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Research Profile of Problem Based Learning on Physics Learning During the Covid-19 Pandemic

Binar Kurnia Prahani [1*)], Budi Jatmiko [2], Tan Amelia [3], Nova Allysa Qotrunnada [4], Shalsa Billa Ardhana Neswary [5], Kirana Aureola Arzak [6]
State University of Surabaya, Indonesia[1,2,4,5,6], Dinamika University, Indonesia[3]
[*)]Corresponding E-mail: binarprahani@unesa.ac.id

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ABSTRACT
This study was conducted with the aim of analyzing the profile of the Problem Based Learning Model in Physics learning during the Covid-19 Pandemic. The research method used is literature study or literature study. The data collection technique used is to look for relevant journals that will be used as references, The journals analyzed were 32 journals, most of which were reputable international journals and journals published in the range of 2020-2022, because at that time the Covid-19 pandemic occurred in Indonesia. From the results of research that has been carried out learning physics during this pandemic has quite an impact on student learning outcomes. In physics lessons, many students experience misconceptions, do not understand physics concepts and their enthusiasm for learning decreases. One model that may be relevant during the COVID-19 pandemic is the model discussed in this study, namely Problem Based Learning. It is proven that the Problem Based Learning model in physics learning during the covid-19 pandemic in Indonesia is effectively used in improving students' problem solving abilities, critical thinking, creative thinking, and student argumentation. Even though there are some obstacles such as the uneven internet in Indonesia which prevents them from accessing the materials. And also still need relevant teaching materials and learning tools during the covid-19 pandemic.

INTRODUCTION

Education is the process of changing the attitudes and behavior of a person or group of people for the purpose of human growth through teaching and training efforts. Education is a development process aimed at developing the potential of students so that those involved can face and solve life problems [1] [2] [3]. Through education, one's potential can develop rapidly by creating a fun and easy-to-understand learning atmosphere based on the ability to define the quality of oneself, society, state and nation [4] [5]. Education is very important to implement, the form of an education is learning.

Learning is a process carried out by each individual to increase knowledge, both knowledge, skills, attitudes and other positive knowledge. Learning is a permanent change in a person's behavior or character as a result of experience and practice, not because of the growth or maturity process [6]. Learning is the process by which a learner interacts with an educator or learning resource in a learning environment. Learning is the support provided by educators to enable the process of acquiring knowledge and acquiring skills and habits, as well as shaping the attitudes and beliefs of students. From the learning outcomes we will also get many benefits as well as knowledge, skills and ethics in life. Learning activities are educational processes that provide opportunities for students to do so and develop the potential to improve the attitudes, knowledge and skills they need to survive [7].

However, the learning process was disrupted by the Covid 19 pandemic. The increasingly massive Covid-19 pandemic case requires all activities to be carried out from home, including teaching and learning activities [8]. Especially Education is a very important human need to develop learning skills in the 21st century which is hampered by limited learning activities [9]**.** With the advent of COVID 19, the education sector is facing many challenges. Class activities, educational activities, and social gatherings for all purposes were temporarily suspended, which adversely affected the activities [10]. This is explained by the (Minister of Education and Culture of the Republic of Indonesia 2020) regarding circular letter Number 4 of 2020 concerning the implementation of education policies in the emergency period of the spread of covid 19. This is done to minimize physical contact in bulk so that it can break the chain of the spread of the corona virus. In line with this, the digitalization of the system in the 4.0 industrial revolution requires educators and students to be able to quickly adapt to existing changes [11]. Teachers and students are forced to adopt online learning to ensure the teaching and learning process continues, and students get their right to gain knowledge from school even in a pandemic [12]. One of the government's strategies to maintain the learning process is to use current information technology, however the Covid-19 pandemic has also provided insight into the future sustainability of the world of education through technological assistance [13] [14]. So that learning is done online by utilizing existing technology. Online learning is also known as e-learning. Basically, e-learning has two types, namely synchronous and asynchronous [15]. Synchronous is learning that is carried out at the same time between educators and students, usually using media zoom, google meet, and others. While *asynchronous* is learning that is carried out at a time that is not required to coincide, for example, educators have provided material on Google Classroom so students can access the material at any time. Of the two types of online learning above, each of them has weaknesses, one of the problems with online learning, both synchronous and asynchronous, is the facilities and infrastructure, because the facilities and infrastructure differ from one student to another [16].

Online learning carried out during the Covid-19 pandemic has many obstacles [17]. In addition to students, teacher readiness is also the main thing that must be considered. This pandemic has also caused students' understanding levels to decline. Online learning is too complicated for giving tasks that are deemed less effective, so the meaning of learning is not clearly conveyed [18]. The use of learning media in online-based physics learning during the Covid-19 pandemic has its own challenges, especially the practical activities in physics learning [19]. In practical learning, the learning media found are still minimal and limited to practical tools that are used directly. Whereas this learning requires the existence of new, active, and constructive learning media that supports the distance learning process [20] [21]. In addition, online learning (internet) becomes very difficult to implement in some limited areas with unsatisfactory networks [22] [23]. A flexible learning model is needed in online learning, especially in Physics lessons. Physics is a part of science. Physics is one of the branches of education organized to develop analytical thinking skills to solve environmental problems both qualitatively and quantitatively [24] [25]. Most students think physics is a very difficult subject, so many students don't like physics [26]. Physics learning should aim at the active role of students in the teaching and learning process, and the teacher only as a learning facilitator [27]. Therefore, learning physics will not be enough if only knowing and memorizing students must understand the concept by using the right model.

One of the learning models that can be used in physics subjects during the COVID-19 pandemic is the Problem Based Learning (PBL) Model which can help students learn to use e-learning [28]. Problem based learning learning model, where teaching and learning activities in this model make students more active in learning concepts and encourage focus in responding to events in a systematic and planned manner [29] [30] [31]. Problem Based Learning (PBL) is a problem-based learning model designed to provide students with essential knowledge that will make them proficient in problem solving and have skills in participating in teams [32] [33] [34]. Problem Based Learning is a learning model that uses real problems found in everyday life and aims to enable students to build knowledge about science. The main focus of the Problem Based Learning model is the development of critical thinking and problem solving skills, and this Problem Based Learning model can develop students' abilities to actively build their own knowledge. And this PBL model can help students in learning contextual concepts [35]. In addition, the Problem Based Learning Model requires students to instill the basics of scientific thinking, develop mental thinking which is very much needed in 21st century learning [36]. The steps of this Problem Based Learning model are orienting students to problems, organizing people to learn, then guiding investigations both in groups and individually, presenting the work, and the last step is analyzing and evaluating the problem solving process. The Problem Based Learning model can be applied or used using various online applications that can be accessed by all students with internet-connected cell phones. Such as, Zoom Meeting and WhatsApp [37]. To maximize the learning process, zoom meetings are assisted by the WhatsApp application. The WhatsApp application can be installed on a smartphone and used as a standard conversation to send text messages, pictures, videos, and even telephones. These two applications are used to maximize the PBL learning model in the student learning process. You can increase student grades.

From the problems that have been discussed, in this article we will conduct research with the aim of knowing the Profile of Problem Based Learning Research in Physics learning during the Covid-19 pandemic in Indonesia. From the title we take, there are still very few journals discussing this matter. This title can add insight and knowledge about learning by using the Problem Based Learning model during the Covid 19 Pandemic, which is later expected to be able to find new innovations regarding the problems that we will find later to improve the learning process in Indonesia.

METHOD

This study uses a literature study research model. This literature study research is a way of solving problems by tracing previously written sources. In other words , the term study literature is also very familiar with the term literature study. Research Methods The study of literature is a series of activities related to the methods of collecting library data, reading and recording, and managing research materials. This type of research is carried out by reviewing articles in international and national journals, as well as several other sources [38].

The method of collecting data in this study is to read articles that are relevant to the title of the research to be carried out, then classified more specifically according to the research topic. In classifying the articles or journals found, they use criteria in the range of 2020 – 2022 [39]. Next, identify the process of learning physics material using the PBL model which was carried out during the covid 19 pandemic in Indonesia. From the identification results then analyzed through the process of categorization and classification and the last step is to describe the results of the literature review and conclude [40]. This literature study has the aim of describing the main content based on the information obtained [41] [42]. The following are the steps used in this study, which can be observed in **Figure 1.**

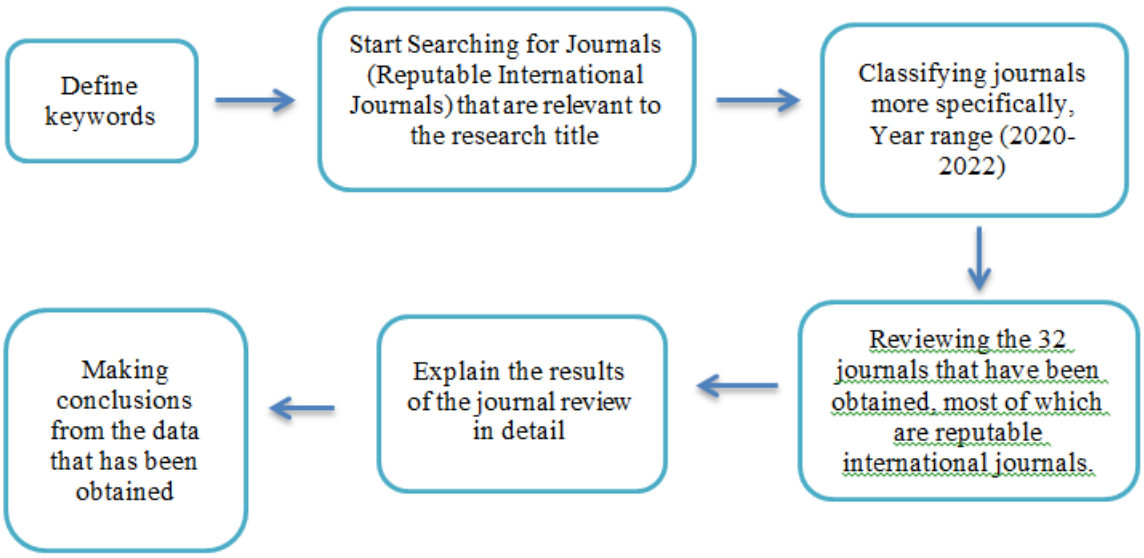

Fig 1. *Research Method*

RESULTS AND DISCUSSIONS

Problem Based Learning is a learning model that involves students in an activity (problem) that requires students to be more active. Especially during the Covid 19 pandemic in Indonesia which has an impact on education. And teachers must be able to bring relevant learning models during this pandemic. From the literature study that has been carried out and has carried out the existing stages, several journals relevant to the title of this study were obtained, namely knowing the profile of the use of Problem Based Learning (PBL) models in physics subjects during the covid 19 pandemic. The journals we use is the journal for 2020–2022, because in that year the COVID-19 pandemic occurred in Indonesia. And the journals used are international journals. The following is a summary of the literature study in the attachment **Table 1.**

Characteristics of Problem Based Learning models

Problem based learning model is a problem based learning model whose learning involves students to be active during the learning process [43]. The application of the Problem Based Learning model must be done with careful preparation, starting from learning tools to data collection tools. Due to the Covid19 pandemic, this learning is done online, which requires teachers to spend productive time during learning. When applying the PBL model with the experimental method, researchers must prepare mentally as much as possible so that the results obtained are optimal [36]. Characteristics in Problem Based Learning itself is that learning tends to be student centered , in learning will be divided into small groups, the teacher is only a facilitator, this model is a way to focus on problems and develop problem solving skills, and the new knowledge students gain is the result of self-directed learning or so-called self-directed learning [44] [45]. In addition Problem Based Learning allows students to apply their knowledge and skills to new questions. Students are required to analyze problems, build concept networks, and develop strategies to solve these problems [46].

Advantages of Problem Based Learning

The advantages of the problem based learning model are that students have the ability to solve problems in real situations, students can increase their own knowledge through the learning process, in this model students can also solve difficult problems by conducting discussions so that problems can be resolved. In the process of discussion and presentation students are trained to communicate scientifically. In addition, *problem based learning* can build students' self-confidence, create a supportive environment that leads to teamwork, improve interpersonal communication and critical

thinking skills, and increase self-awareness [47]. Problem Based Learning is one of the learning models that can improve students' conceptual understanding, this model encourages students to make scientific entries to gain scientific knowledge [36]. Besides that, Problem Based Learning can also provide a stimulus to arouse students' curiosity about learning subjects and as a trigger to expand knowledge and understanding of the material, this model can provide opportunities for students to reason through learning and interaction between students [46]. In several literature studies, it was also found that the Problem Based Learning Model used during the covid 19 pandemic with an average level of student learning independence using phet simulation in physics learning in the modeling class after participating in learning activities obtained results of 3.37 which were classified as good, and 3.29 in the implementation class which is classified as good, so the research results obtained that the problem-based learning model based on PhET is effective in achieving learning independence in students' physics lessons [48]. Then in the next meta-analysis study, the application of the PBL (problem based learning) model is very useful and effective in improving the mathematical solving ability of high school students, taking into account the learning time at the time of its implementation, with this finding informing educators, government and other stakeholders about the effectiveness of APP in learning process [47].

Disadvantages of Problem Based Learning

Of the advantages mentioned above, this model certainly also has some drawbacks, including it takes a long time in the learning process, The teacher's ability to motivate students is needed to allow effective group collaboration, Students will be hesitant to try it if they don't believe it is difficult to solve. the problems they study, as well as the learning media used must be considered and relevant to this model [49]. On the other hand, most school situations do not encourage a Problem Based Learning approach. In practice, this model requires facilities and infrastructure that are not owned by all schools. For example, many schools do not yet have adequate experimental facilities to complete the implementation of Problem Based Learning [50]. Lack of learning Problem Based Learning during the covid 19 pandemic is the problem of the internet being less stable in some places which makes it difficult for students to access the internet [51].

Problem Based Learning research profile in physics learning during the covid 19 pandemic

Physics learning that was carried out during the covid 19 pandemic before applying the Problem Based Learning model from the results of a literature study showed 36% of students had misconceptions, 3% of students did not understand the concept and only 30% of students understood the concept of motion, this happened because students were less active at the time. online learning and the model used is not appropriate [52]. Problem based learning models used during a pandemic on physics subjects from several journals that have been studied have broadly stated that they are effective in use, although there are some studies which state that they are less effective because of certain factors, such as internet network conditions that are not the same in every place, different ways of learning students and students' abilities in understanding physics are also diverse. Caroni & Nikoulina [53] stated that learning with this method is effectively used and provides many benefits and helps students during the pandemic. In another study, physics lessons on business and energy materials with problem based learning models carried out during the COVID-19 pandemic were in the moderate category, the study also found several facts, namely students still have difficulty connecting mathematical concepts, procedures, and conclusions in a different way. logical, coherent, and consistent. Problem Based Learning during the COVID-19 pandemic was also effective in improving students' problem-solving abilities in physics lessons, but the improvements experienced by students varied, namely in student intelligence and student activities during learning [54]. From the review of articles that have been carried out, after the PBL model was applied there was an increase even though the increase in each student was different. According to Hidaayatullaah et al [54], the reason was that students' intelligence definitely had differences and the activities carried out by students were different during the learning process.

Learning Media used in the Problem Based Learning model during the covid 19 pandemic

One of the learning media that can be used in the problem-based learning model is a website-based e-

book because based on research [55] which has carried out validation tests by material experts, media experts, and learning experts, as well as field tests and field tests, it can be concluded that a website-based ebook on Static and Dynamic fluids with advanced PBL models is possible to be developed independently and this media can teach to improve students' ability to solve physics problems through Problem Based Learning [55]. Other learning media sources are the Edmodo application and Zoom-based online learning resources with a problem-based learning model (PBL) on accelerated linear motion hardware that meet the criteria very well and are suitable for use in learning physics sets [56]. Google classroom application is also effectively used as a learning medium in this model [57]. In addition, high school physics learning during the COVID-19 pandemic, teachers still do not have definite media so that student learning outcomes do not decline [58]. From the research that has been carried out, it shows that several learning components have an effect on overcoming the challenges of learning during the COVID-19 pandemic, namely the development of technology, learning models, and learning materials [59]. So for further researchers, make new innovations regarding learning media that can increase student interest and achievement in studying physics, which must be adapted to the increasingly rapid developments of the times.

CONCLUSION AND SUGGESTION

Based on the research conducted, it can be concluded that the Effective Problem Based Learning (PBL) Learning Model was used during the Covid-19 Pandemic in Physics subjects to improve problem solving skills, critical thinking, creative thinking and student argumentation and so on. Although it is known that this PBL model is more effective in face-to-face learning, the obstacle experienced by students in Physics Learning is the uneven Internet problem in Indonesia, which makes it difficult for them to access materials. And student literacy during the pandemic is in the low category. Moreover, Physics is a subject that requires concentration in understanding it. So it is recommended that new evaluations and innovations are still needed in applying the Problem Based Learning learning model during this pandemic, and also that teaching materials and physics learning tools are needed that are relevant to the existing problem based learning model and the environment.

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Appendix

Table 1. Study Literature journal from 2020-2022

Author (Year)	Research purposes	Research design	Research result
Caroni & Nikoulina (2021) [53]	The aim is to determine the effectiveness of using the PBL model carried out on students during the COVID-19 pandemic	• The research method used is to compare PBL, namely face-to-face and online, with a descriptive statistical design • Qualitative Data	The results obtained are that students can receive the PBL learning model online, and it is also effectively used online, even though PBL is more effective when used offline.
Thamrin, Hutasuhut, Aditia, & Putri (2022) [60]	This study aims to determine the effectiveness of the application of blended learning materials with the PBL model to improve student learning outcomes	• The method used is quasi-experimental with Posttest control group design	The results showed that the application of blended learning with the PBL model was effective in improving learning outcomes during the COVID-19 pandemic.
Putri, Sunarno, & Marzuki (2021) [36]	The aim is to analyze and describe students' argumentation skills using the PBL model on static fluid material during the Covid-19 pandemic	• This research uses a descriptive method • Data collection techniques with test instruments	From the results of this study, it can be concluded that the argumentation ability of students after applying the PBL model is relatively high, seen from each argumentation indicator whose average value is high even in the covid 19 pandemic.
Yustina, Mahadi, Ariska, Arnentis, & Darmadi (2022) [61]	This study aims to analyze the impact of problem-based learning (PBL) through E- learning on students' creative thinking skills during the COVID19 pandemic.	• Method quasi-experimental design and pre test post test control group design	The results of this study are the PBL learning model through e-learning during the COVID19 pandemic has affected students' creative and effective thinking skills, especially initial thinking skills and complex thinking skills compared to learning without the PBL model.
Mufida, Sinaga, & Samsudin (2021) [62]	The purpose of this study was to evaluate and identify the problem solving achievements of high school students on business and energy materials during distance learning during the covid 19 pandemic.	• The quantitative method used is pre-experimental with a one-shot case study design.	The conclusion of this study is that overall, students' proficiency in solving physics problems on the topic of work and energy is moderate.
Puspitasari, Mufit, & Asrizal (2021) [52]	The purpose of this study was to determine students' understanding of the concept of motion in physics and to know the	• This is a descriptive research using a survey in the form of a test instrument	The results showed that 36% of students experienced misconceptions, 34% of students did not understand the concept and only 30% of students

	learning process during the Covid-19 pandemic		understood the concept of motion, this happened because students were less active during the online learning process, and the model used was not appropriate.
Ramli, Sunaryo, & Serevina (2019) [55]	The aim is to develop physics learning materials in the form of web-based static fluid ebooks and dynamic fluids with a problem based learning approach for student learning.	• The research method used is Research and Development (R&D) research. • With the ADDIE development model	The result of this research is the use of static and dynamic fluid e-books based on problem based learning effectively contributes to increasing the average ability of students in solving physics problems .
Sani, Sukarmin, & Suharno (2021) [58]	The purpose of this study was to identify and analyze the needs of teachers in developing Physics material in the form of electronic modules based on local wisdom to build critical thinking skills in online learning during the COVID19 pandemic.	• The research used is descriptive research • Data collection techniques using questionnaires and interviews	The results of this study are that teachers need to develop electronic module materials based on information research of the type of local intelligence to strengthen critical thinking skills and student character values during the COVID19 pandemic.
Sudarsana, Sarwanto, & Marzuki (2022) [59]	This study aims to determine the need for learning physics due to the covid19 pandemic.	• This type of research is a preliminary study with a descriptive approach • The instrument used is a questionnaire	This study shows that several learning components that affect the resolution of learning problems during the COVID19 pandemic, namely the evolution of technology, learning models and learning materials.
Sudarwanto, Serevina, Nugroho, & Lipikuni (2019) [56]	Aims to develop online learning resources on accelerated linear motion material with the Problem Based Learning model in the covid 19 pandemic	• This type of research is education research and development with the ADDIE model	The result of the research is an online learning resource on accelerated linear motion using the PBL model. Learning resources that were developed and tested for validity were lesson plans, worksheets, and handouts. It can be concluded that the online resources developed are suitable for learning physics in state vocational schools during the COVID-19 pandemic with the PBL model.
Yurniwati & Utomo (2020) [46]	Aims to design a PBL Learning Model to improve critical thinking skills in geometry.	• The research used is Literature Study	From this study, the results show that Flipped Classroom -based PBL learning improves students' higher-order thinking skills and is suitable for use during the Covid19 pandemic.
Hidaayatullaah, Dwikoranto, Suprapto,	Aims to determine the effect of the application of the PBL model on momentum and impulse	• Research Experimental design • One group pretest-posttest paradigm	The results of this study indicate that the experimental group and the replication have an effect after the PBL model is applied.

Mubarok, & Wulandari (2020) [54]	materials		However, it has increased differently, the reason is that the intelligence of students who definitely have differences and the activities carried out by students are different during the learning process
Jatmiko et al (2021) [63]	Aims to profile research trends in the online physics learning process during the COVID19 pandemic.	• The research method uses Bibliometric analysis	The result of this research is online learning has been proven effective in improving students ' performance in physics.
Rahmawati, Jumadi, & Astuti (2020) [64]	Aims to observe the effectiveness of e-handout assisted by Phet simulation on collision and impulse materials to train students' conceptual understanding	• Using the ADDIE Development model	From the results of the validation and the existing criteria, the e-handout is feasible to be used in the learning process which can train students to increase their understanding of the concept of momentum and impulse.
Musna,Juandi, & Jupri (2021) [47]	Aims to analyze the effect of problem-based learning (PBL) on students' mathematical problem solving abilities.	• The method used is a systematic review of search results in electronic journals	The result of this research is that the magnitude of the effect of the application of the PBL model on the problem-solving ability between study groups does not differ according to the characteristics of education level, class, number of samples and academic year.
Misbah et al (2021) [65]	Aims to prove the effectiveness of physics e-modules as teaching materials during the COVID-19 pandemic	• Descriptive method with normalized gain	The results of the study stated that e-modules are effective in improving student learning outcomes, practical as student teaching materials . So e-modules are effectively used as teaching materials during the covid 19 pandemic. Even if there are some small obstacles that occur, such as the availability of the internet.
Serevina & Khofiya (2021) [66]	This study aims to develop online problem-solving -based learning tools for effective blood circulation materials during the COVID-19 pandemic .	• ADDIE research method	The conclusion of this study is that a question-based online learning tool for circular motion material can facilitate the online teaching and learning process of the Covid19 pandemic for students and teachers. This media has been tested by professionals and physics teachers, is easy to interpret and is suitable for use as learning media in schools.
Melinda, Hariyono, Erman, & Prahani	The goal is to analyze the initial level of student scientific literacy during physics learning during	• This research design is pre-experimental	The results of this study are the literacy profile of students in physics subjects during the pandemic is in the low category,

(2021) [67]	the COVID-19 pandemic		namely 28.38 %. Or be at level 2.
Hasan, Mursalin, & Odja (2021) [68]	To find out students' problem solving abilities on physics concepts with blended learning during the covid 19 period	• Mixed method with explanatory sequential strategy.	problem solving ability of physics concepts on light material is in the low category. The low problem-solving ability of students for physics concepts needs to be improved in the application of student learning in online learning during the Covid19 pandemic, including the internet and student independence in completing assignments and concepts of physics problems.
Parno, Yuliati, & Hermanto (2020) [69]	To compare the improvement of students' scientific literacy skills from PBL STEM to optics.	• Quasi-experimental design nonequivalent group design	From the research conducted, the class is divided into 3, namely the PBL STEM model, PBL, and the control class. The PBL STEM model resulted in the highest increase in students' scientific literacy, and the PBL model was moderate, and the lowest increase in scientific literacy was in the control class with the conventional model.
Heryani, Sinaga, & Chandra (2021) [70]	The purpose of the study was to analyze students' mastery of concepts in Energy material during distance learning during the COVID-19 pandemic	• Quantitative Descriptive Method	In the study, it was found that the mastery of students' concepts on energy material was in the sufficient category. This was due to differences in learning styles between students, learning strategies and learning models that were less relevant.
Bektiarso, Dewi, & Subiki (2021) [49]	To test the effectiveness of problem-based learning with 3D thinking maps on creative thinking skills and physics learning outcomes	• True Experimental Method with Posttest Only Control Design	From the research it was concluded that there was a significant increase in critical thinking skills in the application of problem-based learning models with 3D thinking maps
Saputra, Jumadi, & Wilujeng (2020) [48]	To find out whether the use of phet simulation pad Smartphone with PBL model is effective on student independence and the effect of independence in learning	• Quasi Experiment • Research design Non-Equivalent Control Group Design	The results showed that the problem-based learning model based on PhET was effective in achieving learning independence in physics lessons for class X MAN 3 Sleman students.
Herliana, Astra, Supriyati, Mazlina, & Musdar (2020) [71]	To test the difference in physics learning outcomes at Depok Senior High School based on gender differences after the application of the blended problem based learning model	• Ex Post Facto Research	The results showed that the learning outcomes of high school students after using the mixed problem based learning learning model did not show any gender differences. This shows that this learning model is suitable for high school students in physics class.

Gebze, Jumadi, & Perwati (2020) [72]	To find out the improvement of problem solving in physics material after it is applied using Android-based learning media	• The research design is one group pretest-posttest and includes a pre-experimental study.	From the research, the results showed that the students' problem-solving abilities were in the low and medium Ngain categories. This is due to the lack of time for the learning process.
Putranta, Kuswanto,Hajaroh, Dwiningrum, & Rukiyati (2021) [51]	Aims to explore the strategy of physics teachers in carrying out traditional game-based learning in high school during the Covid-19 pandemic.	• Using Analytical Reduction research	In the research, it was found that traditional games such as stilt grobak sodor, bekelan, etc. can use PBL, Inquiry, and PjBL models with the help of media such as whatsapp, zoom etc. This has become a way of learning physics based on traditional games during the COVID-19 pandemic.
Erlangga, Nadhiroh, & Wingsih (2020) [57]	Analyzing the effect of worksheets in the form of questions on problem-based learning (PBL) through Google classroom during the Covid19 pandemic to improve students' critical thinking skills during the pandemic.	• Conventional Method, Pretest and Posttest	The results of the research conducted indicate that The average score of critical thinking skills in the experimental class is higher than in the control class. because of that, The use of LKS with PBL using Google Classroom is said to have an effect on students' critical thinking skills.
Nurjamilah, Rokhmat, Sahidu, Harjono, & Hikmawati (2021) [44]	To test the effect of the causative model on students' reasoning abilities and creativity during the Covid 19 pandemic	• This type of research uses a quasi-u research with a 2x2 . factorial design • Purposive Technique	In this study, the causal learning model affects reasoning skills in physics learning more than conventional learning models during the Covid-19 pandemic.
Zaki, Sinaga, & Kaniawati (2021) [45]	Aims to find out the comparison of student learning outcomes after carrying out physics learning activities through e-learning during the covid 19 period	• Types of Qualitative Descriptive Research • Comparative Method	The results of research from 3 high school schools that have studied with e-learning during the COVID-19 pandemic, but students face many obstacles when using e-learning. Learning outcomes data also shows that the use of e-learning makes student learning outcomes decline.
Abtokhi, Jatmiko, & Wasis (2021) [73]	The purpose of this study is to analyze the basics of learning physics with a self-regulated approach to problem-solving abilities during a pandemic with an online system	• Types of quantitative research • Using pretest posttest	The results showed that the self-regulated approach had been implemented well, but it was not optimal in improving students' problem-solving abilities in physics lessons.
Azura, Jatmiko, Ibrahim, Hariyono, &	To scientifically analyze the basic Science Literacy skills of high school students about the kinetic	• Pre-experimental research method.	The results showed that the ability of high school students was very low, many students did not master reading comprehension skills in

Prahani (2021) [43]	theory of gases.		Physics
Sutrisno, Simaremare, Suyudi, Taqwa, & Parno (2021) [74]	to improve students' understanding in practice and the quality of learning during the COVID-19 pandemic.	• The type of research is classroom action research	Based on the research that has been done that the learning of modern physics experiments is good, and there is an increase in students' understanding of practice. To be more effective , this online learning method is recommended to use modern physics experiment videos as an alternative to other physics experiments.