

# Needs Analysis of Mathematics Modules as Learning Materials in Distance Learning During Covid-19 Pandemic

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## ABSTRACT

Distance Learning (DL) is a program applied in Indonesia during COVID-19 pandemic. There are definitely many obstacles to implementing learning mathematics during the DL. One obstacle encountered is the absence of learning materials that can accommodate learning mathematics during DL. Therefore, this study was conducted to analyze teachers' and students' need for learning materials as a mathematics module to accommodate DL during the COVID-19 pandemic. This study was a descriptive qualitative study. The data collection technique used supporting instruments, namely questionnaire and interviews guideline, which were then descriptively analyzed. The findings showed that students encountered difficulties in understanding learning materials they had during the DL. Based on the results of interviews and questionnaire analysis, it was found that mathematics teachers and students needed learning materials in the form of modules to complement mathematics learning during DL activities. The developed module has criteria such as; being clear in the delivery of the material, systematic, easy-to-understand language, and a simple yet attractive appearance that can be understood independently, which are the learning materials needed by students during DL. The module must also be equipped with learning activities and assessment tools according to the competencies that want to be achieved.

**Keywords:** Distance learning, Learning materials, Mathematics modules.

## 1. INTRODUCTION

The presence of the Corona virus in Indonesia forces all sectors to innovate quickly and respond to current circumstances, particularly in the education sector [1]. A major change in the education sector to solve the COVID-19 pandemic is the parallel introduction of distance learning (DL) or learning from home. Online learning is carried out beginning at the middle or the end of March 2020 at the level of elementary school (*SD*) to high school (*SMA*) and from kindergarten to higher education [2]. The enactment of DL impacts changing the method or way of teaching and learning, which initially the teacher and students can interact directly so that learning can be carried out with a variety of methods which changes drastically to online learning.

Online learning is currently ongoing, of course, there are so many challenges that need to be overcome. The present state of the DL cannot be considered optimal since there are still a variety of challenges to face [3]. These problems and challenges are an obstacle for implementing the DL, provided that implementing the DL is a have to ensure that educational programs can still be carried out in the middle of the ongoing COVID-19 pandemic emergency. The problems faced during this DL were (1) the students were not prepared to face COVID-19; (2) Internet network constraints in certain areas; (3) facilities for laptops, cellphones, etc. cannot be used properly; (4) all parents are forced to become teachers at home; and (5) good messages are not conveyed [4].

Online learning requires students to understand math concepts independently at home. The development of the concept of self-study is one

consequence of the characteristics of DL which demand higher independent learning abilities than face-to-face forms of education [2]. Using various media and learning materials aims to support the achievement of competencies in online learning.

The findings of observations and interviews with mathematics teachers in the city of Surakarta revealed that we carried learning activities out online via the WhatsApp application, which was carried out once a week. The learning process begins one week before the teacher's meeting to share the learning videos downloaded via YouTube and then ask students to study the material and summarize the material from the video. At the next meeting, which is the main schedule, the teacher will provide feedback to the students and provide practical questions to the students. Besides video, the teacher often uses learning materials as material summaries collected by the teacher, which are then submitted to students via WhatsApp groups along with practice questions. For the learning materials used by the teacher, the learning materials could not reach competence as learning is performed online. Students could not be autonomous of learning and performing student behaviors has not met the expected conditions because of lack of direct supervision.

Appropriate learning materials can help students gain competence individually, even though they study online. Many teaching materials are used to achieve student learning competencies, such as handouts, worksheets, and learning modules. To facilitate distance learning, teaching materials are needed for students can be use to study independently. Modules as a learning materials is the right way to improve the quality learning for students, because at this time development of learning materials in the form of modules become a very urgent needed. The use of the module is expected the more learning activities well-planned, independent, complete, and with quality results [5]. The modules has a function as an independent learning tool. Modules are printed learning materials that are designed in such a way to be studied independently by students [6]. Module is one of the learning materials routinely organized using a vocabulary that is easy to understand and can be individually studied in order to have a positive effect on student learning outcomes [7]. Learning materials as modules will help students gain competence individually in today's online learning environment. This research is the initial research of the development research stage in the form of a mathematics module. The initial research was conducted in the form of analyzing the student needs

of the mathematics module as a learning material for the DL during the COVID-19 pandemic.

## **2. METHODOLOGY**

A descriptive qualitative was used as the research method in this study. The instrument used in this study was an auxiliary instrument in the form of a questionnaire and interview guide. The auxiliary instrument in the form of a questionnaire given to students contains questions about the problems encountered by students during DL related to learning materials as well as questions about the development of learning materials in the form of mathematics modules for learning during DL. Data from interviews conducted with teachers were used to determine the teacher's needs for learning materials in the form of modules. In addition to knowing the module requirements, the data obtained was also used to determine the criteria of module expected by teachers and students so that they could be used as learning materials for mathematics learning during DL. The subjects of this study were a mathematics teacher and eleventh grade students of SMA Negeri 8 Surakarta.

The data obtained were then analyzed according to Miles and Huberman's theory consisting of four stages. Those stages are data collection, data reduction, data display and drawing conclusion [8]. The data collection stage was carried out by conducting interview to mathematics teachers using auxiliary instruments in the form of interview guidelines and distributing auxiliary instruments in the form of questionnaires to eleventh grade students of SMA Negeri 8 Surakarta. The data reduction stage was conducted simultaneously with the data collection stage and was carried out repeatedly until the conclusion could be drawn. The data reduction stage was carried out by sharpening, classifying, directing, removing unnecessary data and organizing the data so that the conclusion could be drawn. The data obtained were then selected, simplified and transformed into a summary or brief description.

At the data presentation stage, the data obtained were presented in the form of narrative text which was supported with charts, graphs and columns. All of them were designed to combine information in order to draw the conclusion. After the data were presented completely and correctly, the final stage was drawing conclusions. Conclusions were drawn objectively and in accordance with the data obtained.

### 3. RESULTS AND DISCUSSION

#### 3.1. Mathematics teaching and learning processes during DL

Teaching and learning processes during DL are online learning carried out once a week through WhatsApp group application in 2 x 60 minutes. The process of providing material was delivered one week before the day of the main meeting in which the teacher distributed learning videos obtained from YouTube. The next activity done by the students was watching those learning videos and making summary within one week. Then, the summaries were submitted to the teacher via WhatsApp application on the main schedule day. On the main schedule day, the teacher an opportunity for the students to ask any questions related to the materials delivered before. After the question and answer process, the teacher gave 3 to 5 exercises that students must do as formative assessments. In addition to providing material via video, the teacher also provided the materials through a summary of the materials written by the teacher and then distributed to students via the WhatsApp group.

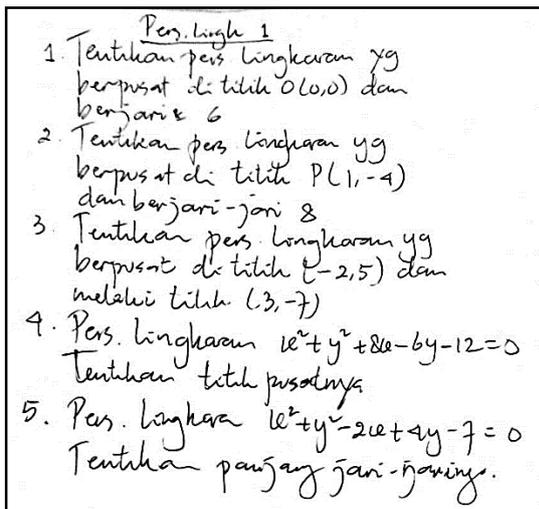


Figure 1 Question exercises on circle material.

Learning materials used by the teacher during DL were in the form of BSE books available in the library. The school does not provide any learning materials for students to study online, so students are free to use the materials. Then, the assessment conducted by the teacher included the assessment of attitudes, knowledge and skills. The attitude assessment carried out by the teacher was taken from the activeness of students during the discussion, the responses of students in the group, and the responsibility of the students in completing the

assignments given by the teacher. The assessment of knowledge was based on the results of assignments done and submitted by the students. The assignment was done through WhatsApp group, Quipper, and Microsoft 365. The assessment of students' skills was based on students' creativity in making summaries related to the materials. Then, the teacher also provided several questions that could be used as additional exercise for the students. Figure 1 shows the practice questions given.

The data for the analysis of the mathematics module needs for high school students were got from a questionnaire containing the teaching materials used by students during DL, the difficulties experienced by students when learning mathematics during DL, and the student's needs for teaching materials that could be used independently during DL. The results of the needs analysis obtained are as follows. Based on the results of the questionnaire, each student had over one teaching material used during DL. The percentage of teaching materials that were mostly owned and used by students during DL was textbooks, namely 52%. Students who use one of the teaching materials as modules during DL are 31% of the 54 students. This data shows that there are still many students who do not have the right teaching materials that can be used during DL. Figure 2 is the percentage of ownership of mathematics teaching materials that students have during DL.

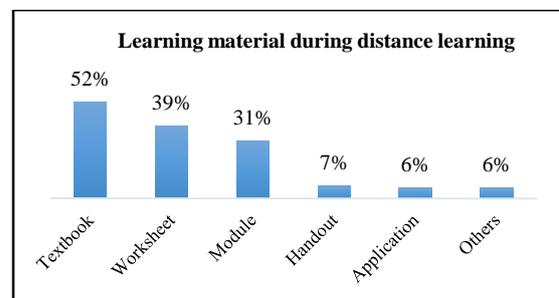


Figure 2 Percentage of mathematics teaching materials ownership.

There are 87 percent of students had trouble interpreting the teaching materials they have in the course of the DL. The difficulties encountered are created by uncertain teaching materials in terms of the delivery of materials, interpreting the use of materials to solve mathematical problems is not simple, and the display style is too busy causing less concentration. There are 91 percent of students said, they needed a math module to learn mathematics during DL. The module that students expect is a module that can help students learn independently, the explanation of the material in the module is clearly and systematically

**Table 1.** The problems encountered by teachers and students during distance learning

Learning components	Problems encountered by teachers	Problems encountered by students
Teaching and learning process	The teacher was not accustomed to conducting online learning.	Students had less interest and enthusiasm during DL. Students had difficulties in mathematics material during DL. Students had less courage to ask the teacher about the materials.
Learning media	The teacher did not have learning media that was in accordance with DL. The teacher used learning media from the online platform (YouTube) in delivering material.	Students found it difficult to understand the material if they only saw the material explanation from the online platform (YouTube).
Learning materials	The teacher only had one source of learning material that was in the form of a textbook (BSE). Teachers did not have learning materials that were able to accommodate students to learn independently during DL.	Most students did not have mathematics materials during DL. Students were just waiting for the summary of the material from the teacher. The materials owned by students did not explain the material in detail and are less systematic.
Accessibility	Learning application used could not support mathematics learning optimally. It was encountered that the application cannot display graphic image. (ex. Figure 2)	Some students did not have the means to access learning applications used during DL. The condition of the internet signal was not optimal in some areas where the students live in.
Assessment	There were many students who were inactive during online learning and most students did not submit the assignments given, so the teacher did not have many assessment sources. The results of the student's answers were the same between one student and another.	Students could not understand the material well, so that daily assignments and tests were not done optimally.

conveyed, has a light language that is easy to understand and has an attractive and fun appearance to use as a learning companion.

**3.2. Problems encountered by the teacher and students during distance learning**

Based on the results of interviews and the auxiliary instrument in the form of questionnaire, it

was found the problems encountered by teachers and students during carrying out distance learning. Figure 3 is an example of an accessibility problem that teachers encounter while using an online learning platform, that is, a graphic image that does not show.



**Figure 3** The Quipper application cannot display graphics.

Those problems encountered by teachers and students during carrying out distance learning are summarized in Table 1.

### 3.3. Need analysis of module for teacher and students

Distance learning requires teachers to be creative and innovative in exploring fun learning activities, especially due to limited technology and internet connection [3]. One of the interests or learning objectives is students' cognitive development that is the development related to students' intellectual abilities [9]. Thus, teaching and learning processes must focus on student needs. But, in fact too many teachers do not have learning materials or teaching tools to provide material during DL. The use of textbooks as learning materials is deemed less effective for teachers in teaching and learning processes. Online learning applications used by teachers cannot be used effectively, so this hinders the learning processes. The assessment system carried out by the teacher is just based on the students' activeness in group forums and the completeness of student assignments that are submitted in a timely manner.

Distance learning is often associated with the term autonomous learning [10]. Based on the problems described, the fundamental problem during the implementation of DL for teachers and students is the absence of learning materials that can be used by students independently in learning during DL. One of the weaknesses encountered during online learning is being in a location with unstable internet signal or words unresponsive means [11]. The implementation of online learning make students have difficulty in

understanding the mathematics material taught by the teacher. It is in line with the study conducted by revealing that online learning causes students to be unable to understand the material well [12]. It has an impact on the low enthusiasm of the students in joining DL. Lack of students' enthusiasm is a sign of low motivation [13]. Low student motivation could result in students' achievement and competence [14].

In order to deal with those problems, the teacher suggests an offline learning materials that could help the students learn during DL. Those learning materials are arranged in a clear, systematic, attractive manner and are equipped with formative and summative assessments based on the competencies the teacher wants to measure. Furthermore, with the existence of clear and attractive learning materials in terms of presentation of the materials and being equipped with an assessment in accordance with the teacher's assessment criteria, the problems faced by teachers and students could be overcome. In addition, the students are able to study the materials presented by the teacher through these learning materials independently so that it can foster student independence in learning [2] and improve student learning achievement [15]. The needs that must be met by teachers and students during distance learning are summarized in Table 2.

From the Table 2 we can conclude that the materials that should be used by students during DL in order to help the process of understanding the material independently are the materials that are in the form of modules [16]. Modules are learning materials having the characteristics of independent learning principles [17]. Modules are one of learning materials arranged systematically using language that is easy to understand and can be studied independently, so that it can have a positive impact on student learning outcomes [7]. In addition, modules are arranged systematically and attractively that include material content, methods and evaluation that can be used independently [18]. The contents of the module are arranged systematically and clearly in order to make it easier for students to learn the materials independently. The compiled modules could contain several learning activities that are adjusted to the number of lesson hours. Each learning activity contains various learning activities that students can do in order to achieve learning competencies. At the end of the module, both formative and summative assessment aspects are listed as evaluation materials in order to develop teaching and learning processed and assess students' achievement and competencies.

**Table 2.** Needs that must be met teachers and students during distance learning

Learning components	Teachers needs	Students needs
Teaching and learning process	The existence of teaching materials that can help teachers to deliver mathematics learning during DL.	Interesting learning activities and provide a clear and detailed explanation of the material.
Learning media	Learning media that students can use independently during DL.	Learning media that can be used offline and can be used as an independent exercise.
Learning materials	Learning materials that can accommodate students to study independently and effectively during DL. One of them is teaching materials in the form of modules.	Learning materials that can be used independently, anytime, anywhere, have a detailed and systematic explanation of the material.
Accessibility	Learning facilities that minimize the use of the internet.	Offline learning facilities in the form of modules so that internet network constraints and limited communication tools can be overcome.
Assessment	Formative and summative assessments are needed that can measure the achievement of competence during distance learning.	Students need a detailed explanation of the material so as to produce the maximum competency achievement.

Therefore, it is necessary to develop learning materials in the form of modules to overcome the problems faced by teachers and students during distance learning.

#### 4. CONCLUSION

The problems encountered by the teacher and students during DL could be overcome by providing offline learning materials that could be studied independently by the students in order to be able to fully understand the material whenever and wherever they are and could reduce the use of internet signals. Therefore, it is necessary to develop a teaching material in the form of a module to facilitate mathematics distance learning. The developed module should have an attractive appearance so that students do not get bored easily while using the module. The modules should also be arranged in a clear, systematic manner and use language that could be understood by senior high school students (eleventh grade students) so that the students are able to understand the material optimally. The modules developed are arranged based on the competencies that want to be achieved and equipped with the assessment tools needed by the teacher to assess

students' achievement and competencies. In addition, the module could also be equipped with learning activities along with exercises to sharpen the understanding of concepts and their applications related to the competencies that want to be achieved.

#### ACKNOWLEDGMENTS

The authors wish to thank Mrs. Sri Hartatik and the respondent for their support and assistance with data collection also we thank the anonymous referees for their useful suggestions.

#### REFERENCES

- [1] S. D. Handayani and A. Irawan, "Pembelajaran Matematika di Masa Pandemi Covid-19 Berdasarkan Pendekatan Matematika Realistik," *J. Math Educ. Nusant. Wahana Publ. Karya Tulis Ilm. di Bid. Pendidik. Mat.*, vol. 6, no. 2, pp. 179–189, 2020, doi: 10.29407/jmen.v6i2.14813.
- [2] P. Megawanti, E. Megawati, and S. Nurkhafifah, "Persepsi Peserta Didik terhadap PJJ pada Masa Pandemi COVID-19," *J. Ilm. Pendidik.*, vol. 7, no. 2, pp. 75–82, 2020.

- [3] F. N. Arifa, "Tantangan Pelaksanaan Kebijakan Belajar dari Rumah dalam Masa Darurat Covid-19," *Info Singkat;Kajian Singk. Terhadap Isu Aktual Dan Strateg.*, vol. XII, no. 7/I, pp. 13–18, 2020.
- [4] H. Suharna and N. H. Abdullah, "Kemampuan Berpikir 4C Matematika dalam Pembelajaran di Masa Covid-19 Terutama Di Era New Normal," *Delta-Pi J. Mat. dan Pendidik. Mat.*, vol. 9, no. 2, pp. 178–185, 2020.
- [5] C. I. Mufidah, "Pengembangan Modul Pembelajaran Pada Kompetensi Dasar Hubungan Masyarakat Kelas X Apk 2 Di Smkn 10 Surabaya," *J. Adm. Perkantoran*, vol. 2, no. 2, pp. 1–17, 2014.
- [6] Suleha, "Pengembangan Modul Pembelajaran Mata Pelajaran Produktif dalam Rangka Peningkatan Kompetensi Siswa Usaha Perjalanan Wisata Di SMK Negeri 1," *J. Ilmu Pendidik. LPMP Kalimantan Timur*, vol. XIII, no. 2, pp. 83–96, 2019, [Online]. Available: <https://lpmpkaltim.kemdikbud.go.id/>.
- [7] Miftakhudin, R. Y. Purwoko, and D. Yuzianah, "Integrasi Etnomatematika pada Pengembangan E-Modul dengan Pendekatan Saintifik untuk Menstimulasi Berpikir Logis Siswa SMP," *Prisma*, vol. 2, pp. 510–515, 2019, [Online]. Available: <https://journal.unnes.ac.id/sju/index.php/prisma/>.
- [8] M. B. Miles and A. M. Huberman, *Analisis Data Kualitatif: Buku Sumber Tentang Metode-metode Baru*. 1992.
- [9] E. Puspitasari, "Profesionalisme Guru dalam Mengenal Perkembangan Siswa Sebagai Subjek Belajar," *J. Eduksos*, vol. IV, no. 2, pp. 1–11, 2015.
- [10] K. A. Puspitasari and S. Islam, "Kesiapan Belajar Mandiri Mahasiswa dan Calon Potensial Mahasiswa Pada Pendidikan Jarak Jauh di Indonesia," Jakarta, 2003.
- [11] J. W. Kusuma and H. Hamidah, "Perbandingan Hasil Belajar Matematika dengan Penggunaan Platform Whatsapp Group Dan Webinar Zoom dalam Pembelajaran Jarak Jauh Pada Masa Pandemi Covid 19," *JIPMat*, vol. 5, no. 1, pp. 97–106, 2020, doi: 10.26877/jipmat.v5i1.5942.
- [12] B. Kusumaningrum and Z. Wijayanto, "Apakah Pembelajaran Matematika Secara Daring Efektif? (Studi Kasus pada Pembelajaran Selama Masa Pandemi Covid-19)," *Kreano, J. Mat. Kreat.*, vol. 11, no. 2, pp. 136–142, 2020.
- [13] R. Rimbarizki, "Penerapan Pembelajaran Daring Kombinasi dalam Meningkatkan Motivasi Belajar Peserta Didik Paket C Vokasi di Pusat Kegiatan Belajar Masyarakat (PKBM) Pioneer Karanganyar," *J+Plus Unesa*, vol. 6, no. 2, pp. 1–12, 2017.
- [14] R. Facturrahman and M. Cholikh, "Hubungan Motivasi dengan Prestasi Belajar Pada Mata Diklat Sistem Kopling Siswa Kelas XI di SMK Negeri 3 Surabaya," *J. Pendidik. Tek. Mesin UNESA*, vol. 03, no. 1, pp. 74–80, 2014.
- [15] Y. Riyani, "Faktor-Faktor yang Mempengaruhi Prestasi Belajar Mahasiswa (Studi pada Jurusan Akuntansi Politeknik Negeri Pontianak)," *J. EKSOS*, vol. 8, no. 1, pp. 19–25, 2012.
- [16] A. S. Dewi, H. Sitompul, and E. Napitupulu, "Pengembangan E-Modul Pembelajaran Ekonomi Sma," *J. Teknol. Inf. Komun. Dalam Pendidik.*, vol. 5, no. 2, pp. 111–124, 2018.
- [17] S. Wulandari, Y. Darma, and U. D. Susiaty, "Pengembangan Modul Berbasis Pendekatan Realistic Mathematics Education (RME) Terhadap Pemahaman Konsep," *J. Pendidik. Inform. dan Sains*, vol. 8, no. 1, pp. 143–152, 2019, doi: 10.31571/saintek.v8i1.1179.
- [18] E. Tjiptiany, A. As'ari, and M. Muksar, "Pengembangan Modul Pembelajaran Matematika dengan Pendekatan Inkuiri untuk Membantu Siswa SMA Kelas X dalam Memahami Materi Peluang," *J. Pendidik. Teor. Penelitian, dan Pengemb.*, vol. 1, no. 10, pp. 1938–1942, 2016.