Research Article

Development of Electronic Teaching Materials Based on Smart Application Creator (SAC) to Improve Contextual Thinking Ability of VIII Junior High School Students on Vibration and Wave Materials

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ABSTRACT

The ability to think contextually has an important role in everyday life, with the ability to think contextually high will support the useful value of science in real life. However, in reality, many students are classified as lacking in contextual thinking skills. Because of this, the researchers compiled electronic teaching materials based on Smart Application Creator (SAC), which presented interesting and contextual teaching materials on Vibrations and Waves with the hope of improving students' contextual thinking skills. The method used by researchers is R&D through 4 stages, namely define, design, develop and disseminate. Data collection through questionnaires and tests then carried out the descriptive quantitative analysis. The final results of the study are: 1) the teaching materials prepared by the researcher are suitable for use both in terms of material (97.395%) and from the aspect of media assessment (100%). 2) The teaching materials that are arranged have a practicality level of 100% with a very practical conclusion to use. 3) Teaching materials prepared by researchers are effective in improving students' contextual thinking skills. Because there is an average difference between the pre-test and post-test learning outcomes, the average post-test score is higher. 4) The teaching materials prepared by the researchers were very interesting (88.83%). So that overall, it can be concluded that smart application creator (SAC) based electronic teaching materials are feasible to use.

INTRODUCTION

The development of education in this world has undergone many changes, including in our own country. In our country, Indonesia, education has undergone various changes, which can be said to be quite rapid. This happens because of the changes in the order of life that occur. We, as citizens of Indonesia, need to prepare ourselves so that we are not left behind

by other countries. Education is defined as an effort to realize the learning process so that students actively develop their potential.

Natural Sciences is the science that discusses natural phenomena that are systematically arranged based on the results of experiments and observations made by humans. An educator or teacher must help students acquire skills to weigh risks and benefits to make well-informed decisions based on real internal evidence (Berne, 2014). In connection with this, further research is needed on how students are able to master science material and can apply the knowledge he gets contextually.

Many studies have shown that learning with a contextual approach method can develop and create scientific attitudes that are owned by students (Hafnidar et al., 2016). Learning with a contextual approach was originally developed in the United States. Real-life events are associated with existing material to help contextual learning, and besides, learning with this approach can increase the motivation of students to be able to implement their knowledge in their lives. The emergence of this approach is motivated by the low and low quality of graduates, which is marked by the inability of students to connect the material that has been studied in life and their environment so that many problems arise in a society that is not resolved due to the low quality of graduates. As many as 75.63% of students in a study have the ability to think in real terms, which are still not in line with expectations (Prihatiningsih et al., 2016). Therefore many developments have been made to overcome this, one of which is a learning model with a socio-scientific approach by thinking that contextual. From 1997 to 2001, various studies were carried out aimed at testing, developing, and assessing the effectiveness of contextual learning (Sulianto, 2008). The results of these studies showed very good success.

Science or what is commonly referred to as science is a science that is very important for its application in everyday life. To maximize the role and use of science or science by students, it is necessary to learn that directly connects or links in the learning activity process with authentic or real problems that exist in everyday life (contextual) related to natural science. This assumption is also supported by the opinion of several previous experts and researchers, who state that the process of learning activities in science subjects in the 21st century focuses on students, where the activities are collaborative, integrated with society, and contextual (Putriana, Astrid R. Suryawati. E. Suzanti. F, 2020).

The use of contextual-based learning focus will be able to develop logical/authentic thinking skills and will increase students' understanding better because this contextual-based learning activity directly invites students to learn through real experiences (Hafnidar et al., 2016). Contextual learning in science and technology, when a person can apply scientific knowledge to socio-scientific problems (Dori et al., 2018). There is also a view that science learning at the junior high school level focuses on planting direct (contextual) learning experiences, which aims to develop and improve the process skills and scientific attitudes of students (Rosalina & Suhardi, 2020).

Apart from being based on the aforementioned opinions, in the 21st-century, it can be seen that the development of science and technology has progressed very rapidly. This is a signal or an alarm that the heavier and more complicated the challenges in the world of education are. One example is producing superior, ethical, and intellectual human resources. This is in line with learning activities using the socio-scientific approach and contextual thinking, wherein learning activities with this model students are required to connect learning activities with problems that exist in the real world and then find solutions. This is in accordance with contextual learning, the benefits of contextual learning later, students can learn non-passively and can think critically in analyzing a problem that comes from the experiences they have experienced (Sulastri & Pertiwi, 2020).

The achievement of the goals and ideals of educational activities still really needs to be maximized, and there needs to be a lot of innovations that can increase the effectiveness of the learning process and the delivery of the content of the lessons. One of the efforts to increase the effectiveness of the learning process and the delivery of subject matter is by using learning media that can attract and increase the learning motivation of students. The use of technology-based learning media is currently not being maximized, even though at this time technology is developing very rapidly, and it is easy to obtain by all groups. One technology that is currently very popular among students and society, in general, is the smartphone. The survey results show that today's students have great attention to the use of smartphones (Lestari et al., 2019). Based on this, teaching materials packaged in smartphones have good prospects to be developed to maximize learning activities. According to the results of a preliminary study conducted by researchers through a questionnaire given to students, as many as 66.7% of students who filled out the questionnaire liked learning via smartphone/cellphone rather than through books and 33.3% of students who filled out questionnaires did not like learning via smartphone/HP than through books. It can be seen from the results of the preliminary study that the majority of students like learning via smartphones/cellphones. Therefore it is necessary to prepare teaching materials based on smartphones/cellphones. In addition, one of the basic considerations for the preparation of smartphone-based electronic teaching materials is the flexibility in accessing them (Calimag et al., 2014).

From the description above, the researcher is interested in developing teaching materials oriented in contextual thinking skills with the title "Compilation of Electronic Teaching Materials Based on Smart Application Creator (SAC) to Improve Contextual Thinking Ability of Class VIII Junior High School Students on Vibration and Wave Material". Through the research of electronic teaching materials based on Smart Application Creator (SAC), which presents this contextual material, it is hoped that students can apply knowledge of science in everyday life in real terms because it has been balanced with increased contextual thinking skills.

METHODS

The approach in this research uses a quantitative descriptive approach. Where in this study, researchers used instruments or questionnaires to collect data and tests that produced numeric data. After the data is collected, the data will be analyzed according to the statistical method used and then interpreted.

The preparation of electronic teaching materials in the form of a smart application creator (SAC) uses the Research And Development (R&D) method (Hanafi, 2017). Research And Development (R&D) is a method used to produce products and test the effectiveness of a method. The product results from this research and development can be in the form of electronic teaching materials based on smart application creator (SAC), which can support the learning process.

The research subject of the preparation of electronic teaching materials based on smart application creator (SAC) in learning activities on vibrations and waves to improve contextual thinking skills of students, namely students of class VIII SMP/MTs. This research will be carried out in one of the schools in Ponorogo Regency, namely MTs Muhammadiyah 1 Ponorogo. This study obtained a research sample using the accidental sampling technique. Accidental sampling is a sampling technique based on chance (Sugiyono, 2008) which is carried out not randomly or non-probability sampling.

In the making of electronic teaching materials for vibration and wave materials, researchers used ten development steps proposed by Thiagarajan et al. (Prasetiyo & Perwiraningtyas, 2017), which have been modified into four stages, namely define, design,

develop and disseminate. This simplification is done because of the limited time in completing this study.

RESULTS AND DISCUSSION
Product Eligibility

After the product developed by the researcher has reached the finalization stage and has gone through the guidance stage of the supervisor who has helped provide input and suggestions to maximize the product development, then the product developed by the researcher is submitted to the validator to be assessed by the validator. There are two validators that assess the products developed by researchers, one validator, namely Mrs. Rahmi Faradisya Ekapti, M.Pd. Lecturer of IAIN Ponorogo Tadris Science Department and the second validator is Mrs. Ulinnuha Nur Faizah, S.Pd., M.Sc. is also a lecturer in the Science Teaching Department of IAIN Ponorogo. Products produced in this study can be downloaded by following link : bit.ly/irfggsac .

Table 1. Percentage of Material Expert Validation

No	Assessment Aspects	Level of Validity	Percentage
1	Suitability of material with KI and KD SMP / MTs	Very worthy	100%
2	The suitability of the material with the objectives of learning activities	Very worthy	93,75%
3	The correctness of the concept	Very worthy	90,625%
4	Clarity of material	Very worthy	100%
5	Presentation of material	Very worthy	100%
6	Emphasis on contextual material	Very worthy	100%
	Amount average	**Very worthy**	**97,395%**

Based on table 1, the average resulting from the assessment of the two material expert validators is 97.395%. Thus the electronic teaching material developed by the researcher in terms of material is declared very suitable for use.

Table 2. Percentage of Media Expert Validations

No	Assessment Aspects	Level of Validity	Percentage
1	Display Interesting	Very worthy	100%
2	Clear View	Very worthy	100%
3	Audio Clarity	Very worthy	100%
4	Conformity format	Very worthy	100%
	Amount average	**Very worthy**	**100%**

Based on the recapitulation on table 2, the average resulting from the assessment of the two media expert validators is 100%. Thus the teaching materials developed by the researcher were assessed in terms of their media as very suitable for use with minor revisions according to the suggestions of the validator.

Before the teaching materials developed by the researcher are used to research the teaching materials, they must first go through the feasibility test stages both in terms of the material and in terms of the medium. This feasibility test process was carried out to find out whether the teaching materials prepared by the researcher were in accordance with the criteria or there were still deficiencies (Kusumam et al., 2016). At this stage, the researchers had made product improvements in accordance with the suggestions and input of the examiners/validators. Expert validators help justify the accuracy of the teaching materials compiled by the researcher (Nafiah Suhadi; Sari, Murni Sapta, 2019). The results of the

material expert test obtained an average score for the conformity aspect of the material with KI and KD of 100%, the suitability of the material with the objectives of learning activities amounted to 93.75%, the correctness of the concept is 90.625%, the clarity of the material is 100%, the presentation of the material is 100%, and the emphasis on contextual material is 100%. So that the overall average score obtained is 97.395%. Thus, the electronic teaching material developed by the researcher in terms of material is declared very suitable for use with minor revisions according to suggestions from the validator.

Meanwhile, the results of the validity of the media experts obtained an average score for each aspect, namely the attractive appearance aspect of 100%, the clear view of 100%, 100% audio clarity and 100% conformity of the format. Thus the overall average score is 100%. So it can be concluded that the teaching material developed by the researcher is assessed in terms of its medium, it is declared very suitable for use with minor revisions according to the suggestions of the validator.

Product Practicality

In research and preparation of this research product, in addition to the validity test, the practicality test of the teaching materials was also carried out. The practicality test aims to determine the level of practicality of electronic teaching materials based on Smart Application Creator (SAC). To test the practicality of the product developed by the researcher, a questionnaire was used that was made in accordance with the grid, which was then given to the science subject teacher to be given an assessment in terms of its practicality. From this practicality test, data is obtained in the form of quantitative, from quantitative data the researcher analyzes in order to obtain a conclusion that describes the practicality of electronic teaching materials based on the Smart Application Creator (SAC) that has been developed by the researcher.

Table 3. Percentage of Product Practicality Test

No	Assessment Aspects	Level of Validity	Percentage
1	Suitability of material with KI and KD SMP / MTs	Very worthy	100%
2	The suitability of the material with the objectives of learning activities	Very worthy	100%
3	The correctness of the concept	Very worthy	100%
4	Clarity of material	Very worthy	100%
5	Presentation of material	Very worthy	100%
6	Emphasis on contextual material	Very worthy	100%
7	Display Interesting	Very worthy	100%
8	Clear View	Very worthy	100%
9	Audio Clarity	Very worthy	100%
10	Conformity format	Very worthy	100%
	Amount average	**Very worthy**	**100%**

Based on the results in the table above, it can be concluded that the electronic teaching materials developed by researchers, namely electronic teaching materials based on Smart Application Creator (SAC), are very practical for science teachers to help the process of teaching and learning activities. This can be seen from the assessment that has been given by the MTs science teacher with a score of 100% for its practicality. Thus it shows that the electronic teaching materials developed by researchers are very practical and can be applied and used to support teaching and learning activities.

In addition to testing/validity in terms of material and media, the teaching materials developed are also assessed for their practicality. The practicality assessment was carried out

by the science teacher at MTs Muhammadiyah 1 Ponorogo, Mrs. Putranti Eko Setyarini, S.Pd. Based on the data obtained, the practicality assessment for each aspect of material suitability with KI and KD SMP/MTs, the suitability of the material with the objectives of learning activities, the correctness of the concept, clarity of the material, presentation of material, emphasis on contextual material, attractive appearance, clear appearance, clarity of audio and conformity of the result format obtained a score of 100%. Thus it shows that the electronic teaching materials developed are very practical and can be applied and used to support teaching and learning activities. Teaching materials that have been very practical can be used by students to be more effective and efficient in supporting learning activities (Sunismi, 2016). In addition, the teaching materials prepared by this researcher also contain questions that students can use to practice working on questions. Questions that are accompanied by an answer key with an attractive appearance add to the practical value of this teaching material for use in teaching and learning activities.

Product Effectiveness

The general purpose of this research is to develop a product that can influence/change students to improve students' contextual thinking skills. Because of this, after the product developed by the researcher is finished, the researcher also tests the effectiveness of the product being developed. The effectiveness test was carried out to determine the extent to which the product developed (Smart Application Creator-based electronic teaching materials (SAC) can have a positive influence on students in increasing contextual thinking skills related to vibration and wave material. To determine the effectiveness of Smart Application-based electronic teaching materials. Creator (SAC) that has been developed, the researcher uses the pre-test and post-test method. From the results of the pre-test and post-test, a general conclusion can be made about the feasibility of the product being developed. If the post-test score is better than the pre-test score (post-test score has increased), then the teaching materials The electronics developed by researchers are feasible to be used as supporting learning activities of students, but on the contrary, if the post-test score is lower than the pre-test value, it can be concluded that the electronic teaching materials developed by the researcher do not have an impact to students so it needs to be reviewed.

The analysis of the results of the pre-test and post-test data begins with the normality and homogeneity test with the results of the pre-test and post-test significance values of 0.200, so that it can be seen that the pre-test and post-test significance values are greater than 0.05. Thus it can be concluded that the pre-test and post-test data are normally distributed. While the pre-test and post-test significance value is 0.722, so it can be seen that the pre-test and post-test significance value is greater than 0.05. Thus it can be concluded that the pre-test and post-test data are homogeneous.

After the normality and homogeneity tests were carried out as a prerequisite, then the t-test was carried out. The t-test in this study uses the help of the SPSS program. Below are the results of the pre-test and post-test t-tests

Table 4. Results of the Pre-test and Post-test t-tests

Paired Samples Test								
		Paired Differences						
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		T	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Pre Test- Post Test	-18,148	18,818	3,622	-25,592	-10,704	-5,011	26	0,000

Based on the t-test result on table 4, it can be seen that the significance value (2-tailed) is 0,000, so it can be seen that the significance value (2-tailed) is less than 0.05. This means that it can be concluded that H0 is rejected and Ha is accepted. This shows that the contextual thinking ability of students increases after learning activities are carried out with electronic teaching materials based on Smart Application Creator (SAC).

Learning outcomes are abilities that students have after receiving learning experiences. Learning outcomes have an important role in the learning and learning process. With learning outcomes, students can measure their understanding of the material that has been taught (Wahyuni & Etfita, 2019). Development research is a research method used to produce certain products and test the effectiveness of these products. Development research is not research that is intended to produce theory but to produce certain products (Kusumam et al., 2016). Therefore, apart from the material, media and practicality aspects, a test of the effectiveness of the teaching materials developed by researchers is also carried out. This test was conducted to determine the effectiveness of the teaching materials developed by researchers in improving students' contextual thinking skills. For the effectiveness of electronic teaching materials in improving students' contextual thinking skills based on the data obtained, it shows that the significance value is 0.000 so that it is less than 0.05, thus H0 is rejected and H1 is accepted. In accordance with the H1 hypothesis that there is an average difference between the pre-test and post-test learning outcomes, which means that the use of electronic teaching materials based on smart application creator (SAC) in improving students' contextual thinking skills is effective.

Student Response

Electronic teaching materials based on Smart Application Creator (SAC) developed by researchers in addition to be tested in terms of media, content/content, practicality and effectiveness were also tested for their attractiveness to target users, namely students. To test the students' interest/response to the developed electronic teaching materials, researchers used a questionnaire. From the giving of the questionnaire, the results obtained were numerical data which were then analyzed by the researcher so that the students' responses to electronic teaching materials based on Smart Application Creator (SAC) were developed by the researcher.

The following is the recapitulation of quantitative data on the test of students' interest in the product which can be seen in the table 5.

Table 5. Recapitulation of Product Attractiveness Test

No	Assessment Aspects	Conclusions	Percentage
1	Material Feasibility	Very interesting	80,5%
2	Technical Feasibility	Very interesting	92,5%
3	Feelings of Learners	Very interesting	93,5%
	Amount average	**Very interesting**	**88,83%**

Based on the data above, it can be seen that in the aspect of presenting the feasibility of the material, it gets a very attractive percentage of 80.5%, from the aspect of technical feasibility 92.5% is very interesting, and the feeling aspect of students is 93.5% very interesting. Of the three aspects, the average assessment given by students was 88.83%. This means that it can be concluded that in general students feel very interested in the holding of learning with the help of electronic teaching materials based on Smart Application Creator as developed by researchers.

Another thing that is also considered in developing a product is the product's attractiveness to target users. Teaching materials that are packaged properly and optimally will make users interested in using them further (Oktaviana et al., 2015). Teaching materials must also have complete components to be able to achieve the maximum learning goals (Nafiah Suhadi; Sari, Murni Sapta, 2019). Therefore it is also necessary to make this developed product have a strong appeal to its target users, namely students. To measure the attractiveness of this product, an assessment questionnaire was distributed to students to determine the student's response to the product being developed. Based on the results of the data obtained, it was obtained a score of 80.5% for the feasibility aspect of the material, as much as 92.5% for the technical feasibility, and as much as 93.5% for the aspects of the feelings of students. From these three aspects, an average score of 88.83% is obtained. Thus, it can be stated that the electronic teaching materials developed by the researchers are very interesting. Based on the data above, it can be seen that in the aspect of presenting the feasibility of the material, it gets a very attractive percentage of 80.5%, from the aspect of technical feasibility 92.5% is very interesting, and the feeling aspect of students is 93.5% very interesting. Of the three aspects, the average assessment given by students was 88.83%. This means that it can be concluded that in general students feel very interested in the holding of learning with the help of electronic teaching materials based on Smart Application Creator as developed by researchers.

From several aspects of the assessment of the teaching materials developed by the researcher, it can be seen that from all aspects of the assessment, good scores are generated. Therefore, it can be concluded in general that the electronic teaching materials based on Smart Application Creator (SAC) that have been compiled by researchers are suitable for use. The development of smartphone-based teaching materials has proven to be effective in accordance with Edgar Dale's cone theory of experience (Zulham & Sulisworo, 2016), as a basis for conducting research, namely Edgar Dale's theory of the cone of experience. Edgar Dale's theory states that a person's learning outcomes are obtained through direct (concrete) experience, which can experience involving the senses of sight, hearing, feeling, smell, and touch. (Syamsidar et al., 2018) Thus this theory supports the existence of activity learning with the help of electronic teaching materials based on Smart Application Creator (SAC), which involves the experience of the sense of sight and feelings of pleasure when learning with smartphone media.

CONCLUSION

Based on the analysis of the data that has been obtained in this study, it can be concluded that with the learning activities using electronic teaching materials based on smart application creator (SAC) students' ability to think contextually increases. This is evidenced by the difference in the mean pre-test and post-test results. The mean contextual thinking ability of students before using teaching materials was 42.96, while the mean contextual thinking ability of students after using electronic teaching materials based on smart application creator (SAC) was 61.11. With a significance value of 0.000 so that it is less than 0.05, thus H_0 is rejected, and H_1 is accepted. In accordance with the H_1 hypothesis that there is an average difference between the pre-test and post-test learning outcomes, which means that the use of electronic teaching materials based on smart application creator (SAC) in improving students' contextual thinking skills is effectively used. Efforts to improve students' contextual thinking skills can be made through the use of electronic teaching materials using a smart application creator (SAC).

REFERENCES

Anwar, H. (2014). Proses Pengambilan Keputusan untuk Mengembangkan Mutu Madrasah. *Nadwa*, *8*(1), 37. https://doi.org/10.21580/nw.2014.8.1.56.

Berne, B. (2014). Progression in ethical reasoning when addressing socio-scientific issues in biotechnology. *International Journal of Science Education*, *36*(17), 2958–2977.

Calimag, J. N., Mugel, P. A., Conde, R. S., & Aquino, L. B. (2014). Ubiquitous learning environment using android mobile application. *International Journal of Research in Engineering & Technology*, *2*(2), 119–128.

Dori, Y. J., Avargil, S., Kohen, Z., & Saar, L. (2018). Context-based learning and metacognitive prompts for enhancing scientific text comprehension. *International Journal of Science Education*, *40*(10), 1198–1220.

Hafnidar, S., Gani, A., & Jalil, Z. (2016). Penerapan Pembelajaran Kontekstual Untuk Meningkatkan Kemampuan Berpikir Logis Dan Pemahaman Peserta Didik SMP Pada Materi Sifat-sifat Cahaya. *Jurnal Pendidikan Sains Indonesia (Indonesian Journal of Science Education)*, *4*(2), 61–68.

Hanafi. (2017). Konsep Penelitian R & D Dalam Bidang Pendidikan. *Saintifika Islamica: Jurnal Kajian Keislaman*, *4*(2), 129–150.

Hasruddin. (2009). Memaksimalkan Kemampuan Berpikir Kritis melalui Pendekatan Kontekstual. *Jurnal Tabularasa PPS UNIMED*, *6*(1), 48–60.

Herawati, L. (2016). *Uji normalitas data kesehatan menggunakan SPSS*.Irawan, E. (2014). Pengantar statistika penelitian pendidikan. *Yogyakarta: Aura Pustaka*.

Khotimah, H., Zubaidah, S., & Lestari, U. (2015). Pengaruh Model Pembelajaran Inkuiri Terbimbing dengan Teknik Mind Mapping terhadap Motivasi dan Hasil Belajar Siswa SMP Kelas VIII. In *SKRIPSI Jurusan Biologi-Fakultas MIPA UM* (Vol. 2015, Issue 2015).

Kim, D., Rueckert, D., Kim, D.-J., & Seo, D. (2013). Students' Perceptions and Experiences of Mobile Learning. *Language Learning & Technology*, *17*(3), 52–73.

Kurniati, D., Harimukti, R., & Jamil, N. A. (2016). Kemampuan Berpikir Tingkat Tinggi Siswa SMP di Kabupaten Jember dalam Menyelesaikan Soal Berstandar PISA. *Jurnal Penelitian Dan Evaluasi Pendidikan*, *20*(2), 142–155. https://doi.org/10.21831/pep.v20i2.8058

Kusumam, A., Mukhidin, M., & Hasan, B. (2016). Pengembangan Bahan Ajar Mata Pelajaran Dasar dan Pengukuran Listrik untuk Sekolah Menengah Kejuruan. *Jurnal Pendidikan Teknologi Dan Kejuruan*, *23*(1), 28. https://doi.org/10.21831/jptk.v23i1.9352

Kuswanto, J., & Radiansah, F. (2018). Media Pembelajaran Berbasis Android Pada Mata Pelajaran Sistem Operasi Jaringan Kelas XI. *An Nabighoh Jurnal Pendidikan Dan Pembelajaran Bahasa Arab*, *14*(01), 129.

Lestari, A. I., Senjaya, A. J., & Ismunandar, D. (2019). Pengembangan Media Pembelajaran Berbasis Android Menggunakan Appy Pie Untuk Melatih Pemahaman Konsep Turunan Fungsi Aljabar. *Pedagogy : Jurnal Pendidikan Matematika*, *4*(2), 1–9. https://doi.org/10.30605/pedagogy.v4i2.1437

Majid, A. (2016). Mobile Learning. *Prodi Pengembangan Kurikulum UPI*, *8*, 92–95.

Nafiah Suhadi; Sari, Murni Sapta, K. S. (2019). Validitas dan Kepraktisan Bahan Ajar Pengelolaan Spesies Asing Invasif Acacia Nilotica untuk Matakuliah Pengelolaan Sumberdaya Alam. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, *Vol 4, No 5: MEI 2019*, 654?659. http://journal.um.ac.id/index.php/jptpp/article/view/12459

Nasional, D. P. (2006). *Permendiknas No. 22 Tahun 2006 tentang standar isi*. Jakarta: Depdiknas.

Novita, S., Santosa, S., & Rinanto, Y. (2016). *Perbandingan Kemampuan Analisis Siswa melalui Penerapan Model Cooperative Learning dengan Guided Discovery Learning The Comparison of Student Analitycal Thinking Between the Implementation of Cooperative Learning and Guided Discovery Learning Model*. *13*(1), 359–367.

Nuryadi, Tutut Dewi Astuti, Endang Sri Utami, & Martinus Budiantara. (2017). *Dasar-Dasar Statistika Penelitian*. http://lppm.mercubuana-yogya.ac.id/wp-content/uploads/2017/05/Buku-Ajar_Dasar-Dasar-Statistik-Penelitian.pdf

Oktaviana, I., Sumitro, S. B., & Lestari, U. (2015). Pengembangan Bahan Ajar Berbasis Penelitian Karakterisasi Protein Membran Sperma pada Matakuliah Bioteknologi. *Florea: Jurnal Biologi Dan Pembelajarannya*, *2*(2).

Prasetiyo, N. A., & Perwiraningtyas, P. (2017). Pengembangan Buku Ajar Berbasis Lingkungan Hidup pada Mata Kuliah Biologi di Universitas Tribhuwana TunggaDewi. *Jurnal Pendidikan Biologi Indonesia*, *3*(1), 19–27.

Prihatiningsih, Zubaidah, S., & Kusairi, S. (2016). Kemampuan Berpikir Kritis Siswa SMP Pada Materi Klasifikasi Makhluk Hidup. *Prosiding Seminar Nasional Pendidikan IPA Pascasarjana UM*, *1*, 1053–1062.

Putriana, Astrid R. Suryawati. E. Suzanti. F, Z. (2020). *Socio Scientific Issue (SSI) Based LKPD Development In Learning Natural Science SMP Class VII*. *4*, 122–135.

Robianto, A., & Wahono, M. (n.d.). *Pengembangan Modul Berbasis Aplikasi Android untuk Mata Kuliah Ilmu Bahan Teknik pada Prodi D3 Teknik Mesin Universitas Negeri Malang*.

Rosalina, S. S., & Suhardi, A. (2020). Need Analysis Of Interactive Multimedia Development With Contextual Approach On Pollution Material. *INSECTA: Integrative Science Education and Teaching Activity Journal*, *1*(1), 93–108.

Sa'diyah, H., Alfiyah, H. Y., AR, Z. T., & Nasaruddin, N. (2020). Model Research and Development Dalam Pembelajaran Pendidikan Agama Islam. *EL-BANAT: Jurnal Pemikiran Dan Pendidikan Islam*, *10*(1), 42–73.

Saputro, B. (2017). Manajemen Penelitian Pengembangan (Research & Development) bagi Penyusun Tesis dan Disertasi. In *Journal of Chemical Information and Modeling* (Vol. 53, Issue 9).

Saregar, A., Latifah, S., & Sari, M. (2016). Efektivitas model pembelajaran cups: dampak terhadap kemampuan berpikir tingkat tinggi peserta didik Madrasah Aliyah Mathla'Ul Anwar Gisting Lampung. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*, *5*(2), 233–244.

Sarrab, M., Elgamel, L., & Aldabbas, H. (2012). Mobile learning (m-learning) and educational environments. *International Journal of Distributed and Parallel Systems*, *3*(4), 31.

Sugiyono. (2008). *Metode penelitian pendidikan:(pendekatan kuantitatif, kualitatif dan R & D)*. Bandung: Alfabeta.

Sulastri, S., & Pertiwi, F. N. (2020). Problem Based Learning Model Through Constextual Approach Related With Science Problem Solving Ability Of Junior High School Students. *INSECTA: Integrative Science Education and Teaching Activity Journal*, *1*(1), 50–58.

Sulianto, J. (2008). Pendekatan Kontekstual Dalam Pembelajaran Matematika Untuk Meningkatkan Berpikir Kritis Pada Siswa Sekolah Dasar. *Pendekatan Kontekstual Dalam Pembelajaran Matematika Untuk Meningkatkan Berpikir Kritis Pada Siswa Sekolah Dasar*, *4*(2), 14–25. https://doi.org/10.21831/pg.v4i2.555

Sunismi, A. H. F. (2016). Uji Validasi E-Module Matakuliah Kalkulus I untuk Mengoptimalkan Student Centered Learning dan Individual Learning Mahasiswa S-1. *JRPM (Jurnal Review Pembelajaran Matematika)*, *1*(2), 174–191.

Syamsidar, Maruf, U. M. M., & Hustim, R. (2018). Pembelajaran Fisika Berbasis Cone of Experience Edgar Dale. *Jurnal Pendidikan Fisika*, *6*, 1–12.

Syofian, Siregar. (2017). *statistik parametrik untuk penelitian kuantitatif* . Jakarta: Bumi Aksara.

Teni Nurrita. (2018). Kata Kunci :Pengembangan media pembelajaran untuk meningkatkan hasil belajar siswa. *Jurnal Misykat*, *03*(01), 171.

Wahyuni, S., & Etfita, F. (2019). Efektivitas Bahan Ajar Berbasis Android terhadap Hasil Belajar. *GERAM*, *7*(2), 44–49.

Wijaya, I., & Rakhmawati, L. (2015). Pengembangan Media Pembelajaran Autoplay Media Studio pada Mata Pelajaran Perekayasaan Sistem Audio di SMK Negeri 3 Surabaya. *Jurnal Pendidikan Teknik Elektro*, *4*(3), 957–963.

Yulianti, Y., Buchori, A., & Murtianto, Y. H. (2017). Pengembangan Media Presentasi Visual dengan Pendekatan Kontekstual dalam Pembelajaran Matematika di SMP. *MUST: Journal of Mathematics Education, Science and Technology*, *2*(2), 231. https://doi.org/10.30651/must.v2i2.859

Zulham, M, & Sulisworo, D. (2016). *Pengembangan Multimedia Interaktif Berbasis Mobile dengan Pendekatan Kontekstual pada Materi Gaya*. *7*(September), 132–141.

Zulham, Muhamad, & Sulisworo, D. (2016). Pengembangan Multimedia Interaktif Berbasis Mobile dengan Pendekatan Kontekstual pada Materi Gaya. *Jurnal Penelitian Pembelajaran Fisika*, *7*(2).

Zunaidah, F. N., & Amin, M. (2016). Developing the Learning Materials of Biotechnology Subject Based on Students' Need and Character of Nusantara Pgri University of Kediri. *Jurnal Pendidikan Biologi Indonesia*, *2*(1), 19–30. https://doi.org/10.22219/jpbi.v2i1.3368