

Received : 12 July 2022
Revised : 4 November 2022
Accepted : 5 November 2022
Online : 5 December 2022
Published: 30 December 2022

DOI: doi.org/10.21009/1.08204

Research Profile of Discovery Learning in Physics Learning During the COVID-19 Pandemic

Binar Kurnia Prahani^{1,a)}, Budi Jatmiko¹, Tan Amelia²,
Shalsa Billa Ardhana Neswary¹, Kirana Aureola Arzak¹,
Nova Allysa Qotrunnada¹

¹*Universitas Negeri Surabaya, Jl. Ketintang, Ketintang, Kec. Gayungan, Surabaya City, East Java 60231, Indonesia*

²*Universitas Dinamika, Indonesia, Jl. Raya Kedung Baruk No.98, Kedung Baruk, Kota Surabaya, Jawa Timur 60298, Indonesia*

✉: ^{a)}binarprahani@unesa.ac.id

Abstract

This research aims to analyze the application of discovery learning to physics learning during the COVID-19 pandemic. This research method is a study of literature and journals, as many as ten journals that can be accounted for related to the application of discovery learning research models to physics learning during the COVID-19 pandemic in Indonesia. The study was analyzed using qualitative descriptive analysis with paper review technique. It was concluded that: 1) The application of the discovery learning model to physics learning during the COVID-19 pandemic can improve student understanding, students' critical thinking ability, and mastery of student concepts. 2) The use of online learning tools and discovery learning-based e-modules can improve students' mastery of concepts in physics learning during the COVID-19 pandemic. 3) The advantages of the discovery learning model in physics learning during the COVID-19 pandemic are that it can improve cognitive abilities and form students' disciplined and positive attitudes. 4) The flexibility of the discovery learning model in physics learning during the COVID-19 pandemic is that students have difficulty understanding the material, and teachers find it difficult to present the material, so the application of the discovery learning model in physics learning during the COVID-19 pandemic in Indonesia is not all effective.

Keywords: COVID-19 pandemic, discovery learning, physics learning

INTRODUCTION

The COVID-19 pandemic is now becoming global (Ibrahim et al. 2020). The COVID-19 pandemic caused many unexpected global challenges for different countries (Ametepe & Khan 2021). One of them is Indonesia (Fajri et al. 2021). Information about COVID-19 from various news stories grabbed the attention of the world community (Hakim & Mulyapradana 2020). The COVID-19 pandemic has not only had a devastating impact on the global economy (Mok et al. 2021) but it also includes education (Fitria 2021). The government issued several policies (Monica & Fitriawati 2021). During the COVID-19 pandemic, there is a social distancing policy aimed at minimizing the spread of COVID-19. COVID-19 spreads quickly and is easily transmitted (Setiaji & Dinata 2020). The COVID-19 outbreak brought many urgent changes in various sectors (Khasanah et al. 2020). One of them is the education sector. The COVID-19 pandemic has transformed traditional ways of teaching and learning into transformative online teaching and learning (Armoed 2021). In March 2020 to early 2022, all

educational activities were carried out in distance learning to prevent the spread of COVID-19. Even now, some schools and universities are still implementing distance learning (Pertiwi et al. 2021). The existence of a social distancing policy that then became the basis for implementing learning from home, and the use of information technology that applies suddenly, thus shocking educators and learners. (Maulidina & Bhakti 2020).

Learning is a teaching and learning activity that has various stages (Novianti & Syarkowi 2021) among others, namely planning, implementing, and evaluating (Pertiwi 2019). The teacher carries out the learning stages using learning media (Okryanida & Astuti 2020) the corresponding. Students can play an active role in following the teacher's instructions during learning (Syarifudin 2020). Online learning is a learning system (Styawati et al. 2021) that requires tools to use internet access (Al-qoyyim et al. 2022). Online learning is transitioning from traditional to innovative teaching from personal to virtual (Danchikov et al. 2021). The characteristics of online learning are utilizing electronic technology services and computer advantages (Widiya et al. 2020) to increase the likelihood that students can continue their learning activities (Yunitasari & Hanifah 2020). Technology becomes a means in the learning process (Pakpahan & Fitriani 2020). In online learning, students and teachers interact using video (Lapitan et al. 2021). Online learning using the internet network can be carried out and followed for free or a certain fee (Baety & Munandar 2021). The purpose of online learning is to provide quality learning services that are massive and open (Handarini & Wulandari 2020).

Physics studies a natural phenomenon (Dani & Qurana 2022) or inanimate objects in the living environment, space, and time and any interactions that accompany them (Fatimah et al. 2020). Physics education today metamorphoses from a simple exchange of knowledge to a more complex one with the presence of scientific investigations for students (Cai et al. 2021). Physics is also a science derived from observations and experiments and connects reality based on the scientific method (Jafar 2019). Physics is one branch of natural science that aims to study and provide qualitative and quantitative understanding (Amin & Sulistiyono 2021). Physics can also be seen as processes and products (Rizaldi et al. 2021). Physics learning is often considered an abstract science presented in a less interesting theory and is considered an elusive and mastered science (Mayanti et al. 2022). Therefore, teachers need to use various learning methods and models that can make it easier for students to understand the concepts of physics (Kurnia et al. 2022).

One model that can help students understand physics concepts easier is the discovery learning model (Harefa 2021). The discovery learning model is a model with a discussion process guided by teachers so that students can find and complete the period given to achieve equality (Sahara et al. 2018). The discovery learning model is considered a promising learning model due to the active involvement of students in the learning process (Dwijayanti et al. 2020). The discovery learning model is also considered suitable because it can train learners' skills (Nurfadillah et al. 2022). Discovery learning can facilitate student learning in studying physics (Yerimadesi et al. 2018). In this model, students are required to be independent through inventions (Amrianto & Lufri 2019). Based on this background, this study was conducted to analyze the application of discovery learning to physics learning during the COVID-19 pandemic in Indonesia.

METHODS

This research uses literature studies. Secondary data from this study in the form of journals that can be accounted for well (Effendi et al. 2021) nationally and internationally accredited by SINTA regarding discovery learning in physics learning during COVID-19 in Indonesia and other sources on the website (Suliyannah et al. 2021). The collected data will be analyzed using qualitative descriptive analysis using the Miles and Huberman model. (Turmuzi et al. 2021). Data analysis according to Miles and Huberman will be shown in FIGURE 1.

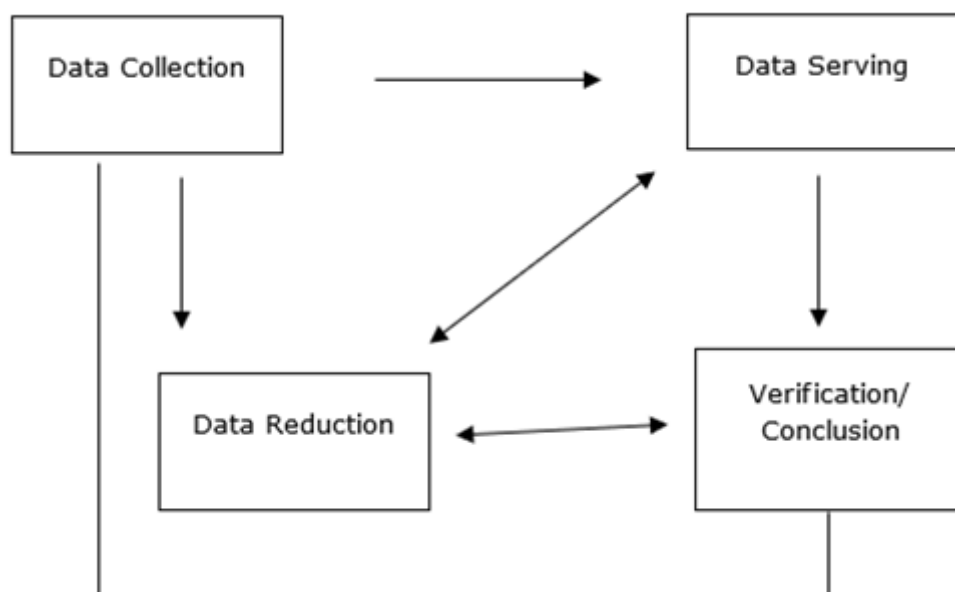


FIGURE 1. Qualitative Data Analysis

The relationship between data collection and conclusions is that after getting the data, then conclusions are made to get answers from the research objectives. Data collection is the primer data that will deeply explore answers and find the novelties of the research. Hence, this research will have a few conclusion that answer the research objective

RESULTS AND DISCUSSION

The discovery learning model is a model that learns a fun concept and principle that requires students to be active, and creative (Susmiati 2020). The existence of the COVID-19 pandemic requires teachers to find solutions so that learning continues to run well until it achieves certain goals, one of which is by implementing discovery models in the implementation of physics learning. In this study, national and international journals related to discovery learning in physics learning during COVID-19 in Indonesia are shown in TABLE 1.

TABLE 1. Relevant Research Results Application of the Discovery Learning Model in Physics Learning During the COVID-19 Pandemic.

No.	Author	Research Purposes	Research Result
1.	(Dewi 2021)	Improving the understanding of physics concepts in newton law students of class X MIA-1 SMA Negeri 3 Sibolga school year 2021-2022 by applying discovery learning methods through online learning.	With the implementation of discovery learning methods through online learning, students' understanding of student subjects has increased.
2.	(Gunawan et al. 2021)	Measuring the effectiveness of discovery learning-based learning tools with cognitive approaches and conflict approaches to student mastery of concepts.	The use of discovery learning-based learning tools using cognitive approaches and conflict approaches is effectively used to improve students' mastery of concepts.
3.	(Egista et al. 2022)	Develop a decent discovery learning model learning device to increase the mastery of learner concepts on harmonic vibration materials.	Learning devices using discovery learning models can increase the mastery of learner concepts.

No.	Author	Research Purposes	Research Result
4.	(Ramadoni et al. 2019)	Develop physics modules using an integrated value-based discovery learning model with a science process approach.	Physics modules using an integrated value-based discovery learning model with a science process approach can improve students' abilities and values.
5.	(Sarah 2021)	Describe the implementation of discovery learning by using personal sites in the physics classroom.	Discovery learning using a personal site improves student interaction and student learning outcomes during online learning.
6.	(Sulistyo & Kartono 2021)	Knowing the influence of the discovery learning model with the active learning teacher-student approach assisted by the WhatsApp application on learning during COVID-19.	The use of the discovery learning model with a teacher-student approach assisted by the WhatsApp application in the era of the COVID-19 pandemic shows a fairly effective relationship and can be an alternative solution.
7.	(Sudarsana et al. 2021)	Knowing the development of website integrated discovery learning-based physics modules is a necessity in physics learning due to the COVID-19 pandemic.	E-modules physics based on integrated discovery learning websites affect physics learning in the era of the COVID-19 pandemic.
8.	(Mahendra et al. 2018)	Develop physics high school student worksheets on temperature and heat materials based on discovery learning models based on metacognitive.	The use of physics LKS in high school students based on the discovery learning model can be said to be valid and can be used for the learning process. The use of LKS based on the discovery model can improve student learning outcomes.
9.	(Praptama et al. 2021)	Knowing the influence of the use of video media with discovery learning models on temperature and heat materials to increase student activity during COVID-19.	Learning using video media with discovery learning models on temperature and heat materials can increase student activity during COVID-19.
10.	(Andriani et al. 2021)	Knowing physics learning during the COVID-19 pandemic at SMA Negeri 1 Kuwus.	Physics teachers use the discovery model with online methods have not been maximized, students become less active.
11.	(Sartono 2019)	Describe the physics learning process by applying the discovery learning model assisted by student worksheets.	With the application of the discovery learning model assisted by LKS, it can improve the learning achievement of student fluid matter physics.
12.	(Kusrini et al. 2018)	Describes the application of the discovery learning model assisted by power point media in class X science 3 students of SMA Negeri 2 Merauke.	Discovery learning models can make students more active and motivated to find solutions to the problems they get.
13.	(Yuszahra et al. 2018)	Knowing the application of discovery learning with e-learning media to learning during the COVID-19 period.	The discovery learning model can improve cognitive abilities and shape students disciplined and positive attitudes during the COVID-19 period.
14.	(Saprudin et al. 2021)	Deciphering the results of studies related to the use of e-books in physics learning.	The use of e-books by applying the discovery learning model can increase students' interest and motivation to learn during online learning.

No.	Author	Research Purposes	Research Result
15.	(Ramadan et al. 2020)	Improving guided discovery-based online physics learning tools for class X students.	Guided discovery-based online physics learning tools are worth using for online learning of momentum and impulse materials during the COVID-19 pandemic.
16.	(Idrus et al. 2021)	Develop a web-based physics e-module using a discovery learning model on newton's law material.	The use of web-based physics e-modules using the discovery learning model on Newton's law can be said to be feasible and valid for learning during the COVID-19 pandemic.
17.	(Maulidiyah et al. 2020)	Improving discovery learning-based e-learning using schoology in physics learning.	The development of e-learning based on the discovery learning model is feasible to be used in physics learning for high school students.
18.	(Serevina & Luthfi 2021)	Develop discovery learning-based online learning tools on momentum and impulse.	Discovery learning-based online learning tools on momentum and impulse are right to use.
19.	(Masril et al. 2019)	Knowing the effect of virtual laboratory implementation using the discovery learning model in high school.	With the implementation of virtual laboratories using the discovery learning model can improve the competence of students' skills.
20.	(Kasmiana et al. 2020)	Knowing the influence of guided discovery learning models in understanding student concepts.	The use of guided discovery learning models can improve student learning outcomes and understanding of student concepts.
21.	(Irma et al. 2021)	Analyzing the influence of the Discovery-Based Unity of Science model with sets approach to students' critical thinking skills during the COVID-19 pandemic.	The use of the Discovery-Based Unity of Science learning model with the SETS approach can improve students' critical thinking skills during the COVID-19 pandemic.
22.	(Hikmawati et al. 2021)	Describes the effectiveness of the discovery learning model to train the science process skills of class XI SMA Negeri 1 Kediri students related to elasticity material and Hooke law.	The application of the discovery learning model is effectively used in physics learning and can improve students' science process skills related to elasticity matter and Hooke laws.
23.	(Yoesoef 2022)	Increase activity and meaningful learning of physics from home with a level of inquiry discovery learning.	The application of the level of inquiry discovery learning model can increase student activities and meaningful learning experiences in physics from home during the COVID-19 pandemic.
24.	(Safira et al. 2021)	It was knowing the effect of the implementation of the Guided Discovery Learning Assisted Video and Interactive Simulation (GDM-VIS) model in physics learning.	Implementing the Guided Discovery Learning Assisted Video and Interactive Simulation (GDM-VIS) model can improve students' understanding of concepts.
25.	(Khovivah et al. 2021)	It was knowing the improvement of student learning outcomes on light matter using the discovery learning model.	Learning using the discovery learning model can improve student learning outcomes on light material during a pandemic.
26.	(Awaliyah Rizky & Budi Bhakti 2021)	Develop physics modules using discovery learning models on energy subjects.	The development of physics modules using the discovery learning model on the subject matter of energy is valid and can be used for physics learning.

No.	Author	Research Purposes	Research Result
27.	(Lidiana et al. 2018)	It was knowing the effect of discovery learning using PhET on physics learning outcomes of grade II students of SMAN 1 Kediri for the 2017/2018 Academic Year.	The use of discovery learning models using PhET can improve student physics learning outcomes.
28.	(Septi et al. 2022)	It was knowing the influence of discovery learning models on students' science process skills on physics subjects.	Discovery learning models can improve students' science process skills in physics subjects.
29.	(Salsabila et al. 2019)	It was knowing the effect of implementing the discovery learning model on elasticity material and Hooke's law on physics learning outcomes of high school students.	Implementing the discovery learning model on elasticity material and Hooke's law can improve the physics learning outcomes of high school students.
30.	(Suryanti et al. 2021)	Knowing the influence of the discovery learning model on the mastery of concepts and physics knowledge of high school students.	Discovery learning models can improve high school students' mastery of physics concepts and knowledge.

Model Discovery Learning

Discovery learning is a learning model that usually uses constructivists based on the inquiry theory of learning and occurs in problem-solving situations where learners will learn through already gained knowledge and previous experience to discover facts and relationships related to the new material studied (Simamora et al. 2019). Discovery learning is also a learning that invites students to solve problems to develop knowledge and skills (Yuliana 2018). So, from some of these opinions, it can be concluded that discovery learning is a learning process that is not given as a whole but involves students to organize and develop knowledge and skills that are useful for solving a problem.

According to Maharani (2017) there are several steps of the discovery learning model, namely: (1) Stimulation (stimulus or providing stimulation). Students will be given a problem at the beginning of learning so that students feel confused and curiosity will arise to investigate this matter. And the teacher will be a facilitator by giving a question and directions according to the discovery. (2) Problem statement (statement or problem identification). Here, the teacher allows the learner to identify everything related to the events of the relevant problem. (3) Data collection. From the data collection, evidence related to existing evidence will be obtained so that students can obtain and collect appropriate information. (4) Data processing. Students can process various data and information obtained previously. (5) Verification. Participants prove whether or not a pre-existing statement is true. (6) Generalization (generalization or drawing conclusions). Learners can draw conclusions that will be used as a general principle for all problems. From Maharani, it was found that by using the discovery learning model, it can improve student learning outcomes.

Characteristics of Discovery Learning

Discovery learning is a learning process that is not given as a whole but involves learners organizing and developing knowledge and skills that are useful for solving a problem. There are several characteristics of the discovery learning model, namely: (1) emphasizing more on the learning process, not the teaching process, (2) encouraging students to be more independent, (3) paying attention to the attitudes and beliefs of students in learning, (4) providing opportunities for students to build new knowledge and understanding based on real experiences, (5) encouraging the development of curiosity naturally in students, (6) have the view that learning is a process, not pressing on results.

The purpose of using the discovery learning model in teaching and learning activities is to increase the involvement of students actively in obtaining and processing learning gains, directing students to continue to be learners, not making teachers the only source of information that students need, training students to explore and utilize their environment as a source that will continue to be explored (Fransiska et al. 2018).

Advantages of Discovery Learning in Physics Learning during COVID-19

The advantages of the discovery learning model are that it can help students to improve and improve cognitive skills and processes, can make students develop more according to their respective speeds, can increase the level of appreciation in students because of the results of discussions, is able to make students feel happy because they can carry out research, and can help students in dispelling doubts because it leads to the truth for sure (Yuliana 2018).

During COVID-19, the use of discovery learning models in physics learning in schools can increase students' understanding of student physics subjects (Dewi 2021). Based on previous research conducted by Praptama (2021) the advantage of using the discovery learning model in physics learning during COVID-19 is that it can increase student activity on temperature and heat materials. Based on previous research also conducted by Yuszahra (2018), it is known that the discovery learning model can improve cognitive abilities and can form disciplined and positive attitudes of participants during the COVID-19 pandemic.

During the COVID-19 pandemic, students have carried out remote learning so that teachers are looking for other solutions so that physics learning continues to run well. One of the ways carried out by Sudarsana (2021) is by using physics e-modules based on an integrated discovery learning model website and obtained under the use of physics e-modules based on the discovery learning model can affect physics learning in the era COVID-19 pandemic. Another way is also done by Sulisty (2021), namely doing it using the WhatsApp application using a discovery learning model with a teacher-student approach can show a fairly effective relationship and can be an alternative solution in physics learning during the COVID-19 pandemic.

Disadvantages of Discovery Learning in Physics Learning during COVID-19

In addition to having advantages, the discovery learning model also has several disadvantages, especially during the COVID-19 pandemic. The discovery learning model has its drawbacks, which can lead to the assumption that there is a readiness of the mind to learn, the use of this model can consume a lot of time, the application of discovery learning requires a resource-rich learning environment, and students often have difficulty in forming opinions, making predictions, or drawing conclusions, and some teachers are not necessarily able to manage discovery learning properly (Khasinah 2021). According to Yuliana (2018) discovery learning also has a drawback, namely that the discovery learning model is said to be not efficient enough to be used in teaching and learning activities in a large number of students because this model takes a long time to solve a problem.

Previous research conducted by Andriani (2021) explained that the difficulties experienced by students during physics learning during this pandemic are the absence of internet quotas, difficulty understanding materials and teachers'

CONCLUSION

From the results of the study using the literature study method related to the application of the discovery learning model to physics learning during the COVID-19 pandemic in Indonesia, it can be concluded that: 1) The application of the discovery learning model to physics learning during the COVID-19 pandemic can improve student understanding, students' critical thinking ability, and mastery of student concepts. 2) The use of online learning tools and discovery learning-based e-modules can improve students' mastery of concepts in physics learning during the COVID-19 pandemic. 3) The advantages of the discovery learning model in physics learning during the COVID-19 pandemic are that it can improve cognitive abilities and form students' disciplined and positive attitudes. 4) The flexibility of the discovery learning model in physics learning during the COVID-19

pandemic is that students have difficulty understanding the material, and teachers find it difficult to present the material so that the application of the discovery learning model in physics learning during the COVID-19 pandemic in Indonesia is not all effective.

The limitation of this research is that it only uses the discovery learning model in general. The implications for further research can be to develop and refine discovery learning models in the future.

ACKNOWLEDGMENT

The author's gratitude goes to the Directorate General of Higher Education, Research, and Technology; Ministry of Education, Culture, Research and Technology, Indonesia who has supported funding in *Penelitian Dasar Unggulan Perguruan Tinggi - DRTPM 2022* [Contract Number: 29551/UN38.9/LK.04.00/2022].

REFERENCES

- Al-qoyyim, TM et al. 2022, 'The Effectiveness of Online Learning Media on Physics Subjects During a Pandemic', *AMPLITUDO: Journal of Science & Technology Innovation*, vol. 1, no. 1, pp. 1-4.
- Ametepe, JD & Khan, N 2021, 'Teaching Physics During COVID-19 Pandemic: Implementation and Report of Teaching Strategies to Support Student Learning', *Journal of Physics: Conference Series*, vol. 56, no. 6, pp. 1-11.
- Amin, A & Sulistiyono, S 2021, 'Pengembangan Handout Fisika Berbasis Contextual Teaching and Learning (CTL) Untuk Meningkatkan Aktivitas Dan Hasil Belajar Fisika Siswa Sma', *Jurnal Pendidikan Fisika Undiksha*, vol. 11, no. 1, pp. 29-38.
- Amrianto, A & Lufri, L 2019, 'Effect of Example Non Example Method Implementation in Scientific Approach and Discovery Learning Model on VII Grade Students' Cognitive Competence in Learning Natural Science', *Journal of Physics: Conference Series*, vol. 1387, no. 1, pp. 1-6.
- Andriani, F, Harso, A & Rahmawati, AS 2021, 'Pembelajaran Fisika di Sma Negeri 1 Kuwus Golowelu Selama Masa Pandemi Covid-19', *Karst : Jurnal Pendidikan Fisika dan Terapannya*, vol. 4, no. 2, pp. 91-99.
- Armoed, Z 2021, 'The Covid-19 Pandemic: Online Teaching and Learning at Higher Education Institutes', *IOP Conference Series: Earth and Environmental Science*, vol. 654, no. 1, pp. 1-7.
- Awaliyah Rizky, S & Budi Bhakti, Y 2021, 'Development of Discovery Learning Based Physics Learning Module in Energy Discussion', *JPP (Jurnal Pendidikan dan Pembelajaran)*, vol. 28, no. 1, pp. 17-22.
- Baety, DN & Munandar, DR 2021, 'Analisis Efektifitas Pembelajaran Daring Dalam Menghadapi Wabah Pandemi Covid-19', *Edukatif : Jurnal Ilmu Pendidikan*, vol. 3, no. 3, pp. 880-889.
- Cai, S et al. 2021, 'Effects of Learning Physics Using Augmented Reality on Students' Self-efficacy and Sonceptions of Learning', *British Journal of Educational Technology*, vol. 52, no. 1, pp. 235-251.
- Danchikov, EA et al. 2021, 'The Potential of Online Learning in Modern Conditions and Its Use At Different Levels of Education', *Linguistics and Culture Review*, vol. 5, no. S1, pp. 578-586.
- Dani, AU & Qurana 2022, 'Pengaruh Model Pembelajaran Process Oriented Guided Learning Terhadap Pemahaman Konsep Fisika', *Jurnal Pendidikan Fisika*, vol. 10, no. 1, pp. 56-60.
- Dewi, I 2021, 'Penerapan Metode Discovery Learning Melalui Pembelajaran Daring untuk Meningkatkan Pemahaman Konsep Fisika pada Pokok Hukum Newton Siswa Kelas X MIA-1 SMA Negeri 3 Sibolga Tahun Jaran 2021-2022', *ESTUPRO*, vol. 6, no. 3, pp. 53-63.
- Dwijayanti, LM, Na'Im, M & Soepeno, B 2020, 'The Effect of Discovery Learning under Mind Mapping on Students' Results of History Learning at SMAN 1 Tenggara', *IOP Conference Series: Earth and Environmental Science*, vol. 485, no. 1, pp. 1-7.

- Effendi, A, Fatimah, AT & Amam, A 2021, 'Analisis Keefektifan Pembelajaran Matematika Online Di Masa Pandemi Covid-19', *Teorema: Teori dan Riset Matematika*, vol. 6, no. 2, pp. 250-259.
- Egista, E, Taufik, M & Zuhdi, M 2022, 'Pengembangan Perangkat Pembelajaran Fisika Pada Materi Getaran Harmonis Menggunakan Model Discovery Learning untuk Meningkatkan Penguasaan Konsep Peserta Didik', *Jurnal Ilmiah Profesi Pendidikan*, vol. 7, no. 1, pp. 41-46.
- Fajri, Z et al. 2021, 'Student's Learning Motivation and Interest; the Effectiveness of Online Learning during COVID-19 Pandemic', *Journal of Physics: Conference Series*, vol. 1899, no. 1, pp. 1-10.
- Fatimah, Z et al. 2020, 'Model Inkuiri Terbimbing Berbantuan Laboratorium Virtual Untuk Meningkatkan Keterampilan Proses Sains', *Jurnal Pendidikan, Sains, Geologi, dan Geofisika (GeoScienceEd Journal)*, vol. 1, no. 2, pp. 28-32.
- Fitria, E 2021, 'Analisis Pemanfaatan Media Online pada Pembelajaran Daring Fisika terhadap Motivasi Belajar Siswa', *Journal of Innovation in Teaching and Instructional Media*, vol. 2, no. 1, pp. 43-51.
- Fransiska, L, Subagia, IW & Sarini, P 2018, 'Pengaruh Model Pembelajaran Guided Discovery Terhadap Keterampilan Proses Sains Siswa Smp Negeri 3 Sukasada', *Jurnal Pendidikan dan Pembelajaran Sains Indonesia (JPPSI)*, vol. 1, no. 2, pp. 68-79.
- Gunawan, G et al. 2021, 'The Effectiveness of Physics Learning Tools Based on Discovery Model With Cognitive Conflict Spproach Toward Student's Conceptual Mastery', *Journal of Physics: Conference Series*, vol. 1747, no. 1, pp. 1-7.
- Hakim, M & Mulyapradana, A 2020, 'Pengaruh Penggunaan Media Daring dan Motivasi Belajar Terhadap Kepuasan Mahasiswa Pada Saat Pandemi Covid-19', *Widya Cipta: Jurnal Sekretari dan Manajemen*, vol. 4, no. 2, pp. 154-160.
- Handarini, OI & Wulandari, SS 2020, 'Pembelajaran Daring Sebagai Upaya Study From Home (SFH)', *Jurnal Pendidikan Administrasi Perkantoran (JPAP)*, vol. 8, no. 3, pp. 496-503.
- Harefa, D & Telukdalam, P 2021, 'Penggunaan Model Pembelajaran Student Facilitator and Explaining Terhadap Hasil Belajar Fisika', *Jurnal Dinamika Pendidikan*, vol. 14, no. 1, pp. 116-131.
- Hikmawati, H et al. 2021, 'Discovery Learning Model to Practice Students' Science Process Skill in Elasticity and Hooke's Law', *Journal of Physics: Conference Series*, vol. 1779, no. 1, pp. 1-5.
- Ibrahim et al. 2020, 'Sosialisasi Kesehatan untuk Pencegahan Penyebaran Covid 19 di SMA Mesjid Raya Aceh Besar', *BAKTIMAS Jurnal Pengabdian pada Masyarakat*, vol. 2, no. 4, pp. 196-202.
- Idrus, H, Fitrawati, L & Umar, AA 2021, 'Development of Web-Based Physics E-Module Using Discovery-based Learning Model on Newton's Law Materials', *Sainstek: Jurnal Sains dan Teknologi*, vol. 13, no. 2, pp. 84-89.
- Irma, I, Meriyati, M & Irwandani, I 2021, 'Model Pembelajaran Discovery Based Unity of Science (DBUS) dengan Pendekatan SETS: Pengaruh Terhadap Kemampuan Berpikir Kritis Pada Masa Pandemi Covid-19', *U-Teach: Journal Education of Young Physics Teacher*, vol. 2, no. 1, pp. 29-35.
- Jafar, AF 2019, 'Implementasi Strategi Belajar Kooperatif Murder Terhadap Pemahaman Konsep Fisika Peserta Didik', *Jurnal Pendidikan Fisika*, vol. 7, no. 1, pp. 26-30.
- Kasmiana, Yusrizal & Syukri, M 2020, 'The Application of Guided Discovery Learning Model to Improve Students Concepts Understanding', *Journal of Physics: Conference Series*, vol. 1460, no. 1, pp. 1-6.
- Khasanah, DRAU, Pramudibyanto, H & Widuroyekti, B 2020, 'Pendidikan Dalam Masa Pandemi Covid-19', *Jurnal Sinestesia*, vol. 10, no. 1, pp. 41-48.

- Khasinah, S 2021, 'Discovery Learning: Defnisi, Sintaksis, Keunggulan, dan Kelemahan', *MUDARISUNA: Media Kajian Pendidikan Agama Islam*, vol. 11, no. 3, pp. 402-413.
- Khovivah, A et al. 2021, 'Upaya Meningkatkan Hasil Belajar Siswa Kelas VIII pada Mata Pelajaran IPA Materi Cahaya melalui Model Pembelajaran Discovery Learning di SMPN 1 Bintang Bayu Tahun Ajaran 2020/2021', *BEST Journal (Biology Education, Sains and Technology)*, vol. 4, no. 1, pp. 94-100.
- Kurnia, R, Hairunnisyah, H & Gunada, IW 2022, 'Pengembangan Perangkat Pembelajaran Berbasis Inkuiri Terbimbing Terintegritas dengan Karakter untuk Meningkatkan Pemahaman Konsep Fisika Peserta Didik', *Jurnal Ilmiah Profesi Pendidikan*, vol. 7, no. 2, pp. 285-291.
- Kusrini et al. 2018, 'Efektivitas Model Pembelajaran Discovery Learning Powerpoint Media To Improve Student Learning Outcomes in', *Ejournal.Unmus.Ac.Id*, vol. 1, no. 1, pp. 27-32.
- Lapitan, LD et al. 2021, 'An effective blended online teaching and learning strategy during the COVID-19 pandemic', *Education for Chemical Engineers*, vol. 35, pp. 116-131.
- Lidiana, H, Gunawan & Taufik, M 2018, 'Pengaruh Model Discovery Learning Berbantuan Media PhET Terhadap Hasil Belajar Fisika Peserta Didik Kelas XI SMAN 1 Kediri Tahun Ajaran 2017/2018', *Jurnal Pendidikan Fisika dan Teknologi*, vol. 4, no. 1, pp. 49-55.
- Maharani, BY & Hardini, ATA 2017, 'Penerapan Model Pembelajaran Discovery Learning Berbantuan Benda Konkret Untuk Meningkatkan Hasil Belajar IPA', *E-Jurnal mitra pendidikan*, vol. 1, no. 5, pp. 549-561.
- Mahendra, YS, Ertikanto, C & Rosidin, U 2018, 'Development Worksheet Physics Temperature Material and Kalor With Discovery Learning Model Based on Metakognitif Approach', *Jurnal Pendidikan Fisika*, vol. 6, no. 1, pp. 85-99.
- Masril, Hidayati & Darvina, Y 2019, 'Implementation of Virtual Laboratory Through Discovery Learning to improve Student's Physics Competence in Senior High School', *Journal of Physics: Conference Series*, vol. 1185, no. 1, pp. 1-8.
- Maulidina, S & Bhakti, YB 2020, 'Pengaruh Media Pembelajaran Online Dalam Pemahaman Dan Minat Belajar Siswa Pada Konsep Pelajaran Fisika', *ORBITA: Jurnal Kajian, Inovasi dan Aplikasi Pendidikan Fisika*, vol. 6, no. 2, p. 248.
- Maulidiyah, DR, Serevina, V & Budi, AS 2020, 'E-Learning Berbasis Discovery Learning Menggunakan Schoology', *Prosiding Seminar Pendidikan Fisika (E-Journal) SNF*, vol. 9, pp. 191-198.
- Mayanti, A, Poluakan, C & Tumimomor, FR 2022, 'Pengaruh Model Problem Based Learning (PBL) Menggunakan Metode Demonstrasi dan Eksperimen pada Pembelajaran Fisika tentang Hukum Newton', *Charm Sains: Jurnal Pendidikan Fisika*, vol. 3, no. 1, pp. 9-14.
- Mok, KH, Xiong, W & Bin Aedy Rahman, HN 2021, 'COVID-19 Pandemic's Disruption on University Teaching and Learning and Competence Cultivation: Student Evaluation of Online Learning Experiences in Hong Kong', *International Journal of Chinese Education*, vol. 10, no. 1, pp. 1-20.
- Monica, J & Fitriawati, Di 2021, 'Efektivitas Penggunaan Aplikasi Google Meet Sebagai Media Pembelajaran Online Pada Mahasiswa Saat Pandemi Covid-19', *National Conference on Applied Business, Education, & Technology (NCABET)*, vol. 1, no. 1, pp. 388-394.
- Novianti, R & Syarkowi, A 2021, 'Kepuasan Siswa Terhadap Pembelajaran Fisika di Era New Normal Covid-19', *Journal of Natural Science and Integration*, vol. 4, no. 2, pp. 162-174.
- Nurfadillah, Cahyana, W & Putra, DP 2022, 'Penerapan Model Discovery Learning Berbantuan Media Flipbooks dalam Pembelajaran Fisika untuk Melatih Keterampilan Metakognisi Siswa SMAN 10 Gowa', *Jurnal Pendidikan MIPA*, vol. 12, no. 1, pp. 23-29.

- Okyanida, IY & Astuti, IAD 2020, 'Peningkatan Kompetensi Guru Melalui Pelatihan Media Pembelajaran Interaktif Berbasis Videoscribe bagi Guru MGMP Fisika Kabupaten Lebak', *Jurnal Pengabdian Pada Masyarakat*, vol. 5, no. 4, pp. 1035-1042.
- Pakpahan, R & Fitriani, Y 2020, 'Analisa Pemanfaatan Teknologi Informasi Dalam Pembelajaran Jarak Jauh Di Tengah Pandemi Virus Corona Covid-19', *JISAMAR (Journal of Information System, Applied, Management, Accounting and Research)*, vol. 4, no. 2, pp. 30-36.
- Pertiwi, FN 2019, 'Sistem Pengelolaan Laboratorium IPA 65', *Kodifikasia: Jurnal Penelitian Islam*, vol. 13, no. 1, pp. 65-76.
- Pertiwi, WA et al. 2021, 'Application of Online Science Practicum by Using Microsoft Teams and Learning Management System (LMS) During the Covid 19 Pandemic', *Journal of Physics: Conference Series*, vol. 2019, no. 1, pp. 1-7.
- Prapta, SS, Setiyaji, WT & Purwaningsih, E 2021, 'Pengaruh Video Pembelajaran Dengan Model Discovery Learning Materi Suhu Dan Kalor Untuk Meningkatkan Aktivitas Siswa', *Jurnal Pendidikan Fisika dan Teknologi*, vol. 7, no. 2, pp. 131-140.
- Ramadan, EM, Jumadi, J & Rahmawati, DU 2020, 'Physics Online Learning Devices Based on Guided Discovery Model for High School Class X on Momentum and Impulse Material', *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, vol. 6, no. 2, pp. 163-172.
- Ramadoni, A, Yulkifli & Ratnawulan 2019, 'Development of Physics Module SMA/MA Integrated Character Values based on Discovery Learning Models With Approach Science Process Skills', *Journal of Physics: Conference Series*, vol. 1185, no. 1, pp. 1-5.
- Rizaldi, DR et al. 2021, 'Adaptation to New Normal Conditions: Students Physics Learning Outcomes Using the Blended Learning Model', *International Journal of Asian Education*, vol. 2, no. 3, pp. 369-376.
- Safira, I et al. 2021, 'The Relationship between Students' Learning Motivation and Learning Outcomes through Guided Discovery Model Assisted Video and Interactive Simulation', *Jurnal Pendidikan Fisika*, vol. 9, no. 2, pp. 145-153.
- Sahara, R, Mardiyana & Saputro, DRS 2018, 'Discovery Learning With SAVI Approach in Geometry Learning', *Journal of Physics: Conference Series*, vol. 1013, no. 1, pp. 1-5.
- Salsabila, RY, Prastowo, SHB & Effendi, M 2019, 'Implementasi Model Pembelajaran Discovery Learning Pada Materi Elastisitas Dan Hukum Hooke Terhadap Hasil Belajar Fisika Siswa Sma', *SEMINAR NASIONAL PENDIDIKAN FISIKA 2019 "Integrasi Pendidikan, Sains, dan Teknologi dalam Mengembangkan Budaya Ilmiah di Era Revolusi Industri 4.0 "*, vol. 4, no. 1, pp. 111-114.
- Saprudin, S, Haerullah, AH & Hamid, F 2021, 'Analisis Penggunaan E-Modul Dalam Pembelajaran Fisika; Studi Literatur', *Jurnal Luminous: Riset Ilmiah Pendidikan Fisika*, vol. 2, no. 2, pp. 38-42.
- Sarah, LL 2021, 'The Implementation of Discovery Learning Using Personal Site in Physics Online Classroom', *Journal of Physics: Conference Series*, vol. 1957, no. 1, pp. 1-6.
- Sartono, B 2019, 'Penerapan Model Pembelajaran Discovery Learning Berbantuan Lembar Kerja Siswa Untuk Meningkatkan Prestasi Belajar Fisika Materi Fluida Pada Siswa Kelas Xi Mipa 3 Sma Negeri 1 Ngemplak Boyolali Semester Ganjil Tahun Pelajaran 2018/2019', *Prosiding SNFA (Seminar Nasional Fisika dan Aplikasinya)*, vol. 3, no. 1, pp. 52-64.
- Septi, SE et al. 2022, 'Pengaruh Model Pembelajaran Discovery Learning Terhadap Keterampilan Proses Sains Siswa Pada Mata Pelajaran Fisika di SMAN 10', *Jurnal Phi: Jurnal Pendidikan Fisika dan Fisika Terapan*, vol. 3, no. 2, pp. 10-18.
- Serevina, V & Luthfi, K 2021, 'Development of Discovery Learning-based on Online Learning Tools on Momentum and Impulse', *Journal of Physics: Conference Series*, vol. 1876, no. 1, pp. 1-9.

- Setiaji, B & Dinata, PAC 2020, 'Analisis kesiapan mahasiswa jurusan pendidikan fisika menggunakan e-learning dalam situasi pandemi Covid-19', *Jurnal Inovasi Pendidikan IPA*, vol. 6, no. 1, pp. 59-70.
- Simamora, RE, Saragih S & Hasratuddin, H 2019, 'Improving Students' Mathematical Problem Solving Ability and Self-Efficacy through Guided Discovery Learning in Local Culture Context', *International Electronic Journal of Mathematics Education*, vol. 14, no. 1, pp. 61-72.
- Styawati, Oktaviani, L & Lathifah 2021, 'Penerapan Sistem Pembelajaran Dalam Jaringan Berbasis Web Pada Madrasah Aliyah Negeri 1 Pesawaran', *Jurnal WIDYA LAKSMI (Jurnal Pengabdian Kepada Masyarakat)*, vol. 1, no. 2, pp. 68-75.
- Sudarsana, W, Sarwanto, S & Marzuki, A 2021, 'Pengembangan E-Modul Fisika Berbasis Discovery Learning Terintegrasi Website Sebagai Alternatif Pembelajaran Akibat Pandemi Covid 19', *EDUPROXIMA : Jurnal Ilmiah Pendidikan IPA*, vol. 3, no. 2, pp. 65-71.
- Sulistyo, L & Kartono 2021, 'Guided Discovery Learning Model With the Teacher-Student Active Learning Approach, Assisted by the WhatsApp Solution Alternative Application on the COVID-19 Pandemic', *Journal of Physics: Conference Series*, vol. 1918, no. 4, pp. 1-3.
- Suliyannah et al. 2021, 'Literature Review on the Use of Educational Physics Games in Improving Learning Outcomes', *Journal of Physics: Conference Series*, vol. 1805, no. 1, pp. 1-11.
- Suryanti, E, Asrizal, A & Mufit, F 2021, 'Meta Analisis Pengaruh Model Discovery Learning terhadap Hasil Belajar Siswa pada Mata Pelajaran PAI', *ORBITA: Jurnal Kajian, Inovasi dan Aplikasi Pendidikan Fisika*, vol. 7, no. 2, pp. 305-312.
- Susmiati, E 2020, 'Meningkatkan Motivasi Belajar Bahasa Indonesia Melalui Penerapan Model Discovery Learning dan Media Video Dalam Kondisi Pandemi Covid-19 bagi Siswa SMPN 2 Gangga', *Jurnal Paedagogy: Jurnal Penelitian dan Pengembangan Pendidikan*, vol. 7, no. 3, pp. 212-215.
- Syarifudin, AS 2020, 'Impelementasi Pembelajaran Daring Untuk Meningkatkan Mutu Pendidikan Sebagai Dampak Diterapkannya Social Distancing', *Jurnal Pendidikan Bahasa dan Sastra Indonesia Metalingua*, vol. 5, no. 1, pp. 31-34.
- Turmuzi, M et al. 2021, 'Analisis Kesulitan Belajar Mahasiswa Secara Online (E-Learning) Selama Masa Pandemi Covid-19', *Edukatif: Jurnal Ilmu Pendidikan*, vol. 3, no. 3, pp. 900-910.
- Widiya, AAS, Hasanah, M & Mustofa, MR 2020, 'Analisis Motivasi Belajar Mahasiswa dengan Sistem Pembelajaran Daring Selama Masa Pandemi Covid-19', *Jurnal EQUATION Teori dan Penelitian Pendidikan Matematika*, vol. 3, no. 2, pp. 40-54.
- Yerimadesi et al. 2018, 'Development of Guided Discovery Learning Based Module on Colloidal System Topic for Senior High School', *Journal of Physics: Conference Series*, vol. 1116, no. 4, pp. 1-10.
- Yoesoef, A 2022, 'Peningkatan Aktivitas Dan Pengalaman Belajar Bermakna Fisika Dari Rumah Siswa Kelas X MIPA 3 SMAN 2 Kediri Tahun Pelajaran 2020/2021 Dengan Level of Inquiry Discovery Learning Dalam Masa Pandemi Covid-19', *Jurnal Profesi dan Keahlian Guru*, vol. 3, no. 2, pp. 40-46.
- Yuliana, N 2018, 'Penggunaan Model Pembelajaran Discovery Learning Dalam Peningkatan Hasil Belajar Siswa Di Sekolah Dasar', *Pedagogi: Jurnal Ilmu Pendidikan*, vol. 18, no. 2, pp. 21-28.
- Yunitasari, R & Hanifah, U 2020, 'Pengaruh Pembelajaran Daring terhadap Minat Belajar Siswa pada Masa COVID 19', *Edukatif: Jurnal Ilmu Pendidikan*, vol. 2, no. 3, pp. 232-243.
- Yuszahra, R, Maryani & Supriadi, B 2018, 'Model Discovery Learning Dengan Media E-Learning Pada Pembelajaran Fisika Saat Covid-19 Di Sma', *Angewandte Chemie International Edition*, vol. 5, no. 1, pp. 33-39.