Journal of Natural Science and Integration
P-ISSN: 2620-4967|E-ISSN: 2620-5092
Vol. 5, No. 2, October 2022, pp 199-207

Available online at:
http://ejournal.uin-suska.ac.id/index.php/JNSI
DOI: 10.24014/jnsi.v5i2.14894

Development of Learning Tools with the Means Ends Analysis Learning Model Based on Problem Solving in Newton's Law

Mila Rahmiza Putri[1], Muhammad Nasir[1]*, Zuhdi Ma'ruf[1], Ervi Yenni[2]

[1]Department of Physics Education, Universitas Riau, Indonesia
[2] Department of Chemistry Education, Universitas Riau, Indonesia

**Correspondence Author: muhammad.nasir@lecturer.unri.ac.id*

Received: 22 Juny 2022 Accepted: 10 September 2022 Published: 30 October 2022

ABSTRACT
This study aims to produce a learning tool with the Means Ends Analysis (MEA) learning model based on problem solving in Newton's Law material for class X high school students. This research was conducted to improve problem solving abilities among students who were still low, especially on Newton material and the lack of learning tools used. The learning tools developed in this study consist of Learning Implementation Plans (RPP), Student work sheets (LKPD), and Assesment Instrument Tests. This type of research is Research and Development (R&D) with a 4D development model (Define, Design, Develop, and Disseminate). The research instruments used were lesson plans validation sheets, LKPD, and Cognitive Learning Outcomes Tests used by validators to assess learning tools. Data analysis in this study used descriptive analysis, by calculating the validity score of each learning device indicator. Based on the results of the validity analysis, the average value of lesson plan validity is 0.78. The average validity of LKPD is 0.75. The average validity of the Learning Outcomes Test Instrument is 0.802. The average validity of the overall device is 0.77, the learning tool for the MEA model based on problem solving in Newton's Law material is declared valid and suitable for use as a learning tool in Newton's Law material.

Keywords: *learning tools, MEA, problem solving, newton's law*

INTRODUCTION

Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and the skills needed by themselves, society, nation and state. Education is one of the factors that influence the quality of a country (Zulkifli et al., 2022). The success of a learning process is seen from several factors including the use of learning tools. Appropriate learning devices are needed to facilitate the learning process and achieve the desired learning objectives.

Problem solving skills are one of the skills required in 21st century education (Hasan et al., 2021; Hidayah et al., 2022; Julius et al., 2021; and Hidayat et al., 2017). Problems Solving needs to be taught to students in order to train students' analytical skills in making decisions, these students will be able to make decisions because they already have the skills to gather relevant information, analyze information, and realize how necessary it is to re-examine the results that have been obtained (Hertiavi et al., 2010). Based on the results of Susiana's research (Susiana et al., 2017) the problem-solving ability of high school physics class X students is very

low, the learning process applied by the teacher is still teacher-centered which is the cause of the low ability of students to solve problems (Pasigon, 2022). The solution to overcome this is to use a learning model that can support in improving students' problem solving abilities.

Based on research conducted by Rismatul Azizah (Azizah & Yuliati, 2015) 71% of students think that physics is difficult and has many formulas, while 25% of students say that physics has many concepts (Inriani et al., 2021; Puspita et al., 2020) states that there are many complaints about physics subjects, therefore a sense of passion and love for physics must be grown in order to avoid boredom in students.

Newton's Law is one of the physics subject matter that is difficult for students to understand so that it has an impact on solving problems related to Newton's Law material (Asrizal et al., 2022; Setyani et al., 2017; Nurcahyo et al., 2017; Wardani et al., 2021). In Newton's Law material, some students tend to memorize the sounds of Newton's Laws, without understanding the physical meaning of Newton's Laws (Mariani & Susanti, 2019). Research conducted related to problem solving skills in Newton's Law material found that students experienced difficulties when trying to understand the concept of force in Newton's Law and constructing free body diagrams (Zahroh et al., 2018). Innovation and alternatives are needed to improve problem-solving abilities, one of which is the development of learning tools carried out by the teacher so that students have a positive response to the learning delivered (Rahman, 2017). The development of learning tools must use the right learning model, which does not make students only remember and memorize formulas (Simanungkalit, 2016).

The Means Ends Analysis (MEA) learning model is a learning model that can train and improve the problem-solving skills of Rahmawati's students in (Mariani & Susanti, 2019). Based on previous theory and research, it was found that the MEA learning model showed effectiveness in increasing problem solving abilities (Mariani & Susanti, 2019). The MEA learning model is a variation learning model between problem-solving methods and syntax that presents the material in a heuristic-based problem-solving approach, namely in the form of a series of questions which are instructions to help students solve the problems they face (Huda, 2013). Therefore the use of the MEA model is considered suitable to overcome problems in students' lack of ability to solve problems (Riana, 2017).

Based on the description above, research on the development of learning tools was carried out with the title Development of Learning Tools with the Means Ends Analysis Learning Model Based on Problem Solving in Newton's Law, the research objectives were to determine the validity of learning devices using the MEA learning model based on problem solving in Newton's Law material for class X SMA. While This research is expected to provide benefits including. For students, as an effort to increase interest in learning and students' critical thinking patterns which will later affect students' problem solving abilities, for teachers, it can be used later as a guide and alternative in designing learning tools for students, for researchers, as a provision that later can be applied in learning science at school and then for other researchers, the results of this study can be used as a reference in conducting similar research.

METHODOLOGY

The type of research used is the research and development method of R&D (Research and Development). This development research was carried out to produce learning tools consisting of RPP (Learning Implementation Plans), LKPD (Student Worksheets), and tests of cognitive learning outcomes. The development model used is the 4D development model (Define, Design, Develop, Disseminate). According to Thiagarajan(Thiagarajan, 1974), the 4D development model consists of 4 main stages.

In this study, it was only carried out until the Development stage, namely validation by experts. At the Define stage, initial analysis, student analysis, task analysis, concept analysis, and formulation of learning objectives were carried out. At the Design stage, the activities of preparing tests, selecting media, choosing formats and initial design of learning devices are carried out. At the Development stage, the validator repairs and validates the learning device.

The definition stage is carried out by analyzing development needs, product development requirements that are suitable for users and research and development (R&D) models that are suitable for developing products. The analysis phase can be carried out through a literature study or preliminary research, namely Beginning-end analysis, Analysis of students, Task analysis, Concept analysis and Formulation of learning objectives.

Design stage researcher designed the initial model of the developed learning tools, namely lesson plans, worksheets, and tests of cognitive learning outcomes using the "MEA" model based on problem solving in Newton's Law material. There are 4 steps in this stage, namely Preparation of test standards, Media selection, Format selection and Initial design of learning devices

The research data is in the form of quantitative data obtained from the results of the assessment by the validator for learning devices. The research instrument used was validation sheets for lesson plans, worksheets, and tests of cognitive learning outcomes. The data collection technique used in this study is that the learning tools that have been developed are given to the validator to be validated. The device is repaired according to the suggestions from the validator until the developed device is valid.

The data analysis technique used in this study is descriptive data analysis. The validation results are calculated using the aiken V formula for each indicator used to determine the validity level of the device being developed. The validation questionnaire assessment score uses a scale (1-5). After determining the score of the validation instrument, the next step is to calculate the score using the aiken V formula. The conclusion criteria for this study were carried out by means that each component of the assessment was declared valid if V_count > V_table, where the number of raters (n) in this study was 21 by 5 category. So that the V table in this study is 0.69 with a 1% chance of error.

RESULT AND DISCUSSION

In this study, only three stages of development were carried out in the 4D development model, namely the Define, Design, and Development stages. At the Define stage, initial analysis, student analysis, task analysis, concept analysis, and formulation of learning objectives were carried out. Then at the Design stage, the design of learning tools consisting of lesson plans, worksheets, and tests of cognitive learning outcomes is carried outsupport by (Hidayat et al., 2017). The RPP was made for 5 meetings and LKPD for 5 meetings, as well as a 10-item cognitive learning outcomes test consisting of multiple choices with Bloom's taxonomy level from C2-C6. Then at the Development stage repair and validation of the learning device is carried out by the validator.

From the results of collecting assessments by the validator, data obtained from the validation results of learning tools based on the MEA learning model. The validation results can be seen in Table 1.

Table 1. Learning Tools Validation Result

No	Learning Tools	Mean Value Validity	Category
1.	RPP For meeting 1	0,78	Valid
2.	RPP For meeting 2	0,78	Valid

No	Learning Tools	Mean Value Validity	Category
3.	RPP For meeting 3	0,78	Valid
4.	LKPD For meeting 1	0,75	Valid
5.	LKPD For meeting 2	0,75	Valid
6.	LKPD For meeting 3	0,75	Valid
7.	Instrument test	0,802	Valid
	Mean	**0,77**	**Valid**

Based on Table 1, the average validator assessment for all learning tools consisting of lesson plans, worksheets, and tests of cognitive learning outcomes is 0.77. Based on the data analysis results obtained from the validator on learning tools based on the MEA learning model, the average value for all devices is 0.77 where the average result of validating all devices is > 0.69 so that learning devices that have been validated as a whole are declared valid and can be used as a learning tool in the classroom. Based on these data, the details for each learning device are as follows.

Learning Implementation Plans (RPP)

The lesson plan made in this study refers to Permendikbud no 22 of 2016, where the lesson plan consists of seven main components that are developed, namely subject identity, learning objectives and indicators, selection of teaching materials, learning models/methods, selection of learning media, learning steps , and ratings. The RPP that has been developed in this study is the MEA model RPP which consists of 3 RPPs. The lesson plan for the first meeting contains Newton's Laws, the lesson plan for the second meeting contains material about Force in Newton's Laws, and the lesson plan for the third meeting contains material on Applications of Newton's Laws.

The RPP made is adjusted to the stages of the MEA learning model, namely identification of differences in the Current State and Goal State, Organization of Sub Goals and selection of solutions. There are 9 assessment indicators in the RPP. From these indicators developed into RPP assessment points. The results of the RPP validation can be seen in Table 2.

Table 2. Learning Implementation Plans (RPP) Validation Results

No	Aspect	RPP For meeting 1		RPP For meeting 2		RPP For meeting 3	
		Mean Score	Category	Mean Score	Category	Mean Score	Category
1.	RPP Format	0,75	V	0,75	V	0,75	V
2.	RPP Identity	0,83	V	0,83	V	0,83	V
3.	Competence Achievement Indicators	0,79	V	0,79	V	0,79	V
4.	Learning Objective	0,75	V	0,75	V	0,75	V
5.	Material Of Learning	0,75	V	0,75	V	0,75	V
6.	Learning Stage	0,77	V	0,77	V	0,77	V
7.	Source Of Learning	0,83	V	0,83	V	0,83	V
8.	Assesment	0,75	V	0,75	V	0,75	V
9.	Language and Writing	0,75	V	0,75	V	0,75	V
	Mean Score	**0,78**	**V**	**0,78**	**V**	**0,78**	**V**

Note : V = valid

Based on Table 2, it can be seen that the validation of the RPP that was developed, namely the RPP for meeting 1, RPP for meeting 2 and RPP for meeting 3 showed an average validation of 0.78. That way the RPP has been said to be valid and appropriate to be used as a guide in the learning process of Newton's Law material. In addition, the RPP is said to be valid because the aspects, format, language, and content are appropriate and meet good criteria

(Budiarso, 2017) as support by (Nurcahyo et al., 2017; Supeno et al., 2018; Pasigon, 2022; and Hasan et al., 2021).

Student Worksheets (LKPD)

Student Worksheets (LKPD) are teaching materials used by teachers to help students in the learning process to achieve Basic Competence. The student worksheet products developed in this study are student worksheets that refer to the MEA learning model. In this student worksheet there are stages of the MEA learning model, namely identification of differences between the Current State and Goal State, Sub Goal organization and selection of solutions.

In the identification of the differences between the Current State and the Goal State contains steps to distinguish the problems obtained with the goals to be achieved. In the sub-goal organizational section, students are guided to group the problems that have been obtained. In the solution section students are guided to determine solutions to solve problems that have been grouped so that the Goal State is achieved.

On student worksheets there are questions that students will work on in order to find out whether or not the learning objectives have been achieved. Student worksheets that have been made consist of 3 student worksheets. Meeting 1 student worksheet contains about Newton's Laws, student worksheets 2 contain about Forces, and meeting student worksheets 3 about Applications of Newton's Laws. Assessment indicators on student worksheets consist of 3 indicators that are developed into assessment items. The results of the validation of student worksheets can be seen in Table 3.

Table 3. Student Worksheets Validation Results (LKPD)

No	Aspect	LKPD meeting 1		LKPD meeting 2		LKPD meeting 3	
		Mean	Category	Mean	Category	Mean	Category
1.	LKPD Format	0.75	V	0.75	V	0.75	V
2.	LKPD Content	0.75	V	0.75	V	0.75	V
3.	Language	0.78	V	0.78	V	0.78	V
Mean		**0.75**	V	**0.75**	**V**	**0.75**	**V**

Note : V = valid

Based on Table 3 it can be seen that the validation of the student worksheets (LKPD) that was developed, namely LKPD meeting 1, LKPD meeting 2 and LKPD meeting 3 shows an average validity score of 0.75 so that it can be said to be valid and can be used as student worksheets in the learning process on Newton's law material as support by (Rahman, 2017; Bahtiar et al., 2022; Setyani et al., 2017).

The Assessment Instrument Test

The assessment instrument aims to determine students' mastery of a material or subject matter. Based on Permendikbud Number 23 of 2016 concerning Educational Assessment Standards, the purpose of evaluating learning outcomes by educators aims to monitor and evaluate the process of learning progress and improving student learning outcomes on an ongoing basis.

In this study, the cognitive learning outcomes test questions in the form of multiple choices(Batlolona et al., 2021) totaled 10 questions with choices A, B, C, D, and E. The questions were made using Bloom Anderson's taxonomy with 5 levels of cognitive aspects, namely C2 (understand), C3 (apply) , C4 (analyze), C5 (evaluate), and C6 (create). Level C2 consists of 2 questions, level C3 consists of 5 questions, level C4 consists of 1 item, level C5 consists of 1 item, and level C6 consists of 1 item. Tests of cognitive learning outcomes are made in reference to GPA (Competency Achievement Indicator) and learning objectives. In line with The purpose of making cognitive learning outcomes test questions is to find out the increase in physics

learning outcomes in Newton's Law material (Wicaksono et al., 2017). The validation indicators for the learning outcomes test consist of 16 assessment indicators (Hidayat et al., 2017). The validation results of cognitive learning outcomes tests can be seen in Table 4.

Table 4. Assesment Instrument Test Validation Result

No.	Item	V	Category
1.	Question Items according to indicators	0.9167	V
2.	Question Items according to Material Learning	0.8333	V
3.	The question contains only one correct answer	0.8333	V
4.	Questions are formulated clearly	0.75	V
5.	The questions are adjusted to the cognitive domain being measured	0.8333	V
6.	Homogeneous answer choices	0.8333	V
7.	Questions do not show answers/answers to other questions	0.8333	V
8.	The distractor work well	0.75	V
9.	The location of the correct answer is determined randomly	0.8333	V
10.	Discourses, pictures or graphs work well	0.75	V
11.	Between the items do not depend on the other	0.75	V
12.	Formulation of communicative sentences	0.75	V
13.	Sentences use good and correct language	0.75	V
14.	The formulation of the sentence does not contain multiple interpretations	0.75	V
15.	Use common language (not local language)	0.8333	V
16.	The formulation of the question Does not contain offensive statements	0.8333	V
	mean	**0.802**	**V**

Note : V = valid

Based on Table 4, it can be seen that the average validation result of the developed cognitive learning outcomes test is 0.802 where this value can be said to be valid. So that the cognitive learning outcomes test developed is feasible to be used as a cognitive learning outcomes test for students in Newton's Law material in school learning. This is in accordance with research conducted by (Budiarso, 2017; Batlolona et al., 2021).

The implications of research on developing learning tools using the Means Ends Analysis Based Problem Solving Model on Newton's Law material is that it can be an option for teachers in carrying out physics learning which aims to improve mastery of physics concepts, students' problem solving skills and other higher order thinking skills. So that the learning process that is carried out when applying this learning tool does not require a long time, the physics teacher must use the right strategy and calculate the time carefully so that learning becomes effective, efficient and more optimal.

Further research that can be done is to conduct learning using the learning tools that have been developed so that their effectiveness can be measured to improve student learning outcomes, problem-solving skills, especially higher-order thinking skills.

CONCLUSION

Based on the results of the study it was concluded that a learning tool based on the MEA learning model had been produced which fulfilled the validity element as a lesson plan on Newton's Law material.. Based on the validator's assessment and data analysis that has been carried out, the RPP learning tool gets an average validity value of 0.78 and is declared valid. meanwhile, student worksheets (LKPD) get an average validity value of 0.75 and are declared valid. Then for the cognitive learning outcomes test, it gets an average validity value of 0.802 and is declared valid. As for the overall device consisting of lesson plans, worksheets, and cognitive learning outcomes tests, it is declared valid with an average validity of 0.77 so that it is suitable for use as a learning tool used to help students understand Newton's Law material for class X SMA/MA.

REFERENCES

Asrizal, A., Ayu, D. F., Mardian, V., & Festiyed, F. (2022). Electronic Learning Material of Newton's Laws with Kvisoft Flipbook Maker to Improve Learning Outcomes of Students. *Jurnal Penelitian Pendidikan IPA*, *8*(2), 489–498. https://doi.org/10.29303/jppipa.v8i2.1222

Azizah, R., Yuliati, L., & Latifah, E. (2015). *Kesulitan Pemecahan Masalah Fisika pada Siswa SMA. Jurnal Penelitian Fisika dan Aplikasinya (JPFA),* 5(2), 44-50.

Bahtiar, B., Ibrahim, I., & Maimun, M. (2022). Profile of Student Problem Solving Skills Using Discovery Learning Model with Cognitive Conflict Approach. *Jurnal Penelitian Pendidikan IPA*, *8*(3), 1340–1349. https://doi.org/10.29303/jppipa.v8i3.1657

Batlolona, J. R., Nenohai, A. J. W. T., Wenno, I. H., Wartono, & Yurdabakan, I. (2021). Merry go Round Technique and Students' Physics Cognitive Learning Outcomes on Work and Energy Topic. *Jurnal Pendidikan IPA Indonesia*, *10*(2), 178–186. https://doi.org/10.15294/jpii.v10i2.22964

Budiarso, A. S. (2017). Analisis Validitas Perangkat Pembelajaran Fisika Model Inkuiri Terbimbing untuk Meningkatkan Hasil Belajar Siswa SMA pada Materi Listrik Dinamis. *Jurnal Edukasi*, *4*(2), 15. https://doi.org/10.19184/jukasi.v4i2.5204

Hasan, M., Mursalin, & Odja, A. H. (2021). Analysis of Student Problem Solving Skills On Physics Concepts in SMP/MTs Through Blended Learning Early Teaching During The Covid-19 Pandemic. *Journal of Physics: Conference Series*, *1876*(1). https://doi.org/10.1088/1742-6596/1876/1/012081

Hertiavi, M. D., Langlang, H., & Khanafiyah, S. (2010). Penerapan Model Pembelajaran Kooperatif tTipe Jigsaw untuk Peningkatan Kemampuan Pemecahan Masalah Siswa SMP. *Jurnal pendidikan Fisika Indonesia, 6*(1). https://doi.org/10.15294/jpfi.v6i1.1104

Hidayah, T. L., Supeno, S., & Nuha, U. (2022). Pengaruh Model Inkuiri Terbimbing Menggunakan Laboratorium Virtual Terhadap Keterampilan Argumentasi Ilmiah Siswa SMP. *EDUSAINTEK: Jurnal Pendidikan, Sains Dan Teknologi*, *9*(1), 239–250. https://doi.org/10.47668/edusaintek.v9i1.425

Hidayat, S. R., Setyadin, A. H., Hermawan, H., Kaniawati, I., Suhendi, E., Siahaan, P., & Samsudin, A. (2017). Pengembangan Instrumen Tes Keterampilan Pemecahan Masalah pada Materi Getaran, Gelombang, dan Bunyi. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, *3*(2), 157–166. https://doi.org/10.21009/1.03206

Huda, M. (2013). *Model-Model Pengajaran dan Pembelajaran* (Cet. 5). Pustaka Pelajar.

Inriani, I., Azhar, A., & Nasir, M. (2021). Development of Learning Devices Using Creative Problem Solving (CPS) Models on Static Electricity Material. *Jurnal Penelitian Pendidikan IPA*, *7*(SpecialIssue), 213–217. https://doi.org/10.29303/jppipa.v7ispecialissue.1119

Julius, R., Abd Halim, M. S., Abdul Hadi, N., Alias, A. N., Mohd Khalid, M. H., Mahfodz, Z., & Ramli, F. F. (2021). Bibliometric Analysis of Research in Mathematics Education using Scopus Database. *Eurasia Journal of Mathematics, Science and Technology Education*, *17*(12), em2040. https://doi.org/10.29333/ejmste/11329

Mariani, Y., & Susanti, E. (2019). Kemampuan Pemecahan Masalah Siswa Menggunakan Model Pembelajaran MEA (Means Ends Analysis). *Lentera Sriwijaya : Jurnal Ilmiah Pendidikan Matematika*, *1*(1), 13–26. https://doi.org/10.36706/jls.v1i1.9566

Nurcahyo, A. W., Wartono, W., & Yuliati, L. (2017). Kemampuan Pemecahan Masalah Hukum Gerak Newton Mahasiswa melalui Pembelajaran Cooperative Problem Solving. *Jurnal Pendidikan: Teori, Penelitian, dan Pengembangan, 2*(7), 963-970. https://doi.org/10.17977/jptpp.v2i7.9686

Pasigon, C. P. (2022). Attributes Of Students Towards Problem Solving In Physics: A Step Towards Students' Capacity Building. *Journal of Positive School Psychology*, *6*(10), 531–544.

Puspita, A. D., Islami, N., Nasir, M., & Fakhruddin. (2020). Development of Interactive Learning Media Based on HOTS Material Temperature and Heat. *Journal of Physics: Conference Series*, *1655*(1), 1–6. https://doi.org/10.1088/1742-6596/1655/1/012011

Rahman, A. A. (2017). Pengembangan Perangkat Pembelajaran Berbasis Pendekatan Realistik Untuk Meningkatkan Kemampuan Pemecahan Masalah Matematis Siswa SMP N 3 LANGSA. *MAJU : Jurnal Ilmiah Pendidikan Matematika*, *4*(1).

Riana, A. A. (2017). Application of Means Ends Analysis (MEA) Learning Model in Attempt to Improve Student's High Order Thinking. *International Journal Pedagogy of Social Studies*, *2*(1), 145. https://doi.org/10.17509/ijposs.v2i1.8688

Setyani, N. D., Cari, C., Suparmi, S., & Handhika, J. (2017). Student's Concept Ability of Newton's Law Based on Verbal and Visual Test. *International Journal of Science and Applied Science: Conference Series*, *1*(2), 162. https://doi.org/10.20961/ijsascs.v1i2.5144

Simanungkalit, R. H. (2016). Pengembangan Perangkat Pembelajaran untuk Meningkatkan Kemampuan Pemecahan Masalah Matematis Siswa SMP Negeri 12 Pematangsiantar. *MUST: Journal of Mathematics Education, Science and Technology*, *1*(1), 39. https://doi.org/10.30651/must.v1i1.96

Supeno, S., Subiki, S., & Rohma, L. W. (2018). Students' Ability In Solving Physics Problems on Newtons' Law of Motion. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*, *7*(1), 59–70. https://doi.org/10.24042/jipfalbiruni.v7i1.2247

Susiana, N., Yuliati, L., & Latifah, E. (2017). Analisis Pembelajaran Berdasarkan Profil Kemampuan Pemecahan Masalah Fisika Siswa Kelas X SMA. *Biologi, Pembelajaran, Dan Lingkungan Hidup Perspektif Interdisipliner*, *3*(1), 210–214.

Thiagarajan, S. (1974). Instructional development for training teachers of exceptional children: A sourcebook.

Wardani, K. E. K., Djudin, T., & Mursyid, S. (2021). Pengaruh Model Cooperative Problem Solving Terhadap Kemampuan Pemecahan Masalah Siswa pada Materi Tekanan. *Jurnal Inovasi Penelitian dan Pembelajaran Fisika*, *2*(1), 36. https://doi.org/10.26418/jippf.v2i1.42453

Wicaksono, I., Jatmiko, B., & Prastowo, T. (2017). Pengembangan Perangkat Pembelajaran Fisika Model Learning Cycle 5e untuk Meningkatkan Pemahaman Konsep Siswa pada Materi Fluida Statis. *JPPS (Jurnal Penelitian Pendidikan Sains)*, *4*(2), 518. https://doi.org/10.26740/jpps.v4n2.p518-524

Zahroh, S. H., Parno, P., & Mufti, N. (2018). Keterampilan Pemecahan Masalah dengan Model Search, Solve, Create, and Share (SSCS) Problem Solving Disertai Conceptual Problem Solving (CPS) pada Materi Hukum Newton. *Jurnal Pendidikan: Teori, Penelitian, dan Pengembangan,* 3(7), 968-973.

Zulkifli, Z., Azhar, A., & Syaflita, D. (2022). Application Effect of PhET Virtual Laboratory and Real Laboratory on the Learning Outcomes of Class XI Students on Elasticity and Hooke's Law. *Jurnal Penelitian Pendidikan IPA*, *8*(1), 401–407. https://doi.org/10.29303/jppipa.v8i1.1274