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A Comparison by Gender: Interest and Science Process Skills

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ABSTRAK

Keterampilan belajar ini merupakan hal yang mendukung terselenggaranya proses pembelajaran yang baik. Pembelajaran yang monoton akan sulit diterima, hal ini menyebabkan siswa malas mengerjakan tugas karena sistem pendidikan yang diterapkan. Penelitian ini bertujuan untuk menganalisis perbandingan minat dan proses sains serta untuk mengetahui hubungan antara minat siswa dan keterampilan proses sains antara perempuan dan laki-laki pada mata pelajaran IPA. Metode dalam penelitian ini adalah analisis data kuantitatif komparatif. Dimana komparatif adalah penelitian yang membandingkan dua variabel atau lebih. Hasil penelitian ini adalah uji-t keterampilan proses sains siswa pada pembelajaran IPA baik siswa putri maupun putra, sehingga dapat disimpulkan bahwa ada hubungan antara keterampilan proses sains siswa kelas VII A dengan siswa kelas VII B . Siswa kelas VII A dan kelas VII B. Keterampilan proses sains Pada mata pelajaran IPA kelas VII A dapat disimpulkan bahwa ada hubungan antara minat dan keterampilan proses sains antara siswa perempuan dan laki-laki serta di kelas VII A dan B. Penelitian ini sangat penting dilakukan karena ada tidak banyak penelitian yang membandingkan minat dan keterampilan proses sains dengan beberapa tes yang digunakan. Sangat bermanfaat untuk mengetahui perbandingan minat dan keterampilan proses sains di setiap kelas dan perbandingan indikator yang akan digunakan.

ABSTRACT

This learning skill is a thing that supports the implementation of a good learning process. Monotonous learning will be difficult to accept, this causes students to be lazy to do assignments because of the applied education system. This study aims to analyze the comparison of interest and science processes and to determine the relationship between students' interest and science process skills between women and men in science subjects. The method in this research is comparative quantitative data analysis. Where comparative is research that compares two or more variables. The results of this study are the t-test of students' science process skills on science lessons for both female and male students, so it can be concluded that there is a relationship between the science process skills of class VII A and class VII B students. Class VII A and class VII B students. Science process skills In science subjects for class VII A, it can be concluded that there is a relationship between interest and science process skills between female and male students as well as in grades VII A and B. This research is very important to do because there are not many studies that compare the interests and skills of the science process with several tests that are used. It is very useful to know about the comparison of interests and skills of the science process in each class and the comparison of indicators that will be used.

1. INTRODUCTION

Education is a means to develop knowledge, skills, attitudes, and habits of students with national education. National education functions to develop abilities consisting of spiritual, social, knowledge and skills, this development reflects the productivity benefits that come from improving education (Mason, 2020; Susilowati, 2017; Zaki, 2017). Education can be said to be the key to the success of students, students can be more literate with the outside world and are the spearhead in developing resources and changing the behavior of each individual (Asrial et al., 2019; Emilzoli et al., 2021; Muradi et al., 2021). Humans need education in order to be useful for society and the nation, thereby producing an intellectual generation to increase knowledge (D. Darmaji et al., 2019; Pelullo & Di Giuseppe, 2018; Yanti & Yusliani, 2020). Learning is made based on the competency needs of students. There are many needs that students need, starting from understanding the material and concepts. Learning is basically not only learning about concepts, theories and facts, but is more concerned with applications in everyday life (Barnard et al., 2021; Dewi & Rukmini, 2019; Elisabet et al., 2019; Santosa, 2018). Students in learning have their own styles that increase students' motivation and interest in learning, increase creativity, so that the learning process can explore developments (Banggur et al., 2018; Ladjar et al., 2018; Zendler & Greiner, 2020). In the education variable,

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performance and strategy are very important learning activities to evaluate (Alhassan & & Chen, 2019; Bruyckere et al., 2017). Therefore, every student, both male and female, really needs education.

All fields of education must be opened as wide as possible for women and men without boundaries, there is no gender discrimination in education even in the assessment of the teaching and learning process carried out by teachers. In collecting data teachers examine interventions across respondents that may be relevant by gender (Doğan et al., 2019; Nito et al., 2020). Learning can be carried out effectively by considering the presentation of literacy enrichment teaching according to the characteristics of students (Hartini, S. et al., 2018; Puspita., 2019; Rochman et al., 2017). The teaching and learning process must be supported especially science learning materials including basic concepts that can be a vehicle for learning for students (Prihatini, 2017; Riswanto & Dasmo, 2015; Şemin, 2019). Therefore, skills in learning are needed. This learning skill is a thing that supports the implementation of a good learning process. Monotonous learning will be difficult to accept, this causes students to be lazy to do assignments because of the applied education system (Astalini et al., 2018; Mansouri & Moumine, 2017; Sari et al., 2017). Misinterpreting a construction or teaching characteristic reduces students' interest in learning (Adom et al., 2020; Apriyani, 2017; Kurniawan et al., 2019). Given that learning integration is important, it can offer learning according to the interests of students, therefore students can apply what they learn (Asrizal et al., 2018; Mutakinati et al., 2018; Setiawan et al., 2017). Regarding student understanding, sometimes it is hampered by a subject, one example is physics.

Physics is one of the difficult subjects. Problems often faced by students are not understanding physics learning, an adequate learning supports students to study in the field of science (Decock, 2017; Halim et al., 2017; Wilson et al., 2020). Physics itself is related to science that analyzes concepts, principles, and reviews the basic physics and characteristics (Maison et al., 2018; Nurazizah et al., 2017). Students' ability to learn physics is the relationship between direct interaction to encourage academics and use technology in learning (Dou et al., 2018; Hamdani et al., 2017; Van De Heyde & Siebrits, 2022). This concerns the interest shown in teaching and learning interactions in the classroom. The greater the student's interest in learning, the easier it will be to carry out the learning process. interest in learning is a form of student interest in the lesson to be studied by having 2 cognitive and affective aspects in growing interest in learning (Saputro & Amir, 2018; Sari et al., 2017). Some topics can be measured by a number of validated methods to assess student interest (Jack et al., 2017; Kwarikunda et al., 2020; Swirski et al., 2018). Students who have an interest in studying physics will try to concentrate on learning. Then the student will continue to study until he can understand the material (Dou et al., 2018; Giglio et al., 2020; Luo et al., 2020). This is supported by the science process skills possessed by the teacher.

Science process skills are needed in today's modern era. This era is referred to as the age of knowledge, a challenge in an increasingly dynamic and advanced knowledge era that requires human resources (Banggur et al., 2018; Pramana et al., 2021; Van Mieghem et al., 2022). Science process skills have several features to require students to think critically (Dishon, 2021; Rusmono & Alghazali, 2019). Previous research has not discussed the interests and skills of the science process as a whole, only partially on each indicator. Therefore, the urgency of this research is to make comparisons and the relationship between interests and science process skills by using several indicators. Therefore, this research is very important to do because there has been no research linking interest and kps. By looking at how important the interests and skills of students' science processes are from the attachment to the questionnaire, the researchers conclude that the objectives are to compare the interests and processes of science and to find out the relationship between the interests and skills of students' science processes between women and men on science subjects.

2. METHODS

This research uses quantitative research which is divided into two types: associative and comparative. Survey design is a procedure in quantitative research in which you administer a survey or questionnaire to a small group of people (called a sample) to identify trends in attitudes, opinions, behaviors, or characteristics of a large group of people. The sample in this study was 70 students from SMPN 1 Muaro Jambi in Muaro Jambi district. The sampling technique is purvosive sampling. The reason for taking this technique is because not all samples have criteria that match the phenomenon being studied. The sample taken is class VII A and VII B consisting of 40 women and 30 men. There are 2 instruments in this research, namely interest in science and science process skills. The assessment instrument is one of the latest experimental assessment instruments in the field of assessment (Purwanti et al., 2020). There are 30 valid question items on this instrument using a Likert scale. The scale consists of 5 points with 1 (very bad), 2 (not good), 3 (fairly good), 4 (good), 5 (very good). Each statement is representative of each indicator of Interest and science process skills. This research focuses on 6 dimensions of interest, namely attention in

learning, student involvement, feelings of pleasure, curiosity, learning materials and teacher attitudes, and the benefits of subjects while on science process skills this research focuses on 12 dimensions where 6 basic science process skills and 6 more integration science process skills. For the questionnaire grid for this research in Tables 1 and Table 2.

Table 1. Grid of Student Interest Questionnaire Instruments in Science Subjects

Variable	Indicator	No. Statement Items
Student interest in science subjects	Attention in learning	1, 2, 3, 4
	Student engagement	5, 6, 7, 8, 9
	Feeling happy	10, 11, 12, 13, 14
	Curiosity	15, 16, 17, 18, 19
	Learning materials and teacher attitudes	20, 21, 22, 23, 24, 25
	Benefits of subjects	26, 27, 28,29, 30
Number of Statements		**30**

Table 2. Grid of Student Science Process Skills Questionnaire Instruments in Science Subjects.

Variable	Indicator	No. Statement Items
Science Process Skills of students in science subjects	Observation	1,2,3
	Communication	4,5,6,7
	Conclusion	16, 17, 18, 19
	Obtain and process data	28, 29, 30, 31
	Doing Experiments	44, 45, 46, 47
Number of Statements		**19**

This research was carried out starting from mentioning a questionnaire or questionnaire, then quantitative data analysis was carried out using two types, namely associative and comparative. Where associative is research that seeks to find a relationship between one variable and other variables, while comparative is research that compares two or more variables. In this study, we will discuss descriptive statistical tests of variables, the second is the assumption test which is divided into normality, homogeneity and linearity, then the third is the T test and also the correlation test of students' interest and science process skills in science subjects. Therefore, differential statistics are used with assumption tests consisting of tests of normality, linearity, and homogeneity. As well as hypothesis testing T test and correlation. The normality test aims to determine whether a data can be said to be normal or not, while the homogeneous test aims to determine whether the data of the two samples is homogeneous or not. The first step in this research is to determine the normality and homogeneity of a data using normality test and homogeneity test. The research method is basically a scientific way to obtain data with certain purposes and uses, one of which is to clarify various analytical processes using real calculation methods (Suharsaputra, 2012). Next, identify the results for follow-up. At the data collection stage, questionnaires were given to 70 students at one SMPN 1 Muaro Jambi school in Muaro Jambi district. From this data, data analysis is then carried out, namely data coding, filtering appropriate data and analyzing the data.

3. RESULT AND DISCUSSION

Results

In the results here we will discuss about the test descriptive statistical variables, the second is the assumption test which is divided into normality, homogeny and linearity, then the third is the T test and also the correlation test of students' interest and science process skills in science subjects. Descriptive statistics is a statistical analysis process that focuses on the management, presentation, and classification of data. With this process, the data presented will become more attractive, easier to understand, and able to provide more meaning for data users. In this test, the researcher took 3 indicators to test students' interest in science lessons and 2 indicators on science process skills. In the descriptive statistical test results from class VII A and VII B there were 35 students with 20 female students and 15 male students. On the indicator of attention in learning to student interest in science learning there is an interest of 60% female students better than 42.9% male students. It can be said that the male students of class VII A are lower than the female students.

The next test was carried out in class VII B with the same indicator on interest in science learning.

there is an attitude of female students 40% less good than the data of male students 42.9%. It can be said that the male students of class VII B are superior to the female students. Next to the second indicator for interest, namely learning materials and teacher attitudes. on this indicator there is an attitude of students of class VII A, 65% female students are sufficient than male students, namely 64.3%. It can be said that the female students of class VII A are superior to the boys. Then the second indicator test was continued, namely interest in class VII B where 45% female students were quite good from male students, namely 35.7%. It can be said that female students are superior to boys. In the indicator of interest, it discusses the benefits of subjects where in class VII A 45% female students are less good than male students, namely 57.1%. It can be said that male students are superior to female students.

Furthermore, in class VII B, 55% of female students were not good, 57.1% of boys were good. It can be said that male students are superior to girls. On the indicators of science process skills, the researchers took the first 2 indicators of observation in learning science where class VII A female students 35% were not good enough than male students, which was 35.7% very good. So, it can be said that male students are superior to girls. Furthermore, the test was carried out in class VII B where 40% female students were less good than male students, namely 57.2% very good. So it can be said that male students are superior to girls. In the next indicator about science process skills, namely communication where in class VII A 65% female students are better than boys, namely 42.9%. So it can be said that female students are superior to boys. Furthermore, in class VII B, 55% female students were less good than male students, namely 57.1%. So it can be said that male students are superior to girls. The data is normally distributed as seen from the significance value, if the significance value is > 0.05. The results of the normality test are shown below. The normality test of students' interest in science in grades VII A and VII B is described in Table 4.

Table 4. Normality test of interest and science process skills for grades VII A and VII B

Variable	Class	Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistics	df	Sig.	Statistics	df	Sig.
Interest	VII_A	0.089	34	0.200	0.790	34	0.356
	VII_B	0.127	34	0.137	0.950	34	0.175
KPS	VII_A	0.099	34	0.300	0.978	34	0.720
	VII_B	0.090	34	0.300	0.966	34	0.363

Based on the Table 4, it can be concluded that the data is normally distributed, the normality test is obtained with the Kolmogorov-smoniv test, the significance value is 0.200 > 0.05 and 0.137 > 0.05 for the interests of class VII A and VII B. It can be concluded that the data is normally distributed. > from 0.05 with results 0.300 > 0.05 and 0.300 > 0.05 for science process skills for grades VII A and VII B. This test is carried out in order to find out whether the x and y data are homohen or not. The requirement in this test is that if the significance value is > 0.05, it can be said that the x and y data are homogeneous (same). If the significance value is < 0.05 then the data is not homogeneous (not the same. Based on analysis data, the variance of the two variables is the same or homogeneous with the results obtained from the linearity test that is obtained is a significance value of 0.717 for the interest variable and 0.545 for the science process skill variable that has met the requirements > 0.05. This test is carried out in order to see a linear relationship between two or more variables. The requirements for this test, if the significance value is > 0.05. Based on analysis data, it can be concluded that there is a linear relationship between interest and science process skills in class VII A and VII B obtained, the results of the linearity test obtained are a significance value of 0.806 for class VII A and 0.834 for class VII B has met the requirements > 0.05.

Hypothesis test is a procedure that is carried out and aims to decide whether to accept or reject the hypothesis about population parameters. In this study, two hypothesis tests will be conducted, namely the T test and the correlation test. In this test, it is carried out in order to find out the difference between the variables on science subjects. The condition in this test is if the significance value is > 0.05, it can be said that the variable has no difference. If the significance value is <0.05, then the variable has a significant difference. From the analysis data, it is found that there are differences in the interests of female students and male students in class VIIA & B towards science subjects. This is evidenced by the value of sig (2-tailed) 0.030 < 0.05 and (2-tailed) 0.028 < 0.05. then there are differences in the science process skills of female students and male students in grades VIIA & B towards science subjects. This is evidenced by the value of sig (2-tailed) 0.037 < 0.05 and (2-tailed) 0.042 < 0.05. In this test, it is carried out in order to determine the relationship of the variable to science subjects. The condition in this test is if the significance value is > 0.05, it can be said that the variable has no relationship. If the significance value is <0.05, then the variable has a significant relationship. The correlation test of students' interest and science process skills in class VII A is described in Table 5.

Table 5. Correlation test of interest and science process skills for class VII A

Class	Variable	N	Pearson Correlation	Sig. (2-tailed)
VII A	interest of students	20	0.657	0.036
VII B	KPS of students	15	0.642	0.043

From the table, it is found that there is a relationship between the interest and science process skills of female students and male students in class VII A on science subjects. This is proven by the value of sig (2-failed) 0.036 > 0.05. Then, it was found that there was a relationship between the interest and science process skills of female and male students in class VII B on science subjects. This is evidenced by the value of sig (2-failed) 0.043 > 0.05.

Discussion

Creating a learning atmosphere and learning process according to interests and talents so that students actively develop their potential and ideals (Habiba et al., 2020; Quay, 2016; Sappaile, 2017; Setiawan, 2017; Yulian, 2018). In research that discusses the concept of interest in learning, students tend to forget the concept of interest in learning itself so that sometimes there is a lot of decline in the learning process. This can also occur as a result of a monotonous and unattractive learning system. Monotonous learning will cause students to get bored in learning (Diah & Riyanto, 2016; Gunawan et al., 2019; Jubaedah, 2017). The results of this study are expected to contribute ideas for knowledge and education as well as provide an overview of the relationship between interest and science process skills to science learning outcomes. Measurement of student interest in science (Science) has focused on what interest is being measured. Science process skills are needed to support learning that will be carried out in the classroom (Anam, 2020; Darmaji Darmaji et al., 2019; Haryadi & Pujiastuti, 2020). Therefore, as an educator, he is required to have his own skills that can increase student interest in learning (Af'idayani et al., 2018; Zainuddin et al., 2020). Therefore, there is a need for a teaching process skill, especially in science subjects. In research that discusses the concept of science process skills, there are still many who tend to only focus on an indicator of testing the science process skills. This sometimes makes a skill test less accurate. The learning process must create an atmosphere so that students are active in education (Asrial et al., 2020; Astalini et al., 2020). Process skills are important to be promoted as one of learning. So that they are able to carry out the desired learning process. Active learning is seen when students are enthusiastic about answering questions to improve their skills (Amdany et al., 2018; Kurniawan et al., 2019).

This research is in line with previous research where interest in learning, enthusiasm needs to be considered to encourage learning abilities leading to positive effects (Fadilah & Efendi, 2020; Ho & Ismawan Prasetia Devi, 2020; Sutarto et al., 2020). Therefore, to increase interest in learning, one must have learning process skills, especially science process skills. Science process skills are skills in using students' minds (Anam, 2020; Haryadi & Pujiastuti, 2020; Perdana et al., 2017). As for skills that occur naturally that students must possess (Darmaji Darmaji et al., 2018; Zainuddin et al., 2020). Previous research has not discussed the interests and skills of the science process as a whole, only partially on each indicator . Therefore, the purpose of this study is to make comparisons and relationships between interests and science process skills using several indicators. Based on the presentation of various studies that have been carried out on the relationship between interests and self-skills to learning outcomes, this can be used as a basis and reference in conducting research to further investigate learning interests and self-skills with science learning outcomes. The essence of measuring interest in school is useful for knowing students' feelings during the learning process. Because, if students have a good interest in a lesson, they will be happy with the learning process in the classroom and can improve their self-assessment.

4. CONCLUSION

Based on the results of hypothesis testing, research testing and data analysis, the conclusions of this study are the results of the t-test of students' skills in science lessons, both female and male students, found a relationship between the learning interests of class VII A students and class VII B students. based on the results of this study that there is a relationship between interest and science process skills between female and male students and in grades VII A & B. Student interest and science process skills have a significant effect on success, increase learning outcomes, and affect student achievement.

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6. REFERENCES

Adom, D., Mensah, J. A., & Dake, D. A. (2020). Test, measurement, and evaluation: Understanding and use of the concepts in education. *International Journal of Evaluation and Research in Education*, *9*(1), 109–119. https://doi.org/10.11591/ijere.v9i1.20457.

Af'idayani, N., Setiadi, I., & Fahmi. (2018). The Effect of Inquiry Model on Science Process Skills and Learning Outcomes. *European Journal of Education Studies*, *4*(12), 177–182. https://doi.org/10.5281/zenodo.1344846.

Alhassan, A., & & Chen, D. (2019). Investigating business EFL postgraduate student writing in a UK university : a qualitative study Investigating business EFL postgraduate student writing in a UK university : a qualitative study. *Cogent Education*, *6*(1). https://doi.org/10.1080/2331186X.2019.1699741.

Amdany, P., Sularmi, S., & Sriyanto, M. I. (2018). Learning Motivation of Slow Learner in Elementary School. *Social, Humanities, and Educational Studies (SHEs): Conference Series*, *1*(1), 613–618. https://doi.org/10.20961/shes.v1i1.23506.

Anam, R. S. (2020). The Analysis of Science Process Skills on Pre-Service Elementary School Teachers. *Al Ibtida: Jurnal Pendidikan Guru MI*, *7*(2), 226. https://doi.org/10.24235/al.ibtida.snj.v7i2.6470.

Apriyani, D. D. (2017). Pengaruh Penggunaan Media Proyeksi Terhadap Hasil Belajar Matematika. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, *7*(2), 115–123. https://doi.org/10.30998/formatif.v7i2.1828.

Asrial, A., Syahrial, S., Maison, M., Kurniawan, D., & Piyana, S. (2020). *E-Module Etnokonstruktivisme untuk Meningkatkan Persepsi, Minat, Dan Motivasi Siswa Kelas V Sekolah Dasar*. https://doi.org/10.21009/jtp.v21i2.11030.

Asrial, Syahrial, Kurniawan, D. A., Chan, F., Septianingsih, R., & Perdana, R. (2019). Multimedia innovation 4.0 in education: E-modul ethnoconstructivism. *Universal Journal of Educational Research*, *7*(10), 2098–2107. https://doi.org/10.13189/ujer.2019.071007.

Asrizal, Amran, A., Ananda, A., Festiyed, F., & Sumarmin, R. (2018). The development of integrated science instructional materials to improve students' digital literacy in scientific approach. *Jurnal Pendidikan IPA Indonesia*, *7*(4), 442–450. https://doi.org/10.15294/jpii.v7i4.13613.

Astalini, A., Darmaji, D., Kurniawan, D., Anggraini, L., & Perdana, R. (2020). E-Assessment Konsep Diri Siswa pada Pembelajaran Fisika. *Jurnal Ilmu Pendidikan*, *25*(2), 73–81. https://doi.org/10.17977/um048v25i2p73-81.

Astalini, A., Kurniawan, D. A., & Sumaryanti, S. (2018). Sikap Siswa Terhadap Pelajaran Fisika di SMAN Kabupaten Batanghari. *JIPF (Jurnal Ilmu Pendidikan Fisika)*, *3*(2), 59. https://doi.org/10.26737/jipf.v3i2.694.

Banggur, M. D. V., Situmorang, R., & Rusmono, R. (2018). Pengembangan pembelajaran berbasis blended learning pada mata pelajaran etimologi multimedia. *Jurnal Teknologi Pendidikan*, *2*(2), 152–165. https://doi.org/10.21009/jtp.v20i2.8629.

Barnard, M., Whitt, E., & McDonald, S. (2021). Learning objectives and their effects on learning and assessment preparation: insights from an undergraduate psychology course. *Assessment and Evaluation in Higher Education*, *46*(5), 673–684. https://doi.org/10.1080/02602938.2020.1822281.

Bruyckere, P., De, Kirschner, P. A., Bruyckere, P., De, & Kirschner, P. A. (2017). Measuring teacher authenticity : Criteria students use in their perception of teacher authenticity. *Cogent Education*, *14*(1). https://doi.org/10.1080/2331186X.2017.1354573.

Darmaji, D., Kurniawan, D. A., & Irdianti, I. (2019). Physics education students' science process skills. *International Journal of Evaluation and Research in Education*, *8*(2), 293–298. https://doi.org/10.11591/ijere.v8i2.28646.

Darmaji, Darmaji, Kurniawan, D. A., & Irdianti, I. (2019). Physics education students' science process skills. *International Journal of Evaluation and Research in Education*, *8*(2), 293–298. https://doi.org/10.11591/ijere.v8i2.28646.

Darmaji, Darmaji, Kurniawan, D. A., Suryani, A., & Lestari, A. (2018). An Identification of Physics Pre-Service Teachers' Science Process Skills Through Science Process Skills-Based Practicum Guidebook. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*, *7*(2), 239–245. https://doi.org/10.24042/jipfalbiruni.v7i2.2690.

Decock, P. B. (2017). Studying Physics: Reading Origen and Philo. *Journal of Early Christian History*, *7*(3), 96–115. https://doi.org/10.1080/2222582x.2018.1434675.

Dewi, R. A. K., & Rukmini, P. (2019). The effect of thematic learning by using a scientific approach to increase the multiple intelligence of students. *Jurnal Prima Edukasia*, *7*(1), 40–46. https://doi.org/10.21831/jpe.v7i1.24326.

Diah, & Riyanto. (2016). Problem-Based Learning Model In Biology Education Courses To Develop Inquiry Teaching Competency Of Preservice Teachers. *Cakrawala Pendidikan*, *35*(1), 47–57. https://doi.org/10.21831/cp.v1i1.8364.

Dishon, G. (2021). The new natural? Authenticity and the naturalization of educational technologies. *Learning, Media and Technology*, *46*(2), 156–173. https://doi.org/10.1080/17439884.2020.1845727.

Doğan, Y. B., Akar, H., & Üstüner, M. (2019). Examining the measurement invariance of the teachers' sense of self-efficacy scale in terms of gender. *International Journal of Evaluation and Research in Education*, *8*(2), 213–220. https://doi.org/10.11591/ijere.v8i2.18694.

Dou, R., Brewe, E., Potvin, G., Zwolak, J. P., & Hazari, Z. (2018). Understanding the development of interest and self-efficacy in active-learning undergraduate physics courses. *International Journal of Science Education*, *40*(13), 1587–1605. https://doi.org/10.1080/09500693.2018.1488088.

Elisabet, E., Relmasira, S. C., & Hardini, A. T. A. (2019). Meningkatkan Motivasi dan Hasil Belajar IPA dengan Menggunakan Model Pembelajaran Project Based Learning (PjBL). *Journal of Education Action Research*, *3*(3), 285. https://doi.org/10.23887/jear.v3i3.19451.

Emilzoli, M., Ali, M., & Rusman. (2021). Perceptions, attitudes and lifestyles of students of Madrasah Ibtidaiyah Teacher Education Study Program about education for sustainable development. *IOP Conference Series: Earth and Environmental Science*, *739*(1). https://doi.org/10.1088/1755-1315/739/1/012058.

Fadilah, N., & Efendi, N. (2020). Student Pleasure Attitude and Interest in Spending Time Learning Science Against Student Cognitive Learning Outcomes. *Academia Open*, *3*, 1–11. https://doi.org/10.21070/acopen.3.2020.497.

Giglio, S., Bertacchini, F., Bilotta, E., & Pantano, P. (2020). Machine learning and points of interest: typical tourist Italian cities. *Current Issues in Tourism*, *23*(13), 1646–1658. https://doi.org/10.1080/13683500.2019.1637827.

Gunawan, Harjono, A., Hermansyah, & Herayanti, L. (2019). Guided inquiry model through virtual laboratory to enhance students' science process skills on heat concept. *Cakrawala Pendidikan*, *38*(2), 259–268. https://doi.org/10.21831/cp.v38i2.23345.

Habiba, B., Mulyani, S., Nia, N. I., & Nugroho, P. (2020). Konsep Layanan Responsif bagi Siswa yang Mengalami Kesulitan Belajar secara Daring Dimasa Pandemi Covid-19. *KONSELING EDUKASI "Journal of Guidance and Counseling,"* *4*(2), 305–322. https://doi.org/10.21043/konseling.v4i2.7583.

Halim, A., Suriana, S., & Mursal, M. (2017). Dampak Problem Based Learning terhadap Pemahaman Konsep Ditinjau dari Gaya Berpikir Siswa pada Mata Pelajaran Fisika. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, *3*(1), 1–10. https://doi.org/10.21009/1.03101.

Hamdani, H., Mursyid, S., Sirait, J., & Etkina, E. (2017). Analisis Hubungan antara Sikap Penyelesaian Soal dan Hasil Belajar Mahasiswa Calon Guru Fisika. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, *3*(1), 151–156. https://doi.org/10.21009/1.03205.

Hartini, S., S., Firdausi, Misbah, & Sulaeman. (2018). The Development of Physics Teaching Materials Based on Local Wisdom to Train Saraba Kawa Characters. *Jurnal Pendidikan IPA Indonesia*, *7*(2). https://doi.org/10.15294/jpii.v7i2.14249.

Haryadi, R., & Pujiastuti, H. (2020). PhET simulation software-based learning to improve science process skills. *Journal of Physics: Conference Series*, *1521*(2). https://doi.org/10.1088/1742-6596/1521/2/022017.

Ho, L., & Ismawan Prasetia Devi. (2020). A New trend in understanding students' interest in learning science: microetnography. *Integrated Science Education Journal (ISEJ)*, *1*(2), 62–66. https://doi.org/10.37251/isej.v1i2.72.

Jack, B. M., Lin, H., & Shyang. (2017). Making learning interesting and its application to the science classroom. *Studies in Science Education*, *53*(2), 137–164. https://doi.org/10.1080/03057267.2017.1305543.

Jubaedah, J. (2017). Penerapan Model Cooperative Learning Tipe Student Teams Achievement Division (STAD) Untuk Meningkatkan Hasil Belajar Siswa Pada Mata Pelajaran IPA. *Jurnal Cakrawala Pendas*. https://doi.org/10.31949/jcp.v3i2.591.

Kurniawan, D. A., Astalini, A., Kurniawan, N., & Pathoni, H. (2019). Analisis korelasi sikap siswa dan disiplin siswa terhadap IPA pada Siswa SMP Provinsi Jambi. *Jurnal Pendidikan Fisika Dan Keilmuan (JPFK)*, *5*(2), 59. https://doi.org/10.25273/jpfk.v5i2.5014.

Kwarikunda, D., Schiefele, U., Ssenyonga, J., & Muwonge, C. M. (2020). The Relationship between Motivation for, and Interest in, Learning Physics among Lower Secondary School Students in Uganda. *African Journal of Research in Mathematics, Science and Technology Education*, *24*(3), 435–446. https://doi.org/10.1080/18117295.2020.1841961.

Ladjar, M. A. B., Juliantine, T., & Mulyana. (2018). Pengaruh Model Problem-Based Learning dan Discovery Learning serta Kecerdasan Intelektual terhadap Berpikir Kreatif. *Jurnal Pendidikan Jasmani Dan Olahraga*, *3*(1). https://doi.org/10.17509/jpjo.v3i1.9837.

Luo, Z., Jingying, C., Guangshuai, W., & Mengyi, L. (2020). A three-dimensional model of student interest during learning using multimodal fusion with natural sensing technology. *Interactive Learning Environments*, 1–14. https://doi.org/10.1080/10494820.2019.1710852.

Maison, Astalini, Kurniawan, D. A., & Sholihah, L. R. (2018). Deskripsi Sikap Siswa Sma Negeri Pada Mata Pelajaran Fisika. *Jurnal Eduasains*, *10*(1). https://doi.org/10.15408/es.v10i1.7214.

Mansouri, Z., & Moumine, M. E. A. (2017). Primary and Secondary Education in Morocco: From Access to School into Generalization to Dropout. *International Journal of Evaluation and Research in Education (IJERE)*, *6*(1), 9. https://doi.org/10.11591/ijere.v6i1.6341.

Mason, G. (2020). Higher education, initial vocational education and training and continuing education and training: where should the balance lie? *Journal of Education and Work*, *33*(7–8), 468–490. https://doi.org/10.1080/13639080.2020.1755428.

Muradi, A., Islam, U., Antasari, N., & Kalimantan, S. (2021). Revitalization of Education for Children in Indonesian Families During the Covid-19 Pandemic. *İlköğretim Online*, *20*(3), 481–490. https://doi.org/10.17051/ilkonline.2021.03.48.

Mutakinati, L., Anwari, I., & Yoshisuke, K. (2018). Analysis of students' critical thinking skill of middle school through stem education project-based learning. *Jurnal Pendidikan IPA Indonesia*, *7*(1), 54–65. https://doi.org/10.15294/jpii.v7i1.10495.

Nito, P. J. B., Manto, O. A. D., & Wulandari, D. (2020). Pengaruh Program Mentoring Terhadap Peningkatan Kemampuan Berpikir Kritis Penggunaan Standardized Nursing Language Mahasiswa Keperawatan sebagai Metode Pembelajaran. *Dinamika Kesehatan: Jurnal Kebidanan Dan Keperawatan*, *11*(2), 462–472. https://doi.org/10.33859/dksm.v11i2.

Nurazizah, S., Sinaga, P., & Jauhari, A. (2017). Profil Kemampuan Kognitif dan Keterampilan Berpikir Kritis Siswa SMA pada Materi Usaha dan Energi. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, *3*(2), 197–202. https://doi.org/10.21009/1.03211.

Pelullo, C. P., & Di Giuseppe, G. (2018). Vaccinations among Italian adolescents: Knowledge, attitude and behavior. *Human Vaccines and Immunotherapeutics*, *14*(7), 1566–1572. https://doi.org/10.1080/21645515.2017.1421877.

Perdana, Sarwanto, Sukarmin, S., & Sujadi, I. (2017). Development of E-Module Combining Science Process Skills And Dynamics Motion Material To Increasing Critical Thinking Skills And Improve Student Learning Motivation Senior High School. *International Journal of Science and Applied Science*, *1*(1), 45–54. https://doi.org/10.20961/ijsascs.v1i1.5112.

Pramana, C., Susanti, R., Ernawati, K., Darmawan, I. P. A., Miftah, M. Z., Lestyowati, J., Werdiningsih, R., & Ramadhani, R. (2021). Distance Learning In Primary Schools During The Covid-19 Pandemic In Indonesia: Challenges, Solutions, And Projections. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, *12*(4), 263–270. https://doi.org/10.17762/turcomat.v12i4.502.

Prihatini, E. (2017). Pengaruh Metode Pembelajaran dan Minat Belajar Terhadap Hasil Belajar IPA. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, *7*(2), 171–179. https://doi.org/10.30998/formatif.v7i2.1831.

Purwanti, E., Palupi, R. Z. P., Galuh, A., & Rianingsih, D. (2020). *Pengembangan instrumen penilaian keterampilan abad 21*. Kota Tua.

Puspita., L. (2019). Pengembangan modul berbasis keterampilan proses sains sebagai bahan ajar dalam pembelajaran biologi Module development based on science process skills as teaching materials in biological learning. *Jurnal Inovasi Pendidikan IPA*, *5*(1), 79–87. https://doi.org/10.21831/jipi.v5i1.22530.

Quay, J. (2016). *Not ' democratic education ' but ' democracy and education ': Reconsidering Dewey ' s oft misunderstood introduction to the philosophy of education Not ' democratic education ' but ' democracy and education ': Reconsidering Dewey ' s oft misunderstood int*. *1857*(May). https://doi.org/10.1080/00131857.2016.1174098.

Riswanto, H., & Dasmo, D. (2015). Upaya Meningkatkan Hasil Belajar Ilmu Pengetahuan Alam (IPA) dengan Metode Pembelajaran Mind Map. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, *5*(2), 246–252. https://doi.org/10.30998/formatif.v5i2.330.

Rochman, C., Nasrudin, D., Muslim, & Hermita, N. (2017). Characteristics of the ability of physics concept in enrichment teaching materials of natural and mineral resources (NMRs) literacy. *Jurnal Pendidikan IPA Indonesia*, *6*(2), 252–256. https://doi.org/10.15294/jpii.v6i2.9482.

Rusmono, & Alghazali, M. I. (2019). Pengaruh Media Cerita Bergambar Dan Literasi Membaca Terhadap Hasil Belajar Siswa Sekolah Dasar. *JTP - Jurnal Teknologi Pendidikan*, *21*(3), 269–282. https://doi.org/10.21009/jtp.v21i3.13386.

Santosa, F. H. (2018). Pengaruh Model Pembelajaran dan Kemampuan Berpikir Kritis Terhadap Hasil Belajar Sejarah Siswa di SMA Negeri 1 Pandeglang. *Jurnal Teknologi Pendidikan*, *20*(1). https://doi.org/10.21009/jtp.v20i1.6777.

Sappaile, N. (2017). Pengaruh Kompetensi Pedagogik, Kompetensi Profesional, dan Sikap Profesi Guru Tehadap Kinerja Penilaian Guru di Sekolah Dasar. *Jurnal Teknologi Pendidikan*, *19*(1). https://doi.org/10.21009/jtp.v19i1.5334.

Saputro, B. I., & Amir, C. (2018). Kompetensi Pustakawan Perpustakaan Khusus: Studi Kasus Di Perpustakaan Kementerian Pendidikan Dan Kebudayaan. *Baca: Jurnal Dokumentasi Dan Informasi*, *39*(2), 207. https://doi.org/10.14203/j.baca.v39i2.428.

Sari, N., Suryanti, K., Manurung, S. M., & Sintia, S. (2017). Analisis Penggunaan Media Pembelajaran Untuk Meningkatkan Motivasi Peserta Didik Terhadap Pembelajaran Fisika Kelas XI MIPA 1 SMA Titian Teras Muaro Jambi. *Jurnal Pendidikan Fisika Dan Keilmuan (JPFK)*, *3*(2), 110. https://doi.org/10.25273/jpfk.v3i2.1297.

Şemin, F. K. (2019). Competencies of principals in ensuring sustainable education: Teachers' views. *International Journal of Evaluation and Research in Education*, *8*(2), 201–212. https://doi.org/10.11591/ijere.v8i2.18273.

Setiawan, D. (2017). Pendekatan Saintifik dan Penilaian Auntentik untuk Meningkatkan Mutu Pembelajaran Pendidikan Agama Islam. *AL-ASASIYYA: Journal Of Basic Education*, *1*(2). https://doi.org/10.24269/ajbe.v1i2.683.

Setiawan, Innatesari, D. K., Sabtiawan, W. B., & Sudarmin, S. (2017). The development of local wisdom-based natural science module to improve science literation of students. *Jurnal Pendidikan IPA Indonesia*, *6*(1), 49–54. https://doi.org/10.15294/jpii.v6i1.9595.

Suharsaputra, U. (2012). *Metode Penelitian Kuantitatif, Kualitatif, dan Tindakan*. PT Refika Aditama.

Susilowati, S. (2017). Pengembangan Bahan Ajar IPA Terintegrasi Nilai Islam untuk Meningkatkan Sikap dan Prestasi Belajar IPA Siswa. *Jurnal Inovasi Pendidikan IPA*, *3*(1), 78. https://doi.org/10.21831/jipi.v3i1.13677.

Sutarto, S., Sari, D. P., & Fathurrochman, I. (2020). Teacher Strategies in Online Learning to Increase Students ' Interest in Learning During COVID-19 Pandemic. *Jurnal Konseling Dan Pendidikan*, *8*(147800), 129–137. https://doi.org/10.29210/147800.

Swirski, H., Baram-Tsabari, A., & Yarden, A. (2018). Does interest have an expiration date? An analysis of students' questions as resources for context-based learning. *International Journal of Science Education*, *40*(10), 1136–1153. https://doi.org/10.1080/09500693.2018.1470348.

Van De Heyde, V., & Siebrits, A. (2022). Digital laboratory report writing, assessment and feedback in the 21st century for an extended curriculum programme for physics. *Research in Science and Technological Education*, *40*(1). https://doi.org/10.1080/02635143.2020.1775571.

Van Mieghem, A., Struyf, E., & Verschueren, K. (2022). The relevance of sources of support for teachers' self-efficacy beliefs towards students with special educational needs. *European Journal of Special Needs Education*, *37*(1). https://doi.org/10.1080/08856257.2020.1829866.

Wilson, M. T., Seshadri, S., Streeter, L. V., & Scott, J. B. (2020). Teaching physics concepts without much mathematics: ensuring physics is available to students of all backgrounds. *Australasian Journal of Engineering Education*, *25*(1), 39–54. https://doi.org/10.1080/22054952.2020.1776027.

Yanti, Y., & Yusliani, E. (2020). Meta-Analisis : Pengaruh Integrasi Pendidikan Lingkungan dalam Pembelajaran IPA Terhadap Sikap Peduli Lingkungan Siswa. *Jurnal Penelitian Dan Pembelajaran Fisika*, *6*(1), 9–16. https://doi.org/10.24036/jppf.v6i1.108590.

Yulian, V. N. (2018). Developing Teaching Materials Using Comic Media to Enhance Students' Mathematical Communication. *IOP Conference Series: Materials Science and Engineering*, *335*(1). https://doi.org/10.1088/1757-899X/335/1/012110.

Zainuddin, Suyidno, Dewantara, D., Mahtari, S., Nur, M., Yuanita, L., & Sunarti, T. (2020). The correlation of scientific knowledge-science process skills and scientific creativity in creative responsibility based learning. *International Journal of Instruction*, *13*(3), 307–316. https://doi.org/10.29333/iji.2020.13321a.

Zaki, M. (2017). Implementasi Program Imtaq dalam Pembentukan Sikap Toleransi Peserta Didik. *JTP - Jurnal Teknologi Pendidikan*, *19*(2), 99–113.

Zendler, A., & Greiner, H. (2020). The effect of two instructional methods on learning outcome in chemistry education: The experiment method and computer simulation. *Education for Chemical Engineers*. https://doi.org/10.1016/j.ece.2019.09.001.