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The Effectiveness of SETS Learning Model toward the Misconception Decrease of Tenth Graders on Work and Energy Materials

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ABSTRACT
This study aims to determine the percentage of misconceptions in the work and energy sub-subject and to find out whether the SETS learning model is effective in reducing student misconceptions about work and energy. This research is quantitative research with the type of Pre-Experimental Design using the One Group Pretest-Posttest Design. The sampling technique used in this study was purposive sampling which is a technique for determining samples from members of the population with certain considerations by the desired criteria to be able to determine the number of samples to be studied by taking a sample of class X IPA 2, totaling 30 people. Based on the results of the pretest and posttest, the percentage reduction in misconceptions was 19.14% with an N-Gain of 44% which was included in the medium category. Research data were analyzed by normality test and hypothesis test. The results showed that the normality test using the Shapiro-Wilk test showed that the data were normally distributed with a pretest significance value of 0.842 and a posttest value of 0.520. The results of the research hypothesis using the t-test stated a significance value of 0.000, which means 0.000 <0.005 and H1 was accepted. The conclusion from this study is that the SETS learning model is effective in reducing the misconceptions of class X students on work and energy material.

INTISARI
Penelitian ini bertujuan untuk mengetahui persentase penurunan miskonsepsi pada sub materi usaha dan energi serta mengetahui apakah model pembelajaran SETS efektif untuk menurunkan miskonsepsi peserta didik pada materi usaha dan energi. Penelitian ini merupakan penelitian kuantitatif dengan jenis penelitian eksperimen semu *(Pre-Experimental Design)* menggunakan desain penelitian *One Group Pretest-Posttest Design*. Teknik pengambilan sampel yang digunakan dalam penelitian ini yaitu *purposive sampling* yang merupakan teknik penentuan sampel dari anggota populasi yang dilakukan dengan pertimbangan tertentu sesuai dengan kriteria yang diinginkan untuk dapat menentukan jumlah sampel yang akan diteliti dengan mengambil sampel kelas X IPA 2 yang berjumlah 30 orang. Berdasarkan hasil *pretest* dan *posttest* diperoleh hasil persentase penurunan miskonsepsi sebesar 19,14% dengan N-Gain 44% yang termasuk dalam kategori sedang. Data penelitian dianalisis dengan uji normalitas dan uji hipotesis. Hasil penelitian menunjukkan bahwa pada uji normalitas

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menggunakan uji Shapiro-Wilk menunjukkan data berdistribusi normal dengan signifikansi nilai *pretest* sebesar 0,842 dan nilai *posttest* sebesar 0,520. Hasil hipotesis penelitian dengan menggunakan uji-t menyatakan nilai signifikansi sebesar 0,000 yang berarti 0,000<0,005 dan H_1 diterima. Kesimpulan dari penelitian ini yaitu, model pembelajaran SETS efektif terhadap penurunan miskonsepsi peserta didik kelas X pada materi usaha dan energi.

A. Introduction

Everyone lives nearly with physics because everyone can experience the phenomena directly around their environment. All formal education receives the physics learning process as a method to understand the concepts, principles, and laws; and the relevances of the principles and concepts on the observed physics phenomena to direct the learners' conceptions [1]. When the learners interpret a concept personally, the interpretation could be defined as conception. Suparno [2] explains that conception refers to a capacity to understand a concept by interacting with the environment or formal education. Misconception occurs when the concepts of learners deviate from the scientific and agreed concepts and when the learners believe in their understanding of the constructed concept. A misconception or incorrect concept refers to an irrelevant concept with a scientific understanding of the incorrect conception of the learners [2].

Therefore, many researchers focus on the study of misconception with the scope of negative impacts on learning [3]. Difficulties in the complex misconception problems are sometimes unmanageable due to the learners' fossilized mindsets to change. This situation requires immediate management to prevent the fossilized misconception in later education or the future life of the learners [4]. By considering this situation, a method to manage misconceptions is important to design. Therefore, teachers must apply a complex learning model and provide learners opportunity to construct their languages by having relevant experience [4].

Misconception problems in various science fields especially physics are raised by researchers in which physics could discuss the phenomena in life [5]. The materials of work and energy in physics become a complex topic in the mechanics field [6]. The complexity is observable from the correlation among the concepts [7]. Learning physics is inseparable from facts, concepts, and theories of solving problems in daily life [8]. In this stage, the expectation of the learners with background knowledge of their life comes from the experience and the acquired information from the environment [9]. Tanjung & Hasibuan [10] also state that misconception is mostly observable on the topic of work because the learners cannot differ from the given force direction. The promoted work is the multiplication between force and displacement.

Misconception of learners is inseparable from the causes or the sources of notion incompatibility. Misconception may come from incorrect concepts or incorrectness in

combining the concepts [11]. Teachers, learners, textbooks, contexts, and teaching methods become the causes of misconceptions [2]. It happens because of prejudice, capability interest development period, thinking style, and individual relationships. Incorrectness committed by teachers occurs due to incapability, less subject mastery, inaccurate teaching methods, and poor behavior of the teachers. Misconception also occurs due to the experience and learning method without the available provision for the learners to reveal the arguments [12]. In this case, learners believe that teachers provide accurate teachings so that correcting misconceptions due to ineffective teaching methods provides challenges. Therefore, teachers must be aware of the materials of work and energy [13].

The researchers interviewed the teachers of tenth grade at Public Senior High School 1 Kalasan. The results revealed that the learners had misconceptions about the materials of work and energy. This matter happens because of the initial pre-conception of the learners from the learners' experience before learning the materials of work and energy. Misconception of learners deals with how the learners state that if an object does not receive any work, the object will not work at all. Besides that, when an individual promotes certain works but the object moves oppositely from the given work, this situation makes the individual not do any work. Lack of understanding during the learning process may include misconceptions about conservative-style topics. The interview results with the physics teachers also found that learners' misconceptions that were manageable by providing brief explanations. However, the researchers found no maximum efforts to manage misconception problems. Besides that, the assessment results of the learners, dealing with the conceptual understanding of work and energy, showed many learners had misconceptions. However, the greatest misconception percentage is 70%. In this case, the learners had a misconception of mechanical energy conservation law. The researchers also found that 57% of learners had misconceptions about the concept of work and 43% of learners had misconceptions about some questions about the concepts of work, kinetic energy, potential energy, and mechanical energy. The results showed the misconception of each concept of work and energy.

Silalahi [14], found that 64% of learners thought physics was a complicated and less attractive lesson to learn. They found the implementation of traditional learning models, such as lecturing and fewer teaching variations, made them have misconceptions. Therefore, many methods are applicable to manage misconceptions, such as applying the SETS learning model. The SETS learning model is abbreviated from Science, Environment, Technology, and Society proposed by Achmad Binadja. The paradigm of the SETS learning model focuses on the process instead of the product as suggested by constructivism. This criticism focuses on the cognition construction by finding, labeling, and organizing new materials [16]. SETS learning model aims to make the learners master the concept, improve their creativity, and

make them comprehensively understand problems [17]. Problem-solving skills and critical thinking of learners could be improved with the SETS learning model [18]. The increased critical thinking indirectly influences the conceptual understanding levels of the learners [19].

Previous studies found certain orders to conduct the SETS learning model such as empowering the concept with clarifications of the teachers to prevent misconceptions. The syntax of the SETS learning model includes initiation, conceptual development, conceptual application, conceptual empowerment, and evaluation. The syntax shows the focus of the learning model to empower the concept and prevent misconception. SETS learning model makes learners learn physics for more than science concepts including the science implementation into technology, environment, and society [19]. Some previous studies found that SETS could improve conceptual understanding and daily-life implementation [16], [19].

Misconception requires immediate management to prevent the impact of further misconceptions [20]. Poor and inactive conceptions of learners during the learning process may decrease understanding and lead to misconceptions [21]. Based on the explanations, and research about the "Effectiveness of SETS Learning toward the Decreased Misconception of Tenth Graders on the Materials of Work and Energy."

B. Method

This quantitative research consists of data collection and finding display. This pre-experimental design involved learners, grouped into experimental and control groups, based on the research objectives to manage misconceptions in a class due to the given treatment. This one-group pretest-posttest design only used pretest and posttest after the treatment [22].

O_1	X :	O_2
Pretest	*Treatment*	*Posttest*

Figure 1. Research Design

Remarks :
O_1 = Pretest before the treatment
O_2 = Posttest after the treatment
X = The treatment of the SETS learning model

The research site was at Public Senior High School 1 Kalasan and lasted from February to March in the even semester of the 2022/2023 academic year. The researchers chose the samples with purposive sampling. This sampling technique selects samples from a population based on pre-determined criteria [23] The samples

consisted of the learners from X Science 2 as the experimental group because the learners met the inclusion criteria, having the materials of work and energy for tenth grade. The researchers also used a diagnostic test, the four-tier test with multiple choices and closed answers as the research instrument. The researchers validated the instrument by involving two experts. They were the physics education lecturers and a physics teacher at senior high school. The researchers used the paired sample t-test to examine the hypotheses or examine the effectiveness of the SETS learning model in managing misconceptions. Before examining the hypotheses, the researchers examined the normality with the Shapiro-Wilk test.

C. Results and Discussion

Research Results

This research involved 30 learners from the X Science 2 class of Public Senior High School 1 Kalasan. Then, the researchers conducted pretest and posttest and put them into graphics.

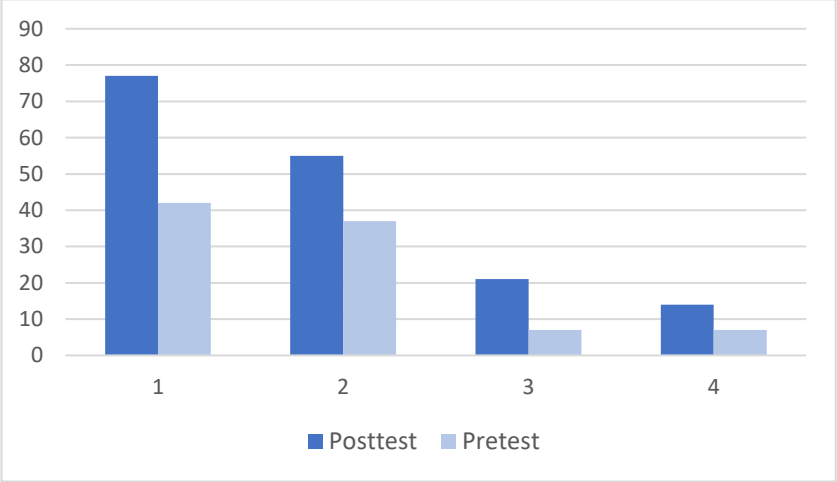


Figure 2. The Misconception Graphics of the Learners for Each Sub-Concept

The graphic shows the misconception occurrence by 30 learners on each sub-concept with 20 question items. The digit 1 states the sub-concept of work; the digit 2 states the sub-concept of potential energy, kinetic, and mechanic; the digit 3 states the mechanic energy conservation law concept; and digit 4 states the conservative and non-conservative forces. The pretest and posttest data found decreased misconception of the learners based on the patterns of the four-tier test answers with the analyses based on the sub-concept. Table 1 shows the results.

Table 1. The Mean Percentages of the Decreased Misconceptions

Sub-Concepts	Definition		
	no %	ni %	Δn (%)
Work	25.66	14.33	11.33
Potential, Kinetic, and Mechanic Energy	26.18	17.62	8.57
The Law of Mechanic Energy Conservation	70	23.33	46.67
The Conservative and Non-Conservative Forces	23.33	13.33	10
Mean Total	36.29	17.15	19.14

Remarks:

ni (%) : The percentage of misconceptions (posttest)

no (%) : The percentage of misconceptions (pretest)

Δn (%) : Misconception decrease

Table 1 shows the percentage mean is 36.29%. The percentage of posttest mean conception is 17.15% with the decreased misconception of 19.14%. The criteria of decreased misconceptions are observable with N-gain of pretest and posttest results.

Table 2. The mean percentage of decreased misconceptions with N-gain

Pretest	Posttest	Decreased Misconceptions	N-Gain	Criteria
36.29%	17.15%	19.14%	44%	Moderate

The data shows the decreased misconception based on the N-gin test with a percentage of 44%. The percentage shows the decreased misconception is at a moderate level. The described research data include the cognitive questions about the concept with the four-tier test. The questions consisted of 22 items. Figure 3 shows the pretest-posttest results.

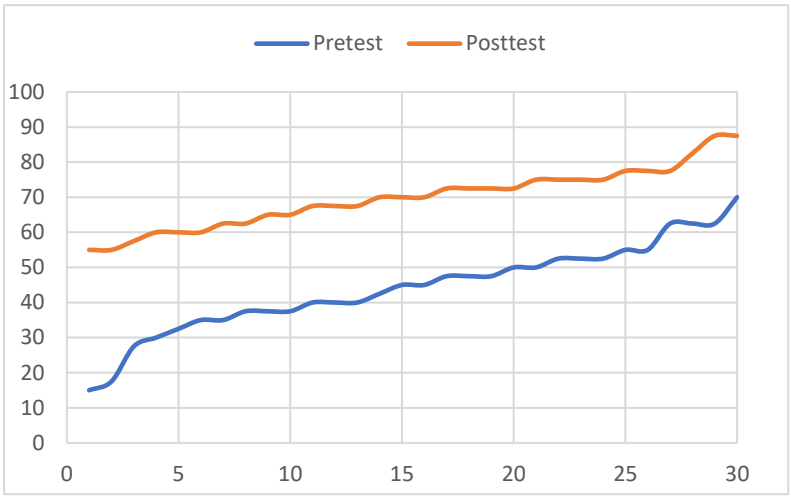


Figure 3. The Pretest and Posttest Score Results

The researchers used the Shapiro-Wilk test with SPSS to determine the distribution normality. The obtained data were useful to determine the normality. Table 3 shows the results.

Table 3. The Normality Test Data

Data	Shapiro-Wilk Test (Significance)
Pretest	0,842
Posttest	0,520

Table 3 shows the pretest with a significant score of 0.842 while posttest with 0.520. If the significant score of the Shapiro-Wilk normality test is higher than 0.05, the data has a normal distribution. The pretest-posttest scores show a significant level higher than 0.05, indicating the normal distribution data.

The hypothesis test is useful to examine the SETS learning model's effectiveness in decreasing the misconception of the learners. Once the test shows normal data distribution, the researchers will examine the hypothesis with a paired sample t-test.

Table 4. The Hypothesis Test

	Paired Differences				
	Mean	Std. Deviation	t	df	Sig. (2-Tailed)
Pretest-Posttest	- 25,67	12,33	-11,398	29	.000

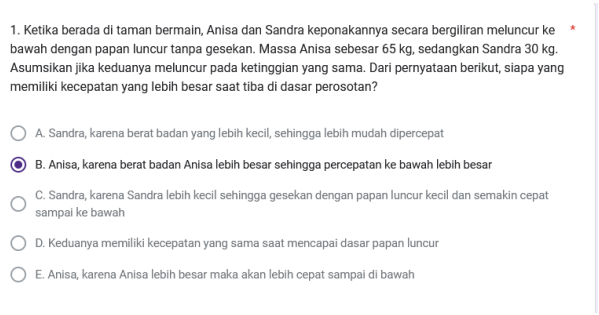
The proposed hypotheses are H_0: the SETS learning model is not effective in decreasing the tenth graders' misconceptions about the materials of work and energy; and H_1: the SETS learning model is effective in decreasing the tenth graders' misconceptions about the materials of work and energy. The researchers make the decisions of the hypotheses if the significance is higher than 0.05, accepting H_0 or else denying H_1. However, if the significance is lower than 0.05, accept H_1 and deny H_0. Table 4 shows the paired sample t-test. The significance is 0.000 lower than 0.005. Thus the result accepts H_1, indicating the effectiveness of the SETS learning model in decreasing tenth graders' misconceptions of the materials of work and energy.

Discussion

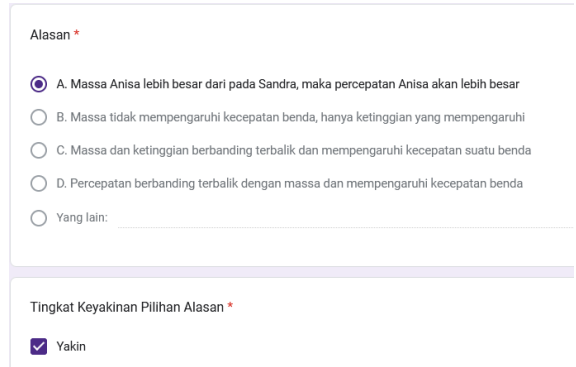
The pretest mean score of the diagnostic test with a four-tier test level is 44.15, indicating low conceptual cognition of the learners. Fitri, Sahala, & Oktavianty [24] also found some factors of low learning outcomes including misconception. The posttest mean increases to 69.83 after receiving the SETS learning model. In this research, the researchers found misconceptions occurred on all sub-materials of work and energy with different percentages.

The identification of misconceptions in this research is - some sub-concepts have misconceptions with varied criteria, from low to high criteria. The assessment results of the learners related to the cognitive questions about the material of works and energy also indicate misconception. However, the greatest misconception percentage is 70%. In this case, the learners had a misconception of mechanical energy conservation law. The researchers also found that 57% of learners had misconceptions about the concept of work and 43% of learners had misconceptions about some questions about the concepts of work, kinetic energy, potential energy, and mechanical energy. The following sections provide the analysis results of each question with high misconceptions based on the sub-concepts.

The misconception level on each sub-material of work and energy on the sub-concepts with high misconceptions such as the mechanic energy conservation law, based on the pretest, is 70%. After providing the treatment with the SETS learning model, the misconception decreased, proven by the posttest score of 23.33%. The score is categorized to be low. In this question, 90% of learners argued that high mass led to high acceleration. Suparno [2] explains that some misconceptions are - the mixed concepts between work and force. This case deals with mechanical energy conservation. The law says that energy cannot be created or eliminated but energy can be converted to other forms of energy by maintaining the same speed.



(a) the learners' answers



(b) the learners' arguments

Figure 4. Examples of the Questions

The sub-concept about work, question number 4, has incorrect answers of 56.67% on the pretest, categorized as moderate. The question discusses an inclined plane if it is associated with the elevation angle. Some learners thought small elevation angles led to high work. However, the applied equation of inclined planes is $m.g.s.\sin\theta$, indicating a high value of sin θ of an elevation angle, the experienced work is high. After receiving the SETS learning model, the increased misconception percentage is 26.67%.

The other high misconception is observable in the sub-concept of work with a percentage of 43.3%, on question number 3. Firstly, the work of an orbiting satellite around the Earth. Many learners thought that no gravitational force in outer space because the established resultant by the gravitation is 0 as a correct concept. The concept of work on the satellite is simple. If the motion is perpendicular to the force, then no work is established. After receiving the SETS learning, the misconception decreased to 20%.

Suparno [2] explains that learners may have various misconceptions about work as found in question number 14. The percentage of this misconception reaches a percentage of 43.3% about the work by force on rough surfaces. The learners thought

that the size of the work to move an object was influenced by the track. The size of the work by gravitation is equal for both tracks. It happens because the work by the gravitational force is dependent on the height position change instead of the track change to cover. After managing the misconceptions, the decreased misconception on the post-test is 26.6%. The percentage mean of the misconception on the sub-concept of work, before the treatment, was 26.18%. After providing the treatment, the decreased misconception percentage is 14.33%.

The other misconception before the treatment was about the sub-concept of potential, kinetic, and mechanical energy with a pretest score of 26.18%. After receiving SETS, the misconception decreased to 17.62%. The improvement total in the understanding of potential, kinetic, and mechanic energy is 8.57%. One of the complex questions for the learners is - the analysis of potential and kinetic energy on a shot bullet. Anggrayni & Ermawati [25] explain that learners may encounter difficulties although the question has the same concept to answer. The learners experienced misconception in analyzing the moment of the potential energy has no value or when the kinetic energy has no value. Maison, Lestari, & Widaningtyas [6] also explain a misconception that a moving object toward the ground has higher potential energy than kinetic energy. This misconception is a moderate misconception about potential, kinetic, and mechanical energy.

The misconception level of the sub-concept of conservative and non-conservative forces obtained a pretest percentage of 23.33%, categorized as low. However, after the treatment, the misconception decreased as shown in the post-test result with a percentage of 13.33%. The decreased misconception is by 10%. The most common misconception about the number-15 question is about an inclined plane. The proportion of the misconception is 26.6%. Learners could not accurately determine the converted energy by the non-conservative force. The learners also thought that frictional force was a conservative force. After receiving the treatment, the misconception decreased to 13.3%. Then, for question number 17 about the sizes of works and frictional fore and weight, the result shows a misconception percentage of 20% on the pretest and decreases to 13.3% on the posttest.

The total mean of the misconception percentage of the pretest is 36.295, categorized as moderate. Then, after providing the SETS learning model, the misconception decreased to 17.15% in the post-test, categorized as low. The decreased misconception on all sub-concepts of works and energy obtains a percentage of 19.14%. The decreased misconception is inseparable from the given treatment, the SETS learning model. The steps of the learning model significantly influenced the initiation and conceptual formation. In this initial stage, the researchers could determine the notions and arguments of the learners about society and environmental issues. Besides that, the concept enforcement is also important to manage misconception because in this step the concept is strengthened with important concepts to figure out.

D. Conclusion

Based on the results and discussions, the decreased misconception percentage of the tenth graders about the materials of work and energy is 19.14%, proven with a significant decrease from moderate to low category. SETS learning model (Science, Environment, Technology, and Society) is effective to use in the materials of work and energy to decrease misconceptions, as proven by the t-test result. The obtained significance is 0.000 lower than 0.005, accepting H_1 and denying H_0. SETS model is effective in decreasing the tenth graders' misconceptions about the materials of work and energy.

Reference

[1] P. Rawh, A. Samsudin, and M. G. Nugraha, "Pengembangan Four-Tier Diagnostic Test untuk Mengidentifikasi Profil Konsepsi Siswa pada Materi Alat-alat Optik," *WaPFi (Wahana Pendidikan Fisika)*, vol. 5, no. 1, pp. 84–89, 2020, doi: 10.17509/wapfi.v5i1.22888.

[2] P. Suparno, *Miskonsepsi & Perubahan Konsep dalam Pendidikan Fisika* . Jakarta: Gramedia Widiasarana Indonesia, 2013.

[3] R. Entino, E. Hariyono, and N. A. Lestari, "Analisis Miskonsepsi Peserta Didik Sekolah Menengah Atas pada materi Fisika," *PENDIPA Journal of Science Education*, vol. 6, no. 1, pp. 177–182, 2021, doi: 10.33369/pendipa.6.1.177-182.

[4] Y. Yuliati, "Miskonsepsi Siswa Pada Pembelajaran IPA Serta Remediasinya," *Jurnal Bio Education*, vol. 2, no. 2, pp. 50–58, 2017, doi: 10.31949/be.v2i2.1197.

[5] F. N. Hidayati, H. Akhsan, and Syuhendri, "Identifikasi Miskonsepsi Siswa Kelas X pada Materi Elastisitas dan Hukum Hooke di SMA Negeri 1 Indralaya," *Jurnal Inovasi dan Pembelajaran Fisika*, vol. 3, no. 2, 2016, doi: 10.36706/jipf.v3i2.3838.

[6] M. Maison, N. Lestari, and A. Widaningtyas, "Identifikasi Miskonsepsi Siswa Pada Materi Usaha Dan Energi," *Jurnal Penelitian Pendidikan IPA*, vol. 6, no. 1, pp. 32–39, 2020, doi: 10.29303/jppipa.v6i1.314.

[7] K. Khaerunnisak, "Peningkatan Pemahaman Konsep dan Motivasi Belajar Siswa Melalui Simulasi Physic Education Technology (PhET)," *Jurnal Penelitian Pendidikan IPA*, vol. 4, no. 2, pp. 7–12, 2018, doi: 10.29303/jppipa.v4i2.109.

[8] L. D. Herliandry, A. Harjono, and J. 'Ardhuha, "Kemampuan Berpikir Kritis Fisika Peserta Didik Kelas X dengan Model Brain Based Learning," *Jurnal Penelitian Pendidikan IPA*, vol. 5, no. 1, pp. 39–47, 2018, doi: 10.29303/jppipa.v5i1.166.

[9] N. Wahyuni, Y. B. Bhakti, T. Z. Mutakin, and I. A. D. Astuti, "The Development of Four-Tier Diagnostic Test Instrument to Identify the Learners' Misconception on Circular Motions," *Impulse: Journal of Research and Innovation in Physics Education*, vol. 1, no. 1, pp. 24–31, 2021, doi: 10.14421/impulse.2021.11-03.

[10] R. Tanjung and M. Z. A. Hasibuan, "Analisis Miskonsepsi Siswa SMA Negeri Kota Medan pada Mata Pelajaran Fisika (Mekanika) dengan Menggunakan Metode Certainty of Response Index (CRI)," *Jurnal Ikatan Alumni Fisika Universitas Negeri Medan*, vol. 2, no. 2, pp. 63–70, 2016.

[11] E. Purwanto and Winarti, "Representasi Miskonsepsi Peserta Didik pada Materi Suhu dan Kalor," *Papua Journal of Physics Education (PJPE)*, vol. 1, no. 1, pp. 28–35, 2020, doi: 10.31957/pjpe.v1i1.1279.
[12] W. Winarti, E. Pardiyanto, and F. Kurnianto, "Senior High School Students' Understanding of Newton's Laws in Outer Space: Identification of Misconceptions," *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*, vol. 10, no. 2, pp. 265–276, 2021, doi: 10.24042/jipfalbiruni.v10i2.8997.
[13] R. E. Scherr, M. Plisch, K. E. Gray, G. Potvin, and T. Hodapp, "Fixed and Growth Mindsets in Physics Graduate Admissions," *Phys Rev Phys Educ Res*, vol. 13, no. 2, pp. 1–12, 2017, doi: 10.1103/PhysRevPhysEducRes.13.020133.
[14] H. Pramono and Nana, "Upaya Peningkatan Kemampuan Kognitif dan Komunikasi Ilmiah Siswa Kelas X MIA 1 SMA Negeri 1 Ciamis Menggunakan Model Pembelajaran Inquiry," *Diffraction*, vol. 1, no. 1, pp. 1–10, 2019, doi 10.37058/diffraction.v1i1.812.
[15] S. Asminah, "Motivasi dan Hasil Belajar Biologi pada Peserta Didik Kelas X IPA 1 SMA Negeri 3 Pontianak dengan Menerapkan Model Pembelajaran SETS," *Jurnal Pembelajaran dan Pendidikan Karakter*, vol. 1, no. 1, pp. 34–39, 2021.
[16] R. E. Yager and H. Akcay, "Comparison of Student Learning Outcomes in Middle School Science Classes with an STS Approach and a Typical Textbook Dominated Approach," *RMLE Online*, vol. 31, no. 7, pp. 1–16, 2008, doi: 10.1080/19404476.2008.11462050.
[17] E. Yuniastuti, "Pengaruh Model Pembelajaran SETS (Science, Environment, Technology and Society) Terhadap Hasil Belajar Biologi Siswa Kelas VII SMP Kartika V-1 Balikpapan Tahun Pelajaran 2015/2016," *Jurnal Sains Terapan*, vol. 1, no. 2, pp. 72–77, 2015, doi: 10.32487/jst.v1i2.94.
[18] U. Usmeldi, R. Amini, and S. Trisna, "The Development of Research-Based Learning Model with Science, Environment, Technology, and Society Approaches to Improve Critical Thinking of Students," *Jurnal Pendidikan IPA Indonesia*, vol. 6, no. 2, p. 318, Oct. 2017, doi: https://doi.org/10.15294/jpii.v6i2.10680.
[19] M. J. Fitri, S. Trisna, and I. R. Yanti, "The Development of a Physics Module Based on the SETS Learning Model to Improve Students' Conceptual Understanding," *Jurnal Ilmu Pendidikan Fisika*, vol. 6, no. 3, pp. 254–262, 2021, doi: 10.26737/jipf.v6i3.2131.
[20] A. Ahmad, S. Suyono, and L. Yuanita, "Reduksi Miskonsepsi Asam Basa Melalui Inkuiri Terbuka dan Strategi Conceptual Change," *Jurnal Penelitian Pendidikan Sains*, vol. 3, no. 1, pp. 286–293, 2017, doi: 10.26740/jpps.v3n1.p286-293.
[21] E. van den Berg, *Miskonsepsi Fisika dan Remediasi*, no. July. Salatiga: Universitas Kristen Satya Wacana, 1991.
[22] J. R. Fraenkel and N. E. Wallen, *How to Design and Evaluate Research in Education, Seventh Edition*. Boston: McGraw-Hill Higher Education, 2012.
[23] Sugiyono, *Metode Penelitian Kuantitatif, Kualitatif, dan RnD*. Bandung: Alfabeta, 2011.
[24] Suryani. Fitri, Stepanus. Sahala. S, and Erwina. Oktavianty, "Remediasi Miskonsepsi Menggunakan Model Pembelajaran REACT Tentang Usaha Dan Energi Di SMA," *Jurnal Pendidikan dan Pembelajaran Khatulistiwa*, vol. 8, no. 9, pp. 1–9, 2019, doi: 10.26418/jppk.v8i9.35649.

[25] S. Anggrayni and F. U. Ermawati, “The validity of Four-Tier’s Misconception Diagnostic Test for Work and Energy Concepts,” in *Journal of Physics: Conference Series*, 2019, pp. 1–13. doi: 10.1088/1742-6596/1171/1/012037.