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Design of Android-Based Learning Media "MathArt" on Simple Interest, Discounts, and Taxation at the Lower Secondary Level of Education

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ABSTRACT

This study aims to design and evaluate the effectiveness of the MathArt application, an Android-based learning media focused on simple interest, taxes, and discounts for lower secondary education at SMPN 17 Bengkulu City. The research adopts a four-stage Research and Development (R&D) method: 1) research, 2) planning, 3) development, and 4) product trials. Data were collected qualitatively via Google Forms, targeting data form students and teachers. Questionnaires assessed MathArt's practically and effectiveness. Responses showed strong positive reception on MathArt, with 87.32% from students and 87.54% from teachers. This indicates its high suitability as a social arithmetic learning resource.

1. Introduction

The current development of education is closely intertwined with technological advancements. Education and technology play significant roles in human life, as famously noted by Toffler (1980) that the greatest power in the world lies in technology and knowledge. Consequently, in contemporary times, no aspect of human life, including education, can be detached from technology. Presently, the use of gadgets is not limited to specific individuals but is widely embraced by

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school-aged children (Pankaj S., et al., 2015). An example of such technological usage is through gadgets, which facilitate human communication (Sakina, et al., 2021). Over time, the utilization of gadgets across all age groups has proliferated, encompassing devices like mobile phones, televisions, laptops, tablets, computers, smartphones, and many others (Subarkah, 2019).

The development of gadgets has both positive and negative impacts on children. The positive aspect lies in how gadgets ease the acquisition of necessary information, especially when learning through play or vice versa (Sakinah, et al., 2021). Gadgets help save time and costs in the learning process. However, excessive gadget use can result in negative effects on children's daily behaviors. One such negative impact is that students may lack meaningful learning experiences (Suminar, 2019). Consequently, educators need to address these negative impacts by integrating technological media with teaching methods to provide students with enriching learning experiences while saving time and costs.

Utilizing gadgets as teaching materials is not as straightforward as envisioned. Educators must be proficient in the materials to apply them in teaching effectively. Learning media is crucial in supporting structured and varied learning processes, attracting students' interest (Riyan, 2021). Student interest in learning can be fostered by employing engaging learning models and encouraging student participation. Naturally, student interest in learning activities will lead to improved learning outcomes (Metaputri, et al., 2016). An example of utilizing gadgets in learning media is the use of Android-based mathematics learning applications.

A relevant study concerning the use of Android-based mathematics learning applications is "Development of Android-Based Learning Media on Social Arithmetic Material Using a Scientific Approach Assisted by Construct 2 Software in Grade VII of SMPN 137 Jakarta". The research yielded a validation score of 88.77% from validators, indicating a high level of validity. From this research, it is concluded that the use of Android-based mathematics learning applications is highly suitable for mathematics education.

Based on these research findings, we became interested in creating a similar learning media but using different software. In this study, we utilized iSpring Suite and Website APK Builder to develop the MathArt application. The purpose of this research is to design and evaluate the effectiveness of MathArt, an Android-based learning media focusing on simple interest, taxes, and discounts for lower secondary education. In this paper, we will present student and teacher responses to the application, gathered through qualitative data collection and analysis, to assess its practicality and effectiveness in enhancing the learning experience in social arithmetic.

2. Method

The type of research conducted is Research and Development (R&D). Research and Development is a series of product development, aimed at perfecting a product (Sukmadinata, 2012). In this study, the product developed is an Android application named MathArt, created using iSpring Suite and Website APK Builder. The development model used in this research is the Borg and Gall development model, which consists of ten development stages (Winarni, 2018).

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2.1 The Four Stages of R&D

2.1.1 Research and Information Gathering

Research and information gathering involve collecting initial information for product development. This stage includes literature review to gather initial information about what will be created and how it will be developed.

2.1.2 Planning

Planning involves formulating the objectives of the product to be created and determining what will be needed in the product development process. In this stage, we have formulated to create a mathematics learning application covering the topics of single interest, discounts, and taxes. Before creating the learning application, the initial step we took was to identify the basic competencies, indicators, and student classes for the material used in this application. The National Education Standards Body (BSNP) states that social arithmetic is a mathematics subject for Grade VII of junior high school in semester II. The basic competencies and competency achievement indicators are shown in Table 1.

Table 1. Basic Competencies and Competency Achievement Indicators

No.	Basic Competencies	Competency Achievement Indicators
3.9	Understanding social arithmetic (discounts, simple interest, taxation)	Determining the amount of discount Determining the amount of simple interest and tax
4.9	Analyzing various social arithmetic situations (discounts, simple interest, taxation)	Solving story problems related to discounts Solving story problems related to simple interest and tax

The next step is to determine the components that will be included in the application. These components consist of materials, quizzes, and instructional videos. To fulfill the components that will be included in the application, we have designed and created storyboards for instructional videos. Additionally, we have chosen a name for our product, which is the MathArt Mathematics Learning Application. Storyboard Creation Interface for Video Production in the MathArt Application. This storyboard was created using Microsoft PowerPoint 2010 software as shown in figure 1.

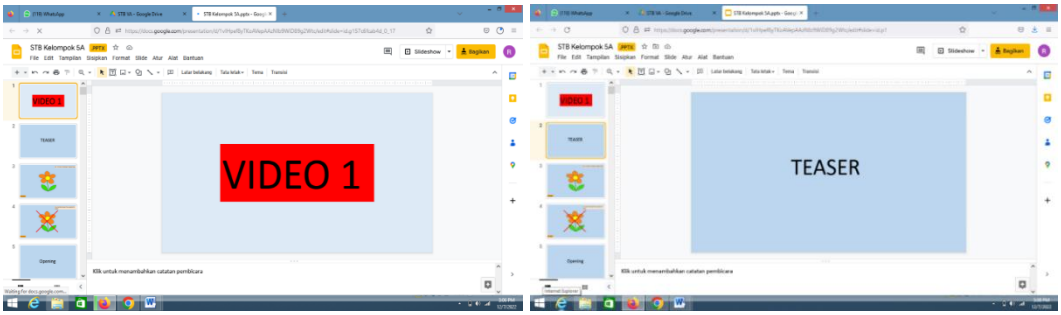

Figure 1. Storyboard Creation Interface

2.1.3 Product Format Development

The development of learning media involves leveraging various software tools, such as Ispring Suite, Website APK Builder, Microsoft PowerPoint, and CapCut, to ensure effectiveness and engagement. Alvin Toffler's quote, 'The illiterate of the 21st century will not be those who cannot read and write, but those who

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cannot learn, unlearn, and relearn' (Toffler, 1980), underscores the commitment to harnessing modern technology for educational advancement. These platforms enable the creation of dynamic and interactive learning materials tailored to students' needs, with Microsoft PowerPoint utilized for storyboarding and CapCut for refining video content, ensuring clarity and coherence in educational material presentation.

Figure 2. Initial Interface of the MathArt Application and Second Page Interface of the MathArt Application

Figure 2 illustrates the initial interface of the MathArt application. The initial interface features the developer's logo, the title of the application's content, and the name of the learning module. On the right side of figure 2 depicts the second page of the MathArt application. On this page, users can find the menu options available in the MathArt application. These options include instructional guidelines, learning objectives, learning materials, instructional videos, and quizzes designed to enhance students' skills.

Figure 3. Second Page Interface of the MathArt Application and Interface of the Objectives Feature in the MathArt Application

Figure 3 showcases the second page interface of the MathArt application, emphasizing the importance of clarifying learning objectives in education. Inspired by contemporary educational thought, the interface echoes the sentiment that "Education is not preparation for life; education is life itself" (Dewey, 2013). By aligning with John Dewey's timeless philosophy, the interface aims to elucidate the purpose behind students' learning journeys, fostering

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deeper engagement and comprehension. This approach, coupled with Benjamin Franklin's adage, "Tell me and I forget, teach me and I may remember, involve me and I learn," emphasizes the importance of actively involving students in their educational endeavors (Franklin, 2014). Thus, through a clear articulation of objectives, the MathArt application cultivates enriched learning experiences, driving students towards academic excellence.

Figure 4. Interface Display of the Objectives and Instructional Videos Features in the MathArt Application

On the left side of Figure 4 is the interface display of the Objectives feature in the MathArt application. This display contains information about the objectives of the learning process, aiming to help students understand the purpose behind their learning journey. On the right side of Figure 4 is the interface display of the Instructional Videos feature in the MathArt application. This feature provides instructions on how to use the feature and access instructional videos, with the goal of enhancing students' understanding of the learning material through the availability of instructional videos within the application.

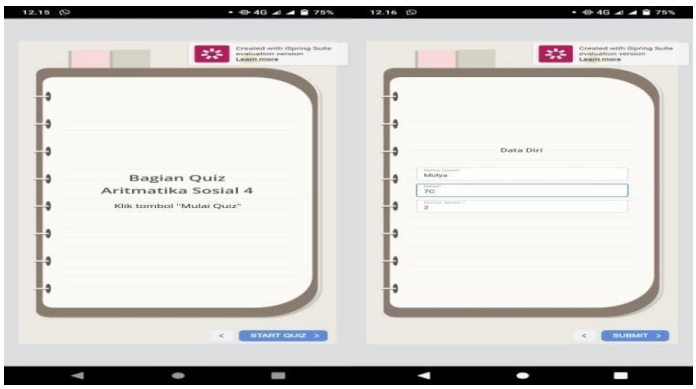

Figure 5. Interface Display of the Quiz Feature in the MathArt Application

Figure 5 displays the interface of the quiz feature in the MathArt application. The initial page of this feature contains the quiz title or introduction, followed by subsequent pages with columns for student personal data. Once students fill in their personal information, they are directed to the quiz instruction page. Here, students can proceed to take the quiz based on the provided instructions. Subsequent pages present quiz questions, allowing students to directly answer by clicking on options A, B, C, and D.

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2.1.4 Field Testing

The field testing for this research was conducted at SMPN 17 in Bengkulu City, involving 34 participants, comprising 29 student respondents and 5 teacher respondents. The field testing falls within the moderate scale, with qualitative data obtained. Qualitative data were collected through questionnaires distributed via Google Forms for student respondents and paper forms for teacher respondents. These questionnaires included three indicators: the content of the learning application, language, and material. The data collected from the questionnaires will be analyzed according to the specific objectives using Likert scale analysis.

2.2 Data Collection Instruments

The instruments used in this study consist of validation questionnaires regarding the MathArt application, which are filled out by teachers and students. The distributed questionnaires assess teachers' and students' evaluations of the MathArt application regarding its content, language, and material. These questionnaires are intended for mathematics teachers and seventh-grade students at SMP N 17 in Bengkulu City. The questionnaires distributed to students and teachers are closed-ended, with four response options: strongly agree, agree, disagree, and strongly disagree.

2.3 Data Analysis Techniques

The research data obtained from student and teacher responses are analyzed using a Likert scale test. The steps of data analysis are as follows.

2.3.1 Data Presentation

In this step, the obtained data will be grouped according to the observed aspects. Subsequently, scoring will be conducted using Likert scale assessment calculations with a point range of 1 - 4.

Table 2. Likert Scale for Assessment

Answer Options	Score
Strongly Agree	4
Agree	3
Disagree	2
Strongly Disagree	1

(Sugiyono, 2015)

2.3.2 Calculation of the Percentage Score

For each aspect on the observed questionnaire using the formula:

$$Score\ Percentage = \frac{\sum Acquired\ score}{\sum Maximum\ score} \times 100\% \quad (1)$$

In this crucial phase, the processed data will undergo meticulous calculation facilitated by Microsoft Excel software, ensuring accuracy and efficiency in deriving meaningful insights. The acquired score, pivotal in assessing the effectiveness of the MathArt application, embodies the summation of individual scores garnered across various indicators within the questionnaire.

As articulated by Sugiyono (2015), "The process of quantitative data analysis

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requires meticulous attention to detail, especially in compiling and aggregating scores obtained from diverse sources." Concurrently, the determination of the maximum achievable score is emblematic of the comprehensive evaluation framework, delineating the upper bounds of potential attainment. Drawing from best practices elucidated by experts in educational research, such as Creswell (2014), this phase underscores the significance of methodological rigor in ensuring the reliability and validity of the assessment process. Thus, through robust data computation and rigorous validation, this endeavor aims to furnish actionable insights conducive to informed decision-making in educational contexts.

2.3.3 Conversion of the Average Percentage Score of the Questionnaire into Qualitative Values Based on the Level of Validity.

Table 3. Categories of Data Validity Levels

Percentage (%)	Answer Options	Justification
80 < score ≤ 100	Highly Valid	No Revision
60 < score ≤ 79	Valid	No Revision
40 < score ≤ 59	Sufficiently Valid	Partial Revision
20 < score ≤ 39	Less Valid	Revision
0 < score ≤ 19	Highly Invalid	Revision

(Riduwan, 2008)

The product is considered suitable and beneficial for use if the validity level of the achieved data results attains a minimum average questionnaire score percentage of not less than 61%, categorized as good.

3. Results and Discussion

3.1 Result

The field trial results aim to determine the success of the MathArt learning application product in achieving its objectives and gather information for enhancing the MathArt learning application product and for the purposes of improvement in the subsequent stages. The outcome of this field trial is as follows:

Table 4. Percentage Interpretation of Student Scores

Aspect	Percentage (%)	Criteria
Learning Application Content	87,50%	Very Strong
Language	86,45%	Very Strong
Material	88,01%	Very Strong

Based on the table provided, the MathArt learning application demonstrates strong performance across various aspects. Specifically, the content of the application achieved a percentage of 87.50%, indicating a robust level of comprehensiveness and relevance. Similarly, the language aspect attained a percentage of 86.45%, suggesting a high standard of linguistic clarity and effectiveness. Moreover, the material aspect scored 88.01%, reflecting a highly substantial and informative content structure. Overall, these results underscore the commendable quality and effectiveness of the MathArt learning application across all evaluated dimensions.

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Table 5. Percentage Interpretation of Teacher Scores

Aspect	Percentage (%)	Criteria
Learning Application Content	86,82%	Very Strong
Language	87,00%	Very Strong
Material	89,00%	Very Strong

Based on the provided table, it is evident that the MathArt learning application excels across various aspects as evaluated by teachers. Specifically, the content of the application scored 86.82%, indicating a highly robust and comprehensive coverage. Similarly, the language aspect achieved a percentage of 87%, reflecting a commendable level of linguistic clarity and effectiveness. Moreover, the material aspect attained an impressive score of 89%, underscoring the substantial and informative content structure of the application. Overall, these results affirm the exceptional quality and effectiveness of the MathArt learning application, as perceived by teachers, across all assessed dimensions.

The result show, the MathArt learning application demonstrates strong performance across various dimensions, with content, language, and material aspects scoring impressively at 87.50%, 86.45%, and 88.01%, respectively. These results highlight the application's comprehensive and relevant educational content, linguistic clarity, and substantial material structure. Similarly, teacher evaluations affirm MathArt's excellence, with high scores across all aspects, underscoring its effectiveness in delivering engaging and informative learning experiences.

3.2 Discussion

After the product is completed, it will be tested on seventh-grade junior high school students and mathematics teachers to assess its suitability. The trial is conducted by students from SMPN 17 in Bengkulu City and mathematics teachers in Bengkulu City. From the trial conducted with 29 student respondents and 5 mathematics teacher respondents, the interpretation percentage scores are obtained as follows: learning application content 87.50%, language 86.45%, and material 88.01% based on student respondents. Thus, from the percentage results obtained from student respondents, it can be concluded that our product excels in the material indicator. This is because in the MathArt application, the material provided is explained briefly, concisely, and clearly, making it easy for students to understand (Sugiyono, 2015).

Meanwhile, based on teacher respondents, interpretation percentage scores are obtained as follows: learning application content 86.82%, language 87.00%, and material 89.00%. Thus, from the percentage results obtained from teacher respondents, it can be concluded that our product excels in the material indicator. This is because in the MathArt application, the material provided is explained briefly, concisely, and clearly, making it easy for students to understand, according to teachers (Creswell, 2014).

Based on the results from both student and teacher respondents, the highest percentage for the MathArt application is in the material indicator. This is because the MathArt application presents material in a structured manner, starting from the understanding of the material, formulas accompanied by symbol explanations, instructional videos, example problems, and quizzes given

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at the end. Below is a further explanation of the material indicator in the MathArt application:

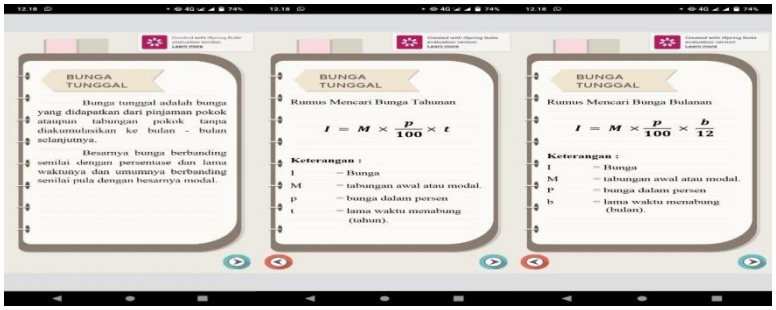

Figure 6. Display Image of Material I

In Figure 6, depicts the initial view of the single interest material page, explaining single interest. Subsequently, on the second and third pages, the formula for single interest is displayed alongside explanations of the formula's symbols. Hence, students can better grasp the material and understand the simple interest formula presented in the MathArt application.

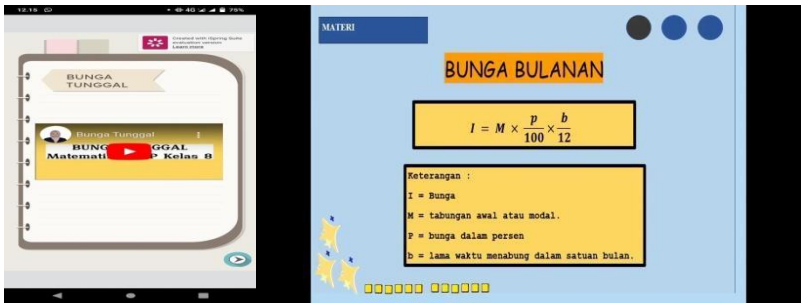

Figure 7. Display of Material I Video Page

Figure 7 depicts the second view of the material page containing a video on single interest. On this page, users are directed to access the instructional video link. Thus, with the presence of this instructional video, students can better comprehend the explained material. In the instructional video, the learning material will be directly explained by the presenter, and it also includes images or real examples of the material, making it less monotonous than text alone.

Figure 8. Display of Material II

Figure 8 displays the page on the discount material. On the first page of the material, the definition of discount is provided, using language that is easily understood by students. Subsequently, on the second and third pages, the

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formula for discount is presented along with explanations of the formula's symbols. This enables students to better comprehend the material and understand the discount formula presented in the MathArt application.

Figure 9. Image Display of the Video Page for Material II

Figure 9 depicts the video page for the discount material. On this page, users are directed to access the instructional video link. Thus, with the presence of this instructional video, students can better understand the explained material. Because in the instructional video, the learning material is explained directly by the presenter, and the video content is not monotonous text but also includes images or real-life examples of the material.

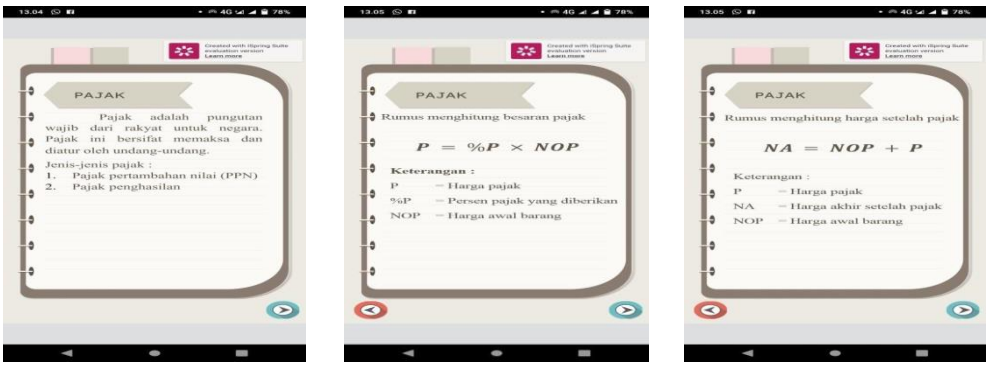

Figure 10. Display of the Page on Material III

Figure 10 illustrates the page layout for the tax material. On the initial page of the material, the definition of tax is provided, employing easily understandable language for students. Subsequently, the second and third pages display the tax formulas accompanied by explanations of the formula symbols. Thus, students can better comprehend the material and understand the tax formulas presented in the MathArt application.

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Figure 11. Display of the Video Page on Material III

Figure 11 depicts the video page on tax material. On this page, users are directed to the instructional video link. Consequently, with the presence of these instructional videos, students can better understand the explained material. These videos provide direct explanations from the presenter and are not solely reliant on text, but also include images or real-life examples of the material.

Aligned with similar research on Android-based learning media using Construct 2 software, it was found that the highest percentage regarding the listed indicators in the application was the suitability of the learning media content, with a percentage of 99.12% (Anisah, et al., 2019). This indicator is a crucial aspect of the success of Construct 2 learning applications, as it encompasses important aspects of the learning process, including learning material. In line with this, the MathArt application has fulfilled the crucial aspect of the learning process, namely learning material, as evidenced by the highest percentage obtained from respondents lying in the material indicator. Thus, it can be said that the MathArt application is highly suitable for use in the learning process of single interest, discount, and tax materials.

4. Conclusions

This study finds that the MathArt application received positive responses, with percentages of 87.32% from students and 87.54% from teachers. Therefore, this application is highly recommended for teachers to use as a learning tool and for future researchers to further develop into an even better learning medium.

Author Contributions

The author contributions for this article are as follows: Ratnah Lestary served as the primary author, responsible for conceptualization, methodology, and validation. Mulya Sarti Apriani contributed to data curation, investigation, and formal analysis. Rizki Putri Kesuma participated in software implementation, visualization, and writing the original draft. Riko Dwi Cahyo provided resources, supervised the project, and reviewed and edited the manuscript. Teddy Alfra Siagian contributed to project administration, funding acquisition, and critical review and revision of the article. All authors read and approved the final version of the manuscript.

Declaration of Competing Interest

As the author of this article, I declare any potential competing interests that may influence the impartiality or interpretation of the study. These interests encompass financial or personal affiliations, rivalries, or religious convictions. It is important to note that there are no conflicts of interest related to this research. There are no financial relationships or agreements with any organization mentioned in the study. The manuscript was not written under any remuneration, and there are no competing interests that could impact the objectivity of the work or the views expressed herein.

References

Anisah, S., Sampoerno, P. D., & Hajizah, M. N. 2019. Pengembangan Media Pembelajaran Berbasis Android Pada Materi Aritmetika Sosial Menggunakan Pendekatan Saintifik Berbantuan Software Construct 2 Di

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P-ISSN: *2656-2286*

Kelas Vii Smp Negeri 137 Jakarta. *Jurnal Riset Pembelajaran Matematika Sekolah*, *3*(2), 37-46.

Metaputri, N. K., & Garminah, N. N. 2016. Pengaruh Model Pembelajaran Inkuiri Terbimbing Dan Minat Belajar Terhadap Keterampilan Proses Sains Pada Siswa Kelas IV SD. *Jurnal Pendidikan Dan Pengajaran*, *49*(2), 89–97. https://doi.org/10.23887/jppundiksha.v49i2.9013

Parsania, P. S., Chavda, N. M., & Kamani, K. C. 2015. Information and Communication Technology & Its Impact in Improving the Teaching and Learning of English Language. *International Journal of Computer Science Engineering and Information Technology Research (IJCSEITR)*, *5*(3), 1-6.

Riduwan. 2008. Metode & Teknik Menyusun Tesis. Bandung: Alfabeta.

Riyan, M. 2021. Penggunaan Media Pembelajaran Berbasis Android Pada Pembelajaran Teks Eksposisi. *Diksi*, *29*(2), 205-216.

Sari, I. R. 2021. *Pengembangan Media Pembelajaran Menggunakan Aplikasi Online Powtoon Pada Materi Aritmatika Sosial Kelas VII SMP* (Doctoral dissertation, Universitas Islam Riau).

Sakinah., dkk 2021. Edukasi Penerapan Penggunaan Teknologi Yang Bijak Terhadap Perilaku Anak Usia Dini: Jurnal Dedikasi. http://openjournal.unpam.ac.id/index.php/PD/article/view/16098.

Subarkah, M. A. 2019. Pengaruh gadget terhadap perkembangan anak. *Rausyan Fikr: Jurnal Pemikiran Dan Pencerahan*, *15*(1).

Sugiyono. 2015. Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan RnD. Bandung: Alfabeta.

Sukmadinata, N. S. 2012. Metode Penelitian Pendidikan. PT Remaja Rosdakarya.

Suminar, D. 2019, May. Penerapan teknologi sebagai media pembelajaran pada mata pelajaran sosiologi. In *Prosiding Seminar Nasional Pendidikan FKIP* (Vol. 2, No. 1, pp. 774-783).

Toffler, A. 1980. The Future Shock "Third Wave". New York: Bantam Book.

Winarni, Endang Widi. 2018. Teori dan Praktik Penelitian Kuantitatif, Kualitatif, PTK, dan R&D. Jakarta: Bumi Aksara.