Al-Jabar: Jurnal Pendidikan Matematka
Volume 13 , Number 2, 2022, Pages 423 – 431
http://ejournal.radenintan.ac.id/index.php/al-jabar/index

The implementation of blended learning model in mathematics subject

Aulia Nurul Azimmah[1]*, Budi Murtiyasa[1]
[1] Universitas Muhammadiyah Surakarta, Indonesia
✉ a410180027@student.ums.ac.id

Article Information
Submitted Oct 10, 2022
Revised September 02, 2022
Accepted September 23, 2022

Keywords
Implementation; Blended Learning; Mathematics.

Abstract
The blended learning model is a learning model that makes it easy for students to learn anywhere and anytime. The purpose of this study was to describe the application of the blended learning model of mathematics at SMP Muhammadiyah 7 Sumberlawan. This research is descriptive qualitative research with class VIII students and math teachers as research subjects. Data collection techniques using interviews, observation, and documentation. Data analysis techniques include data collection, reduction, presentation, and conclusion. Data validity in research using triangulation techniques. The results of this study indicate that students' enthusiasm for offline and online learning is almost the same because they remain active in asking questions when there are things they do not understand related to learning. The difference in the blended learning model lies only in the time and learning process. With the blended learning model, the material delivered by the teacher can be accessed anywhere and anytime to increase student readiness before face-to-face learning in class takes place and make it easier for students in the learning process to construct their own knowledge.

INTRODUCTION

Learning becomes a good communication process between educators and students and fellow students in the context of changing attitudes. Learning can also be defined as a community activity involving using resources from anywhere and at any time to gain knowledge (Surani & Hamidah, 2020; Susilawati, 2021; Wargadinata et al., 2020). There are two types of learning processes: online-based and offline-based learning (Müller & Mildenberger, 2021; Sartika et al., 2020). Learning effectiveness is an educational standard and can be seen in student activities, such as students who tend to actively ask questions, answer questions, and discuss with other students during the learning process (Ahmad, 2017). The effectiveness of learning itself can be obtained through online or offline learning, and the teacher's role in encouraging the creation of learning effectiveness will certainly be very influential. Online learning uses an internet network equipped with accessibility, connectivity, flexibility, and capabilities that can lead to various kinds of learning interactions (Coman et al., 2020; Sadikin & Hamidah, 2020). Online learning can complement students' needs in the learning process by utilizing technology and information so that a modern learning environment is created. Online learning is indeed more effective if it emphasizes each student's learning style and needs (Marshall & Kostka, 2020; Uğur et al., 2011), but students still need teachers who can help them understand the learning material (Kashefi et al., 2012). Because of this, the combination of online and offline learning will be very good if the application is structured.

Based on this, combination-based learning, or “blended learning,” is more effective in the current era (Musa & Suryono, 2022; Staddon, 2022). This is based on the advantages of blended learning itself. Among them, they can learn independently and obtain information without face-to-face contact with the teacher. Students can learn according to their abilities without feeling pressured because their friends have mastered the material faster (Utari et al.,

How to cite Azimmah, A. N., & Murtiyasa, B. (2022). Development of PMRI-based *e-module* teaching materials on class VII social arithmetic. *Al- Jabar: Jurnal Pendidikan Matematika*, *13*(2), 423 – 437.
E-ISSN 2540-7562.
Published by Mathematics Education Department, UIN Raden Intan Lampung

2021). This learning combines interactive learning meetings held in classrooms with virtual sessions by providing the material that students can access anywhere and at any time via the internet (Hadiyanto et al., 2021). Blended learning can be done both at and outside the school (Nida et al., 2020). The basic principle of blended learning is to integrate oral and written communication in offline learning more optimally in online learning (Komala & Sarmini, 2020). One of the goals is to train students to construct their knowledge. During offline learning, material delivery can usually only be done face-to-face. With the blended learning model, the material can be delivered anytime and anywhere to become more effective and efficient.

Several educational institutions, such as the Teaching Personnel Education Institute (LPTK), work to improve education through new learning methods that make students active and teachers mentors and develop quality education (Al-Ghoweri & Al-Zboun, 2021; Bhakti & Maryani, 2016). The blended learning model encourages students to be more active and increases learning independence (Swara et al., 2020). In this lesson, students are required to study and access material independently and complete assignments given by the teacher, individually and in groups (Shamsuddin & Kaur, 2020). The teacher provides a time limit for sending assignments, so students feel responsible for completing assignments on time without delay (Gelles et al., 2020). Students are thus educated and trained to develop a responsible character.

Mathematics is an effective subject when taught using the blended learning model because, with the help of technology, students can access the material provided by the teacher to be studied before the start of learning, which aids them in problem-solving and helps students improve their ability to think. Mathematics is considered a subject that has an important role in that it aims to develop students' mathematical abilities (Darma et al., 2020) and becomes the basis for studying other essential knowledge, such as science and technology (Setiawan et al., 2022). In addition, information and communication technology developments are underpinned by mathematics in the fields of number theory, algebra, analysis, and number theory (Darma et al., 2020). According to Thorne, blended learning is a learning model that provides opportunities to integrate innovation and technology. Using the right learning model is one of the efforts to increase student's mathematical power (Chiu, 2021). Learning mathematics will be fun if the teacher has sufficient knowledge about aspects of learning, such as models, methods, strategies, and effective learning media (Indrapangastuti et al., 2021).

Several studies that have been conducted regarding the banded learning model show that the blended learning model has a positive impact on learning (Albiladi & Alshareef, 2019; Dakhi et al., 2020; López-Pérez et al., 2011). The application of blended learning models also has a significant influence on critical thinking skills (Sutanti et al., 2021), learning motivation (Rahmatullah et al., 2021), representation and mathematical resilience (Khairiyyah & Fauzi, 2021), and writing skills (Wahyuni, 2018). Likewise, its application of blended learning models in mathematics is very good (Attard & Holmes, 2020; Sadieda et al., 2022). Based on several studies regarding the blended learning model with differences in objects and research subjects and showing a positive influence on learning. However, from several previous studies that have been conducted, no research has been found that discusses the implementation of blended learning models on student learning interests. Therefore, this study aims to describe the blended learning model learning application at SMP Muhammadiyah 7 Sumberlawan.

METHODS

This study uses a descriptive qualitative method to describe the implementation of blended learning. Qualitative research describes the activities or current situations (Fadli, 2021). In qualitative research, researchers are involved in this research to understand the situation in the field (Fadli, 2021). This research was conducted at SMP Muhammadiyah VII, Sumberlawan. With research subjects in class VIII students and math teachers. Cartesian coordinates are the material used in this study. The research flow is presented in Figure 1.

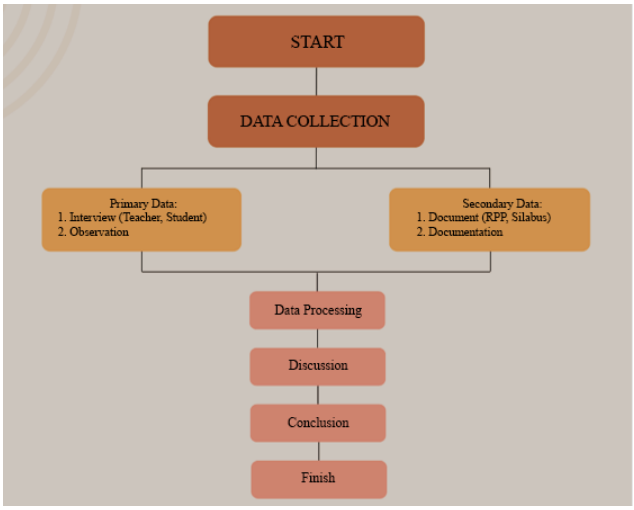

Figure 1. Research Methods

Figure 1 shows the stages of this research. The data to be obtained in this study are in the form of primary and secondary data. Primary data were obtained from interviews and observations. This study conducted interviews with students and teachers to obtain information about the ongoing learning process. Then observation is used to observe the blended learning process, starting from preparation, implementation, and evaluation. At the interview and observation stages, the data to be generated is in the form of interview results regarding the application of the blended learning model. The secondary data obtained was in the form of documents. The teacher made lesson plans regarding the syllabus, lesson plans, copies of student data, and documentation taken during the research.

Researchers used a triangulation technique to test the validity of the data in this study. Triangulation is a technique for testing the credibility of data by checking data from sources using observation and interview collection techniques (Fusch et al., 2018). Technical triangulation is taken in several steps: using participatory observation, interviews, and documentation with the same data source (Rahabav, 2016). The analytical techniques used in this research are data collection, data reduction, data presentation, and concluding (Sutama, 2019).

RESULTS AND DISCUSSION

In the process of conducting research, there are several stages, such as pre-research, data collection, and data analysis. The learning process is carried out by combining online and offline learning. Before learning begins, preparations are made by students and teachers. The teacher prepares material that will be delivered during learning, both offline and online. Then students prepare learning tools such as cell phones when online or books when offline. In this lesson, students carry out learning activities in the classroom with the teacher. After the material and explanation by the teacher are finished, students will be given assignments to work on at home. Then in the next meeting, learning is carried out online, where the material

is provided via the WhatsApp group, and students study it themselves. If there are questions about the material, students can ask through the WhatsApp group platform, and the teacher answers student questions on the platform. Regarding the supporting and inhibiting factors in this learning, the teacher said:

"For the inhibiting factor of this learning model, not all students have cellphones and signals that are less supportive, but by looking at the enthusiasm of the students. Blended learning has been our passion and support for implementing this blended learning model, Miss."

The research process began with interviews with mathematics teachers and then continued with interviews with seven students based on their choice of mathematics teacher. The reason seven students were interviewed was that they were able to think logically and flexibly. Furthermore, observation of learning activities is carried out. Regarding the media used in learning, the mathematics teacher said:

"The only media we use is WhatsApp, because the school is also in a village, and if you use a platform such as an application, not all students have personal cell phones. If using WhatsApp, students who don't have cellphones can use their parents." Then, regarding the differences that occur during offline or online learning, the teacher says:

"The most significant difference is in the time and process of implementing learning, Miss, because when face-to-face, the time is clear and there is minimal delay. Also, the implementation time is easier to explain at one time during the lesson hour, whereas if it is online, I only send the material and ask students if there is something they don't understand". In addition to conducting interviews with teachers, researchers also conducted interviews with students regarding blended learning, where students argued:

"If blended learning is good, miss, we don't get bored with the atmosphere, but what I don't like about blended learning isn't there, miss." "I like learning like this."

Some of the results of interviews conducted by researchers show that the application of the blended learning model gets responses from both students and mathematics teachers. This supports the use of blended learning models. From the interviews, it was also possible to identify deficiencies that students and teachers felt, but this was not an obstacle during the learning process. Students are still highly interested in learning and are active during their studies.

A. Implementation of the blended learning model in class VIII mathematics at SMP Muhammadiyah Sumberlawan

The use of blended learning models in mathematics learning at SMP Muhamadiyah 7 Sumberlawang is implemented following the Learning Implementation Plan that has been made. In this method, it is stated that the teacher prepares learning materials that will be sent to students via WhatsApp. These two forms of material are used so that students understand the material better.

The topics taught in offline and online learning must be continuous because the learning methods are carried out alternately. The topic presented at the time of the research was the position of the point on the line (a, b). When learning occurs online, the teacher uses WhatsApp as an intermediary for communication with students. During learning, students receive material provided by the teacher through the WhatsApp group. After that, students are encouraged to understand the material provided as well as do the assignments that have been given. Then, the teacher explains the material on the blackboard when learning is offline. In addition, the teacher also asked about previous meeting material online.

The teacher asks about student understanding and answers questions from students who need clarification about the material provided during online learning. Most students

need help understanding the position of the point on the line (a, b). After knowing the difficulties experienced by students, the teacher explains the material again slowly and ensures that students understand the parts that have yet to be understood by giving them practice questions. In contrast to online learning, students are expected to comprehend the material in offline learning fully. Providing material through online media allows students to access this material anywhere and anytime without being constrained by time.

The most significant difference between blended learning and other learning is the time and implementation process because the time is accurate in offline learning according to class hours. However, if online, the material given to students by the teacher is only limited to material already on the schedule without more intense interaction. Then, at the offline learning stage, students sometimes do not fully understand the material provided online, so a re-explanation by the teacher is needed about the material they have not understood.

B. The role of the teacher in the implementation of blended learning in mathematics class VIII SMP Muhammadiyah Sumberlawan

Teachers can potentially increase students' enthusiasm when the learning process takes place through blended learning. Based on the results of research conducted in schools, students' enthusiasm for offline and online learning is almost the same because they remain active in asking questions when there is something they do not understand regarding learning. In addition, when learning online through WhatsApp media, students are also active in asking questions, answering teacher questions, and giving opinions. Overall, online learning cannot guarantee whether students understand the material provided by the teacher. Therefore, the teacher repeats the material taught online through face-to-face learning to ensure that students fully comprehend the online material. After online learning is carried out and students have done the assignments given, at that time, the teacher explains the material that was given at the previous meeting. The task given by the teacher to students is in the form of questions regarding the material being taught. From this statement, online and offline learning are interrelated because they help students understand the coordinate system material.

The learning process with the blended learning model in class VIII mathematics at SMP Muhamadiyah 7 Sumberlawang has significant differences regarding time and process. This is where the teacher's role is needed to optimize the blended learning model during implementation. In particular, teachers must pay attention to students during online learning by providing easy material for students to understand and giving assignments that can be completed. The teacher must also ensure that students have mobile phones belonging to both students and parents as a medium for delivering material and assignments during online learning.

C. Student constraints blended learning in mathematics class VIII SMP Muhammadiyah Sumberlawang.

Not a few students are interested in the blended learning process because they feel confused when they have to adjust between offline and online. Therefore, teachers and students must still interact optimally so that the learning process with blended learning in mathematics continues to run according to applicable procedures.

Striking obstacles in blended learning at SMP Muhammadiyah 7 Sumberlawang class VIII in mathematics are that students still find it difficult to balance between offline and online, so a teacher's guide is needed so that students can take lessons comfortably (Wijaya et al., 2016). In addition, students are encouraged to have their own cell phones in the online learning process. However, not all students have personal cell phones, some

students who do not have personal cell phones use their parents' property. The existence of the SMP in the village resulted in the use of mobile phones not being optimal due to the possibility that the signal needed to be improved, resulting in delays in the learning process (Ekayati, 2018). So this can result in students needing to be more optimally engaged in teaching and learning. This can be handled with an offline learning process in the classroom, where the teacher must maximize his ability to provide material and interact with students. With this blended learning model, students can better understand the material. This way, blended learning applied to class VIII mathematics at SMP Muhamadiyah 7 Sumberlawang can run in a structured and efficient manner.

Implications

The blended learning model makes students active and enthusiastic in the learning process. With the blended learning model, the material delivered by the teacher can be accessed anywhere and anytime to increase student readiness before face-to-face learning in class takes place and make it easier for students in the learning process to construct their own knowledge.

Limitations and Suggestions

Limitations in this study include the subjectivity of the researcher. Research depends on the results of research regarding the implied meaning in the interview. Then, students who don't have personal cell phones have difficulty learning online. Other obstacles were students spending more than their quota and an internet connection that could sometimes be more stable.

Given the various limitations found in this study, suggestions for further research can be expanded on the Learning Management System (LMS) that can be used in blended learning. The use of applications can also be developed, such as using social media in learning, other applications that don't take up a large quota, and the need to hold ongoing evaluations to minimize the obstacles experienced by teachers, students, and their parents.

CONCLUSIONS

Based on the results of research on the use of blended learning models in mathematics learning, it was concluded that students' enthusiasm for offline and online learning was almost the same because they remained active in asking questions when there were things they did not understand regarding learning. The only difference in the blended learning process is the time and learning process. Offline learning is clearly in the classroom, while online learning runs flexibly. In applying the blended learning model, mobile phones are necessary for students to receive material and assignments given by the teacher. In this way, blended learning that is applied to class VIII mathematics at SMP Muhamadiyah 7 Sumberlawang can run in a structured and efficient manner.

ACKNOWLEDGMENTS

The author is very grateful to all participants and validators. Also, thanks to the University of Muhammadiyah Surakarta for funding the publication.

AUTHOR CONTRIBUTIONS STATEMENT

BM is a research coordinator. He contributes to developing ideas and methods. ANA is responsible for developing the theory, designing the instruments, and collecting and analyzing the data.

REFERENCES

Ahmad, M. (2017). Efektivitas penerapan pembelajaran berdasarkan masalah untuk membelajarkan kemampuan berpikir kritis matematika siswa SMP. *Jurnal Education and Development*, *6*(4), 34.

Al-Ghoweri, D. J. A., & Al-Zboun, D. M. S. (2021). The extent of the impact of blended learning on developing habits of mind from the standpoint of students of learning and scientific research skills course at the University of Jordan. *International Journal of Higher Education*, *10*(4), 196.

Albiladi, W. S., & Alshareef, K. K. (2019). Blended learning in English teaching and learning: A review of the current literature. *Journal of Language Teaching and Research*, *10*(2), 232–238.

Attard, C., & Holmes, K. (2020). An exploration of teacher and student perceptions of blended learning in four secondary mathematics classrooms. *Mathematics Education Research Journal*, 1–22.

Bhakti, C. P., & Maryani, I. (2016). Peran LPTK dalam pengembangan kompetensi Pedagogik Calon Guru. *JP (Jurnal Pendidikan): Teori Dan Praktik*, *1*(2), 98–106.

Chiu, T. K. F. (2021). Digital support for student engagement in blended learning based on self-determination theory. *Computers in Human Behavior*, *124*(March), 106909. https://doi.org/10.1016/j.chb.2021.106909

Coman, C., Țîru, L. G., Meseșan-Schmitz, L., Stanciu, C., & Bularca, M. C. (2020). Online teaching and learning in higher education during the coronavirus pandemic: Students' perspective. *Sustainability*, *12*(24), 10367.

Dakhi, O., Jama, J., & Irfan, D. (2020). Blended learning: A 21st century learning model at college. *International Journal Of Multi Science*, *1*(08), 50–65.

Darma, I. K., Karma, I. G. M., & Santiana, I. M. A. (2020). Blended learning, inovasi strategi pembelajaran matematika di era revolusi industri 4.0 bagi pendidikan tinggi. *Prosiding Seminar Nasional Pendidikan Matematika*, *3*, 527–539.

Ekayati, R. (2018). Implementasi metode blended learning berbasis aplikasi edmodo. *EduTech: Jurnal Ilmu Pendidikan dan Ilmu Sosial*, *4*(2).

Fadli, M. R. (2021). Memahami desain metode penelitian kualitatif. *Humanika*, *21*(1), 33–54.

Fusch, P., Fusch, G. E., & Ness, L. R. (2018). Denzin's paradigm shift: Revisiting triangulation in qualitative research. *Journal of Social Change*, *10*(1), 2.

Gelles, L. A., Lord, S. M., Hoople, G. D., Chen, D. A., & Mejia, J. A. (2020). Compassionate flexibility and self-discipline: Student adaptation to emergency remote teaching in an integrated engineering energy course during covid-19. *Education Sciences*, *10*(11), 304.

Hadiyanto, H., Failasofah, F., Armiwati, A., Abrar, M., & Thabran, Y. (2021). Students' practices of 21st century skills between conventional learning and blended learning. *Journal of University Teaching and Learning Practice*, *18*(3).

Indrapangastuti, D., Surjono, H. D., Sugiman, & 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), 423–430.

Kashefi, H., Ismail, Z., Yusof, Y. M., & Rahman, R. A. (2012). Supporting students mathematical thinking in the learning of two-variable functions through blended learning. *Procedia - Social and Behavioral Sciences*, *46*(2004), 3689–3695.

Khairiyyah, A., & Fauzi, K. M. S. M. A. (2021). The learning effect of blended learning based on google class room and initial mathematics on mathematic representation and resilience of students in the covid-19 pandemic. *Britain International of Linguistics Arts and Education (BIoLAE) Journal*, *3*(1), 63–76.

Komala, E., & Sarmini, S. (2020). Kemampuan representasi simbolik matematik siswa SMP menggunakan blended learning. *Prisma*, *9*(2), 204.

López-Pérez, M. V., Pérez-López, M. C., & Rodríguez-Ariza, L. (2011). Blended learning in higher education: Students' perceptions and their relation to outcomes. *Computers & Education*, *56*(3), 818–826.

Marshall, H. W., & Kostka, I. (2020). Fostering teaching presence through the synchronous online flipped learning approach. *Tesl-Ej*, *24*(2), 2.

Müller, C., & Mildenberger, T. (2021). Facilitating flexible learning by replacing classroom time with an online learning environment: A systematic review of blended learning in higher education. *Educational Research Review*, *34*(April),

Musa, E. I. O., & Suryono, Y. (2022). Learning challenges during new normal era using a combination of SWOT-PESTEL analysis. *5th International Conference on Current Issues in Education (ICCIE 2021)*, 358–362.

Nida, N. K., Usodo, B., & Sari Saputro, D. R. (2020). The blended learning with whatsapp media on mathematics creative thinking skills and math anxiety. *Journal of Education and Learning (EduLearn)*, *14*(2), 307–314.

Rahabav, P. (2016). The effectiveness of academic supervision for teachers. *Journal of Education and Practice*, *7*(9), 47–55.

Rahmatullah, R., Hasan, M., Ahmad, M. I. S., Ampa, A. T., & Arisah, N. (2021). Implementasi model pembelajaran blended learning terhadap motivasi belajar ekonomi peserta didik pada masa pandemi coVID-19. *Indonesian Journal of Learning Education and Counseling*, *4*(1), 18-33.

Sadieda, L. U., Wahyudi, B., Kirana, R. D., Kamaliyyah, S., & Arsyavina, V. (2022). Implementasi model blended learning pada pembelajaran matematika berbasis kurikulum merdeka. *JRPM (Jurnal Review Pembelajaran Matematika)*, *7*(1), 55–72.

Sadikin, A., & Hamidah, A. (2020). Pembelajaran daring di tengah wabah covid-19. *Biodik*, *6*(2), 109–119.

Sartika, F., Ritonga, M., & Rasyid, A. (2020). Implementation of islamic religious education in Madrasah Ibtidaiyah during covid-19 pandemic. *Khalifa: Journal of Islamic Education*, *4*(2), 1442.

Setiawan, A. A., Muhtadi, A., & Hukom, J. (2022). Blended learning and student mathematics ability in Indonesia: A meta-analysis study. *International Journal of Instruction*, *15*(2), 905–916.

Shamsuddin, N., & Kaur, J. (2020). Students' learning style and its effect on blended learning, does it matter?. *International Journal of Evaluation and Research in Education*, *9*(1), 195–202.

Staddon, R. V. (2022). A supported flipped learning model for mathematics gives safety nets for online and blended learning. *Computers and Education Open*, *3*(April), 100106.

Surani, D., & Hamidah, H. (2020). Students perceptions in online class learning during the Covid-19 pandemic. *International Journal on Advanced Science, Education, and Religion*, *3*(3), 83-95.

Susilawati, S. (2021). Prospects of digital literature and its implications on increasing learning outcomes during the covid-19 pandemic. *Nidhomul Haq: Jurnal Manajemen Pendidikan Islam*, *6*(3), 526–536.

Sutama, S. (2019). *Metode penelitian pendidikan kuantitatif, kualitatif, PTK, mix method, R & D* (1st ed.). CV. Jasmine.

Sutanti, Y. A., Suryanti, S., & Supardi, Z. A. I. (2021). Implementasi model pembelajaran berbasis blended learning untuk meningkatkan kemampuan keterampilan berpikir kritis dan hasil belajar siswa sd. *Cetta: Jurnal Ilmu Pendidikan*, *4*(3), 594–606.

Swara, G. Y., Ambiyar, A., Fadhilah, F., & Syahril, S. (2020). Pengembangan multimedia pembelajaran matematika sebagai upaya mendukung proses pembelajaran blended learning. *Jurnal Inovasi Teknologi Pendidikan*, *7*(2), 105–117.

Uğur, B., Akkoyunlu, B., & Kurbanoğlu, S. (2011). Students' opinions on blended learning and its implementation in terms of their learning styles. *Education and Information Technologies*, *16*(1), 5–23.

Utari, W., Hikmawati, V. Y. B., & Gaffar, A. A. B. (2021). Blended learning: Strategi pembelajaran alternatif di era new normal SD Tunas Harapan. *Prima Abdika : Jurnal Pengabdian Masyarakat*, *1*(4), 120–128.

Wahyuni, S. (2018). The effect of blended learning model towards students' writing ability. *J-SHMIC: Journal of English for Academic*, *5*(2), 97–111.

Wargadinata, W., Maimunah, I., Eva, D., & Rofiq, Z. (2020). Student's responses on learning in the early COVID-19 pandemic. *Tadris: Journal of Education and Teacher Training*, *5*(1), 141-153.

Wijaya, I. M. ., Suweken, G., & Mertasari, N. M. (2016). Pengaruh penerapan model pembelajaran blended learning terhadap motivasi berprestasi dan prestasi belajar matematika siswa SMA Negeri 1 Singaraja. *Jurnal Wahana Matematika dan Sains*, *10*(2), 36–47.