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The Effect of Sensor-Based Elasticity Learning Media to Improve Student Creativity

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Abstrak: The purpose of this study was to determine the effect of sensor-based elasticity learning media to increase students' creativity. This type of research uses quasi-experimental research with the type of research design in the form of a nonequivalent control group design. The population of this study was all class XI MIPA of Praya 2 Public High School. The research sample consisted of class XI MIPA 1 with 29 students as the control class, and class XI MIPA 2 with 28 students as the experimental class. Sampling was carried out using the purposive sampling method. The instrument used to measure student creativity is a creativity test in the form of a description of 8 questions. The creativity test instrument used has been tested for validity, reliability test, level of difficulty test, and differential power test. The results of hypothesis testing based on pre-test and post-test value data are t_{count} greater than t_{table} with a value of 6.56 greater than 1.671 categorized as Ho being rejected and Ha being accepted. So it can be concluded that there is an influence of sensor-based elasticity learning media to increase student creativity.

Kata Kunci: Creativity; Elasticity; Learning media

Introduction

The development of science and technology which continues to increase from year to year will certainly have an impact on many things, one of which is in the field of education. Education is a process to improve the characteristics of a person obtained both in the school, family and community environment. According to Nurkholis (2013), education is a process that includes three dimensions, the individual, the community or the national community of the individual, and all realistic content, both material and spiritual which plays a role in determining the nature, destiny, form of humans and society. Based on Law no. 20 of 2003, the purpose of education is to develop the potential of students to fear God Almighty, have noble character, be knowledgeable, creative, independent, democratic and responsible.

Entering the era of the Industrial Revolution 4.0 caused students, educators, and other learning tools to be able to be upgraded to be even better, especially in the field of technology. At the Education Unit Level Curriculum, there are several weaknesses, one of which is that the competencies developed are more dominated by aspects of knowledge, not fully describing aspects of attitudes and aspects of skills. Because of this, the curriculum was revised to become Curriculum 2013 (K-13). Darise (2019) explained that changing the curriculum to K-2013 is expected to be able to shape students to become productive, characterized, creative and innovative.

Based on the results of observations of Physics learning activities at Praya 2 Public High School, teachers have not fully implemented learning patterns that are in accordance with the 2013 curriculum. Classroom learning activities still use textbooks as teaching materials as well as learning media. Teachers tend to convey learning material without involving students, and there is no interaction that provokes students to be more active in class. This tendency results in the creativity of students being classified as low where they still have difficulty processing and developing the information obtained. The lack of application of K-13 is caused by a lack of facilities provided by schools, teachers have not been able to guide students to be active during the learning process, online learning due to the Covid-19 pandemic, and students who have not been able to follow the K-13 learning pattern. This is of course very ineffective if it is allowed to continue and applied to science learning.

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Science is knowledge obtained through observation and research on something that is being studied. One of the areas of science learning is physics which discusses concepts related to everyday life. According to Fitriani et al. (2017) physics is part of science which is essentially a collection of knowledge, ways of thinking, and investigation. However, many students think that physics is a scary subject, boring, and only about calculations. The assumption that studying physics will have no effect on everyday life, because the learning process tends only towards explaining mathematical equations.

It is these assumptions that ultimately lead to a lack of interest in students learning physics. The lack of interest in learning will have an impact on the low mastery of students' concepts, which will then also affect the creativity of these students. Creativity is a person's ability to relate existing things to get new ideas in order to achieve a problem solving. As is the opinion of Lestari et al. (2019) which states that creativity is a mental process that involves the emergence of new ideas or concepts, or new combinations of existing ideas or concepts. Meanwhile, according to Sumiarti (2016) creativity is a process of actively creating, forming, developing, sorting, and organizing creative ideas or creative activities.

Creative students will always find a way out of any existing problems, tend to be active and independent in finding references to solving problems. According to Nurlaela et al. (2019) creative people have certain characteristics such as being disciplined in doing something, being open in seeing their own and other people's experiences, daring to take risks in making decisions, that is not rejecting all kinds of ideas or ideas given , and the last is trust in others. Through Piirto's explanation, we can conclude that creativity is not a talent that is born. But creativity is an ability that can be learned and developed gradually.

The results of Jaya's research (2012) show that what causes the low creativity of students is that the learning carried out by teachers still separates between formal knowledge taught in the school environment and students' knowledge from everyday life. Dewi et al. (2016) also explained that real experience causes students to form their activeness in learning, so as to increase student creativity. Submission of material that is too formal without giving real examples results in students only following what is explained.

When faced with different problems, students are confused in solving them, even though they are still in the same material. This is because they have not been able to clearly understand what they are learning so as to link the existing material with the problems faced in order to achieve a solution that cannot be done.

One effort that needs to be done to overcome this is by using learning media. Learning media is a means of delivering material or information to students. According to Saputra et al. (2020) learning media is something that is used to convey messages in the form of knowledge to students so they can understand the meaning conveyed through pictures, photos, games or animations. Daryanto (2016) explained that the use of media in general is to clarify messages so that they are not too verbal, more efficient with time and place, attracting interest in learning, facilitating independent learning, stimulating students' attention and thoughts. Keeping up with the current development of the era which is completely dependent on technology, of course the media used also needs to be improved so that it is not too simple. One of them is sensor-based learning media whose use is more practical. This sensor-based media is designed using a detection component so that it will have a more attractive appearance.

Method

This research was conducted at Praya 2 Public High School in the 2022/2023 academic year, class XI MIPA which was held 3 times. The type of research used is quasi-experimental research because it is characterized by the presence of a control group and a treatment designed to change conditions. Sugiyono (2018) explains that quasi-experimental research is a type of research that examines causal relationships. The research design used in this study was the nonequivalent control group design. Research subjects in this design were not randomly selected to be involved in the experimental group and the control group. This research design is used to minimize the influence of foreign variables such as the level of understanding of students who are very different. So that the subject used is at the level of understanding with a difference that is not much different. The following is a research design format shown in Table 1.

Table 1. Research Design (Setyosari, 2013)

Class	Pre-test	Treatment	Post-test
Experiment	O_1	X_1	O_2
Control	O_3	X_2	O_4

All students of class XI MIPA constitute the population used in this study. While the samples used were class XI MIPA 1 as the control class and class XI MIPA 2 as the experimental class. The sample used was taken using a purposive sampling technique. According to Paramita (2021) purposive sampling is a technique with certain considerations in accordance with the objectives or research problems. This technique is used in order to obtain a sample that can represent the study population. So that the increase in creativity that will be experienced by the sample means that the population will also experience the same thing as well. Therefore, several considerations are needed in selecting this sample. The consideration in question is the

determination of the sample by taking into account the level of understanding of students.

The instrument used in this study is a test. According to Malik (2018) the test is a systematic process of measuring a person's ability or condition. The test instrument is used to collect data on increasing student creativity after being given treatment during the learning process. Before the instrument is used in research, it will first be tested for feasibility by testing validity, reliability, difficulty level, and discriminating power. The test was given to the experimental class and control class during the pretest (before being given treatment) and posttest (after being given treatment). The data obtained will then be analyzed with a homogeneity test and a normality test as a form of a condition for conducting a hypothesis test. According to Mundir (2012) the Chi Square equation used to carry out the normality test can be seen in equation 1.

$$x^2 = \sum_{t=1}^{k} \frac{(f_o - f_h)^2}{f_h} \quad (1)$$

The homogeneity test uses the variance test equation or F-test to find out whether the data is homogeneous or not. The formulation according to Kariadinata et al. (2015) can be seen in equation 2.

$$F = \frac{\text{The biggest variance}}{\text{Smallest variance}} \quad (2)$$

The pretest and posttest value data will then be tested for hypotheses using parametric statistics where the data is required to be homogeneous and normally distributed. The parametric statistic used according to Supriadi (2021) is the t-test with the polled variance equation seen in equation 3.

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{(n_1-1){s_1}^2+(n_2-1){s_2}^2}{n_1+n_2-2}\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}} \quad (3)$$

In addition, the N-Gain test was also carried out after testing the hypothesis. The N-Gain test was carried out to determine the level of creativity of students after implementation and before implementation in the experimental class and control class. According to Supriadi (2021) the equation used for the N-Gain test is like equation 4.

$$\langle g \rangle = \frac{\text{Score posttest} - \text{Score pretest}}{\text{Score ideal} - \text{Score pretest}} \quad (4)$$

Result and Discussion

The results of this study consist of the results of the analysis of instrument trials, analysis of pre-test and post-test for student creativity, results of analysis of prerequisite tests (homogeneity test and normality test), analysis of hypothesis testing, and analysis of the N-Gain test.

Table 2. Analysis of the Validity and Reliability of Questions

Information	Valid/Reliable	Invalid/Reliable
Validity	6 question items	2 question items
Reliability	8 question items	-

Based on table 2, the results of the validity test were 6 valid questions and 2 invalid questions out of a total of 8 questions tested. The two invalid questions will still be used by revising them first. Revisions were made by improving the order of the sentences in the questions and improving the quality of the images used. So the decision was taken to use 8 questions as instruments to be given to students. While the results of the reliability test obtained all questions categorized as reliable.

The control class and the experimental class were given a pretest to determine students' initial abilities. After the pretest was given, the experimental class (XI MIPA 2) received treatment in the form of learning using sensor-based elasticity media. While the control class (XI MIPA 1) did not receive treatment and applied conventional learning. After both classes get learning, a posttest is given to measure the increase in students' creativity.

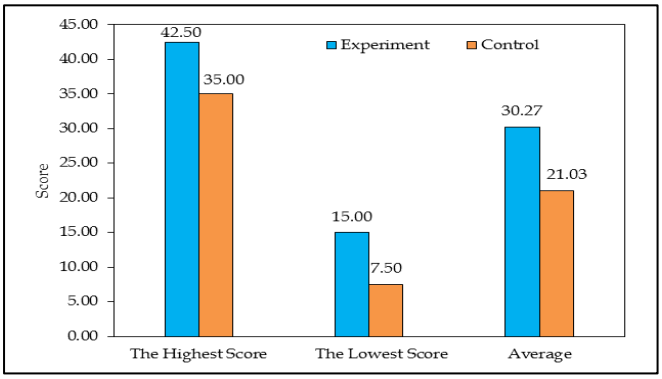

Figure 1. Class student initial test results diagram

Figure 1 shows that the highest pretest value is 42.50 in the experimental class and 35 in the control class. While the lowest score in the experimental class is 15 and in the control class is 7.50. The average score of students' creativity test results for the experimental class was 30.27 and for the control class was 21.03.

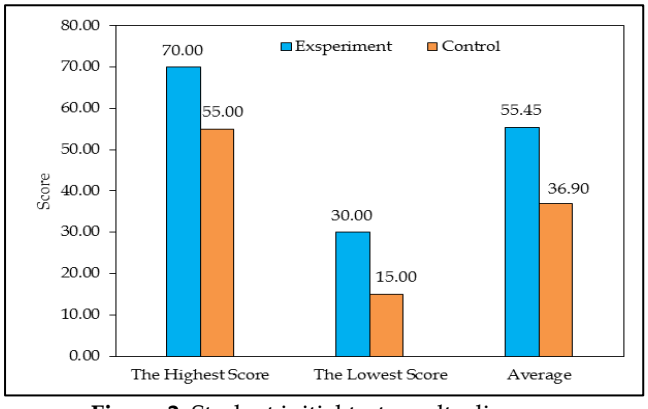

Figure 2. Student initial test results diagram

Figure 2 shows the highest posttest score of 70 in the experimental class and 55 in the control class. While the lowest score in the experimental class was 30 and in the control class was 15. The average value of students' creativity test results for the experimental class was 55.45 and in the control class was 36.90.

The results of data collection obtained will then be analyzed in various stages such as analysis of prerequisite tests (homogeneity test and normality test), hypothesis testing, and N-Gain test. Homogeneity and normality tests were carried out on the results of the pre-test and post-test of both classes. Based on the results of the initial test homogeneity test analysis using a significance level of 5%, the F_{count} value was 1.56 with F_{table} 1.88. The Fcount value is smaller when compared to the F_{table} value, which means that the data is categorized as homogeneous and the two classes have the same initial abilities. The homogeneity test in the final test resulted in an F_{count} value of 1.48 with an F_{table} of 1.88. The Fcount value is smaller when compared to the Ftable value, which means that the data is categorized as homogeneous.

The normality test is the second requirement after the homogeneity test to test the hypothesis. The normality test aims to determine whether the tested data is normally distributed or not.

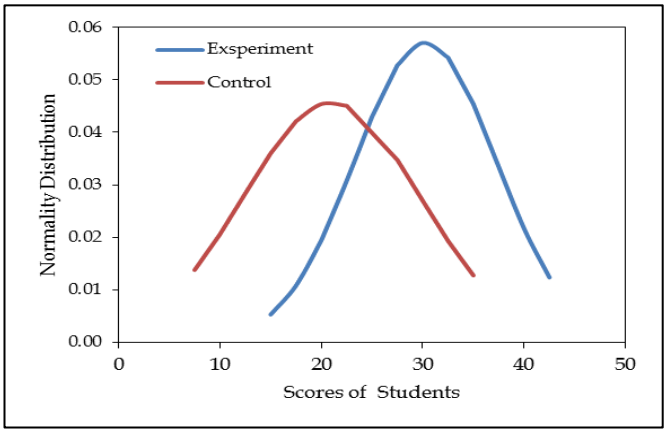

Figure 3. Pre-test data normality curve

Based on the results of the analysis of the normality test of the initial test in the experimental class and the control class, the X^2count values were 7.34 and 9.01 respectively with an X^2table of 11.070. The X^2count values in both classes are smaller than the X^2table values, so they are categorized as normally distributed.

The results of the analysis of the normality test at the end of the test in the experimental class obtained X^2count of 9.71 and in the control class of 10.23 with X^2table of 11.070. The X^2count values in both classes are smaller than the X^2table values, so they are categorized as normally distributed. After the data from the pre-test and post-test results are categorized as homogeneous and normally distributed, a hypothesis test can be carried out.

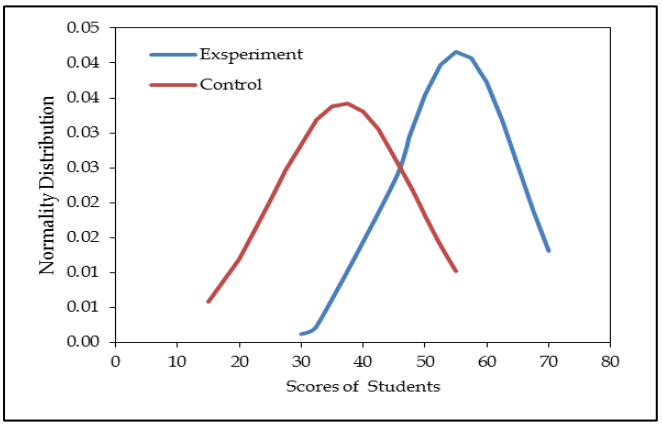

Figure 4. Post-test data normality graph

The hypothesis test used was a two-party t-test with the polled variance equation. This equation can be used if the data is homogeneous and normally distributed. That is why the prerequisite test is carried out first. The significant level used in this calculation is 5% with dk = $(n_1 + n_2) - 2$. The comparison criterion between t_{count} and t_{table} is if $t_{count} > t_{table}$ then Ho is rejected and Ha is accepted, whereas if $t_{count} \leq t_{table}$ Ho is accepted and Ha is rejected.

Based on the results of the hypothesis testing, the t_{count} value was 6.56 and the t_{table} was 1.671. When compared, it is obtained $t_{count} > t_{table}$ and Ha is accepted, which means that there is an effect of using sensor-based elasticity learning media on students' creativity. In addition to testing the hypothesis, the N-Gain test was also carried out to determine the increase in the creativity of the two classes. N-Gain is done by comparing the results of the pre-test and post-test in both classes. In the experimental class, the N-Gain value was 0.36 so that it could be categorized as moderate. The control class gets an N-Gain value of 0.20 so it can be categorized at a low level. Based on these results it was concluded that both classes experienced an increase in creativity.

The influence of the use of sensor-based elasticity learning media in the experimental class is caused by a different way of delivering material compared to normal learning. Learning is done by linking the experience of students as prior knowledge with existing material. Students will be given a question according to the existing material and related to everyday life that they have seen or experienced. The answers given by students will then be associated with the concepts of the material being studied. The process of connecting concepts with prior knowledge will then use learning media as a demonstration tool, so that students more easily understand the intent of the material presented.

Figure 5. Sensor-based elasticity learning media

In addition, the use of this media also triggers a sense of interest from students in the learning that is carried out and has an impact on increased activity and interest in learning. A good understanding of concepts and an increase in students' interest in learning will support an increase in students' creativity. As is the opinion of Ridha et al. (2022) who explained that one of the factors that makes it difficult to increase student creativity is the existence of misunderstood concepts. Riana (2019) explained in his journal that creativity can be developed by placing students to be active in learning.

The results of the research and data processing illustrate that the final ability of students' creativity has increased in both classes compared to their initial ability. However, the results of the comparison of the improvement of the two classes showed that the experimental class experienced a better increase in creativity compared to the control class. This proves that there is an effect of using sensor-based learning media in the experimental class. These results are in accordance with research by Hasanah et al. (2019) which states that there are differences in the creative thinking abilities of students in the control class after learning has increased, although not as high as in the experimental class. Sudiantini et al. (2018) in their research concluded that there is a significant influence of learning media on creative thinking. Sudiantini also explained that learning media were needed that could develop students' creativity, namely learning concepts that were different in answering the problems given and not oriented towards the final answer (result). Hadi et al. (2018) states that there is an influence of packet tracer media on student learning creativity. Research by Rohayu et al. (2021) states that the use of puzzle media can improve students' creative thinking abilities. Hutabarat et al. (2020) states that the application of e-learning-based learning media can increase student learning creativity. Hutabarat also revealed that there was an increase in students' creativity in physics subjects if there was a high utilization of e-learning. Rahmawati et al. (2019) in their research explained that there were significant differences from the use of styrobon learning media on students' thinking creativity. Research by Purwadi et al. (2016) explains that Edmodo media really helps students in increasing creativity.

Conclusion

Based on the results of the research and the data analyzed, it can be concluded that there is an influence of sensor-based elasticity learning media on students' creativity. The advice given is to pay attention to the planned study time so that it is adjusted to the existence of learning media as a demonstration tool when learning activities take place. The learning model to be used can be adapted to the media in order to optimize learning. Teachers can implement a learning system by using learning media on other materials.

Unknowledgment

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Reference

Darise, G. N. (2019). Implementasi Kurikulum 2013 Revisi Sebagai Solusi Alternatif Pendidikan di Indonesia dalam Menghadapi Revolusi Industri 4.0. *Jurnal Ilmiah Iqra*, *13*(2), 41–53. https://doi.org/10.30984/jii.v13i2.967

Daryanto. (2016). *Media Pembelajaran*. Gava Media.

Dewi, S. M., Harjono, A., & Gunawan. (2016). Pengaruh Model Pembelajaran Berbasis Masalah Berbantuan Simulasi Virtual Terhadap Penguasaan Konsep dan Kreativitas Fisika Siswa SMAN 2 Mataram. *Jurnal Pendidikan Fisika Dan Teknologi*, *2*(3), 123–128. https://doi.org/10.29303/jpft.v2i3.302

Fitriani, N., Gunawan, & Sutrio. (2017). Berpikir Kreatif dalam Fisika dengan Pembelajaran Conceptual Understanding Procedures (CUPs) Berbantuan LKPD. *Jurnal Pendidikan Fisika Dan Teknologi*, *3*(1), 24–33. https://doi.org/10.29303./jpft.v3i1.319

Hadi, S., & Purmadi, A. (2018). Pengaruh Media Packet Tracer Terhadap Kreativitas Belajar Siswa pada Mata Pelajaran TIK. *Jurnal Teknologi Pendidikan*, *3*(2), 83–93. https://doi.org/10.33394/jtp.v0i2.1242

Hasanah, E., Darmawan, D., & Nanang. (2019). Pengaruh Penggunaan Media Pembelajaran Articulate dalam Metode Problem Based Learning (PBL) Terhadap Peningkatan Kemampuan Berpikir Kreatif Peserta Didik. *Jurnal Teknologi Pendidikan Dan Pembelajaran*, *4*(1), 826–838. https://doi.org/10.31980/tp.v4i1.503

Hutabarat, H. D., & Hasibuan, F. A. (2020). Peningkatan Kreativitas Siswa Melalui Media Pembelajaran Berbasis E-learning pada Siswa Kelas X SMA

Negeri 1 Angkola Timur. *Jurnal Education and Developmenti*, *8*(4), 508–512. https://journal.ipts.ac.id/index.php/ED/article/view/2210

Jaya, S. P. S. (2012). Pengembangan Modul Fisika Kontekstual untuk Meningkatkan Hasil Belajar Fisika Peserta Didik Kelas X Semester 2 di SMK Negeri 3 Singaraja. *Jurnal Penelitian Pascasarjana Undiksha*, *1*(2), 1–24. https://doi.org/10.23887/jtpi.v1i2.301

Kariadinata, R., & Abdurahman, M. (2015). *Dasar-dasar Statistik Pendidikan*. Pustaka Setia.

Lestari, I., & Zakiah, L. (2019). *Kreativitas dalam Konteks Pembelajaran*. Erzatama Karya Abadi.

Malik, A. (2018). *Pengantar Statistika Pendidikan*. Budi Utama.

Mundir. (2012). *Statistik Pendidikan*. STAIN Jember Press.

Nurkholis. (2013). Pendidikan dalam Upaya Memajukan Teknologi. *Jurnal Kependidikan*, *1*(1), 24–44. https://doi.org/10.24090/jk.v1i1.530

Nurlaela, L., Ismayanti, E., Samani, M., & Buditjahjanto, P. S. (2019). *Strategi Belajar Berpikir Kreatif*. PT Media Guru Digital Indonesia.

Paramita, R. W. D. (2021). *Metode Penelitian Kuantitatif: Buku Ajar Perkuliahan Metodologi Penelitian Bagi Mahasiswa Akuntansi & Manajemen*. Widya Gama Press.

Purwadi, S. J., Sarwanto, & Sunarno, W. (2016). Peningkatan Kreativitas Dan Prestasi Belajar Fisika Materi Sifat Mekanik Zat Melalui Media Edmodo Pada Siswa Kelas X Tkj B Smk Negeri 2 Surakarta Semester II Tahun Pelajaran 2013/2014. *Jurnal Inkuiri*, *5*(1), 45–55. https://media.neliti.com/media/publications/65628-ID-peningkatan-kreativitas-dan-prestasi-bel.pdf

Rahmawati, S., & Kamaludin, A. (2019). Pengaruh Penggunaan Media Pembelajaran Styrobon Terhadap Kreativitas Berpikir dan Hasil Belajar Kognitif. *Jurnal Pendidikan Sains*, *7*(2), 112–122. https://doi.org/10.26714/jps.7.2.2019.20-30

Riana, P. C. (2019). Analisis Tingkat Kreativitas Siswa pada Mata Pelajaran Fisika Kelas XII SMAS Ferdy Ferry Kota Jambi. *Jurnal Pendidikan Fisika Dan Teknologi*, *5*(2), 327–334. https://doi.org/10.29303/jpft.v5i2.1435

Ridha, M. R., Zuhdi, M., & Ayub, S. (2022). Pengembangan Perangkat Pembelajaran PJBL berbasis STEM dalam Meningkatkan Kreativitas Fisika Peserta Didik. *Jurnal Ilmiah Profesi Pendidikan*, *7*(1), 223–228. https://doi.org/10.29303/jipp.v7i1.447

Rohayu, P., A., D., & Afiani, K. D. A. (2021). Analisis Penggunaan Media Pembelajaran dalam Meningkatkan Kemampuan Berpikir Kreatif Siswa. *Jurnal Pendidikan Guru Sekolah Dasar*, *5*(1), 30–46. https://doi.org/10.36456/inventa.5.1.a2623

Saputra, R., Susilawati, S., & Verawati, N. N. S. P. (2020). Pengaruh Penggunaan Media Simulasi Phet (Physics Education Technology) Terhadap Hasil Belajar Fisika. *Jurnal Pijar MIPA*, *15*(2), 110–115. https://doi.org/10.29303/jpm.v15i2.1459

Setyosari, P. (2013). *Metode Penelitian Pendidikan dan Pengembangan*. Kencana.

Sudiantini, D., & Shinta, N. D. (2018). Pengaruh Media Pembelajaran Terhadap Kemampuan Berpikir Kreatif dan Penalaran Matematis Siswa. *Jurnal PPM*, *11*(1), 177–186. https://doi.org/10.30870/jppm.v11i1.2996

Sugiyono. (2018). *Metode Penelitian Kombinasi (Mixed Methods*. Alfabeta: Bandung.

Sumiarti. (2016). Strategi Pembelajaran Kreativitas dalam Pendidikan. *Jurnal Pendidikan Kreativitas Anak*, *1*(2), 14–23. http://repository.uinsaizu.ac.id/id/eprint/3930

Supriadi, G. (2021). *Statistik Penelitian Pendidikan*. UNY Press.