



Jurnal Pendidikan Fisika

<https://journal.unismuh.ac.id/index.php/jpf>

DOI: 10.26618/jpf.v11i1.8105



Flipped Classroom: Its Implementation and Impact in Science Learning (A Case Study During the Covid-19 Pandemic)

Eka Supriasih¹⁾, Apit Fathurohman²⁾, Ida Sriyanti³⁾

^{1),2),3)}Masters Program in Physics Education FKIP, Sriwijaya University, South Sumatera, 30128, Indonesia

*Corresponding author: supriasiheka@gmail.com

Received: June 24, 2022; Accepted: January 02, 2023; Published: January 31, 2023

Abstract – Flipped classroom is a sort of blended learning in which students learn both synchronously and asynchronously. Synchronous learning has taken place in the classroom in real time. Learners gather feedback while communicating with teachers and classmates at the same time. This review expects to figure out how is the execution and effect of Flipped Classroom in Science Learning (Contextual analysis During the Covid-19 Pandemic) of Class VIII at SMPN 3 Rantau Bayur. This study used a case study as an approach in exploring qualitative data. This examination is a distinct subjective exploration as a contextual analysis with information assortment methods as polls and meetings. The results of this review demonstrate that the execution and effect of flipped classroom in science learning during the Covid-19 pandemic is positive, particularly for class VIII students in science subjects at SMPN 3 Rantau Bayur with a typical rate gain of 76.7% or the category of 'very good'. Through the flipped classroom, students have the opportunity to concentrate on the topic at home as they are free to set their learning time. Students become familiar with the topic in an enjoyable situation. Students can repeat the learning videos and they are able to access them from anywhere. Besides, parents can participate in learning activities outside the classroom and make time to help their children learn. However, one of the drawbacks is the lack of devices to watch videos given by the teacher as not all students have computers, laptops, or smartphones. Also, the teachers still find difficulties in preparing good quality videos as learning media for students.

Keywords: covid-19 pandemic; flipped classroom; impact; implementation; limited face-to-face learning

© 2023 Physics Education Department, Universitas Muhammadiyah Makassar, Indonesia.

I. INTRODUCTION

The Indonesian government has undertaken a number of policies in an attempt to combat the rise in COVID-19 cases. In minimizing the spread of the virus, the Indonesian government applied new policy, namely work and school from home, or what

is usually called distance learning (Zamani & Nurcahyo, 2016). This was conducted to ensure that learning continued in the midst of the pandemic where social distancing had been implemented throughout the nation (Sari et al., 2022; Divjak et al., 2022).

During the Covid-19 pandemic, some community groups were refused entry to education as a result of these restrictions. The Ministry of Education, Culture, Sports, and Technology and Science has developed policies for virus prevention in the educational environment, which are stated in many circulations. The Emergency Policy of the Corona Virus Disease on Education-19 Outbreak (Circular Number 4 of 2020) and Prevention in Education Units (Circular Number 3 of 2020) (Arifa, 2020). The Ministry of Education and Culture has released a variety of policies in the form of circulars, including directions for education actors to cooperate on remote learning activities (Sun et al., 2020). Almost all countries in the world carried out distance learning activities at the same time during the COVID-19 pandemic (Goldschmidt, 2020).

Educators must adjust to the new style of working — face-to-face learning which is now made easily. As a result of the Ministry of Education and Culture's Circular, leaders of higher education institutions/schools are required to make decisions or regulations about learning from home (Indrajit, 2020).

Online learning, in general, causes a number of problems, including limited internet network connection, teachers preparation, and methods to present the learning to students (Lie et al., 2020). Also, teachers' ability to use information and technology in learning activities is still inadequate (Fedorov & Levitskaya, 2022).

With this policy, face-to-face learning in schools must be stopped. Instead, the teaching and learning process is recommended to be carried out from home through online learning. Online learning is expected to help overcome problems that occur during pandemic times, especially in the field of education (Mustapa et al., 2022). Online learning is a learning solution during the covid-19 pandemic because online learning has many advantages, for example, learners can follow learning anywhere. The online learning system is able to make it easier for students and educators to access learning without having to come face to face especially during the Corona Virus Disease - 2019 (COVID-19) pandemic like now. Where social restrictions are applied on a large scale in the context of breaking the chain of the spread of COVID-19 which requires all levels of education to carry out the learning process online (Nirwana et al., 2021).

As a consequence, the government issued regulations governing limited face-to-face learning, which differs from regular face-to-face learning in several ways, one of which is the period of time educators and students spent together. Because the use of good and appropriate learning methods can increase learning outcomes, learning must be specifically constructed using adequate learning techniques so that limited face-to-face learning can be carried out effectively and learning objectives can be achieved (Pertiwi, 2019; Suhardi et al., 2015).

Following up on the Regent's circular, SMPN 3 Rantau Bayur aims to provide effective and efficient Limited Face-to-Face Learning programs to students. However, it cannot be used in the same way as normal traditional classes. One of the ways SMP Negeri 3 Rantau Bayur implements blended learning is by limiting the number of students and scheduling lessons alternatively. Blended students combine students' learning activities at home with face-to-face learning activities for students at school. One learning method using blended learning is the flipped classroom, that is in high demand and is used by educators in schools. An inverted class, also called as a flipped classroom, is a learning model that includes activities both within and outside the classroom (Kazu & Kurtoglu, 2020).

Flipped classroom is a sort of blended learning in which students learn both synchronously and asynchronously. Synchronous learning has taken place in the classroom in real time. Learners gather feedback while communicating with teachers and classmates at the same time (Ozdamli & Asiksoy, 2016). Asynchronous learning is more independent than synchronous learning. In its implementation, digital media content were stored on digital platforms and accessed via agreed media. Students can study whenever they want, ask questions in the comments sections, and communicate their opinions or understanding of a subject with the teacher or their classmates. Meanwhile, they

will not receive feedback at same time (Usmadi & Ergusni, 2019).

The flipped classroom is a teaching approach in which students will be given a various learning materials to use prior to learning (Djalante et al., 2020). This strategy helps to stimulate students to come to class with an open mind and a willingness to participate in the discussion. The flipped classroom is a teaching method in which students learn ideas on their own and then apply these theories in the classroom. Some teachers may disagree with the reversed classroom model's efficiency in preparing pupils for face-to-face sessions. Students will be better at learning well in a tough environment if they begin with some knowledge and skills (Sinaga, 2018).

In traditional learning, students get material from teachers in class by lectures, group discussions, reading comprehension, and observations, after which the teacher gives homework to be completed at home as a means of reinforcing the material. Students in the flipped classroom learn the subject matter at home by reviewing learning videos, summarizing, highlighting important points, creating questions to debate with peers, and reading several sources about the topic needed, then completing tasks as a form of learning, in the classroom, improving the subject matter (Bergmann & Sams, 2012). Students not only complete assignments in class, but also interact with their classmates and listen to explanation of concepts that they've never understood.

Several past research had revealed that by the use of flipped classroom learning model as an alternative using a limited face-to-face learning model can improve the efficiency of limited face-to-face learning (Supriatna, 2021). Teachers can employ the flipped classroom as an alternative learning model to produce effective and interactive learning activities in the classroom, resulting in learning results that meet the expected goals (Yanah et al., 2018).

Based on the description above, the researcher are interested to conduct research on Flipped Classroom: implementation and impact in learning Science (Case Study During the Covid-19 Pandemic) Class VIII at SMP Negeri 3 Rantau Bayur. The formulation of the problem in this study is to describe the implementation and impact of flipped classrooms in Science Learning (Case Study During the Covid-19 Pandemic) especially in Class VIII at SMP Negeri 3 Rantau Bayur.

II. METHODS

In this study, the researcher used a case study as an approach in exploring qualitative data. This study was held in the odd semester of the 2021/2022 academic year, with 21 active students of class VIII SMPN 3 Rantau Bayur as the research subjects. Survey, interview, and focus group discussion were used to collect data. Survey form was adopted from the previous research. The survey questions on Google Form media were then sent to students via WhatsApp Groups. The

interview was conducted with with class VIII students, and focus group discussions with science teachers were also used to complete the data. This is a type of research that does not require knowledge of the research subject as the respondent under investigation, indicating that the collected information is based on the current conditions and facts (Patandean & Indrajit, 2021).

The survey consisted of 25 statements. This survey is used to evaluate student responses to science learning in a flipped classroom setting. For each given assertion, students place a check mark (√) in the right column. There are four different answer choices for every statement in the questionnaire, as follows:

Table 1. Scores of answer choices of the questionnaire

Answers Category	Score
Strongly Agree (SS)	4
Agree (S)	3
Don't Agree (TS)	2
Strongly Disagree (STS)	1

(Sugiyono, 2014)

The following percentage calculation will be used to analyze the results of the questionnaire data obtained from the students (respondents):

$$\text{Percentage} = \frac{\text{Total Score}}{\text{Maximum Score}} \times 100\%$$

(Sugiyono, 2014)

$$\text{Criteria score} = \frac{\text{number of respondents} \times \text{scale value}}{\text{scale value}}$$

With the a highest score of 4 and a total of 21 students (respondents), the formula is used:

Table 2. Respondents Criteria Score

Formula	Scale
$1 \times 21 = 21$	Not Good (KB)
$2 \times 21 = 42$	Enough Good (CB)
$3 \times 21 = 63$	Good (B)
$4 \times 21 = 84$	Very Good (SB)

(Sugiyono, 2014)

The below are the scores which were generated and are included in rating scale (Sugiyono, 2014).

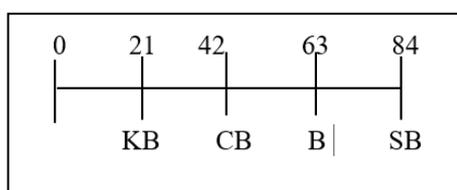


Figure 1. Graph of the Rating Scale Score obtained

If indeed the following conditions have been met:

Table 3. Final Rating Scale Criteria

Rate Answer	Scale
0-20	Not Good
21-41	Enough Good
42-62	Good
63-84	Very Good

(Sugiyono, 2014)

III. RESULTS AND DISCUSSION

Limited face-to-face learning was adopted at SMPN 3 Rantau Bayur as a method of implementation of the Banyuasin Regent's Circular to prevent COVID-19 spread. The Limited Face-to-Face Learning is implemented by assigning students in odd and

even groups based on attendance, so that each class includes students in odd groups and students in even groups. The odd and even groups of students participated in Limited Face-to-Face Learning activities on different days, as determined by the Academic Representative for SMPN 3 Rantau Bayur's schedule. In schools, Limited Face-to-Face Learning activities were also given out on a limited scale, with 30 minutes of Limited Face-to-Face Learning for every hour of learning. The flipped classroom is considered helpful for educators, especially in science subjects, where the subject according to the curriculum is quite substantial and requires detailed explanations, due to limited time to meet in person with students.

Several findings from the research in the Flipped Classroom were examined. The survey information given to students revealed how flipped learning was implemented and what the effect was. The data from the questionnaire were then be displayed, as follows:

Table 4. Flipped Classroom Questionnaire Results: Implementation and Impact in science learning

No	Statement	Answer				Total Score	Percentage (%)
		SS	S	TS	STS		
1	Student responses to the application of the Flipped Classroom learning model in science subjects	12	18	33	0	63	75,0
2	The application of the flipped classroom learning model can motivate students to learn science	16	26	28	1	71	84,5
3	The activeness of students in science learning activities with the application of the science learning model	20	36	7	0	63	75,0
4	Students' opinions about the application of the flipped classroom learning model in science subjects	22	38	5	0	65	77,4
5	The seriousness of students towards the application of the flipped classroom learning model in science subjects	11	32	14	0	57	67,9
6	The effectiveness of the flipped classroom learning model on science learning activities	9	33	13	1	56	66,7
7	Students' understanding of science subject matter using the flipped classroom learning model	11	28	15	9	63	75,0
8	Increase students' knowledge about science subjects	28	36	4	0	68	81,0
9	Teachers and students are more interactive when learning activities in science subjects	28	36	4	0	68	81,0
10	Share knowledge with friends about the science subjects being studied	24	33	6	1	64	76,2
11	Science subjects become more interesting using the flipped classroom learning model	32	39	0	0	71	84,5
Total Average						709	76,7

According to the table of the results of the questionnaire given to students above, students' responses to the questionnaire

statement number 1 regarding flipped classroom in science subjects was 75.0 percent. Students expressed their gratitude

with the flipped classroom in this statement. According to the results of student interviews, satisfaction develops when learning model implemented is not boring. They can learn from watching movies and watching them again and over until they completely get the science subject matter. Next, the implementation of the flipped classroom learning model can motivate students to learn sciences received 84.5 percent. Studies claim because of the flipped classroom, they were more motivated to learn science. And, according to the results of student interviews, they become much more motivated because they are always curious about what other materials the science teachers will present and discuss in classroom.

The students' activeness in learning activities when using the flipped classroom obtained 75.0 percent responses. Students become more interested in limited face-to-face learning, not just with their classmates but also with their teachers. Furthermore, the use of the flipped classroom on science subject material in question number 4 received 77.4 percent. In this case, the respondents agree that using a flipped classroom that can provide learning films is perfect for science subjects since the material is sometimes abstract and difficult to observe with naked eyes. Students also believe that by using this learning model, they will be more dedicated to studying the subject.

For question number 5 regarding the sincerity of students towards to the implementation of the flipped classroom in

science subjects, the score percentage was 67.9%. The students in this case stated that the flipped classroom stimulated their interest in the subject subjects more than before the teacher applied this learning model. This is due to fact that this learning method gives a variety of learning films that are both helpful and interesting to students. Next, students' opinion about the efficiency of the flipped classroom on learning activities in science disciplines scored 66.7 percent. Students in this scenario believe that the flipped classroom has improved their interest in the science material presented by the teacher. As a result, science education becomes more effective and innovative.

Furthermore, question number 7 obtained a score of 75.0 percent. In this scenario, the students stated that it was easier for them to concentrate on the subject matter. When students have limited face-to-face learning, they are also more likely to know the subject material. This is because, prior to the limits of face-to-face learning, students had already made arrangements for the material to be reviewed through learning videos sent by teachers. Next, question 8 is about improving students' knowledge of science subjects and it obtained 81.0 percent score. This is in conformity with the results of researchers' interviews with students in class VIII, which found that students' knowledge increased as a result of the flipped classroom. Student receives information both through textbooks they already own, but also through videos

given by teachers, which they receive via WhatsApp groups before entering class.

Related to question 9, which has an 81.0 percent response, teachers and students should be more interactive when learning science subjects. This is because before conducting the Limited Face-to-Face Learning activity, teachers have educated students by giving videos on the subject matter which would be presented. As a response, when Limited Face-to-Face Learning happens, students are more enthusiastic about asking questions about subject, answering questions given by teachers, and participation in interesting and different discussion activities. Students with students, students with teachers, and students with parents at home all interact in this interactive. Because some students' parents participated actively in commenting on the videos and books they watched and read at home, according the results of the interviews with students.

Question number ten received 76.2 percent when it comes to discussing knowledge about the science subjects getting studied with the others. This is due to fact that students' reactions to and reactions to learning videos provided by educators are not always consistent. As a result, students will share their knowledge with others. Science subjects become more interesting using the flipped classroom, based on question number 11, which obtained 84.5 percent score. This is in accordance with the findings of the researcher's student interviews, which showed

that science subjects became more interesting as a result of the flipped classroom.

Based on the analysis and discussion of the results of the questionnaires which were finished, and the research results of interviews with researchers, it can be concluded that the implementation and impact of flipped classroom in science learning during in the covid-19 pandemic is positive, especially for class VIII students in science subjects at SMPN 3 Rantau Bayur, who obtained an average percentage gain of 76.7 percent, which is very good.

During the Coronavirus pandemic, the flipped classroom had several advantages and disadvantages in ensuring the successful implementation and impact on science uptake. The advantage is that students have more time at home to concentrate on subjects before the teacher explains them in the study room, helping them to become more independent. Students can learn about the subject in a range of locations and climates. When students are in class, they stand out enough for the teacher for seeing when they are having difficulty understanding tasks or activities, allowing students and teachers to improve their academic skills. Students can watch the video again and again until they understand fully the material. This is not like normal learning, when if students don't understand, the teacher must repeat the explanation till they do. As a result, they waste too much time, and they participate in Limited Face-to-Face Learning activities, which minimize learning time,

which is not ideal. Students can view the learning videos at any time and from any location as long as they have an effective internet connection. Parents can help their children learn by joining in learning activities outside of the classroom. While watching recordings is one of the disadvantages of the Flipped Classroom, it really does require several devices, especially one PC, PC, or cell phone. Students that do not have one will have to go to a web cafe to get a video, or get a cell phone, PC, or get a PC from either a friend or family member who's doing, or search for a site that reviews material. Meanwhile, for teachers, challenges may occur in preparing high-quality recordings of the both material and information in the text's structure in a short period of time.

Flipped Classroom must be applied in Indonesia in schools with complete and suitable offices and foundations, with the knowledge that this learning procedure requires the students to have equipment that can access learning resources from the Internet. As a consequence, in some parts of Indonesia wherever access to the internet is restricted, implementing the flipped classroom may be difficult.

Based on the results of the study, it can be stated that the application of the Flipped Classroom learning model is stated to be good. This is in accordance with the results of previous studies that the Flipped Classroom learning model is quite effective during the Covid-19 pandemic. This is in line with

Supriyatni's research, which revealed that that by using the flipped classroom learning model, students are more prepared and confident in participating in class learning because they already have the concepts they get from learning activities at home (Supriyatni, 2021). Flipped Classroom is proven to improve student learning outcomes. In addition to learning outcomes, the flipped classroom can also improve critical thinking skills and communication skills so that this model can be used as a way for students to have 21st century skills (Yulianti & Wulandari, 2021). Besides, the application of the flipped classroom method can be used as an alternative the selection of learning methods at limited face-to-face meetings so that limited face-to-face learning can be more effective because students have prepared material independently outside the classroom and improve learning outcomes (Supriatna, 2021).

However, in its implementation in Indonesia, the Flipped Classroom learning model, especially for science subjects, can only be applied in schools where students already have complete and adequate facilities and infrastructure considering that this strategy requires students to have tools that can access learning materials online. As a result, in some parts of Indonesia, which still have difficulty accessing the internet network, it will also be difficult to apply the flipped classroom learning model.

IV. CONCLUSION AND SUGGESTION

The Flipped Classroom learning model is a learning method that reversed the sequence of learning activities in the classroom and outside the classroom. Learning activities normally done in class are carried out at home, such as watching learning videos and completing tasks related to the subject of the subject in the learning videos. On the other hand, learning activities that are generally finished are completed in class, such as question and answer activities related to the topic in learning videos that have been studied at home, and educators provide practice questions for students to discuss in groups in order to solve the questions given. Educators, as facilitators, create digital learning materials in the form of videos for students to study at home so that they are better prepared in class.

In using it, the flipped classroom learning model has both advantages and disadvantages. This can be overcome by engaging together with the school, parents, and the school committee. As a result, limited face-to-face learning process will become more effective.

REFERENCES

- Arifa, F. N. (2020). Tantangan pelaksanaan kebijakan belajar dari rumah dalam masa darurat covid-19. *Info Singkat: Kajian Singkat Terhadap Isu Aktual Dan Strategis*, 7(7), 13–18.
- Bergmann, J., & Sams, A. (2012). *Flipped your classroom reach every student in every class every day*. Kim McGovern.
- Divjak, B., Rienties, B., Iniesto, F., Vondra, P., Zizak, M. (2022). Flipped classrooms in higher education during the covid-19 pandemic: Findings and future research recommendation. *Internasional Journal of Educational Technology in Higher Education*, 19(9), 1-24.
<https://doi.org/10.1186/s41239-021-00316-4>
- Djalante, R., Lassa, J., Setiamarga, D., Sudjatma, A., Indrawan, M., Haryanto, B., Mahfud, C., Sinapoy, M. S., Djalante, S., Rafliana, I., Gunawan, L. A., Surtiari, G. A. K., & Warsilah, H. (2020). Review and analysis of current responses to covid-19 in Indonesia: Period of January to March 2020. *Progress in Disaster Science*, 6, 1-9.
<https://doi.org/10.1016/j.pdisas.2020.10.0091>
- Fedorov, A., & Levitskaya, A. (2022). Theoretical concepts of film studies in cinema art journal: 1945–1955. *International Journal of Media and Information Literacy*, 7(1), 71–109.
<https://doi.org/10.13187/ijmil.2022.1.71>
- Goldschmidt, K. (2020). The covid-19 pandemic: Technologi use to support the wellbeing of children. *Journal of Pediatric Nursing*, 53, 88–90.
<https://doi.org/10.1016/j.pedn.2020.04.013>
- Indrajit, R. E. (2020). *Flipped classroom [Video]*.
<https://www.youtube.com/watch?v=7n6rb1DEViE>
- Kazu, I. Y., & Kurtoglu, C. (2020). Research of flipped classroom based on students' perceptions. *Asian Journal of Education and Training*, 6(3), 505–513.
<https://doi.org/10.20448/journal.522.2020.63.505.513>
- Lie, A., Tamah, S. M., Gozali, I., Triwidayati, K. R., Utami, T. S. D., & Jemadi, F. (2020). Secondary school language teachers' online learning engagement during the covid-19 pandemic in Indonesia. *Journal of Information*

- Technology Education: Research*, 19, 803–832. <https://doi.org/10.28945/4626>
- Mustapa, D. A., Arbie, A., Buhungo, T. J., & Nuayi, A. W. (2022). Effectiveness of team-based learning-inquiry learning tools on online learning. *Jurnal Pendidikan Fisika*, 10(1), 22–31. <https://doi.org/10.26618/jpf.v10i1.6720>
- Nirwana, N., Sultan, A. D., & Khaeruddin. (2021). The application of online learning assisted with quizizz educational games in learning physics. *Jurnal Pendidikan Fisika*, 9(3), 193–197. <https://doi.org/10.26618/jpf.v9i3.5195>
- Ozdamli, F., & Asiksoy, G. (2016). Flipped classroom approach. *World Journal on Educational Technology: Current Issues*, 8(2), 98–105. <https://doi.org/10.18844/wjet.v8i2.640>
- Patandean, Y. R., & Indrajit, R. E. (2021). *Flipped classroom: Membuat peserta didik berpikir kritis, kreatif, mandiri dan mampu berkolaborasi dalam pembelajaran yang responsif*. CV Andi Offset.
- Pertiwi, D. I. (2019). Upaya meningkatkan hasil belajar siswa dengan menggunakan model pembelajaran discovery pada mata pelajaran IPA SDN 66 Kota Bengkulu. *Diploma Thesis*. IAIN Bengkulu.
- Sari, S. S., Zul, M., & Haris, A. (2022). Analysis of students' physics learning outcomes using e-learning during covid-19 pandemic. *Jurnal Pendidikan Fisika*, 10(1), 67–74. <https://doi.org/10.26618/jpf.v10i1.6431>
- Sinaga, K. (2018). Pengaruh penerapan flipped classroom pada mata kuliah kimia dasar untuk meningkatkan self regulated learning. *EduChemia (Jurnal Kimia Dan Pendidikan)*, 3(1), 106–118. <https://doi.org/10.30870/educhemia.v3i1.2626>
- Sugiyono. (2014). *Metode penelitian pendidikan (pendekatan kuantitatif, kualitatif dan R&D)*. Alfabeta.
- Suhardi., Hanaping, S., & Said, M. A. (2015). Peningkatan hasil belajar fisika melalui model pembelajaran kooperatif tipe team assisted individualization pada siswa kelas VII.D SMP Negeri 2 Bangkala Kabupaten Jeneponto. *Jurnal Penelitian dan Pengembangan Pendidikan Fisika*, 1(2), 89–96. <https://doi.org/10.21009/1.01214>
- Sun, L., Tang, Y., & Zuo, W. (2020). Coronavirus pushes education online. *Nature Materials*, 19, 687. <https://doi.org/10.1038/s41563-020-0678-8>
- Supriatna, U. (2021). Flipped classroom: Metode pembelajaran tatap muka terbatas pada masa pandemi covid-19. *Ideas: Jurnal Pendidikan, Sosial, Dan Budaya*, 7(3), 57–62. <https://doi.org/10.32884/ideas.v7i3.408>
- Supriyatni. (2021). Meningkatkan hasil belajar IPA melalui model pembelajaran flipped classroom terintegrasi portal rumah belajar untuk siswa SD. *JIRA: Jurnal Inovasi Dan Riset Akademik*, 2(8), 1322–1330. <https://doi.org/10.47387/jira.v2i8.218>
- Usmadi & Ergusni. (2019). Penerapan strategi flipped classroom dengan pendekatan scientific dalam pembelajaran matematika pada Kelas XI SMKN 2 Padang Panjang. *JEP (Jurnal Eksakta Pendidikan)*, 3(2), 192–199. <https://doi.org/10.24036/jep/vol3-iss2/333>
- Yanah, P. A., Nyeneng, I. D. P., & Suana, W. (2018). Efektivitas model flipped classroom pada pembelajaran fisika ditinjau dari self efficacy dan penguasaan konsep siswa. *JIPFRI (Jurnal Inovasi Pendidikan Fisika Dan Riset Ilmiah)*, 2(2), 65–74. <https://doi.org/10.30599/jipfri.v2i2.302>
- Yulianti, Y. A., & Wulandari, D. (2021). Flipped classroom : Model pembelajaran untuk mencapai kecakapan abad 21 sesuai kurikulum 2013. *Jurnal*

Kependidikan: Jurnal Hasil Penelitian Dan Kajian Kepustakaan Di Bidang Pendidikan, Pengajaran Dan Pembelajaran, 7(2), 372-384.

<https://doi.org/10.33394/jk.v7i2.3209>

Zamani, A. Z., & Nurcahyo, H. (2016). Pengembangan media pembelajaran berbantuan komputer untuk meningkatkan motivasi dan hasil belajar. *Jurnal Pendidikan Matematika dan Sains*, 4(1), 89–100.

<https://doi.org/10.21831/jpms.v4i1.1293>

7