JURNAL PEMBELAJARAN FISIKA
http://jurnal.fkip.unila.ac.id/index.php/JPF
VOL. 14 (1), JUNE 2026, 53-63 || P-ISSN 2302-0105, E-ISSN 2684-9828
RESEARCH ARTICLE

# An Analysis of Students' Needs Regarding Learning Models and Contextual Teaching and Learning (CTL) in Relation to the Physics Learning Outcomes of Year 10 Students at Sukamenang State Senior Secondary School

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## Article History

Received:
28 November 2025

Accepted:
1 July 2026

Published:
6 July 2026

## Keywords

Contextual Teaching and Learning, Student Learning Outcomes

## Abstract

Physics learning in secondary schools is still often teacher-centered, so students tend to be passive and have difficulty understanding concepts. This condition has an impact on low learning outcomes that have not reached the Minimum Completion Criteria (KKM). This study aims to analyze students' needs for the CTL model in improving high school students' physics learning outcomes. This study is a qualitative descriptive study that describes in depth the application of the CTL model in physics learning. Data collection techniques were carried out through interviews, observations, and documentation of physics teachers and several students to obtain information about the learning process, student activity, and changes in conceptual understanding during the application of CTL. Based on the interview results, teachers stated that the use of the CTL model was able to increase student engagement during learning, especially during discussions and practical activities. Students also found it easier to understand concepts because the material was related to real experiences and interesting activities. In addition, the results of observations showed an increase in student motivation, group cooperation, and critical thinking skills. Thus, the application of the CTL model is expected to create active, contextual, and meaningful learning and make a real contribution to improving physics learning outcomes at the high school level.

**DOI:** http://dx.doi.org/10.23960/jpf.v14i1.17

## INTRODUCTION

Education is the main foundation in shaping the quality of human resources capable of facing global challenges and technological developments (Hanifah et al., 2023). In education, physics learning at the high school level is very important because the learning process does not only focus on the transfer of facts and formulas, but also on the learning outcomes (Marlinda Mega Dwi Prastuti et al., 2018). Physics learning at the secondary level often faces challenges in the form of low problem-solving skills, motivation, and learning outcomes of students when the material is abstract and not connected to the context of everyday life (Ainur et al., 2024; Sari et al., 2024). The reality in many schools is that physics learning is still conducted conventionally, with lectures as the dominant method and few activities that actively involve students. As a result, students become passive and many are unable to understand concepts in depth (Nasrah et al., 2024).

One of the science-based disciplines (IPA) is Physics. Physics can be seen as one of the most basic and fundamental disciplines, with the main objective of understanding how the universe works (Puspitasari et al., 2024) . From Newton's laws to Einstein's theory of relativity, physics has become the foundation for various other disciplines, including chemistry, biology, engineering, and computer science. The development of physics not only provides a deep understanding of the basic properties of matter and energy, but also encourages the birth of technology (Rakhmawati & Putri, 2024). Teachers carry out the learning process based on learning tools so that the learning process runs more effectively. These learning tools consist of lesson plans, worksheets, teaching materials, and authentic assessments (Nababan et al., 2021). The criteria for good learning tools are validity, practicality, and effectiveness in their use (Nasrah & Jasruddin, 2015) . The development of technology and future science is important to understand in making changes for the development of the world. The current young generation is expected to have the knowledge and skills to face changes in the future (Putri Kholifatun et al., 2024).

Based on observations conducted on physics learning at Sukamenang State High School in the 2024/2025 academic year, it was found that the learning activities used so far tend to be teacher-centered and limited to assignments, making students passive. This has resulted in low physics learning outcomes for some students. However, teachers prefer to apply this model because it does not require materials for practice, as it is sufficient to explain the concepts in the book. However, teachers prefer to apply this model because it does not require materials for practice, as it is sufficient to explain the concepts in the book.

Interviews with physics teachers and students show that even though the school has set a Minimum Passing Grade (KKM) target, many students have not reached this target because the learning feels abstract and is not directly related to their experiences.

The fact that students' physics learning outcomes are less than optimal is evident from the results of the daily tests of 10th grade students in physics, which are still below the minimum competency criteria of 70. When broken down, 20 students (57.14%) have achieved the target and 16 students (42.86%) have not, out of a total of 36 students. The causes are 1) Lack of student participation (activity) in teaching and learning activities. 2) The physics teaching and learning process is still focused on the teacher and not enough on the students. 3) The learning model used is dominated by certain students. 4) Meanwhile, students who are less active tend to be passive in the learning process; they only receive the knowledge that comes to them, resulting in low learning outcomes. One alternative to overcome this problem is for teachers to be able to present physics lesson material optimally. Therefore, creativity and new ideas are needed to develop ways of presenting subject matter in schools(Hanifah et al., 2023) . This problem is often encountered in the teaching and learning process in the classroom. Therefore, it is necessary to apply a learning model that can help students understand the subject matter and its application and relevance in everyday life (Cahyadi et al., 2025).

This situation highlights the urgency of developing innovative learning methods that can connect physics theory with real-life contexts in students' environments. One learning model with significant potential is Contextual Teaching and Learning (CTL). The CTL model is based on the idea that learning will be more meaningful when students can see the connection between the subject matter and their own life situations (Sihombing et al., 2023) . Empirical research even shows that the application of CTL in physics learning can significantly increase student activity, conceptual understanding, and learning outcomes (Jubhari et al., 2022) . The effectiveness of CTL greatly depends on the suitability of the learning model to the needs and characteristics of students and the context of the school where it is implemented (Fitriani et al., 2024; Mudaim et al., 2023) . The CTL model places students as active subjects who observe, discuss, experiment, and reflect, while teachers act as facilitators and guides.

Other studies support that the implementation of CTL not only impacts cognitive aspects but also higher-order thinking skills such as critical and creative thinking. For example, studies using CTL-based e-modules found increased student engagement and better understanding of physics concepts (Hanifah et al., 2023) . In addition, meta-analyses show that the effect of the CTL model on the science process and critical thinking skills is significant (Nasrah et al., 2024) . Various studies have proven that physics learning will be more effective if the material is linked to everyday contexts. Contextual approaches such as Contextual Teaching and Learning (CTL) have been proven to improve students' conceptual understanding, motivation, and learning outcomes. Research conducted by (Jubhari et al., 2022) shows that the application of CTL increases student engagement in the learning process through observation, discussion, and context-based problem-solving activities. Furthermore, another study (Sihombing et al., 2023) found that CTL makes learning more meaningful so that students are able to relate abstract physics concepts to real phenomena.

Although many studies support the effectiveness of CTL in improving the quality of physics learning, each school has different needs, student characteristics, and contexts. There has been no study that specifically analyzes student needs for the application of CTL in physics learning at Sukamenang State High School in the 2024/2025 academic year. By applying the CTL learning method, it is hoped that student learning outcomes can be analyzed. The learning method is intended to shift learning from teacher-centered to student-centered (Gumay & Bertiana, 2018).

Additionally, research (Hanifah et al., 2023) indicates that the use of CTL-based e-modules can enhance critical thinking skills and understanding of physics concepts. A meta-analysis conducted by(Nasrah et al., 2024) also reports that the effect of the CTL model on the science process and critical thinking skills is in the high category. Consistently, these various studies reinforce that CTL not only has an impact on the cognitive domain but also supports the development of 21st-century skills such as collaboration, communication, and creativity.

The rationale for this study stems from the need to optimize high school students' physics learning outcomes through the application of a more contextual and interactive learning model. The main issues that arise are: how can physics learning be made more meaningful for students? How can teachers effectively implement the CTL model so that students do not just memorize, but understand and apply concepts in real contexts? The CTL model was chosen as a solution because it has been empirically proven and has a strong theoretical basis for improving the quality of physics learning(Rosalina et al., 2024).

Contextual Teaching and Learning (CTL) is a learning model that emphasizes the connection between subject matter and real-life situations faced by students. Through this approach, students are encouraged to learn material by relating it to their daily experiences so that learning becomes more meaningful and relevant. This method is designed so that students do not just memorize information, but also understand, apply, and develop the skills they learn. Conventional learning, which relies solely on verbal explanations and textbooks, is often insufficient to bridge this gap in understanding (Juwita & Arini, 2025).

Based on the above description, the main problem in this study is the low physics learning outcomes caused by teacher-centered learning that does not accommodate students' needs for contextual learning. In addition, there has been no study that specifically analyzes students' needs for the CTL model in physics learning at Sukamenang State Senior High School. Therefore, the uniqueness of this study lies in its focus on identifying student needs as the basis for developing more targeted CTL learning strategies. This study is expected to contribute theoretically to the study of context-based physics learning and practically to teachers in designing more active, meaningful, and student learning outcome-oriented learning.

## METHOD

This study uses a qualitative descriptive method because it aims to describe in depth the students' needs for the Contextual Teaching and Learning (CTL) model in physics learning. The qualitative approach was chosen because it is able to explore learning experiences, perceptions, and problems felt by students and teachers in the context of real learning.

Time The research was conducted at Sukamenang State High School, located on Jalan Lintas Lama, Sukamenang Village, Karang Jaya District, North Musi Rawas Regency, in the odd semester of the 2025/2026 academic year. The selection of the research location was based on preliminary observations that showed low physics learning outcomes and minimal application of innovative learning models. The research subjects included one physics teacher and six tenth-grade students.

Data collection techniques were conducted through face-to-face interviews, where the interview results were recorded to facilitate analysis. This research was carried out in three main stages, namely the preparation, implementation, and evaluation stages. The interview data described the students' views on their understanding of the material and the teacher's assessment of the learning model and teaching methods (Cahyadi et al., 2025).

The data analysis technique in this study used qualitative descriptive analysis. The data obtained through interviews were analyzed to determine students' needs regarding the application of the Contextual Teaching and Learning (CTL) model in physics learning. The analysis procedure was carried out in three main stages, namely: 1. Data reduction, 2. Data presentation, and 3. Drawing conclusions (Rijali, 2018).

### Data Reduction

The data from the interviews with teachers and students were transcribed in full, then sorted and selected according to the focus of the study. Irrelevant information was eliminated, while data related to student needs and the application of physics learning using CTL were grouped into specific categories.

### Data Presentation

The reduced data was organized in the form of narrative descriptions, thematic tables, and groupings based on the indicators studied, such as student needs in understanding physics material, activity in learning, and the relevance of the material to real-life contexts.

### Drawing Conclusions

Conclusions were drawn based on patterns, data correlations, and field findings regarding student needs for the CTL learning model. The results of this analysis are used as a basis for formulating recommendations for the application of CTL to improve the quality of physics learning. The validity of the data is strengthened through source triangulation and technique triangulation, namely by comparing the data from teacher and student interviews. The data analysis process refers to the steps outlined by Miles and Huberman, which include data reduction, data presentation, and conclusion drawing/verification.

## RESULT AND DISCUSSION

### Results of Student and Teacher Interviews on the CTL Learning Model

Table 1. Student Interview Results

| No | Question | Interview Results (Summary) |
|---|---|---|
| 1 | What are your thoughts on physics learning? | Some students said that physics learning is fun; some said it is quite fun because the teacher is cool; others felt that the learning is good and easy to understand. |
| 2 | What do you know about learning models? | Some students know nothing at all, while others are familiar with models such as practice, discussion, and exercises. |
| 3 | What do you know about the CTL model? | Some students have heard of it and have used it; some are completely unfamiliar with it. |
| 4 | Have you ever learned using CTL? | Most students have, especially for certain subjects; a small number have not. |

| | | |
|---|---|---|
| 5 | What is your biggest challenge when learning physics? | Difficulty memorizing formulas, understanding calculations, and heat-related material; there are also students who do not find it difficult. |
| 6 | What media do teachers use? | Textbooks, printed books, cell phones, laptops, and whiteboards. |
| 7 | How important is the learning model? | All students stated that it is important and very important because it facilitates understanding of the material. |
| 8 | How do teachers teach? | Fun, quite fun, easy to understand; however, sometimes boring if too theoretical. |
| 9 | Do you like discussions? | The majority like it and feel that discussions are helpful; one student does not like it. |
| 10 | Have you ever had difficulty achieving a score above the minimum passing grade? | Some have never; some have had difficulty. |

Table 2. Results of Teacher Interviews

| No | Question | Interview Results (Summary) |
|---|---|---|
| 1 | Curriculum used | K13 and Merdeka Curriculum |
| 2 | Has CTL ever been used? | Yes, it has been used |
| 3 | Preparation of lesson plans | Always prepared |
| 4 | KKM provisions | Follow the Physics Teacher Working Group (MGMP) |
| 5 | Student learning outcomes | Most are good, some require remedial |
| 6 | Is CTL used in physics learning? | Yes |
| 7 | Learning evaluation | There is at the end of each lesson. |
| 8 | Characteristics of CTL | Simple, innovative, contextual |
| 9 | Use of laboratories | Actively used |
| 10 | Other laboratory functions | There are additional functions |
| 11 | Learning resources used | Books, internet, media |
| 12 | Use of worksheets | Not used |
| 13 | Use of study groups | Yes |
| 14 | How to develop materials | Practice, models, adapting to student characteristics |
| 15 | The impact of CTL on student learning outcomes | Improving student learning outcomes |

Based on interviews with students and teachers regarding the CTL learning model, it was found that most students considered physics lessons to be enjoyable and easy to understand, although some still experienced difficulties, especially in memorizing formulas and understanding calculations. Students' knowledge of learning models varied, with some unfamiliar with the terms "learning model" and "CTL," while others had used them in the learning process.

Students also said that they preferred teachers to explain lessons by relating the concepts to everyday life because if the lessons were related to everyday life, it would be easier for students to understand and comprehend the lessons, making it easier to understand the theory. Teachers also said that in the teaching and learning process, they often use lectures, demonstrations, and CTL or contextual learning. Teachers explained that linking theory to everyday life is intended to avoid misinterpreting the concepts that have been taught. The obstacle is not too difficult; in fact, students prefer to relate it to everyday life because it is more enjoyable, but if there are more lectures, students usually prefer to play or make noise. Students also consider the learning model to be very important because it helps them understand the material and makes learning more interesting, especially when accompanied by class discussions (Pransiska et al., 2019) . On the other hand, the teacher stated that physics learning has used the K13 and Merdeka curricula, and CTL has been and is still used as a learning approach. Teachers routinely prepare lesson plans, use various learning resources such as books and the internet, and conduct evaluations at the end of each lesson. According to teachers, CTL has simple, innovative, and contextual characteristics that can improve student learning outcomes. Overall, the interviews showed that both students and teachers had positive views on the use of CTL, although there were still certain obstacles that needed to be addressed in its implementation.

Based on the initial observation results in physics learning in grade X at Sukamenang State High School, it is known that the learning process is still dominated by the lecture method so that students play a passive role and only receive information from teachers without active involvement in exploring physics concepts. Teachers tend to choose this method because it is considered practical and does not require a lot of media or practical activities. This teacher-centered learning condition has a direct impact on the low motivation and understanding of students towards abstract physics material. Several field studies in high schools show a similar phenomenon where teacher-centered (lecture) learning is associated with low student activity, interest, and mastery of concepts in physics (Sudiatmika, 2023).

Referring to the research question regarding the analysis of student and teacher needs for the Contextual Teaching and Learning (CTL) model in physics learning, the interview results showed that most students responded positively to physics learning when a contextual approach was used. Most students stated that physics learning was fun and easy to understand when teachers related the material to everyday life. However, some students also expressed obstacles such as difficulty in memorizing formulas and understanding calculations, which were the main barriers in their learning process.

The findings indicate that the need for CTL implementation arises from specific learning difficulties experienced by students rather than from a general preference for innovative learning models. Interview data revealed that students particularly struggled with memorizing physics formulas, understanding numerical calculations, and learning heat-related concepts. These findings suggest that students encounter difficulties not only in achieving learning outcomes but also in constructing conceptual understanding, especially when physics content is presented in an abstract form.

Another important finding is that students preferred learning activities involving discussion and real-life examples. This indicates a mismatch between students' learning needs and the dominant instructional practices observed in the classroom. Although teachers occasionally implemented contextual activities, learning was still largely lecture-based, limiting opportunities for students to actively construct knowledge through exploration and inquiry. As a result, students tended to rely on memorization rather than conceptual understanding. In addition, the interviews also showed that most students had learned using the CTL model, and they felt that learning became more interesting because it involved practical activities, discussions, and examples relevant to real-life experiences. Almost all students considered the learning model to be very important because it helped improve their understanding of the material. Students also stated that the teachers' teaching methods tended to be enjoyable, although sometimes the learning became less interesting when there was too much theory. The majority of students liked the discussion activities because they provided an opportunity to exchange opinions.

Teachers also observed an increase in student participation and activity in learning activities. Students asked more questions and were more confident in expressing their opinions when CTL was implemented. This condition supports the opinion that CTL creates more meaningful learning, thereby encouraging students to be actively involved. Although some students still have difficulty understanding physics formulas and calculations, teachers can overcome these obstacles by providing more contextual explanations and utilizing various learning media such as textbooks, laptops, cell phones, and learning resources from the internet.

From the teachers' perspective, the interview results confirmed that the CTL model has been used in physics teaching and is considered capable of improving learning outcomes and student activity. Teachers stated that students became more active in asking questions, engaging in discussions, and more easily understood abstract concepts when learning was linked to contextual examples. Teachers also emphasized that CTL characteristics such as being innovative, simple, and contextual were very helpful for students in building more meaningful understanding. Thus, the overall research results show that students and teachers have similar views regarding the effectiveness of the CTL model in supporting the physics learning process.

These findings reinforce the view that CTL can analyze learning quality needs, especially in subjects with abstract characteristics such as physics. By connecting the material to real phenomena, students have the opportunity to understand concepts more deeply and be able to relate them to their daily experiences. The findings of this study indicate that analyzing the learning needs of the Contextual Teaching and Learning (CTL) model in physics learning increases student engagement and activity and makes the material more meaningful (Hidayat et al., 2020) . Therefore, CTL-based physics learning not only helps students understand the material but also analyzes students' needs for this model. It is relevant to be applied continuously because it can create more interactive, engaging, and meaningful learning for students.

Thus, this study contributes scientifically by mapping the real needs of high school students and teachers regarding CTL-based physics learning. The empirical findings that CTL increases students' motivation, activity, and understanding of abstract physics concepts reinforce the evidence that CTL is effective in physics education at the secondary level, in line with previous studies. Therefore, we recommend that schools and teachers consistently implement CTL with appropriate media or modules, and that future researchers conduct studies with larger samples and different materials to broaden the generalization of the results (Arabiyah & Fatimah, 2023).

## CONCLUSION

Based on the needs analysis derived from interviews with students and teachers, it was found that students experience difficulties in learning physics, particularly in memorizing formulas, understanding calculations, and comprehending heat-related concepts. These difficulties are closely related to the dominance of teacher-centered instructional practices that provide limited opportunities for students to connect physics concepts with real-life situations. The findings indicate that students require learning approaches that emphasize contextual experiences, active participation, and meaningful engagement with physics concepts. Therefore, the Contextual Teaching and Learning (CTL) model is considered relevant because its characteristics align with the specific learning needs identified in this study. Further research is also recommended to explore combinations of CTL with other approaches or interactive learning media, as well as conducting long-term evaluations to determine the sustainability of the impact on student motivation and understanding.

## ACKNOWLEDGEMENTS

The author would like to express his deepest gratitude to the principal, physics teachers, and all students of Sukamenang State High School, North Musi Rawas Regency, for their permission, support and active participation in this study. Gratitude is also extended to supervising lecturer for their valuable guidance and constructive feedback throughout the research and manuscript preparation. The author extends special appreciation to partner research from University of New South Wales, Sydney, Australia as co-author, for sharing valuable scholarly insights during the writing process, overseeing the execution of the research, and contributing significantly through writing-Review and editing. Last but not least, sincere thanks go to the student peers who assisted in field data collection and learning implementation. All forms of support and collaboration have been vital to the completion of this research.

## REFERENCES

Arabiyah, & Fatimah. (2023). Efektivtias Penerapan Pembelajaran Fisika Berbasis Kontekstual Terhadap Hasil Belajar Siswa Pada Materi Usaha dan Energi Kelas XI. Jurnal Pembelajaran Dan Pengajaran Fisika, 6. https://doi.org/https://doi.org/10.33627/ge.v6i1.1084 e-ISSN:

Cahyadi, Y., Sunarsih, E., & Safrihady. (2025). Pemgaruh model pembelajaran Contextual Teaching and Learning terhadap kemampuan pemahaman konsep IPA siswa kelas V SD N 88 Singkawang. Jurnal Ilmiah Pendidikan Dasar, 10(2), 306–317. https://doi.org/10.22202/economica.2017.v6.i1.1941

Dewi, L. (2021). Analisis Pendekatan Pembelajaran Contextual Teaching and Learning ( CTL ) terhadap Peningkatan Hasil Belajar Fisika dengan Metoda Library Research. 5(2), 237–243. https://doi.org/https://doi.org/10.33369/pendipa.5.2.237-243 ABSTRACT

Fitriani, L., Yuliani, H., Syar, N. I., & Fisika, P. P. (2024). Penerapan Model Pembelajaran Contextual Teaching and Learning ( CTL ) pada Materi Momentum dan Impuls : Dampak Aktivitas Belajar Siswa. 4(2), 65–74.

Gumay, O. P. U., & Bertiana, V. (2018). Pengaruh metode demonstrasi terhadap hasil belajar fisika kelas X MA ALmuahjirin tugumulyo. SPEJ (Science and Physics Education Journal), 1(2). https://doi.org/https://doi.org/10.31539/spej.v1i2.272

Hanifah, A., Sudibyo, E., & Budiyanto, M. (2023). Contextual-Based Physics Learning Through Experimental Method to Increase Learning Outcomes in Thermodynamics Material. Studies in Learning and Teaching (SiLeT), 4(2), 250–259. https://doi.org/https://doi.org/10.46627/silet.v4i2.206 study

Hidayat, R., Ahzan, S., Prasetya, D. S. B., & Hidayat, S. (2020). Penerapan pendekatan Contextual Teaching and Learning (CTL) berbasis masalah untuk meningkatkan aktivitas dan hasil belajar. Jurnal Ilmiah IKIP Mataram, 7(1), 39–43. https://ojspanel.undikma.ac.id/index.php/jiim/article/view/3288%0A

Jubhari, Y., Sasabone, L., & Nurliah, N. (2022). The Effectiveness of Contextual Teaching and Learning Approach in Enhancing Indonesian EFL Secondary Learners' Narrative Writing Skill. REiLA : Journal of Research and Innovation in Language, 4(1), 54–66. https://doi.org/10.31849/reila.v4i1.8633

Juwita, E., & Arini, W. (2025). Analisis Respon Siswa terhadap Model Pembelajaran Contextual Teaching and Learning ( CTL ) pada Hasil Belajar Siswa Kelas VIII SMP Negeri Sukamana. 07(02), 9154–9161. http://jonedu.org/index.php/joe

Mudaim, S., Danawan, A., & Kunci, K. (2023). Pembelajaran Fisika Berbasis CTL Melalui E-LKPD Liveworksheet untuk Meningkatkan Minat dan Hasil Belajar Fisika Materi Pemanasan Global Pendahuluan. 5(2), 71–80.

Nababan, R., Rohadi, N., & Purwanto, A. (2021). HARMONIS BERBASIS MODEL MENTAL DAN BERPOLA. Amplitudo: Jurnal Ilmu Dan Pembelajaran Fisika, 1, 53–64. https://doi.org/10.33369/ajipf.1.1.53-64

Nasrah, Jasruddin, & Tawil, M. (2015). Jurnal Pendidikan Fisika Universitas Muhammadiyah Makassar Pengembangan Perangkat Pembelajaran Fisika Berbasis Pendekatan Contexstual Teaching And Learning ( CTL ) Untuk Memotivasi Dan Meningkatkan Hasil Belajar Fisika Peserta Didik Kelas VIII SMP Negeri. Jurnal Pendidikan Fisika, 5, 235–248. https://doi.org/https://doi.org/10.26618/jpf.v5i2.709

Nasrah, Malago, J., & Saman, A. (2024). Designing a Learning Model with a Contextual Teaching Learning Approach Based on the Flipped Classroom to Improve Science Understanding. Asian Journal of Education and Social Studies, 50(3), 60–70. https://doi.org/10.9734/ajess/2024/v50i31280

Nisa, P. K., Makida, Z., Liana, N., Ernasar, Mahardika, K., Handono, S., & 1, 2, 3, 4, 5, 6Pendidikan. (2024). The role of physics Learning in the transformation of. 7(1). https://doi.org/10.31605/phy.v7i1.3410

Pransiska, Gumay, O. P. U., & Amin, A. (2019). Universitas Papua The Effectiveness of Contextual based Textbooks on the Amount and Measurement Material of Class X Students of Tugumulyo Senior Efektivitas Buku Ajar Berbasis Kontekstual pada Materi Besaran dan. Kasuari: Physics Education Journal (KPEJ) Universitas Papua, 2(2), 82–88. http://jurnal.unipa.ac.id/index.php/kpej%0AThe

Puspitasari, A., Mufida, F., & Setiaji, B. (2024). Analysis of the Influence of Analytical Mechanics Concept on the Development of Modern Physics Analisis Pengaruh Konsep Mekanika Analitik Terhadap Perkembangan Fisika Modern. 60–68.

Rakhmawati, A., & Putri, R. S. (2024). J k i p. Jurnal Keguruan Dan Ilmu Pendidikan, 2(4), 106–110. https://jurnalcendekia.id/index.php/jkip/%0AVolume:

Rosalina, Widyaswarani, E., Saputra, F. A., Nurcholis, R. A., & Lutfiana, A. F. (2024). Pembelajaran untuk meningkatkan keaktifan siswa dalam pembelajaran untuk meningkatkan keaktifan siswa. Paradigma: Jurnal Filsafat, Sains, Teknologi, Dan Sosial Budaya, 30(5), 58–65.

Sihombing, K. S., Napitupulu, R. P., & Sijabat, D. (2023). Pengaruh Model Pembelajaran Contextual Teaching And Learning ( CTL ) terhadap Hasil Belajar Siswa pada Subtema 1 Kelas V SDN 095552 jln . Asahan kab . Simalungun. INNOVATIVE: Journal Of Social Science Research, 3, 7678–7690. https://j-innovative.org/index.php/Innovative/article/view/1252

Sudiatmika, K. (2023). Penerapan model pembelajaran problem based learning dalam meningkatkan motivasi dan hasil belajar fisika materi gerak melingkar pada siswa kelas X.B SMA Negeri 1 selemadeg. 24(1), 138–147. https://doi.org/10.5281/zenodo.7813562