statements that must be answered by respondents freely in their opinion (Arifin, 2014). Analysis of the usability aspect using a questionnaire is then calculated with Cronbach's Alpha reliability consistency as follows:

$$r_{11} = \left[\frac{n}{n-1} \right] \left[1 - \frac{\sum \sigma^2 i}{\sigma^2 t} \right]$$

Where :

r_{11} = instrument reliability

n = the number of questions

$\sum \sigma^2 i$ = number of variant items

$\sigma^2 t$ = total varian

A research instrument is declared reliable by using this technique, if the reliability coefficient (r_{11}) > 0.6 (Setyawan, 2013). Alpha Cronbach calculations are calculated by interpreting the reliability value of Alpha Cronbach as follows:

Table 1: Alpha Cronbach Interpretation

No	R Value	Interprestation
1.	R > 0.9	Excellent
2.	0.9 > R > 0.8	Good
3.	0.8 > R > 0.7	Acceptabel
4.	0.7 > R > 0.6	Questionable
5.	0.6 > R > 0.5	Poor
6.	R < 5	Unacceptabel

The questionnaire instrument was chosen by the researcher because the questionnaire are in accordance with the needs of researchers to obtain the required data. The research instrument was a feasibility questionnaire for the educational application "The Booster" adapted from Romi Satria Wahono (2006). Instrument testing was carried out with the aim of knowing whether the instrument is reliable and valid or not.

In this study, the formula used to test the validity of the instrument is Pearson's product moment correlation, as follows:

$$r_{xy} = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{(\sum X^2 - (\sum X)^2)(N \sum Y^2 - (\sum Y)^2)}}$$

Information:

- r_{account} : Correlation Coefficient X and Y
- N : Number of subjects
- $\sum XY$: Sum of products X and Y
- $\sum X$: Total price of X
- $\sum Y$: Total price of Y
- $N \sum X$: Sum of X squared
- $N \sum Y$: Sum of Y squared

Reliability means standing the test or being trusted. An instrument is said to be reliable if it has constant results even though it is carried out several times at different times.

Table 2: Interpretation of r Value

The Value of r	Interpretation
0,800 to 1,000	Very high
0,600 to 0,799	High
0,400 to 0,599	Medium
0,200 to 0,399	Low
0,000 to 0,199	Very low

The instrument is said to be reliable if r_{count} is greater or equal to r_{table} and vice versa if r_{count} is less than r_{table} , the instrument is said to be reliable r_{count} is matched with the interpretation table r with the condition that it is said to be reliable if $r_{count} \geq 0.600$. From the reliability test, a score of 0.61 was obtained, so the instrument used was reliable.

The data collected was then analyzed to determine the assessment and opinion of the product produced. Product quality assessment data were obtained from questionnaire results by media experts, material experts, and learning practitioners. The data was then analyzed by following steps:

- a. Change the qualitative assessment to quantitative with the provisions that can be seen in table 2.

Table 3: Provisions for Scoring

Category	Score
SA (Strongly Agree)	4
A (Agree)	3
DA (Dis Agree)	2
Don't agree	1

The modification was carried out by removing the "Strongly Disagree" classification, so that the scale used became a scale of 4. This was done so that the "Disagree" classification answer was considered representative.

- b. Calculate the average score of each indicator with the formula:

$$\bar{x} = \frac{\sum x}{N}$$

Information:

\bar{x} = average score

$\sum x$ = total score

N = number of test subjects

The average score data collected is converted into a qualitative value with the following predetermined criteria.

The effectiveness of the media is determined by looking at the completeness of student learning outcomes by using the learning media used during the learning process. Data on student learning outcomes were obtained through sheets about students' abilities before and after the treatment using Si Booster learning media-based android. The effectiveness results using learning outcomes and the description generally uses the T Paired Test statistical technique. The paired t-test is a comparative test performed on single paired samples (Angraini et.al., 2017). Paired t-test was used because the effectiveness test in this study used the One Group Pretest-Posttest Design. Before testing the hypothesis, a requirements analysis test was carried out in the form of a normality test as a condition for testing the hypothesis.

4. RESEARCH RESULTS

Product Development

The development of learning media based on Android is an adaptation and modification of using 4D models. Implementation of all procedures for the development of this research in detail can be seen in the

following description. The test subjects involved were one media expert, one material expert, and one Pendidikan Anak Usia Dini (Indonesia Early Childhood Care and Education) (PAUD) practitioner. The trial studied is the quality and feasibility of learning media in the form of an Android-based educational application which includes aspects of material relevance, aspects of play, aspects of language, aspects of visual appearance, aspects of software engineering, and aspects for learning strategies. The Android-based educational application is made on the basis of the Android system using the Android Studio application and the Java programming language. Android is an operating system developed for Linux-based mobile devices. Initially this operating system was developed by Android Inc.

Define Phase

The define phase was done by conducting a needs analysis. Analysis of needs related to problems and characteristics of students, hardware, and software. The learning media pursued by teachers in TK Sekar Mekar and TK Negeri Pembina Semarang City has not penetrated the technology preferred by the students. Currently, students tend to use communication devices such as smartphones intensively. The results of the researchers' observations shows that the use of smartphones tends to take up learning time and students' concentration on lessons because they are used to play games, YouTube, or other entertainment features. Making and developing learning media by utilizing technology can improve the quality of the student learning process during and outside the teaching and learning process. The creation of the learning media-based android is expected to make students more interested in learning about Covid 19 and remind people around them to be more aware of efforts to prevent and spread Covid 19. The software used to create this media is divided into : (a) operating system software (Android), (b) learning media creation software (Android Studio), display software (Button Android Studio), Icon: free icon from icon8.com and the rest uses manual coding., and Software uploads questions and materials.

Design Phase

The design phase is the media design stage which includes making the overall media design (storyboard), preparing material, question and answer, creating logos, backgrounds, producing Media Design Storyboards. Storyboard describes all the learning media that will be loaded in the application. Storyboard serves as a guide for programmers to facilitate the media creation process. In this media, the background and fonts are obtained by downloading from various sources which will then be processed by interpreters who are more skillful in the field of graphics and technology. Fonts for the learning media based android were designed by researchers who were then interpreted in digital form by interpreters, then the output results in digital form were selected. Producing logos and application buttons were designed by researchers using hand sketches, then converted into digital form by interpreters.

Picture 1. Learning Media based on Andoid Design



Development Phase

The goal of development is to produce a product and validate the source selected learning Branch (2009:84). Development at this stage is manufacturing Android-based learning media products which can be explained as follows:

a. Making android-based learning media products.

The development stage of making learning media products was carried out according to predetermined planning/design procedures, using Adobe software Flash CS6. The learning media developed was in the form of an Application Package File (APK), which can be presented and operated using an HP smartphone with at least 225MB of internal RAM, 4 inch screen, and install the Adobe AIR application (Adobe Integrated Runtime) v.10. Development of android-based learning media so that the learners run properly under the condition of a minimum operating system Android 4.0 (Ice Cream Sandwich). The procedure for using this media was by installing an application (fuel system gasoline injection) on an Android-based smartphone that has the Adobe AIR application installed, whereas if a computer is used, the Blue software Stacks Agent (0.9.23.5302) which can open Android on a computer/laptop will first need to be installed, then android-based learning applications were installed.

b. Validation and assessment

Android-based learning media that has been developed were then consulted with supervisors, teachers of light vehicle engineering expertise packages TK Negeri Pembina Kota Semarang. It was also validated by media expert lecturers and material expert lecturers. Validation expected to generate suggestions, comments, and input about the media in terms of material and media. The validation process was carried out by media experts and material experts using a questionnaire. The following are the results of the validation that can be used as a basis for analyzing and revising the developed media as well as a basis for product trials on students.

1. Media Experts Validation

Media validation was carried out to examine and assess whether the developed media is feasible to be tested. Media validation is done by filling out a questionnaire using a Likert scale with four alternative answer choices. The questionnaire for media experts has 12 assessment indicators which are grouped into 3 aspects. The results of the recapitulation and validation analysis can be seen in full in the appendix, for the average results of media expert validation in software engineering aspects can be seen in table 4.

Table 6: Media Experts Validation

Indicator	Indicator	Average Score	Category
Display Quality Aspects	8	4	Very Feasible
Software Enginee Aspects	2	3,8	Very feasible
Implementation Aspects	2	3,75	Feasible
Total	12	3,9	Very Feasible

Source: Processed primary data

Based on table 4 obtained an average score of 3.9 which falls into the range $X > 3.4$ with a very decent category. So that the feasibility level of the learning media-based android based on the validation of media experts is in the Very Feasible category.

2. Material Experts Validation

Material expert validation is used to assess material that has been compiled in the Si Booster application. The questionnaire used by the researchers is to use a Likert scale with four alternative answer choices. The material expert questionnaire has 13 assessment indicators which are grouped into 3 aspects. The full results of the recapitulation and validation analysis can be seen in the appendix, for the average material expert validation results on material aspects are in table 7.

Table 7: Material Experts Validation

Indicator	Total Score	Average Score	Category
Learning objectives	2	3,8	Very Feasible
Material selection Aspects	5	3.8	Very Feasible
Evaluation Aspects	2	3,8	Very Feasible
Linguistic Aspects	4	3,8	Very Feasible
Total	13	3,8	Very Feasible

Source: Processed primary data

In regards to the material aspect, there are 4 indicators which include learning objectives obtaining an average score of 3.8 which is included in the very feasible category, material selection has an average score of 3.8 which is included in the very feasible category, Discussion of material obtains an average score of 3.8 which fall into the very decent category. Based on table 7, it is known that in terms of material aspects the results of the assessment with an average of 3.8 are included in the range $2.8 < X < 3.4$ with a very feasible category.

b. Product repair

The results of the validation of learning media-based android are input for media development and improvement before being tested. After the media is fixed according to the expert's advice, then the researcher asked the expert to provide a value (evaluation) of the media Android-based learning, namely by filling in the assessment instrument was made before.

Disseminate Phase

The dissemination process is the final phase of 4D model development. At this phase, the implementation of the media was developed into real learning situations, namely in the classroom. This implementation phase can be used to examine the enthusiasm of students in the process learning using media that has been developed. The student enthusiasm can be achieved by providing feedback questions to students as well as by way of observation during the learning process.

This phase was carried out as a promotion regarding product development so that acceptable to users, both individually and in groups system. The dissemination phase was carried out on 200 students in class B2, TK Sekar Mekar, Sekaran, Semarang City and TK Negeri Pembina Semarang City, TK Aisyiah Kretek, Wonosobo Regency and TK Pertiwi Rojoimo Wonosobo Regency, TK Pertiwi Purwosari and TK Pertiwi Mlati, Kudus Regency, TK Al Kautsar Sampang and TK Aisyiah Gentasari, Calico Regency. Form dissemination namely giving pretest and posttest with the aim of obtaining a value which can be compared to using learning media based on android or not using learning media based on android. The instrument used to collect data on the effectiveness of Android-based learning media is a test. The test used to obtain data on student learning outcomes is a cognitive test carried out at the beginning (pretest) and at the end (posttest) of learning using the experimental class. Effectiveness testing was carried out using the Time Series Design quasi-experimental design formula. The effectiveness of student learning outcomes, researchers conducted pretest and posttest. The pretest effectiveness value was obtained before using the learning media based android and the posttest effectiveness value after using it.

The average student pretest results are 50. The average post-test result for students is 90. Based on the data analysis technique of research learning outcomes to draw conclusions whether there is a significant effect of using the Android-based Si Booster learning media on booster vaccine learning is analyzed statistically. Before testing the hypothesis using the paired t-test, the normality test is first performed. The normality test was carried out to find out whether the sample data came from normally distributed data or not, so that it could be used for

analysis using a paired t test. In the normality test, the trust test is used as stated in the data analysis technique. The results of the normality test with a significant level of α 0.05 for sample 12. Based on the data recapitulation of the results of the analysis of the normality test, it can be seen that the pretest t test is 0.226 smaller than L_{table} 0.242 for α 0.05. Therefore, the pretest values come from normally distributed data. For the posttest obtained L_{count} 0.354 smaller than L_{table} 0.242 for α 0.05. Thus the posttest values are derived from normally distributed data. After the normality test was carried out, a paired t test was carried out to find out whether there was a significant difference in the values of the two groups.

T-test was performed on two paired samples; Paired samples are samples with the same subject, but there are two different treatments, the subject will receive the first treatment, namely the results of learning before using learning media-based android, after that the subject will receive the second treatment, namely the results of learning afterwards. using learning media-based android in learning booster vaccines for early childhood. The value of student learning outcomes before using learning media-based android was 50, while the value of student learning outcomes after using learning media-based android was 90.

It can be concluded that the learning media-based android for Teaching Covid-19 Booster Vaccine to Early Childhood is effective in improving early childhood understanding of the importance of the co-19 booster vaccine. Based on the assessment of the research subjects, the learning media-based android is suitable for use as a learning medium. Students are more interested in learning to learn the importance of the co-19 booster vaccine. The students were very interested and happy with learning media-based android.

5. DISCUSSION

Improving the quality of education can be done by using technology through the creation of android-based learning applications by teachers education that can attract the interest of participants learn in learning activities. Integrating technology into education provides students with an engaging learning experience, allowing them to remain more interested in the subject without being distracted. In the context of teaching and learning, technology can facilitate tasks and improve teachers' performance in creating effective teaching and learning activities. Technology innovations influence the scientific and technological progress in all areas of society (Bilyalova, 2017).

Learning is the development of knowledge, skills, or attitude as an individual interacts with information and environment, deliberate effort by educators to support student learning activities (Kusumandari, et.al, 2018; Kusumandari & Istyarini, 2015). Learning media-based android is a form of variation learning media on covid 19 booster vaccine material. This learning media-based android is used as support for the delivery of learning material by teachers in facilitating students' understanding of submitted material. Media components include text, images, audio, and video. These components can support more optimal student learning. Multimedia enables efficient understanding, learning and application of knowledge (Quinn, 2011). The learning media based on Android with the Basic Competency of Covid 19 was developed using the 4D model developed. Android is an open-source application, which means various application features in the android can be changed according to the needs of its users, including in making learning applications (Lee, 2011; Milovanovic, et.al. 2013).

This research produces learning media with the assessment of media experts reached 3.9 (very feasible), material expert assessment reached 3.8% (very feasible). The value of student learning outcomes before using learning media-based android was 50, while the value of student learning outcomes after using learning media-based android was 90. This is in line with the results of research by Asrori & Bruri (2020) with the title Development of Nahwu Learning Media based Android where as a result Android-based learning media has been successfully developed and effectively implemented in Nahwu courses in tertiary institutions Arabic language education student at Malang State Islamic University. In accordance with the results of learning on the nahwu course, it was found that there were significant differences in learning outcomes between the experimental classes and control class. The results of this study indicated successful and effective Android-based learning media has been developed for improving Student College learning outcomes. The use of technology in learning can provide new changes and improvement in learning and communication . This can be seen from the high motivation of the students after study. This statement shows that using the media is one of the solutions to increase student understanding (Alemu, 2015).

6. CONCLUSION

The conclusions are as follows: (a) The stages of developing the Android-based "Si Booster" Application as a learning medium with the 4D model, (b) Assessment of the Android-Based "Si Booster" Application as a learning media carried out by material experts, media experts, and practicing teachers.

Acknowledgement

I would like to thank the Ministry of Education and Culture Research and Technology for the opportunity given to be able to conduct Kemendikbudristek Research and Technology research through the National Competitive Applied Research program.

Conflict of Interest

The authors declare no conflict of interest.

References

1. Alemu, B. M. (2015). Integrating ICT into Teaching-Learning Practices: Promise, Challenges and Future Directions of Higher Educational Institutes. *Universal journal of educational research*, 3(3), 170-189.
2. Plump CM, LaRosa JJMTR. Using Kahoot! in the classroom to create engagement and active learning: A game-based technology solution for eLearning novices. 2017;2(2):151-8.
3. Arifin, Zainal. (2014). *Penelitian Pendidikan: Metode dan Paradigma Baru*. Bandung: PT Remaja Rosdakarya
4. Asrori, MK; Triyono & M. Bruri. (2020). Development of Nahwu Learning media based on Android. *Utopía y Praxis Latinoamericana*, vol. 25, núm. Esp.1, 2020 Universidad del Zulia, Venezuela Disponible en: <https://www.redalyc.org/articulo.oa?id=27963086022> DOI: <https://doi.org/10.5281/zenodo.3774623>.
5. Bilyalova, A. (2017). ICT in Teaching a Foreign Language in High School. *Procedia - Social and Behavioral Sciences*, 237(June 2016), p.175–181.
6. Branch R.M. (2009). *Instructional Design: The ADDIE Approach*. New York: Springer.
7. Brown, J.W, Richard, B.L & Fred, F.H. (1959). *A-V Instruction Material and Methods*. New York: McGraw-Hill Book Company, Inc.
8. Cascella, Marco; Michael Rajnik; Abdul Aleem; Scott C. Dulebohn; Raffaella Di Napoli (2022). Features, Evaluation, and Treatment of Coronavirus (COVID-19). Florida: StatPearls Publishing LLC.
9. Czeisler MÉ, Tynan MA, Howard ME, et al. (2020). Public Attitudes, Behaviors, and Beliefs Related to COVID-19, Stay-at-Home Orders, Nonessential Business Closures, and Public Health Guidance — United States, New York City, and Los Angeles, May 5–12, 2020. *MMWR Morb Mortal Wkly Rep* 2020;69:751–758. DOI: <http://dx.doi.org/10.15585/mmwr.mm6924e1>.
10. García, Érika (2021). "Google bans 32-bit apps from Android for good". Retrieved November 22, 2021.
11. Forni, Guido & Mantovai, Alberto. (2021). on behalf of the COVID-19 Commission of Accademia Nazionale dei Lincei, Rome. COVID-19 vaccines: where we stand and challenges ahead. *Cell Death Differ* 28, 626–639 (2021). <https://doi.org/10.1038/s41418-020-00720-9>.
12. Gagne, Robert, M. (1970). *The Conditions of Learning*. New York: Holt, Rinehart & Winstone
13. Gagne, Robert, M. (1970). *The Conditions of Learning*. New York: Holt, Rinehart & Winstone
14. Gitlin, Laura & Czaja, Sara. (2016). *Behavioral Intervention Research: Designing, Evaluating and Implementing*. New York: Springer.
15. Hunter D, Werbach K. *For the win: Wharton digital press Philadelphia, PA, USA*; 2012.
16. Gustafson, Kent L. and Robert Maribe Branch. (2002). *Survey of Instructional Development Models*. Pittsford, USA : Eric Clearninghouse.
17. Harold, K. (2004). *Advanced Project Management: Best Practices on Implementation*. USA : Willy & sons
18. Haleem, Abid. Javaid, Mohd. Qadri, Mohd Asim & Suman, Rajiv. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, Volume 3, 2022, Pages 275-285, ISSN 2666-4127, <https://doi.org/10.1016/j.susoc.2022.05.004>
19. Heinich, Robert, Michael Molenda dan James D. Russel. (1982). *Instructional Media: and the New Technology of Instruction*. New York: Jonh Wily and Sons
20. Hewi, L. dan S. (2019). Permainan Dadu pada Pengembangan Perilaku Prososial Anak di RA An-Nur Kota Kendari. *JECED : Journal of Early Childhood Education and Development*, 1(2), 115–128. <https://doi.org/DOI:https://doi.org/10.15642/jeced.v1i2.468>
21. Inayat Ali. (2020). Impact of COVID-19 on vaccination programs: adverse or positive?, *Human Vaccines &*

- Immunotherapeutics, 16:11, 2594-2600, DOI: 10.1080/21645515.2020.1787065
22. Iyengar, Karthikeyan; Gaurav K. Upadhyaya, Raju Vaishya, and Vijay Jain. (2020). COVID-19 and applications of smartphone technology in the current pandemic. *Diabetes Metab Syndr.* 2020 September-October; 14(5): 733–737. Published online 2020 May 26. doi: 10.1016/j.dsx.2020.05.033
 23. Kouhi, Mona & Rahmani, Mohsen. (2022). Design and Development of a Mobile Application for Teaching Triple Multiplication to Preschool Children. *SN COMPUT. SCI.* 3, 156 (2022). <https://doi.org/10.1007/s42979-022-01033-z>
 24. Kusumandari, Rafika Bayu & Istyarini. (2015). Character Education Development Model-Based E-Learning and Multiple Intelegency In Childhood In Central Java. *Global Journal of Computer Science and Technology: H Information & Technology* Volume 15 Issue 3 Version 1.0 Year 2015
 25. Kusumandari, Rafika Bayu & Istyarini. (2022). A Campaign Model for the Prevention of the Spread of Covid-19 Based on Android. *Journal of Positive School Psychology.* 2022, Vol.6, No.4, 2469-2480
 26. Kusumandari, Rafika Bayu & Sukirman. (2017). Organic Village as an Environmental Education Model based Community for Children in Semarang City, Central Java, Indonesia. *Global Journal of Human-Social Science: H Type: Double Blind Peer Reviewed International Research Journal* Publisher: Global Journals Inc. (USA) Online ISSN: 2249-460x & Print ISSN: 0975-587X Interdisciplinary Volume 17 Issue 3 Version 1.0 Year 2017
 27. Kusumandari, Rafika Bayu; Suario, Zulfikasari, Sony. (2019). Game PEKA untuk Trauma Healing Pada Anak Pasca Bencana di Kabupaten Banyumas. *Jurnal Teknologi Pendidikan.* <http://journal.unj.ac.id/unj/index.php/jtp> Vol. 21, No. 3, Desember 2019
 28. Kusumandari, Rafika Bayu. Wibawa, Basuki & Muchtar, Hartati. (2018). Game Learning to Optimize Learning in Disaster Area. *UICRIC 2018 UNNES International Conference on Research Innovation and Commercialization 2018* Volume 2019
 29. Kusumandari, Rafika Bayu. Wibawa, Basuki & Muchtar, Hartati. (2018). Game Learning to Optimize Learning and Trauma Healing in Children After Disaster in Banyumas. *Proceedings of the 1st Sampoerna University-AFBE International Conference, SU-AFBE 2018, 6-7 December 2018, Jakarta Indonesia*
 30. Kusumandari, Rafika Bayu & Wibawa, Basuki (2019). Learning Game Based Android to Reduce Trauma Children in Disaster Areas. *International Journal of Recent Technology and Engineering (IJRTE)* ISSN: 2277-3878, Volume-8, Issue- 1C2, May 2019
 31. Laranjeiro, Dionisia. (2021). Development of Game-Based M-Learning Apps for Preschoolers. *Educ. Sci.* 2021, 11, 229. <https://doi.org/10.3390/educsci11050229>
 32. Liu, Y., Tong, Y., & Yang, Y. (2018). The Application of Mind Mapping into College Computer Programming Teaching. *Procedia Computer Science*, 129, 66–70. <https://doi.org/10.1016/j.procs.2018.03.047>
 33. Lee. J. (2016). *Early Learning and Educational Technology Policy Brief.* USA: Office of Educational Technology, US Department of Education
 34. Lee Wei-Meng. (2011). *Begining Android Application Development.* USA: Willey Publishing, Inc
 35. Lewis M, Sanchez R, Auerbach S, et al. (2020). COVID-19 Outbreak Among College Students After a Spring Break Trip to Mexico — Austin, Texas, March 26–April 5, 2020. *MMWR Morb Mortal Wkly Rep* 2020;69:830-835. DOI: <http://dx.doi.org/10.15585/mmwr.mm6926e1>
 36. Milovanovic, M. Obradovic, J. & Milajic, A. (2013). “Application Of Interactive Multimedia Tools InTeaching Mathematics – Examples Of Lessons From Geometry” *TOJET Turkish Online Journal of EducationalTechnology*, vol. 12 Issue 1
 37. Moghadas, Seyed M; Thomas N. Vilches; Kevin Zhang; Chad R. Wells; Affan Shoukat; Burton H. Singer; Lauren Ancel Meyers; Kathleen M. Neuzil; Joanne M. Langley; Meagan C. Fitzpatrick; Alison P. Galvani (2021). The impact of vaccination on COVID-19 Outbreaks In The United States. *medRxiv [Preprint].* 2021 Jan 2:2020.11.27.20240051. doi: 10.1101/2020.11.27.20240051. Update in: *Clin Infect Dis.* 2021 Dec 16;73(12):2257-2264. PMID: 33269359; PMCID: PMC7709178
 38. Murphy, Mark. (2017). *Habermas and Social Research: Between Theory and Method,* London: Routledge *Advances in Sociology*
 39. Narouch, Dan H. (2022). Covid-19 Vaccines — Immunity, Variants, Boosters. September 15, 2022. *N Engl J Med* 2022; 387:1011-1020. DOI: 10.1056/NEJMra2206573
 40. National Association for Education of Young Children & Fred Rogers Center for Early Learning and Children’s Media at Saint Vincent College. (2012). *Technology and Interactive Media as Tools in Early Childhood Programs Serving Children from Birth through Age 8.* Washington DC:NAEYC; Latrobe, PA: Fred Rogers Center for Early Learning and Children’s Media at Saint Vincent College
 41. Newby, T.J. et. al. (2011). *Educational Technology for Teaching and Learning* (fourth ed.). Boston: Pearson Education, Inc
 42. Papadakis, Stamatios & Kalogiannakis, Michall. (2020). *Mobile Learning Applications in Early Childhood Education.* USA:IGI Global Books

43. Papalia, D. E. dan R. D. Feldman. (2015). *Menyelami Perkembangan Manusia*. Jakarta: Salemba Humanika
44. Pfaut, M., & Parrot, R. (1993). *Persuasive Communication Campaign*. Canada : Pearson Education
45. Quinn, Clark. (2011). *Mobile Learning*. US: The Mc Graww-Hill Companies
46. Richey, Rita C. Kleinn, James D. & Tacey, Monica W. (2011). *The Instructional Design Knowledge Base Theory, Research and Practice*. New York: The McGraw-Hill Companies Inc
47. Safaat H, N. (2012). *Pemrograman Aplikasi Mobile Smartphone dan Tablet PC berbasis Android (versi revisi)*. Bandung : Informatika.
48. Sahat Siagian, et al. (2014). Development of Interactive Multimedia Learning in Learning Instructional Design. *Journal of Education and Practice*. Vol. 5. No. 32. pp. 44-51
49. Sharma, B.M. (2004). *Global Education Series-9: Media and Education*. New Delhi: Commonwealth Publishers
50. Smaldino, Sharon E, dkk (2012). *Instructional Technology & Media For Learning*. Pearson Education. Inc
51. Subramanian, S.V., Kumar, A. (2021). Increases in COVID-19 are unrelated to levels of vaccination across 68 countries and 2947 counties in the United States. *Eur J Epidemiol* 36, 1237–1240 (2021). <https://doi.org/10.1007/s10654-021-00808-7>
52. Sugiharto, DYP & Kusumandari, Rafika Bayu. (2016). Model Development in the Context of Vocational Village Community Empowerment in Central Java. *International Journal of Information and Education Technology*, Vol. 6, No. 7, July 2016
53. Tiagarajan, D. S. (1974). *Instructional Development For Training Teacher Of Exceptional Children*. Minnesota: University of Minnesota
54. Wahono, R. S. (2006). Aspek dan Kriteria Penilaian Media Pembelajaran. Retrieved from <http://romisatriawahono.net/2006/06/21/aspekdan-kriteria-penilaian-media-pembelajaran/>
55. Wardhani, Dhiyan Krishna, et al. (2020). Edukasi Pencegahan Penularan Covid-19 pada Anak Usia Dini Melalui Media Pembelajaran Audio Visual. *Jurnal Abdidas Volume 1 Nomor 3 Tahun 2020 Halaman 131-136*. DOI: <https://doi.org/10.31004/abdidas.v1i3.33>
56. Watson, Oliver, J; Gregory Barnsley; Jaspreet Toor; Alexandra B. Hogan; Peter Winskill, Azra C. Ghani. (2022). Global Impact Of The First Year Of Covid-19 Vaccination: A Mathematical Modelling Study. *The Lancet Infectious Diseases*. Volume 22, Issue 9, P1293-1302, September 01, 2022. DOI:[https://doi.org/10.1016/S1473-3099\(22\)00320-6](https://doi.org/10.1016/S1473-3099(22)00320-6)