Id: 1230264

Participatory Educational Research (PER)
Vol.10(3), pp. 209-225, May 2023
Available online at http://www.perjournal.com
ISSN: 2148-6123
http://dx.doi.org/10.17275/per.23.52.10.3

Blended Learning after the Pandemic: The Flipped Classroom as an Alternative Learning Model for Elementary Classrooms

Asep Nuryadin*
Department of Digital Business, Universitas Pendidikan Indonesia, Bandung, Indonesia
ORCID: 0000-0001-6226-0914

Karlimah Karlimah
Department of Elementary Teacher Education, Universitas Pendidikan Indonesia, Bandung, Indonesia ORCID: 0000-0002-4292-5226

Dindin Abdul Muiz Lidinillah
Department of Elementary Teacher Education, Universitas Pendidikan Indonesia, Bandung, Indonesia ORCID: 0000-0002-8672-1073

Ika Fitri Apriani
Department of Elementary Teacher Education, Universitas Pendidikan Indonesia, Bandung, Indonesia ORCID: 0000-0003-2326-313X

Article history

Received:
06.01.2023

Received in revised form:
20.03.2023

Accepted:
26.03.2023

Key words:
Blended learning; flipped classroom; elementary classrooms; elementary school; K-12 education; the COVID-19 pandemic

This study examines the suitability of implementing blended learning (BL), especially the flipped classroom (FC) model, for elementary classrooms after the COVID-19 pandemic. Data were collected through a survey involving 136 students and interviews with three teachers of a laboratory school in Indonesia. The data analysis results showed several key findings: (1) the number of students who liked BL (46.32%) was almost equal to those who did not like it (53.68%); (2) the percentage of students who responded positively to each of the five aspects of the FC model was higher than 50%, especially related to their preference of doing assignments in class with their teachers than at home (91.18%); (3) the students were digitally ready; (4) a few challenges faced by the teachers in implementing BL were related to utilising digital technology for teaching, developing students to become independent learners, and their workload (5) the teachers experienced various positive impacts of the model, including on the students' understanding, achievement of learning goals, mathematics learning, development of students' independent learning skills, teachers' technological competencies, and parental support; (6) the teachers agreed that BL was suitable for education during the pandemic; and (7) the teachers believed that BL, especially the FC model, would be suitable for education after the

* Correspondency: asep.nuryadin@upi.edu

pandemic. Therefore, it can be concluded that BL, particularly the FC model, can become an alternative learning model for elementary classrooms even after the pandemic.

Introduction

Since declared a global pandemic by The World Health Organization (WHO) (Cucinotta & Vanelli, 2020), the COVID-19 pandemic has forced educational institutions worldwide to close and shift teaching and learning processes from face-to-face (F2F) to online mode, including those in Indonesia (Fauzi et al., 2021; Garad et al., 2021; Marfuah et al., 2022). However, implementing online learning (OL) is challenging as it differs significantly from F2F learning. The pandemic has widened the "learning gap or homework gap" which already existed even before the pandemic happened. The learning gap or homework gap is related to a condition in which students have difficulty completing online work due to various reasons such as socio-economic issues (An et al., 2021; Batac et al., 2021; Clausen et al., 2020; Hartshorne et al., 2020; Van-Lancker & Parolin, 2020).

Blended learning (BL) is considered an alternative way of addressing the equity issue that is exacerbated by the pandemic. BL has been proven appropriate and effective in providing more inclusive access to education during the pandemic (Batac et al., 2021). It is because BL is a combination of traditional F2F and online synchronous or asynchronous learning (Moszkowicz et al., 2020).

Over the years, many studies on BL in K-12 education have been conducted in different countries, including Indonesia (Ardianti et al., 2020; Indrapangastuti et al., 2021; Tanduklangi et al., 2019; Wahyuni et al., 2019). Although studies on BL in the K-12 context continue to grow, the number of studies focusing on how BL is implemented in elementary education during the pandemic is still limited. A study by Batac, Baquiran, and Agaton (2021) has successfully explored basic education teachers' experiences, perceptions, and insights in the Philippines. However, the study did not involve students as participants and did not inquire whether the teachers would apply BL in their classrooms after the pandemic. Moreover, the next question is which BL model(s) will be suitable for elementary schools. It is because various BL models commonly used in K-12 education are different from those identified as suitable for higher education and corporate training (Hew & Cheung, 2014).

One of the most popular BL models is the flipped classroom (FC) or flipped learning. Recently, this model has been in the spotlight and is considered a "new norm" BL type (R. A. Rasheed et al., 2020). It started to receive great attention around a decade ago after being popular in secondary education in the US (Algayres & Triantafyllou, 2020). Consequently, this model has been used in many subjects in primary, secondary, and tertiary education (Fung et al., 2021; Strelan et al., 2020; Zainuddin et al., 2019).

Therefore, this study aims to examine the suitability of BL, especially the FC model, for elementary classrooms in the post-COVID-19 era. Specifically, this study aims to discover (1) students' perceptions of BL implemented during the pandemic; (2) students' perceptions related to the importance of the FC if implemented after the pandemic; (3) students' digital readiness as a crucial factor for implementing the FC; (4) teachers' experiences of implementing BL during the pandemic; (5) teachers' perceptions of the suitability of BL for elementary classrooms during the pandemic; and (6) teachers' perceptions of the suitability of BL, especially the FC model, for elementary classrooms after the pandemic.

Examining this issue is crucial because, despite becoming a widely used solution to overcome challenges during the pandemic, it is still unclear whether BL will still be used in elementary classrooms after the pandemic is over. Thus, the findings of this study will shed some light on the suitability of implementing BL, particularly the FC model, in the post-pandemic era.

Literature Review

Blended Learning

Throughout the years, many definitions of BL have been put forward in the literature. However, most of them revolve around the concept of combining F2F and OL (Cronje, 2020; Prasetya et al., 2020). For example, Tang and Chaw (2016, p.55) state that BL is "a learning delivery approach which blends face-to-face classroom learning and online learning". Meanwhile, Chaeruman, Wibawa, and Syahrial (2018, p.192) state that BL is the combination of "appropriate synchronous and asynchronous learning strategies to achieve certain intended learning outcomes".

While most definitions suggest that BL is simply a combination of F2F and computer-mediated instruction, Cronje (2020) argues that more attention should be paid to pedagogical aspects and relevant learning theories. Thus, Cronje (2020, p.120) asserts that BL should be defined as "the appropriate use of a mix of theories, methods and technologies to optimise learning in a given context". In short, BL should be seen as a broader concept and not only a mixture of F2F and OL.

BL has many positive impacts on elementary classrooms' teaching and learning process (Batac et al., 2021; Kundu et al., 2020; Seage & Türegün, 2020; Shamir-Inbal & Blau, 2021; Yang et al., 2019). For example, a study conducted by Kundu, Bej, and Rice (2020) in an Indian elementary classroom showed that students positively responded to BL, and the teachers accepted this model. In addition, its implementation also positively impacted students' engagement, discipline routines, and classroom climate (Kundu et al., 2020).

During the pandemic, the sudden transition to BL also yielded many benefits for elementary school teachers. For instance, the teachers had opportunities to improve their pedagogical competencies (e.g., learning new ways of teaching) and technological competencies (e.g., learning new digital tools) (Batac et al., 2021; Shamir-Inbal & Blau, 2021).

Despite having numerous advantages, several challenges must be anticipated when implementing BL. For instance, a systematic review by Rasheed, Kamsin, and Abdullah (2020) on the challenges in the online component of BL showed that technological aspects became the main challenges for students, teachers, and educational institutions. Similarly, technological issues also occurred when BL was implemented during the pandemic in rural areas of Indonesia, especially related to access to technology and the ability to use technological tools for OL (Tanujaya et al., 2021). In addition, some other challenges faced by teachers during the pandemic were a lack of pedagogical readiness, a lack of institutional support, and work overload (Batac et al., 2021; Shamir-Inbal & Blau, 2021). Furthermore, students also experienced some other challenges of online BL (a combination of synchronous and asynchronous OL) during the pandemic, namely, difficulties in performing as independent learners, loneliness and anxiety, and a lack of parental support (Shamir-Inbal & Blau, 2021). Therefore, it is essential to anticipate these challenges to implement BL successfully.

The Flipped Classroom

The FC is one of the BL models used in all education levels. The FC is a subcategory of the rotation model as it allows a teacher to transfer information online and then use classroom time for the practice and application stages (Tucker et al., 2017). The inventors of the FC concept, Jonathan Bergmann and Aaron Sams, state that basically, this concept is "that which is traditionally done in class is now done at home, and that which is traditionally done as homework is now completed in class" (Bergmann and Sams, 2012, p.13). Abeysekera and Dawson (2015, p.3) provided a broader definition of the FC, defining FC as "a set of pedagogical approaches that: (1) move most information-transmission teaching out of class (2) use class time for learning activities that are active and social and (3) require students to complete pre- and/or post-class activities to fully benefit from in-class work".

Since the FC model requires a change in how information is delivered, this learning model has many benefits for teaching and learning. One of the most prominent advantages of the FC is that this model stimulates students to become active learners (Cui & Coleman, 2020; Divjak et al., 2022; Fung et al., 2021; Hutchings & Quinney, 2015; Jdaitawi, 2020). In the FC, students are asked to interact with learning materials outside the classroom which can be done at their own pace (Cui & Coleman, 2020; Divjak et al., 2022; Hutchings & Quinney, 2015). Then, classroom time can be repurposed for facilitating collaborative learning activities (Hutchings & Quinney, 2015) and engaging students in activities that require higher-order thinking skills (Cui & Coleman, 2020).

During the pandemic, using the FC brings various advantages, such as maintaining interactivity, overcoming the negative impacts of the shift to distance learning, providing time flexibility for students, and allowing the combination of synchronous and asynchronous teaching and learning (Divjak et al., 2022). In addition, in a study conducted by Campillo-Ferrer and Miralles-Martinez (2021), which combined F2F learning and OL, most of the participants had a positive view of practical in-class activities provided in the FC. Furthermore, after designing, implementing, and evaluating online flipped instruction, Sanandaji and Ghanbartehrani (2021) state that FC is an excellent model for online education both during and after the pandemic.

Despite having many positive impacts on classrooms, implementing the FC is not without challenges. Besides common challenges faced in BL, such as technological issues (A. R. Rasheed et al., 2020), another specific challenge is asking students to complete pre-class and/or post-class learning activities (Cui & Coleman, 2020). Therefore, to get the best benefits of this model, it is crucial to pay attention to this issue.

Methods

Research Design

This study aims to investigate the suitability of BL, especially the FC model, for learning in elementary schools after the COVID-19 pandemic. Therefore, a case study design was used in this study to obtain data from elementary school teachers and students. The case study method was chosen because this method presents unique examples of people in real situations, thereby enabling readers to understand an idea more clearly than just presenting them with abstract theories and principles (Cohen et al., 2018). In this study, the method used was a mixed methods case study design which develops or generates cases from quantitative and

qualitative data and integration of the two (Creswell & Creswell, 2017).

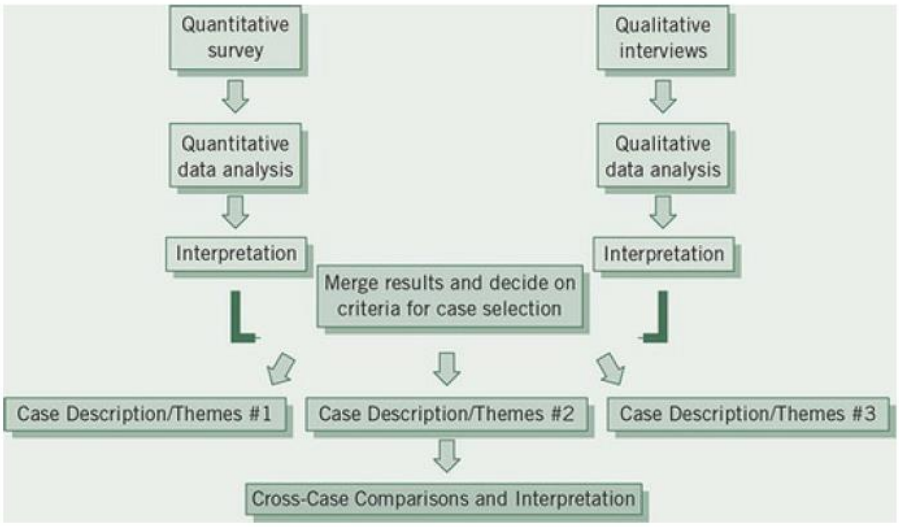

Figure 1. Mixed Methods Case Study Design (Creswell & Creswell, 2017, p. 312)

Context and participants

The Indonesian government issued the learning from home policy to continue education during the pandemic (Prahmana et al., 2021). The policy was implemented at all levels of education, from elementary to higher education. When the policy was applied, different schools in different areas had different teaching and learning methods depending on the number of COVID-19 cases and the schools' readiness. The readiness in question was related to the school, teachers, students, and parents' readiness, especially regarding technological aspects. This study involved 136 students and three teachers (fourth, fifth, and sixth grades) of an elementary school named SD Laboratorium Percontohan UPI Kampus Tasikmalaya, located in Tasikmalaya city, West Java Province, Indonesia. Each grade consisted of two classes (e.g., 4A and 4B), and one teacher from each grade was asked to participate in this study. The demographic information of the students and the teachers participating in the present study is shown in Table 1 and Table 2, respectively.

Table 1. The Demographic Information of the Students

Grade Level	**Male**		**Female**		**Total**	
	n	**%**	**n**	**%**	**n**	**%**
4	22	16.18	24	17.65	46	33.82
5	17	12.50	26	19.12	43	31.62
6	25	18.38	22	16.18	47	34.56
Total	**64**	**47.06**	**72**	**52.95**	**136**	**100**

Table 2. The Demographic Information of the Teachers

Teacher	**Age**	**Years of teaching**	**Grade Taught**
Mrs H	29	3	4A
Mrs A	27	3	5B
Mrs G	23	2	6B

The elementary school is a laboratory school operated by UPI (Universitas Pendidikan Indonesia/Indonesia University of Education), Tasikmalaya Campus. Besides being used as a lab for student teaching and demonstrating classroom management and practices, the school is expected to be a model school for other elementary schools at local and national levels.

During the pandemic, the school implemented different learning models. At the beginning of the pandemic, the school implemented full OL as the number of COVID-19 pandemic cases was still high. Then, in early 2021, lab school started using BL as a learning model across all grade levels (1st-6th). When this study was conducted (May 2022), the school started transitioning to F2F learning with limited classroom capacity and time in accordance with the Indonesian government policy (ANTARA, 2021). Since the school had implemented BL, it was considered an appropriate research site to investigate this issue.

Data collection and analysis

In this case study, data were collected through a survey and interviews. The instruments used for the survey and the interviews were developed by the researchers. The survey was conducted to obtain data on students' perceptions of BL and FC and their digital readiness.

The questionnaire

The questionnaire used in the survey consisted of three open-ended and fourteen closed-ended questions. The three open-ended questions were related to students' demographic information (name, gender, and grade). As for the closed-ended questions, they were three questions on students' perceptions of BL implemented during the pandemic, five questions on students' perceptions related to the importance of the FC model if implemented after the pandemic, and six questions on the students' digital readiness. The students (aged 10-12) were provided with only two options (yes and no) for answering the closed-ended questions. It is because providing three or four or even only two options (yes and no) for survey respondents younger than 11 years old is more recommended (Bell, 2007). Moreover, to obtain accurate results, the teachers assisted the researchers in ensuring that the students understood the questions.

The interviews

The interviews were conducted to collect data regarding teachers' experiences of implementing BL and their perceptions of its suitability, including the FC model. The questions asked to the teachers included the definition of BL, when they first used this model, the BL model used, the benefits and challenges of implementing BL, and their views on BL, including the FC model. The in-depth interviews were conducted via Zoom video conference to minimise the risk of the COVID-19 virus transmission, as it took more than a few minutes to obtain in-depth information from the teachers. Moreover, another benefit of an online interview is that it allows the adjustment of the interview schedule so that the researchers can contact respondents at mutually convenient times (Cohen et al., 2018).

Data Analysis

Then the quantitative data obtained through the questionnaire were analysed using Microsoft Excel. As for analysing the qualitative data collected from the interviews, NVIVO 12 was employed. The qualitative data analysis stage consisted of three concurrent flows of activity, namely, data condensation, data display, and conclusion drawing/verification (Miles et al., 2014). Moreover, to increase the credibility of research findings, data and methodological triangulation was employed in this study (Denzin, 2017).

Results and Discussion

Students' perceptions of BL implemented during the pandemic

The first inquiry explored students' perceptions of BL implemented during the pandemic. Three questions were asked to them to reveal their perceptions regarding F2F, OL, and BL. Table 2 shows that while more than 90% of them liked learning in a F2F environment, only around 12% of them liked fully OL. As for BL, the number of students who answered yes was almost equal to those who answered no.

A similar finding was found in a study conducted by Amir et al. (2020), which evaluated university students' perspectives on distance learning (DL) and classroom learning (CL) during the pandemic in Indonesia. In that study, only 44.2% of the students preferred DL over CL. A study by Li (2022), which focused on examining university students' perceptions of OL during the pandemic in China, found that students tended to prefer BL for the post-pandemic era. Although conducted in higher education, the findings from those studies are related to the present study in the sense that BL would be preferable compared to fully OL.

Table 3. Students' perceptions of BL (n=136)

Learning Mode	**Yes**		**No**	
	n	**%**	**n**	**%**
I like fully F2F learning (learning in the classroom)	124	91.18	12	8.82
I like fully OL (for example, through Zoom or Google Classroom)	16	11.76	120	88.24
I like it if our school combines F2F and OL (for example, there is learning in the classroom and there is learning through Zoom or Google Classroom)	63	46.32	73	53.68

Considering almost half of the elementary school students in the present study stated that they liked being involved in BL, it could be argued that BL is one of the alternative models for elementary classrooms in the post-pandemic era. Furthermore, implementing BL in the future will develop students' readiness to deal with emergencies, increase their familiarity with OL mode, and instill a culture of online teaching and learning (Li, 2022).

Students' perceptions related to the importance of the FC if implemented after the pandemic

The second inquiry aimed to discover students' perceptions related to the importance of the FC if implemented after the pandemic. Table 3 shows that the percentage of students who answered yes to each question was higher than 50%. It means that generally, the students responded positively to each of the five aspects of the FC presented in the questionnaire.

Table 4. Students' perceptions related to the importance of the FC (n=136)

The Aspect of the FC	**Yes**		**No**	
	n	**%**	**n**	**%**
Before going to school, I prefer to learn materials sent by my teacher first rather than not studying first (for example, sent through Google Classroom)	81	59.56	55	40.44
I like watching instructional videos sent by my teacher because I can rewatch them if I do not understand	98	72.06	38	27.94
I like OL because I can learn anywhere and anytime (e.g., watching videos from Youtube or learning materials from Google Classroom)	70	51.47	66	48.53
I prefer to do assignments in class with my teacher than at home	124	91.18	12	8.82
I have a hard time doing homework because no one can provide proper assistance	87	63.97	49	36.03

Around 60% of the students preferred to learn the materials sent by their teachers before

coming to the class. This finding can be beneficial to improving the teaching and learning process because the teacher can repurpose classroom time for collaborative learning (Hutchings & Quinney, 2015) and learning activities that demand higher-order thinking skills (Cui & Coleman, 2020).

Then, around 70% of the students stated that they liked watching videos sent by their teachers because they could rewind them. In addition, more than 50% of them stated that they liked OL because they could learn anywhere and anytime. These two pieces of information represent one of the positive impacts of the FC, namely, allowing students to learn the materials outside the classroom at their own pace (Cui & Coleman, 2020; Divjak et al., 2022; Hutchings & Quinney, 2015).

Regarding doing assignments or homework, more than 90% of them preferred to do assignments in class with their teacher than at home. In addition, more than 60% of them revealed that they had difficulty doing homework because they could not get proper assistance. The need for sufficient support from the teacher can be accommodated in the FC. Since the students have learned a certain topic before coming to class, the teacher can use in-class time to provide timely assistance, especially in solving higher-level problems (Tsai et al., 2015).

In conclusion, this finding demonstrates that the FC will not only be accepted by but also be useful for students. It is especially considering that the highest percentage (91.18%) of the "yes" response was related to the teachers' crucial role in assisting the students in doing assignments. Thus, it can be inferred that implementing the FC will benefit the students, especially in terms of providing adequate, timely assistance when they do assignments.

Students' digital readiness as a crucial factor in implementing the FC

The third inquiry was related to students' digital readiness as an essential part of successful FC implementation in the future. Table 4 shows that the percentages of responses to four of the six aspects of digital readiness were higher than 80%. Therefore, it could be inferred that the students were ready to use digital devices for learning.

Table 5. Students' digital readiness (n=136)

The Aspect of Digital Readiness	Yes		No	
	n	%	n	%
I/my family own a digital device (e.g., smartphone, tablet, or laptop)	136	100.00	0	0.00
I am able to use a digital device well	130	95.59	6	4.41
I am able to use various applications on a digital device for learning (e.g., Youtube and Google Classroom)	125	91.91	11	8.09
I like using a digital device for learning	88	64.71	48	35.29
The internet connection at my home is good	115	84.56	21	15.44
My parents help me when I use a digital device for learning	81	59.56	55	40.44

In addition, since around 60% of the students said that they liked using digital devices for learning and their parents were willing to assist them when using digital devices for learning, the probability of successfully implementing a digital technology-based learning model is high. By being digitally ready, technological challenges, which become the main challenges in the online component of BL, including for students (A. R. Rasheed et al., 2020), can be minimised.

Teachers' experiences of implementing BL during the pandemic

The fourth inquiry focused on several aspects, including teachers' understanding of BL, when they started applying it, the BL model used, and the challenges and benefits of implementing it. All three teachers interviewed had a similar understanding of the definition of BL: a combination of F2F and OL.

> In simple terms, BL is learning that combines F2F and OL. (Mrs G)

This finding is in line with the result of Cronje's (2020) analysis which showed that most of the definitions presented in the literature were limited to defining BL as a mixture of F2F and web-based instruction.

Implementing BL during the pandemic was the teachers' first-time experience. After considering several aspects, the school decided to implement BL through a home visit program in early 2021.

> In early 2021, the home visit program began to be implemented because we felt that children had started to feel bored. Then, it was also necessary for my students to meet F2F with me as their new homeroom teacher. Moreover, COVID-19 cases had declined slightly at that time, so the government allowed limited F2F meetings. (Mrs G)

The home visit program was similar to one of the BL models for K-12, namely, the rotation model (Hew & Cheung, 2014; Staker, 2011; Tucker et al., 2017). In this program, every class in the school was divided into a few groups. Then, on each day, the teacher visited one of the groups. For example, the teacher visited group 1 on Monday, group 2 on Tuesday, and so on. The F2F learning took place in one of the students' houses whose group was being visited that day. As for the other groups that were not being visited on that day, they had an asynchronous online class.

> In the home visit program, the teacher visited a different student's home every school day. So after a class was divided into several groups, the teacher visited each group. As for students who did not have a F2F class, they had to learn online. (Mrs A)

The teachers experienced some challenges when implementing BL during the pandemic. The first challenge was difficulty in using technology for teaching because they had little experience in harnessing digital technology for teaching before the pandemic.

> I used to rarely use gadgets because I did not have enough knowledge about how to use them. Now, the use of gadgets must be prioritised, especially in this modern era. (Mrs H)

The second challenge was related to developing students to become independent learners.

> Then the next challenge was dealing with students who were lazy to read, or who.... so we gave them a video, but they did not really watch the video, just viewed the assignment. Then, they said they did not understand the topic and asked for an explanation. (Mrs A)

The second challenge led to the emergence of the third challenge, namely, work overload.

> I was like a 24-hour security guard. In the middle of the night, my students' parents called me to ask about something. So, in the middle of the night, I gave them an explanation about it via video call. It was such an extraordinary experience. (Mrs A)

The three challenges identified in the present study are in line with those found in previous studies, namely, teachers' use of technology for teaching (A. R. Rasheed et al., 2020), students' difficulty in becoming independent learners (Shamir-Inbal & Blau, 2021), and work overload experienced by teachers (Batac et al., 2021; Shamir-Inbal & Blau, 2021). Thus, developing teachers' digital literacy, helping them in preparing students to become independent learners, and ensuring a reasonable workload for them are the keys to successful BL. Moreover, instilling independent learning skills is crucial for implementing the FC successfully since completing pre-class and/or post-class activities is one of the specific challenges of this model (Cui & Coleman, 2020).

Despite the challenges in its implementation, BL brought various benefits to the teaching and learning process in the school. One of the teachers shared her experience that BL was beneficial for improving students' understanding and achieving learning goals.

> In addition to improving students' understanding and increasing the level of achievement of learning goals ... (Mrs A)

This finding is consistent with that of Seage and Türegün (2020), who found that students receiving BL instruction could perform better in STEM learning when compared to those who received traditional instruction. In relation to STEM learning, the second benefit of BL experienced by the teachers in this study was also related to one of the STEM subjects, namely mathematics.

> Compared to fully OL, BL was more useful, especially in mathematics learning, because students needed to have their questions answered. Then, the teacher also had to explain the benefits of studying a particular topic directly. Therefore, like it or not, not all topics can be taught online. So, certain topics, such as mathematical topics, must be taught directly by the teacher through F2F learning. (Mrs G)

Since classroom interaction became a concern for the teachers, it can be argued that the FC will be suitable to be implemented in the school. It is because the FC can increase student-teacher interaction and allow teachers to allocate more classroom time to help struggling students (Bergmann & Sams, 2012).

Moreover, BL also encouraged the students to become independent learners, including independent lifelong learners.

> I think, in general, one of the benefits of BL was that students who previously had to be helped by the teacher in everything, during the pandemic they were forced by the situation to be able to learn independently, ... they had to study on their own before the teacher gave an explanation. While previously all the information was provided by the teacher, during the pandemic, like it or not, they had to learn independently, look for information on their own, and take the initiative. (Mrs G)
>
> Students became more aware of lifelong learning. So, wherever and whenever, OL can still be continued. OL is very efficient, and the students can learn from anyone. (Mrs H)

Stimulating students to become independent learners is crucial, especially during the pandemic, as it was one of the challenges experienced by K-12 students during distance learning (Shamir-Inbal & Blau, 2021). Through BL, students can be facilitated to get hands-on learning experience and become independent, self-motivated learners (Seage & Türegün, 2020).

Furthermore, BL also improved teachers' technological competencies, such as utilising digital tools for creating instructional videos. The teachers had an opportunity to improve their technological competencies through a training program held by UPI before implementing full OL and BL.

> So actually, before we applied BL, there was an ICT training program for teachers in our school. We were taught how to use greenscreen, make videos, and make motion graphics. We were also taught how to use various digital platforms such as Liveworksheets, Bookwidgets, Quizizz, and Google Forms. (Mrs A)

This study confirms that despite bringing some challenges, BL provided opportunities for the teachers to develop their technological competencies (Batac et al., 2021; Shamir-Inbal & Blau, 2021).

Finally, the implementation of BL was also useful for enhancing parental support.

> Parental support also increased. Previously, parents only relied on teachers, but they inevitably got involved when BL was implemented. It was because the learning time with the teacher was limited, so the teacher did not have enough time to answer the questions of the 25 students individually. So, the role of parents was very helpful for the teacher. (Mrs G)

The BL model used in the school, which was a mixture of F2F and OL, could be regarded as a solution to minimise challenges related to the lack of parental support in distance learning during the pandemic (Shamir-Inbal & Blau, 2021). In connection with the FC model, this model will allow parents to not only support their children's learning but also learn together with them (Bergmann & Sams, 2012).

Teachers' perceptions of the suitability of BL

In terms of the suitability of BL during and after the pandemic, the three teachers agreed that BL was a proper solution to educational challenges that occurred during the pandemic. It was especially for specific subjects or topics which they believed would be more easily understood by students if delivered in an F2F setting. Furthermore, one of the teachers even shared her experience of creating a book containing teachers' teaching experiences during the pandemic in the school.

> During the pandemic, I initiated the creation of a book written by teachers containing their stories related to teaching during the pandemic. As the initiator, I also collected writings from the teachers and the school principal. Then, as the editor, I also read their stories and concluded that BL was very useful and a fairly effective solution". (Mrs A)

The teachers' acceptance of BL reflects that of Kundu, Bej, and Rice (2020), who found that elementary school teachers were willing to accept this model when supported with necessary proficiencies.

The teachers were also asked about their thoughts on the suitability of BL, especially the FC model, for elementary classrooms after the pandemic. The interview results showed that the teachers gave positive responses to this question as they believed the FC would improve students' readiness for learning a certain topic before coming to the class.

> If students' learning motivation is high, even though F2F learning has been carried out at school, the teacher can send learning materials for the next meeting related to the topics that have just been studied. For example, tomorrow's learning will consist of such and such activities, and the topics are this and that. So, its implementation after the pandemic depends on student readiness, teacher readiness, school readiness, and topics to be learned. (Mrs G)
> It will be possible, very effective, and appropriate. When absent, we can share the learning materials online before the class. Then, the students can read them. So, when students learn F2F in class with a substitute teacher, they will already understand what they will learn. (Mrs H)

Besides showing positive views on the FC, two of the three teachers shared their experiences of using learning models similar to the FC model.

> I once shared learning materials in the evening the day before a class. Then, I said that tomorrow there would be a quiz so the students were told to study the topic. The next day when I gave them a quiz, even though it was just a game, they were worried about failing, so they studied first. In the class, what happened was more of a discussion than a transfer of knowledge because they already had a basic understanding of the topic being studied, and I believed it indicated progress. (Mrs A)
> For example, when implementing OL during the pandemic, I shared learning materials before the class. Then, when we did a zoom meeting 30 minutes later, the students already knew which page to open. So, actually, the students understood the topic better through OL. The issue was just that they felt bored because they did not physically meet their friends and teachers. (Mrs H)

Since the teachers had positive views on the FC model, it can be argued that the teaching and learning process in the school can be improved significantly. It is because teachers can repurpose in-class time for conducting collaborative learning (Hutchings & Quinney, 2015), discussing higher-level problems (Tsai et al., 2015), and other activities that demand higher-order thinking skills (Cui & Coleman, 2020). Using the FC will be beneficial for ensuring the students are taught the way the teachers usually teach them when they cannot be present in the class (Bergmann and Sams, 2012) or are substituted by another teacher. Furthermore, the fact that two of the three teachers had felt the benefits of using learning models similar to the FC model could become an excellent starting point for promoting the FC in the school.

Conclusion

This study examines the suitability of implementing BL, especially the FC model, in elementary classrooms after the pandemic. The analysis results of the data collected through a student questionnaire successfully revealed students' perceptions regarding several aspects of BL. Firstly, the percentage of students who stated that they liked BL (46.32%) was almost equal to those who did not like it (53.68%). Although it was not as high as the percentage of those who stated that they liked fully F2F learning (91.18%), it can be argued that BL has the potential to become an alternative model for elementary classrooms. It is especially compared to fully OL, which most of the students disliked (88.24%).

Secondly, in terms of students' perceptions related to the importance of the FC model if implemented after the pandemic, the percentage of students who responded positively to each of the five aspects of the FC was higher than 50%. In fact, 91.18% of them preferred to do assignments in class with their teachers rather than at home. This finding indicates that students will not only accept but also get benefits from this model, especially in terms of receiving adequate, timely assistance. Finally, the percentages of positive responses to four of the six aspects of digital readiness were above 80%. This finding implies that the students were digitally ready. Thus, technological challenges that might hinder the implementation of BL can be minimised.

Then, the analysis results of the data collected through the interviews successfully revealed teachers' experiences and perceptions regarding BL. The home visit program held by the school in early 2021 was their first-time experience of implementing BL. During its implementation, the teachers faced a few challenges related to utilising digital technology for teaching, developing students to become independent learners, and their workload. Despite the challenges, the teachers also experienced various positive impacts of the model, including on the students' understanding, achievement of learning goals, mathematics learning, development of the students' independent learning skills, the teachers' technological competencies, and parental support.

Regarding the suitability of BL, the teachers had a positive view of this learning model and agreed that BL was suitable for the emergency situation during the pandemic. In addition, the more important finding was that they stated that BL, especially the FC model, would be suitable for learning after the pandemic. They believed BL would encourage their students to prepare better before coming to class. Furthermore, since two of them had experience in implementing learning models similar to the FC, the probability of successfully implementing this model is high.

By looking at the students' and teachers' positive perceptions, as well as students' digital readiness, it can be inferred that BL, especially the FC model, will be suitable to be implemented in elementary classrooms after the pandemic.

Despite these encouraging results, this study was conducted only at a school where the school, teachers, students, and parents had a sufficient level of technology readiness. Further investigation needs to be performed at other schools with different technology readiness levels and in varying contexts to obtain more comprehensive information.

Acknowledgements

The authors would like to thank the students and teachers who participated in this study. The authors also gratefully acknowledge the financial support of the Institute of Research and Community Services of Universitas Pendidikan Indonesia.

References

Abeysekera, L., & Dawson, P. (2015). Motivation and cognitive load in the flipped classroom: definition, rationale and a call for research. *Higher Education Research & Development*, *34*(1), 1–14. https://doi.org/10.1080/07294360.2014.934336

Algayres, M., & Triantafyllou, E. (2020). Learning analytics in flipped classrooms: a scoping review. *Electronic Journal of E-Learning*, *18*(5), 397–409. https://doi.org/10.34190/JEL.18.5.003

Amir, L. R., Tanti, I., Maharani, D. A., Wimardhani, Y. S., Julia, V., Sulijaya, B., & Puspitawati, R. (2020). Student perspective of classroom and distance learning during COVID-19 pandemic in the undergraduate dental study program Universitas Indonesia. *BMC Medical Education*, *20*(392), 1–6.

An, Y., Kaplan-Rakowski, R., Yang, J., Conan, J., Kinard, W., & Daughrity, L. (2021). Examining K-12 teachers' feelings, experiences, and perspectives regarding online teaching during the early stage of the COVID-19 pandemic. *Educational Technology Research and Development*, *69*(5), 2589–2613. https://doi.org/10.1007/s11423-021-10008-5

ANTARA. (2021). *Govt revising guidelines for face-to-face learning*. https://en.antaranews.com/news/200913/govt-revising-guidelines-for-face-to-face-learning

Ardianti, S., Sulisworo, D., Pramudya, Y., & Raharjo, W. (2020). The impact of the use of STEM education approach on the blended learning to improve student's critical thinking skills. *Universal Journal of Educational Research*, *8*(3B), 24–32. https://doi.org/10.13189/ujer.2020.081503

Batac, K. I. T., Baquiran, J. A., & Agaton, C. B. (2021). Qualitative content analysis of teachers' perceptions and experiences in using blended learning during the COVID-19 pandemic. *International Journal of Learning, Teaching and Educational Research*, *20*(6), 225–243.

Bell, A. (2007). Designing and testing questionnaires for children. *Journal of Research in Nursing*, *12*(5), 461–469. https://doi.org/10.1177/1744987107079616

Bergmann, J., & Sams, A. (2012). *Flip your classroom reach every student in every class every day*. International Society for Technology in Education.

Campillo-Ferrer, J. M., & Miralles-Martinez, P. (2021). Effectiveness of the flipped classroom model on students' self-reported motivation and learning during the COVID-19 pandemic. *Humanities & Social Sciences Communications*, *8*(1), 1–9. https://doi.org/10.1057/s41599-021-00860-4

Chaeruman, U. A., Wibawa, B., & Syahrial, Z. (2018). Determining the appropriate blend of blended learning: a formative research in the context of Spada-Indonesia. *American Journal of Educational Research*, *6*(3), 188–195. https://doi.org/10.12691/education-6-3-5

Clausen, J. M., Bunte, B., & Robertson, E. T. (2020). Professional development to improve communication and reduce the homework gap in grades 7-12 during COVID-19 transition to remote learning. *Journal of Technology and Teacher Education*, *28*(2), 443–451. https://www.learntechlib.org/primary/p/216289/

Cohen, L., Manion, L., & Morrison, K. (2018). *Research methods in education* (8th ed.). Routledge.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Cronje, J. (2020). Towards a new definition of blended learning. *Electronic Journal of E-Learning*, *18*(2), 114–121. https://doi.org/10.34190/EJEL.20.18.2.001

Cucinotta, D., & Vanelli, M. (2020). WHO declares COVID-19 a pandemic. *Acta Biomedica*, *91*(1), 157–160. https://doi.org/10.23750/abm.v91i1.9397

Cui, T., & Coleman, A. (2020). Investigating students' attitudes, motives, participation and performance regarding out-of-class communication (OCC) in a flipped classroom. *Electronic Journal of E-Learning*, *18*(6), 550–561. https://doi.org/10.34190/JEL.18.6.007

Denzin, N. K. (2017). *The research act: a theoretical introduction to sociological methods*. Routledge.

Divjak, B., Rienties, B., Iniesto, F., Vondra, P., & Žižak, M. (2022). Flipped classrooms in higher education during the COVID-19 pandemic: findings and future research recommendations. *International Journal of Educational Technology in Higher Education*, *19*(1), 1–24. https://doi.org/10.1186/s41239-021-00316-4

Fauzi, A., Wandira, R., Sepri, D., & Hafid, A. (2021). Exploring students' acceptance of Google Classroom during the Covid-19 pandemic by using the technology acceptance model in West Sumatera Universities. *Electronic Journal of E-Learning*, *19*(4), 233–240. https://doi.org/10.34190/ejel.19.4.2348

Fung, C.-H., Besser, M., & Poon, K.-K. (2021). Systematic literature review of flipped classroom in mathematics. *Eurasia Journal of Mathematics, Science and Technology Education*, *17*(6), 1–17. https://doi.org/10.29333/ejmste/10900

Garad, A., Al-Ansi, A. M., & Qamari, I. N. (2021). The role of e-learning infrastructure and cognitive competence in distance learning effectiveness during the Covid-19 pandemic. *Jurnal Cakrawala Pendidikan*, *40*(1), 81–91.

Hartshorne, R., Baumgartner, E., Kaplan-Rakowski, R., Mouza, C., & Ferdig, R. E. (2020). Special issue editorial: Preservice and inservice professional development during the COVID-19 pandemic. *Journal of Technology and Teacher Education*, *28*(2), 137–147. https://www.learntechlib.org/primary/p/216910/

Hew, K. F., & Cheung, W. S. (2014). *Using blended learning: evidence-based practices* (2014th ed.). Springer. https://doi.org/10.1007/978-981-287-089-6

Hutchings, M., & Quinney, A. (2015). The flipped classroom, disruptive pedagogies, enabling technologies and wicked problems: responding to "the bomb in the basement." *Electronic Journal of E-Learning*, *13*(2), 106–119.

Indrapangastuti, D., Surjono, H. D., . S., & Yanto, B. E. (2021). Effectiveness of the blended learning model to improve students' achievement of mathematical concepts. *Journal of Education and E-Learning Research*, *8*(4 SE-Articles), 423–430. https://doi.org/10.20448/journal.509.2021.84.423.430

Jdaitawi, M. (2020). Does flipped learning promote positive emotions in science education? a comparison between traditional and flipped classroom approaches. *Electronic Journal of E-Learning*, *18*(6), 516–524. https://doi.org/10.34190/JEL.18.6.004

Kundu, A., Bej, T., & Rice, M. (2020). Time to engage: implementing math and literacy blended learning routines in an Indian elementary classroom. *Education and Information Technologies*, *26*(1), 1201–1220. https://doi.org/10.1007/s10639-020-10306-0

Li, D. (2022). The shift to online classes during the COVID-19 pandemic: benefits, challenges, and required improvements from the students' perspective. *Electronic Journal of E-Learning*, *20*(1), 1–18.

Marfuah, M., Suryadi, D., Turmudi, T., & Isnawan, M. G. (2022). Providing online learning situations for in-service mathematics teachers' external transposition knowledge during COVID-19 pandemic: Case of Indonesia. *Electronic Journal of E-Learning*, *20*(1), 69–84.

Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: a methods sourcebook* (3rd ed.). SAGE Publications Inc. https://search.library.wisc.edu/catalog/9910191165602121

Moszkowicz, D., Duboc, H., Dubertret, C., Roux, D., & Bretagnol, F. (2020). Daily medical education for confined students during coronavirus disease 2019 pandemic: a simple videoconference solution. *Clinical Anatomy (New York, N.Y.)*, *33*(6), 927–928. https://doi.org/10.1002/ca.23601

Prahmana, R. C. I., Hartanto, D., Kusumaningtyas, D. A., Ali, R. M., & Muchlas. (2021). Community radio-based blended learning model: a promising learning model in

remote area during pandemic era. *Heliyon*, *7*(7), 1–10. https://doi.org/https://doi.org/10.1016/j.heliyon.2021.e07511

Prasetya, D. D., Wibawa, A. P., Hirashima, T., & Hayashi, Y. (2020). Designing rich interactive content for blended learning: a case study from Indonesia. *Electronic Journal of E-Learning*, *18*(4), 276–287. https://doi.org/10.34190/EJEL.20.18.4.001

Rasheed, A. R., Kamsin, A., & Abdullah, N. A. (2020). Challenges in the online component of blended learning: a systematic review. *Computers and Education*, *144*, 1–17. https://doi.org/10.1016/j.compedu.2019.103701

Rasheed, R. A., Kamsin, A., Abdullah, N. A., Kakudi, H. A., Ali, A. S., Musa, A. S., & Yahaya, A. S. (2020). Self-regulated learning in flipped classrooms: a systematic literature review. *International Journal of Information and Education Technology*, *10*(11), 848–853.

Sanandaji, A., & Ghanbartehrani, S. (2021). An evaluation of online flipped instruction methods during the COVID-19 pandemic. *Journal of Information Technology Cases and Applications*, *23*(1), 46–67. https://doi.org/10.1080/15228053.2021.1901360

Seage, S. J., & Türegün, M. (2020). The effects of blended learning on STEM achievement of elementary school students. *International Journal of Research in Education and Science*, *6*(1), 133–140.

Shamir-Inbal, T., & Blau, I. (2021). Facilitating emergency remote K-12 teaching in computing-enhanced virtual learning environments during COVID-19 pandemic - blessing or curse? *Journal of Educational Computing Research*, *59*(7), 1243–1271. https://doi.org/10.1177/0735633121992781

Staker, H. (2011). *The rise of K-12 blended learning: profiles of emerging models.* ERIC. https://files.eric.ed.gov/fulltext/ED535181.pdf

Strelan, P., Osborn, A., & Palmer, E. (2020). The flipped classroom: a meta-analysis of effects on student performance across disciplines and education levels. *Educational Research Review*, *30*, 100314. https://doi.org/10.1016/j.edurev.2020.100314

Tanduklangi, A., Lio, A., & Alberth, A. (2019). Classroom action research in teaching English for senior high school students through blended learning in Kendari of Indonesia. *Journal of E-Learning and Knowledge Society*, *15*(1), 169–182. https://doi.org/10.20368/1971-8829/1579

Tang, C. M., & Chaw, L. Y. (2016). Digital literacy: a prerequisite for effective learning in a blended learning environment? *Electronic Journal of E-Learning*, *14*(1), 54–65.

Tanujaya, B., Charitas, R., Prahmana, I., & Mumu, J. (2021). The mathematics instruction in rural area during the pandemic era: problems and solutions. *Mathematics Teaching Research Journal*, *13*(1), 3–15.

Tsai, C.-W., Shen, P.-D., & Lu, Y.-J. (2015). The effects of problem-based learning with flipped classroom on elementary students' computing skills: a case study of the production of ebooks. *International Journal of Information and Communication Technology Education*, *11*(2), 32–40. https://doi.org/10.4018/ijicte.2015040103

Tucker, C. R., Wycoff, T., & Green, J. T. (2017). *Blended learning in action: a practical guide toward sustainable change*. California: Corwin Press.

Van-Lancker, W., & Parolin, Z. (2020). COVID-19, school closures, and child poverty: a social crisis in the making. *The Lancet Public Health*, *5*(5), e243–e244. https://doi.org/10.1016/S2468-2667(20)30084-0

Wahyuni, S., Sanjaya, I. G. M., Erman, E., & Jatmiko, B. (2019). Edmodo-based blended learning model as an alternative of science learning to motivate and improve junior high school students' scientific critical thinking skills. *International Journal of Emerging Technologies in Learning (IJET)*, *14*(07), 98–110. https://doi.org/10.3991/ijet.v14i07.9980

Yang, J., Yu, H., & Chen, N. (2019). Using blended synchronous classroom approach to promote learning performance in rural area. *Computers and Education*, *141*, 103619. https://doi.org/10.1016/j.compedu.2019.103619

Zainuddin, Z., Zhang, Y., Li, X., Chu, S. K. W., Idris, S., & Keumala, C. M. (2019). Research trends in flipped classroom empirical evidence from 2017 to 2018. *Interactive Technology and Smart Education*, *16*(3), 255–277. https://doi.org/10.1108/ITSE-10-2018-0082