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Analysis of the Application of Blended Learning Models in Physics Learning During the COVID-19 Pandemic

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ABSTRACT

This research was carried out to analyze physics learning using a blended learning model during the COVID-19 pandemic in Indonesia. The method used in this study is the literature study method. A literature study is a type of research used in collecting data and information by collecting and reviewing various references. This study examined as many as 30 journals and articles both nationally and internationally that are valid and accountable. The journals and articles used are published in 2018-2022. Researchers collect data and proceed to the stage of concluding the results of qualitative research. Based on the results of studies and analyses that have been carried out, it can be concluded that: (1) The application of the blended learning model to physics learning is declared valid, practical, and effective as an alternative to learning during the COVID-19 pandemic, (2) The blended learning model can improve students' critical thinking skills and creative thinking abilities, (3) Students tend to ignore academic and social aspects.

INTRODUCTION

In mid-2020 after the COVID-19 pandemic that hit the territory of Indonesia, provincial governments and local governments produced policies in the world of education to temporarily eliminate face-to-face learning and replaced it with online learning to reduce the number of COVID-19 sufferers. The pandemic crisis not only attacked the human respiratory organs (Widiawati et al., 2021), but also stopped the organs of the education and learning system that were held normally through face-to-face learning in schools (Mansyur, 2020). The implementation of all activities outside the home and offices (Spagnuolo et al., 2020), including schools being temporarily closed is an effort by the government to prevent the spread of the virus (Yezli & Khan, 2020). The aftermath of the ongoing pandemic (Sulistyawan, 2021) forced students to learn from home (Hakim & Azis, 2021).

Several learning models were piloted during the pandemic for the sake of educational programs to continue to be carried out (Napaswati, 2020). One of the learning models that can be applied during the COVID-19 pandemic is the blended learning model (Mali & Lim, 2021). The transition period of online learning turning into blended learning takes time to adjust (J. E. Putri, 2021). Blended learning is a learning activity that combines face-to-face and online activities (Yuliati & Saputra, 2020). Basically, blended learning is a collaboration of the advantages of face-to-face and virtual learning (Hapudin, 2019).

This learning model is claimed to combine different ways of delivery, teaching methods and learning styles (Ekayati, 2018) as well as cohesiveness that makes communication open (Zahid & Adi, 2019) and access to information unlimited (Purnama, 2020). Through the application of blended learning, it is hoped that learning activities will be more interesting (Soni et al., 2018) and provide widespread

opportunities to develop their competencies (Supriyati et al., 2020) and access various kinds of information needed to understand teaching materials (Nursiddieq et al., 2022), especially physics materials.

According to (Anthony et al., 2019) there is a discrepancy between blended learning models in physics learning. In addition, physics has a high level of difficulty (Doyan, Saputra, et al., 2022) so that to master it requires more effort (Herlina et al., 2022). In physics learning, direct experience is needed to observe physical phenomena that occur (Wati & Sudarma, 2020) so that students better understand the concepts taught (Yunita et al., 2021). The learning requirements of students are still considered relatively low (Telembanua et al., 2022), so new innovations are needed that are more effective in learning (Tsaniyah et al., 2019; Nana, 2018), especially in the study of physics subjects. However, the blended learning model trains students to be accustomed to finding critical solutions directly (Anggraeni et al., 2019) and using media (Hasan et al., 2021), and maximizing learning processes and services online, offline (outside the network) (Kusyanti, 2022), conventional, media, even computer-based (Rosita et al., 2020) to produce effective, efficient and flexible learning (Suma et al., 2020).

Based on the above background, this research was conducted to analyze physics learning using a blended learning model during the COVID-19 pandemic.

RESEARCH METHOD

The method used in this study is literature study. A literature study is a type of research used in data and information collection by collecting and reviewing various references (Puspitasari, 2019), references and relevant research results to obtain answers and basic philosophical goals regarding the problems to be studied (Saprudin et al., 2021). This study examined as many as 30 journals and articles both nationally and internationally that are valid and accountable. The journals and articles used are published in 2018-2022. Researchers collect data and continue the stage of concluding qualitative research results (Nirmala & Dodik, 2020). The flow of research methods in the literature study is shown in **Figure 1.**

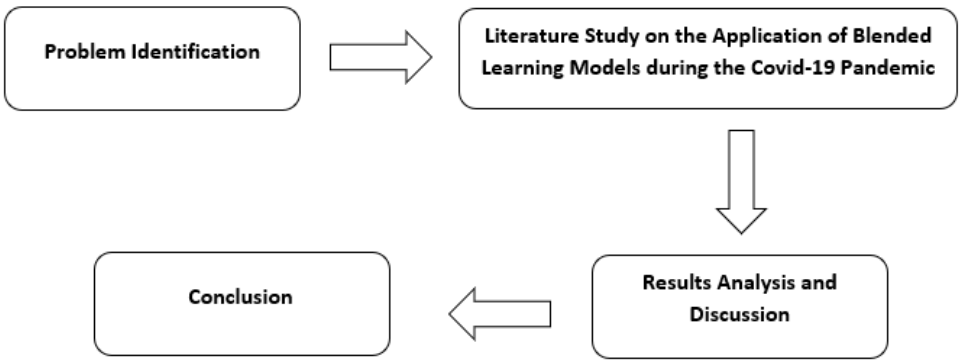

Figure 1. Research Flow

Figure 1. The first stage of this study identified a problem related to education, then in the second stage researchers reviewed as many as 30 national and international journals and articles related to the application of blended learning to physics learning during the COVID-19 pandemic published in the 2018-2022 period. In the third stage, the researcher conducts the analysis stage after reviewing the relevant articles and then a discussion is carried out related to the findings obtained. In the fourth stage, the

researcher designs conclusions based on the results and analysis that has been carried out by reviewing the relevant journals.

RESULTS AND DISCUSSION

In the beginning, the term blended learning was known as the concept of learning hybrid which collaborated face-to-face, online and offline learning (Listiana & Jaharadak, 2019). Blended means mixture or combination while learning is learning (Dwiyogo, 2018). Blended learning is an alternative to the disadvantages of online learning because it combines online, offline and face-to-face learning (Faraniza, 2021).

Figure 2. Blended Learning in Classroom

Figure 3. Blended Learning by Virtual Learning

The implementation of blended learning generally has a 50/50 pattern, with a time allocation of 50% face-to-face 50% online learning (Adri et al., 2021). The application of the time division pattern is flexible following the analysis of competencies needed, subject objectives, characteristics of learners, characteristics and learning abilities and available resources (Dakhi et al., 2020). **Figure 2.** Featuring the implementation of blended learning models in the classroom during physics learning. Students are asked to take part in blended learning by applying a 50/50 ratio pattern, 50% follow face-to-face learning at school and 50% follow distance learning online. **Figure 3**. Featuring teachers who carry out blended learning in two directions by teaching students face-to-face and through virtual learning simultaneously. Students who take part in learning

from home follow the learning by relying on teachers who provide material in class along with students who do face-to-face learning.

Teachers as facilitators in distance learning in blended learning provide material through online media that can be accessed by students via the internet. Based on the blended learning component which includes (1) Online learning, (2) Face-to-face learning, (3) Independent learning, teachers will teach by adjusting to conditions during the pandemic by following the regulated learning components (Karma et al., 2021).

1. Blended Learning Model Concept
   Referring to the opinion of Kusyanti (2022) there are models in blended learning that can be used according to teaching conditions, namely student conditions or environmental conditions including:
   a. Rotation Model
      The rotation model is a model of face-to-face and online learning carried out alternately according to the schedule. There are 3 types of rotation models, namely:
      1. Station rotation model
         There are several places or stops (stations) that students can occupy in turn. Where one of the stops is online learning.
      2. Lab rotation model
         Learners are organized to move from one room to another. One room for online (computer lab) and the other room for face-to-face learning.
      3. Flipped classroom model
         This model is also called reverse learning. Before students start face-to-face learning at school, students do online learning at home by studying the material and discussing it. When face-to-face learning in schools focuses on problem-solving.
      4. Individual rotation model
         Learners get a schedule that has been adjusted to the individual for self-study. Learners only spin into activities scheduled on the learner's playlist.
   b. Flex model
      It is a learning activity that is carried out online but face-to-face learning can be done in tutorials and groups for students who need it.
   c. Self-blend model
      It is online learning where only a small part of the learning only acts as a compliment.
   d. Enriched virtual model
      It is an online learning and occasionally learning is carried out face-to-face as needed.
2. Characteristic Blended Learning Model
   According to Nurhadi, (2020) the characteristics of the blended learning model are (1) Students have the opportunity to interact socially and negotiate (2) Students have enough time and feedback (3) Students are guided to attend the learning process attentively (4) Students work in an ideal atmosphere, namely stress levels or low anxiety. Blended learning has some characteristics. According to (Setyoko & Indriaty, 2018) the main characteristics of blended learning include (1) Learning activities combine various models and concepts as well as learning media, (2) Collaboration between online learning and face-to-face learning (3) Learning is supported by the way of delivery and learning style n effective (4) Teachers as

facilitators while parents as motivators in their children's learning (Tijap et al., 2022).

3. Advantages of Blended Learning Models During the COVID-19 Pandemic
   According to Putri et al., (2021) the perception of students is very diverse and gets a positive support from all aspects/parties about the perception of students towards blended learning in physics subjects. The learning model applied makes students receive the material presented in a more relaxed, flexible, concise, practical, and efficient manner (Susila et al., 2021). The internet plays an important role in implementing blended learning models during the pandemic that have advantages for students including; (1) Students interact directly with the learning content, (2) Opportunities to discuss with friends (3) Access to e-libraries and virtual classes, (4) Assessment of online learning activities, (5) Virtual laboratories.

   In addition, the application of this model makes parents of students freer to supervise the activities of their children in receiving materials. Parents of students will adapt to technology, especially in supervising children's learning activities online so that the 5.0 era will be accepted faster with the collaboration of children and parents who are more tech-savvy (Doyan, Susilawati, et al., 2022). Students become more innovative and creative in completing the tasks given in the most comfortable as possible without formal learning regulations (Marisda & Ma'Ruf, 2021).
4. Weaknesses of Blended Learning Models During the COVID-19 Pandemic
   The blended learning model has several disadvantages in addition to its advantages when applied during the COVID-19 pandemic including; (1) Teaching and learning activities will tend to train (Hamka & Effendi, 2019), (2) Students will experience a phase of ignoring academic and social aspects (3) Student learning motivation decreases, (4) Lack of interaction between teachers and students to slow down the value of learning (5) Online learning facilities are inadequate and teachers are required to immediately master online learning techniques (Dewi Muliani & Citra Wibawa, 2022).

CONCLUSIONS

Based on the results of studies and analyses that have been carried out, it can be concluded that: (1) The application of model blended learning in physics learning is declared valid, practical, and effective as an alternative to learning during the COVID-19 pandemic, (2) The blended learning model can improve students' critical thinking ability and creative thinking ability, (3) Students tend to ignore academic and social aspects.

The implications for future research in learning by applying a blended learning model can utilize learning media that can be obtained online or create media that is easy to make at home by students to support the implementation of conducive, active, innovative and creative learning to improve students' critical thinking and creative thinking skills, especially in physics learning. The limitations of this study include blended learning models in physics learning during the COVID-19 pandemic. For further research, researchers are expected to be able to conduct extensive research related to the application of blended learning models in science learning so that research results become more optimal and general.

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APPENDIX

Table 1. ***Literature Review Related to the Application of Blended Learning Models During the COVID-19 Pandemic***

No	Author	Purpose	Result
1	(Bada & Jita, 2022)	Investigating the effect of blended learning on compulsory courses, Classroom Testing, in nigerian Teacher Education Curriculum.	The application of blended learning can minimize learning disorders and also improve teacher achievement in course class testing.
2	(Bahtiar, 2021)	Explain the validity, practicality, and effectiveness of blended learning models in improving critical thinking skills.	Blended learning models are valid, practical, and effective as an alternative solution to improve students' critical thinking skills.
3	(Bahtiar & Ibrahim, 2022)	Describes the ability to think creatively and the level of creativity of students using blended learning models in learning.	The implementation of the blended learning model can be an appropriate alternative for teachers to carry out the teaching process during the COVID-19 pandemic.
4	(Doyan, Susilawati, et al., 2022)	Identify effectiveness with blended learning models on quantum physics learning tools to improve students' critical and generic science thinking skills.	The implementation of blended learning models in quantum physics learning is effective in improving students' critical and generic science thinking skills.
5	(Nesi & Purwaningsih, 2021)	Analyze the activities and differences in student physics learning achievement while using generative learning models with demonstration methods and conventional models.	It was shown that student activity in the experimental class was better than in the control class and there were differences in student learning achievement using a generative learning model with a demonstration method and using a convention model.

No	Author	Purpose	Result
6	(Fauza et al., 2020)	Identifying difficulty factors in distance physics learning during the COVID-19 pandemic using blended learning.	The difficulty of learning online comes from the internet network that is not smooth and student assignment bills as well as communication difficulties and misconceptions.
7	(López-Fernández et al., 2021)	Reviewing the perceptions of high school physics education teachers about the potential, advantages, and disadvantages of blended learning models.	Through assessment, it is known that there is an excessive workload, worsening social relationships, and not helping to increase student motivation in the application of blended learning.
8	(Hamka & Effendi, 2019)	Develop learning media on an Edmodo-based blended learning model on basic physics materials.	Edmodo-based blended learning media is declared feasible and can be used as a learning medium to convey basic physics material.
9	(Ihsan & Jannah, 2021)	Develop valid, practical, and effective interactive media to improve students' science literacy during the COVID-19 pandemic.	The interactive media developed has valid, practical, and effective criteria to improve students' science literacy during the COVID-19 pandemic.
10	(Dewi Muliani & Citra Wibawa, 2022)	Investigating differences in science learning outcomes between groups of students using video-aided guided inquiry learning models and groups of students who used conventional learning in students during blended learning-based learning.	There were significant differences in science learning outcomes between groups of students who were taught using a video-assisted guided inquiry learning model and groups of students who were taught using conventional blended learning-based learning.

No	Author	Purpose	Result
11	(Karma et al., 2021)	Obtaining alternatives to support learning as well as innovations and solutions related to learning during the COVID-19 pandemic.	Blended learning is applied, with various adjustments then overcome by compiling teaching materials in the form of problem-based, text-based, video, or multimedia practice guides equipped with active interactive communication channels as support.
12	(Kua et al., 2022)	Improving Edmodo-based blended virtual learning by solving problems in the Basic Physics course and describing the effectiveness of products based on trial data analysis.	The improvement of Edmodo-based virtual blended learning with problem-solving is good to be applied to the Basic Physics course.
13	(Lestari et al., 2021)	Analyzing the suitability of blended learning models as an alternative to help students in solving physics problems.	The blended learning model is used as an alternative to help students in solving problems and difficulties in understanding and applying physical concepts in learning physics.
14	(Marisda & Ma'Ruf, 2021)	Reviewing the situation of online physics learning during the COVID-19 pandemic.	Explaining the physics learning process that is not conducive and difficulties in understanding physics materials during the COVID-19 pandemic outbreak.
15	(Mustafidah & Azizah, 2022)	Developing blended learning-oriented LKS media to train students' metacognitive skills during the COVID-19 pandemic.	Using LKS based on blended learning models during the COVID-19 pandemic is declared very valid, practical, and effectively applied in physics lessons.

No	Author	Purpose	Result
16	(Najib & Jatmiko, 2022)	Explaining the level of effectiveness of physics learning based on blended learning models using the Edmodo application in improving the critical thinking ability of high school students.	The use of the Edmodo application with a blended learning model using an effective increase in students' critical thinking skills can be used as an alternative learning model that can be used to improve students' critical thinking skills.
17	(R. Puspitasari et al., 2021)	Knowing the understanding of the concept of the student movement and learning conditions at one of the State High Schools in Padang Pariaman Indonesia during blended learning.	The results showed that the majority of students experienced misconceptions due to students not being actively involved in learning during blended learning.
18	(R. K. Putri et al., 2021)	Describes the perception of students in the blended learning model of Physics subjects, especially during the COVID-19 pandemic.	The perceptions of students are very diverse and get positive support from all aspects/parties about students' perceptions of Blended Learning learning in Physics subjects.
19	(Riyan Rizaldi et al., 2021)	Describe student physics learning outcomes using a blended learning model.	It is known that the group taught with the blended learning model argues that the use of the blended model can be used to adjust students during the transition period to the new normal.
20	(Saputri & Purwanto, 2021)	Describes the influence of google classroom-assisted blended learning on student physics learning outcomes at MAN 3 Medan.	The google classroom-assisted blended learning model significantly shows an influence on the physics learning outcomes of the majority of students in MAN 3 Medan.

No	Author	Purpose	Result
21	(Sefriani et al., 2021)	Analyze the effectiveness of the Edmodo application-based blended learning model during the COVID-19 pandemic as a virtual learning solution.	The results showed that the Edmodo-based blended learning model during the COVID-19 pandemic was effective and could be used as a virtual learning solution.
22	(Serevina & Raida, 2021)	Developing online learning resources as an alternative to learning during the COVID-19 pandemic using websites and parabolic movement materials modeled POE2WE.	The use of the website and parabolic motion materials of the POE2WE model as an alternative learning resource during the COVID-19 pandemic is effective in increasing students' understanding of parabolic motion.
23	(Setyoko & Indriaty, 2018)	Investigating the effect of applying the blended learning model on improving the learning outcomes of physics education students during the pandemic.	There is a significant influence of the use of a Google Classroom-based blended learning model on improving the learning outcomes of the majority of students.
24	(Sriwati et al., 2021)	Knowing the application of blended learning to mechanical wave material and its supporting and inhibiting factors during the COVID-19 pandemic.	Through various evaluations, it was shown that the physics blended learning program at SMA Negeri 1 Timpah supports government policies in responding to the COVID-19 outbreak by learning from home, which is relevant to the supporting factors and obstacles.
25	(Suana, Raviany, et al., 2019)	Explaining the influence of the application of the Whatsapp-based blended learning model on students' critical thinking and problem-solving skills.	The application of the Whatsapp application in a blended learning format affects the improvement of students' critical thinking skills and problem-solving skills.

No	Author	Purpose	Result
26	(Suana, Istiana, et al., 2019)	Investigating the effect of the application of blended learning on static electricity materials on students' critical thinking ability.	The results of the application of the blended learning model are characterized by a significant difference in the average value of N-gain between the experimental class and the control class with the N-gain value in the experimental class higher.
27	(Suryani et al., 2021)	Identify the effectiveness of google classroom-assisted scaffolding-based blended learning strategies in improving student learning outcomes and self-efficacy.	Based on indicators of improving student learning outcomes, high student self-efficacy, and positive student responses, scaffolding-based blended learning strategies assisted by Google Classroom are effective in improving student learning outcomes with n-gain and effect size in the moderate category.
28	(Susila et al., 2021)	Identifying website development as a learning aid medium for blended learning models of rotation dynamics in high schools during the COVID-19 pandemic.	Through the results of the feasibility test, the website as a learning aid medium for the blended learning model of rotational motion material in high school was declared feasible to practice 4C skills.
29	(Tijap et al., 2022)	Investigate the needs, challenges, and practices of Filipino science teachers in the New Normal era.	The blended learning model is assisted by platforms and skill-based online modules as a strategy for overcoming the learning challenges of the New Normal era.

No	Author	Purpose	Result
30	(Widyasari & Rafsanjani, 2021)	Investigating the influence of the application of synchronous and asynchronous-based blended learning as an effort to increase motivation and learning outcomes of students of SMAN 1 Puri Mojokerto in distance learning.	The application of synchronous and asynchronous-based blended learning models in distance learning increases the motivation and learning outcomes of students' physics so that they have increased.