Students' Mathematical Literacy of Learning Independence Using PjBL Model with PMRI Approach Based on Blended Learning Assisted by Google Classroom

by 43 Wardono

Submission date: 14-Apr-2023 07:44PM (UTC+0700)
Submission ID: 2064366339
File name: 43.pdf (252.59K)
Word count: 3220
Character count: 18316

Students' Mathematical Literacy of Learning Independence Using PjBL Model with PMRI Approach Based on Blended Learning Assisted by Google Classroom

Erlina Rahma Damayanti*
Mathematics and Science Faculty
Master in Mathematics Education
Postgraduate Semarang State University
Email:erlinard@students.unnes.ac.id

Wardono**
Mathematics and Science Faculty
Master in Mathematics Education
Postgraduate Semarang State University
Email: wardono@mail.unnes.ac.id

Ani Rusilowati***
Mathematics and Science Faculty
Master in Mathematics Education
Postgraduate Semarang State University
Email: rusilowati@mail.unnes.ac.id

Abstract
This study is a qualitative research. The goal is to analyze students' mathematical literacy viewed from the learning independence. This study was conducted at SMP Negeri Banyubiru with the subjects of 6 seventh grade students in the Academic Year of 2021/2022. The research subjects were chosen based the results of the learning independence scale with the categories of high, moderate, and low. The instruments of this research were mathematical literacy test, interview, and learning independence scale. Based on the results of the analysis, it was found that subjects with high learning independence were able to meet all indicators of mathematical literacy. Meanwhile, subjects with moderate learning independence did not meet the indicators of reasoning and argument, using mathematics tools and devising strategies. Furthermore, subjects with low learning independence were only able to meet the indicators of communication, mathematising, and using symbolic, formal, and technical language and operations.

Keywords: Blended Learning, Independent Learning, Mathematical Literacy, PjBL, PMRI Approach

1.0 Introduction

Mathematical literacy is an ability to learn mathematics in which the students do not only understand the materials but also have to be able to interpret the uses and benefits in daily life. Mathematical literacy is essential for students because it emphasizes the ability to recognize and use basic and simple mathematical knowledge in real life rather than in school so that students with low math skills can complete it (Rizki & Priatna, 2019).

However, students' success is not determined by their knowledge and abilities (hard skills), but rather by the ability to manage themselves and others (soft skills) (Waluya & Esa, 2012). Hard

skills and soft skills, including the values of mathematics in culture and character education, must be developed simultaneously and in balance through learning (Mulyono & Lestari, 2016). One of the soft skills in learning is learning independence. This learning independence is one of the attitudes contained in the 2013 curriculum (Bintari, 2020).

Based on observations, there are many students who depend on their friends' answers in doing mathematical assignments. Furthermore, students do not have the initiative to read the material before learning mathematics. They commonly wait for the teaching materials from the teacher instead of looking for them themselves. It means there are clearly many students with low learning independence. If students' learning independence is low it will affect students' mathematical literacy. This is in line with Kholifasari et al (2020) that learning independence plays an important role in students' mathematical literacy. Students with learning independence are able to solve problems well and affect their learning outcomes. Without learning independence, students will have problems in their behavior, for instance students get shy, lack of motivation to learn, and have bad study habits (Fahmy et al., 2018).

Furthermore, there is a need for a new and more meaningful class for the students in which they are not too reliant on the teacher. This study uses a PjBL learning model based on PMRI approach with blended learning system. Blended learning is a learning system that is a mixture of face-to-face and online. Furthermore, the online learning media used in this study is Google classroom.

Accordingly, the researchers conducted a study on mathematical literacy of independent learning by using PjBL learning with PMRI approach based on blended learning with Google Classroom's assistance.

1.1 Research Problem

The problems in this study are that: (1) students' learning independence is still low, and (2) the learning process has not been able to foster the students' learning independence.

1.2 Objectives of the Study

The purpose of this research is to analyze and describe mathematical literacy using learning PjBL with PMRI approach based on blended learning assisted by Google classroom viewed from the learning independence.

2. Review of Related Theories

This study includes several relevant theoretical studies that are used as the theoretical foundations, namely: (1) mathematical literacy, (2) learning independence, (3) the relationship between mathematical literacy and learning independence.

2.1 Mathematical Literacy

Mathematical literacy is a person's ability to interpret and understand mathematics, not only understanding the concept but also its application in daily life. This is in line with Masjaya & Wardono (2018) that in mathematics, students are not only required to be able to count but also to reason logically and critically in solving problems. Mathematical literacy emphasizes the ability to recognize and use the basic and simple mathematical knowledge in real life rather than in school so that students with low math skills can complete it (Rizki & Priatna, 2019).

2.2 Learning Independence

Learning independence or learning independently is an active learning activity that is driven by intentions from within, aiming to master competence in overcoming a problem, with the abilities and knowledge that people already have (Astuti, 2016). Students' learning independence in solving mathematical problems using learning independence scale can be measured by the following characteristics: (1) taking the initiative in learning, (2) exploring the learning needs, (3) setting the learning goals, (4) controlling the learning methods, (5) considering the difficulties as challenges, (6) utilizing resources related to the learning, (7) selecting and determining the appropriate learning strategies, (8) evaluating the learning outcomes, and (9) self-concept (Wal & Aulia, 2019).

2.3 Relationship between Mathematical Literacy and Independent Learning

Low mathematical literacy is caused by the low learning independence. The learning is teacher-centered that the students become passive (Zuldayni, 2016). In obtaining maximum learning outcomes, it is necessary to learn awareness and preparation for each student' learning needs (Supratinah et al., 2015). Furthermore, learning independence is one of the attitudes contained in the 2013 curriculum (Bintari, 2020). It plays an essential role in students' mathematical literacy as students with learning independence are able to solve problems well and affect their learning outcomes (Kholifasari et al., 2020). This is in line with Darma et al., 2016; Murti et al., 2019) that students with high learning independence have high problem solving abilities. Furthermore, researches show that there is a relationship between learning independence and academic achievement and that learning independence can be taught to the students (Kramarski & Mizrachi, 2006).

3. Research Method

This study is a qualitative research. The subjects in this study were 6 grade VII students of SMP Negeri 2 Banyubiru in the Academic Year of 2021/2022. The subjects were selected using purposive sampling technique. They were selected from three categories of learning independence, namely high learning independence, moderate learning independence, and low learning independence. The instruments in this study were learning independence scale, mathematical literacy test, and interview. The data were collected by the documentation in the form of photos during research in the field and interviews' recording, the questionnaire in the form of a student learning independence scale, the test in the form of students' mathematical literacy test results, and the interviews with the students.

5 Discussion

Based on the results of the learning independence scale, the subjects with the categories of high learning independence, moderate learning independence, and low learning independence were shown in table 4.1 below.

Table 4.1 The Categories of the Students' Learning Independence

Category learning independence	Frequency	Range
Low	5	$x < 80{,}5$
Mid	25	$81 \leq x < 96{,}5$
High	6	$x \geq 97$

Based on Table 4.1, there are 5 students with low learning independence, 25 students with moderate learning independence, and 6 students with high learning independence. The average score of students' learning independence is 89 with standard deviation of 8. Thus, the score range is less than 80.5 for the subjects with low learning independence, the range is more than or equal to 81 and less than 96 for the subjects with moderate learning independence, and the range is more than 97 for subjects with high learning independence.

From the categories of the students' learning independence, 6 subjects were chosen consisting of 2 subjects with high learning independence, 2 subjects with moderate learning independence, and 2 subjects with low learning independence. The high subjects are the ones with codes S-15 and S-35, moderate subjects are ones with codes S-10 and S-33, and low subjects are ones with codes S-12 and S-30.

Based on the results of the interviews and mathematical literacy test, the results and discussion were obtained and defined in the seven stages of mathematical literacy as follows.

In the communication stage, the indicator is that the students are able to understand and recognize the problems in the questions. At this stage, subjects with high, medium, and low learning independence categories did not face significant difficulties in recognizing and formulating problems in questions.

In the mathematising stage, the indicator is that the students are able to change a real-world problem in the problem into its mathematical form. At this stage, subjects with high, medium, and low learning independence categories also did not face difficulties. The subjects can change real-world problems into their mathematical form by replacing what is known in the problem with the mathematical variables. It can be seen from the subject's answer in Figure 4.1 below.

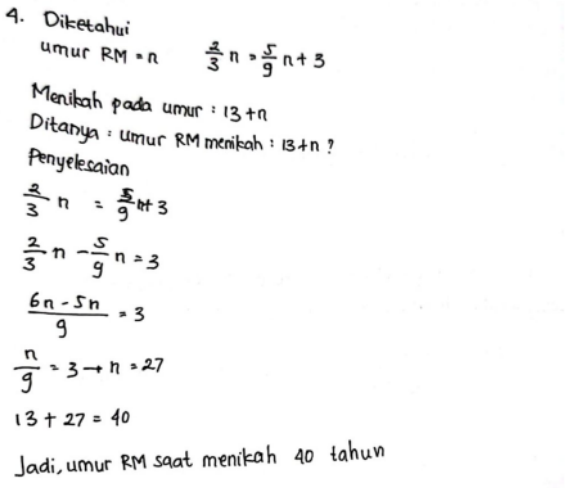

Figure 4.1 Work Result of S-33 Subject

In the representation stage, the indicator is that the students involve objects in mathematics, for instance in the form of using formulas or pictures. At this stage, subjects with high and moderate learning independence used mathematical objects in the form of formulas and pictures. It can be seen from one of the subject's answers in Figure 4.2, which is the subject with the category of high learning independence. The subject was able to illustrate the rectangular land by drawing a rectangular shape and annotating the length which is 12 m, while the width is (4x-1) m. Furthermore, in the interview, the subject was also able to explain the results obtained by using the

rectangular area formula. Meanwhile, subjects with low learning independence did not involve mathematical objects because they did not understand the steps to solve the problem.

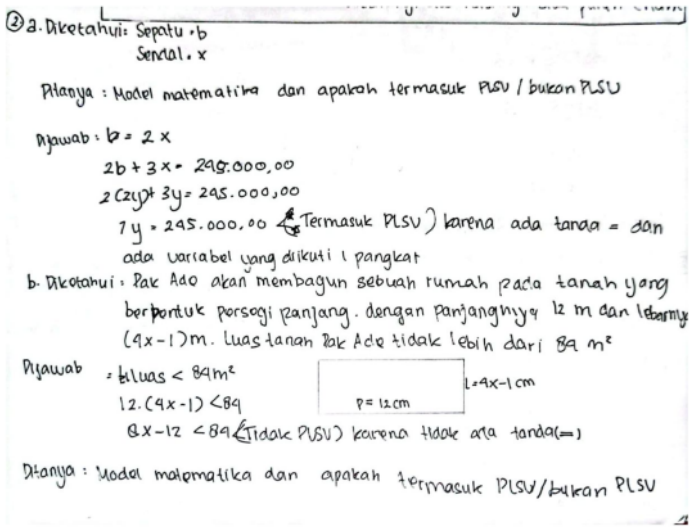

Figure 4.2 Work Result of S-35 Subject

In the reasoning and argument stage, the indicator is that the students are able to reason in solving problems and conclude and check the truth of all their findings. At this stage, only subjects with high learning independence are able to meet the reasoning and argument indicators. Subjects with moderate learning independence were only able to reason in solving problems and providing conclusions but did not re-examine the truth of all their findings. Meanwhile, subjects with low learning independence are unable to reason in solving the problems. They had tendency of not understanding the steps in working on the problems. It is proved by the results of interviews with subjects S-30 in Table 4.1 below.

Table 4.1 Interview Results with S-30

P	:	Okay , did you explain only until what is asked in your answer?
S-30	:	Yes, ma'am.
P	:	Why didn't you continue?
S-30	:	I don't know how to do it, ma'am.
P	:	Okay, there are 4 boxes of mefenafat acid, so how much does it cost?
S-30	:	111,000.
P	:	If you model it in mathematical form, it means that there is an example, namely the mefenafat acid.
S-30	:	Oh...I changed acid mefenafat into *f*.
P	:	So, what is the mathematical model of 4 boxes of mefenafatic acid?
S-30	:	4 boxes of mefenafat acid become 4f = 111,000.
P	:	Try to continue the work again.
S-30	:	It makes me dizzy, ma'am. I do not know how to do it.

In the stage of devising strategies for solving problems, the indicator is that the students are able to explain strategies in solving problems and solve the problems with the correct procedure and can

choose a good strategy in solving the problems. At this stage, the subjects with high learning independence are able to explain the strategies in solving problems in questions well. They can also explain the steps in answering the problems with the correct procedure. Meanwhile, the subjects with moderate learning independence can only explain the steps in working on the problems but cannot determine and explain the strategy in obtaining the answer. Furthermore, subjects with low learning independence were not able to complete the explanation until the end of the problem solving.

In the stage of using symbolic, formal, and technical language and operations, the indicator is that the students can use mathematical models in solving problems. At this stage, subjects with high learning independence were able to describe the use of mathematical models in solving problems in problems very well even though there were errors in writing by S-35 during the process. However, when the researcher re-confirmed, the subject realized his mistake and was able to explain the error well. Similarly, subjects with moderate and low learning independence categories were also able to explain and write well the use of mathematical models in the problems in the problem although the explanation was still incomplete.

In the stage of using mathematics tools, the indicator is that the students use mathematical tools such as rulers. At this stage, a subject with high learning independence used a mathematical tool in the form of a ruler to make rectangular shapes. Besides, he also used a ruler to underline the important conversations with the aim of making it easier to group what is asked in the questions. Meanwhile, the subjects with moderate and low learning independence did not use any mathematical tools.

Based on the description above, each subject based on the category, has different achievement indicators. The following is the summary in Table 4.2 which represents students' mathematical literacy which is viewed based on high learning independence, moderate learning independence, and low learning independence.

Table 4.2 Summary of Students' Mathematical Literacy of Learning Independence

Mathematics Literacy Indicators	Category learning independence		
	High	Mid	Low
Communication	Fulfilled	Fulfilled	Fulfilled
Mathematising	Fulfilled	Fulfilled	Fulfilled
Representation	Fulfilled	Fulfilled	Unfulfilled
Reasoning and argument	Fulfilled	Unfulfilled	Unfulfilled
Devising strategies for solving problems	Fulfilled	Unfulfilled	Unfulfilled
Using symbolic, formal, and technical language and operations	Fulfilled	Fulfilled	Fulfilled
Using mathematics tools	Fulfilled	Unfulfilled	Unfulfilled

Table 4.2 shows that subjects with high learning independence are able to meet all indicators of mathematical literacy. This is in line with Agustiani et al. (2021) that students with high learning independence can fulfill all indicators of mathematical literacy thinking process. Furthermore, Kholifasari et al., (2020) also mentioned that students with high learning independence have a higher mathematical literacy, students with moderate learning independence have moderate mathematical literacy, and students with low learning independence have low mathematical literacy. Subjects in the category of moderate learning independence were not able to meet the indicators of reasoning and argument, devising strategies for solving problems, and using mathematics tools.

This is in line with (Kholifasari et al., 2020) that subjects with moderate learning independence were unable to develop strategies for problem solving.
Subjects in the category of moderate learning independence were only able to meet the indicators of communication, mathematising, and using symbolic, formal, and technical language and operations.

Conclusions

Based on the results of analyzing mathematical literacy using PjBL learning with PMRI approach based on blended learning assisted by Google Classroom in case of learning independence, it can be concluded as follows: (1) students with high learning independence are able to meet all indicators of mathematical literacy, (2) students with moderate learning independence are unable to meet the indicators of reasoning and argument, devising strategies for solving problems, and using mathematics tools, (3) students with low learning independence are only able to meet the indicators of communication, mathematising, and using symbolic, formal, and technical language and operations.

6. References

Agustiani, S., Agustiani, N., & Nurcahyono, N. A. (2021). Analisis Berpikir Literasi Matematika Berdasarkan Kemandirian Belajar Siswa SMP. *EQUALS: Jurnal Ilmiah Pendidikan Matematika*, *4*(2), 67–78. https://doi.org/10.46918/equals.v4i2.966

Astuti, E. (2016). KEMANDIRIAN BELAJAR MATEMATIKA SISWA SMP/ MTs DI KECAMATAN PREMBUN. *Jurnal Pendidikan Surya Edukasi*, *2*(2), 65–75.

Bintari, U. (2020). *Kemampuan Literasi Matematika Ditinjau dari Kemandirian Siswa Kelas VII SMP Negeri 9 Semarang dalam Model Pembelajaran Inquiry Learning Pendekatan Realistik*.

Darma, Y., Firdaus, M., & Haryadi, H. (2016). Hubungan Kemandirian Belajar Terhadap Kemampuan Pemecahan Masalah Matematis Mahasiswa Calon Guru Matematika. *Edukasi*, *14*, 169.

Fahmy, A. F. R., Wardono, & Masrukan. (2018). Kemampuan Literasi Matematika dan Kemandirian Belajar Siswa Pada Model Pembelajaran Rme Berbantuan Geogebra. *Prisma*, *1*(22), 559–567.

Haryati, F. (2015). Meningkatkan Kemandirian Belajar Siswa Melalui Pembelajaran Dengan Pendekatan Metakognitif Berbasis Soft Skill. *Suska Journal of Mathematics Education*, *1*(1), 9. https://doi.org/10.24014/sjme.v1i1.1331

Kholifasari, R., Utami, C., & Mariyam, M. (2020). Analisis Kemampuan Literasi Matematis Siswa Ditinjau Dari Karakter Kemandirian Belajar Materi Aljabar. *Jurnal Derivat: Jurnal Matematika Dan Pendidikan Matematika*, *7*(2), 117–125. https://doi.org/10.31316/j.derivat.v7i2.1057

Kramarski, B., & Mizrachi, N. (2006). Online discussion and self-regulated learning: Effects of instructional methods on mathematical literacy. *Journal of Educational Research*, *99*(4), 218–231. https://doi.org/10.3200/JOER.99.4.218-231

Masjaya, & Wardono. (2018). Pentingnya Kemampuan Literasi Matematika untuk Menumbuhkan Kemampuan Koneksi Matematika dalam Meningatkan SDM. *PRISMA, Prosiding Seminar Nasional Matematika*, *1*, 568–574.

Mulyono, & Lestari, D. I. (2016). The Analysis Of Mathematical Literacy And Self-Efficacy Of Students In Search, Solve, Create, And Share (SSCS) Learning With A Contextual Approach. *Internationl Conference on Mathematics, Science, and Education*, *2016*(Icmse), M159–M164.

Murti, E. D., Nasir, N., & Negara, H. S. (2019). Analisis Kemampuan Pemecahan Masalah Matematis : Dampak Model Pembelajaran SAVI ditinjau dari Kemandirian Belajar Matematis. *Desimal: Jurnal Matematika*, *2*(2), 119–129. https://doi.org/10.24042/djm.v2i2.4072

Rizki, L. M., & Priatna, N. (2019). Mathematical literacy as the 21st century skill. *Journal of Physics: Conference Series*, *1157*(4), 8–13. https://doi.org/10.1088/1742-6596/1157/4/042088

Supratinah, U., Budiyono, B., & Subanti, S. (2015). Eksperimentasi model pembelajaran discovery learning, problem-based learning, dan think-talk write dengan pendekatan saintifik terhadap kemampuan pemecahan masalah matematika ditinjau dari kemandirian belajar siswa. *Jurnal Elektronik Pembelajaran Matematika*, *3*(10), 1138–1149. https://jurnal.uns.ac.id/jpm/article/view/10828%0A

Tipe, K., & Konvensional, C. D. (2016). *Jurnal Ilmiah Universitas Batanghari Jambi Vol.16 No.1 Tahun 2016 PERBANDINGAN HASIL BELAJAR MATEMATIKA MODEL PEMBELAJARAN KOOPERATIF TIPE COOP-COOP DENGAN KONVENSIONAL*. *Zulyadaini 1*. *16*(1), 153–158.

Wal, Z., & Aulia, F. (2019). Kategorisasi Tingkat Kemandirian Belajar Siswa Madrasah Aliyah. *Educatio*, *14*(1), 56. https://doi.org/10.29408/edc.v14i1.1407

Waluya, S. B., & Esa, Y. M. (2012). *Peran matematika dan pendidikan matematika dalam membangun karakter bangsa*. *November*, 978–979. http://eprints.uny.ac.id/7468/1/U-2 Budi Waluyo.pdf

Students' Mathematical Literacy of Learning Independence Using PjBL Model with PMRI Approach Based on Blended Learning Assisted by Google Classroom

ORIGINALITY REPORT

22%	13%	17%	8%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Wardono, B Waluya, Kartono, Mulyono, S Mariani. "Development of innovative problem based learning model with PMRI-scientific approach using ICT to increase mathematics literacy and independence-character of junior high school students", Journal of Physics: Conference Series, 2018 Publication	2%
2	ww.w.ijern.com Internet Source	2%
3	Submitted to Universitas Negeri Manado Student Paper	2%
4	N D S Lestari, D Juniati, S Suwarsono. "Integrating mathematical literacy toward mathematics teaching: the pedagogical content knowledge (PCK) of prospective math teacher in designing the learning task", IOP Conference Series: Earth and Environmental Science, 2019 Publication	2%

5	ejournal.unesa.ac.id Internet Source	1 %
6	journal.upgris.ac.id Internet Source	1 %
7	Muftihatul Azizah, Sunardi, Erfan Yudianto. "Students' mathematical literacy ability in solving story problems", AIP Publishing, 2022 Publication	1 %
8	R N Ismail, A Fauzan, Yerizon, I M Arnawa. "Analysis of Student Learning Independence as the Basis for the Development of Digital Book Creations Integrated by Realistic Mathematics", Journal of Physics: Conference Series, 2021 Publication	1 %
9	Siti Maslihah, S.B. Waluya, Rochmad, Amin Suyitno. "The Role Of Mathematical Literacy To Improve High Order Thinking Skills", Journal of Physics: Conference Series, 2020 Publication	1 %
10	ejournal.radenintan.ac.id Internet Source	1 %
11	Isnaeni Umi Machromah, Christina Kartika Sari, Zakiyyah. "Batik Context as PISA-like Problem to Assess Students' Mathematical	1 %

Literacy", Journal of Physics: Conference Series, 2021
Publication

12	Muhamad Yasin, Syamsul Huda, Fredi Ganda Putra, Muhammad Syazali, Rofiqul Umam, Santi Widyawati. "IMPROVE Learning Model and Learning Independence: Influence and Interaction on Mathematics Problem-Solving Abilities in Islamic Boarding School", Journal of Physics: Conference Series, 2020 Publication	1 %
13	download.atlantis-press.com Internet Source	1 %
14	Submitted to Universitas Negeri Semarang Student Paper	1 %
15	Titin Masfingatin, Vera Dewi Susanti, Eko Apriliawati. "EXPLORATION OF MATHEMATICAL LITERACY SKILLS IN SOLVING HIGHER ORDER THINKING SKILL TASK", AKSIOMA: Jurnal Program Studi Pendidikan Matematika, 2022 Publication	1 %
16	A N Azhiimah, T Rijanto, Munoto, L Nurlaela, I Basuki, Joko. "An analysis of online learning media in promoting learners' autonomy during covid-19 pandemic", Journal of Physics: Conference Series, 2021 Publication	1 %

17	Blischke, . "An Overview", Wiley Series in Probability and Statistics, 2011. Publication	1 %
18	Submitted to Sriwijaya University Student Paper	1 %
19	Dodik Mulyono. "The influence of learning model and learning independence on mathematics learning outcomes by controlling students' early ability", International Electronic Journal of Mathematics Education, 2017 Publication	1 %
20	Yustitia Via. "Numeracy of prospective elementary school teachers with low self-efficacy: A case study", Cypriot Journal of Educational Sciences, 2022 Publication	1 %
21	Submitted to Syiah Kuala University Student Paper	<1 %
22	Submitted to Universitas Sultan Ageng Tirtayasa Student Paper	<1 %
23	Fathur Rahmi, Iltavia Iltavia, Ramzil Huda Zarista. "Mathematical Literacy of Junior High School Students in Solving Problems PISA in Minang Context", JTAM (Jurnal Teori dan Aplikasi Matematika), 2022	<1 %

Publication

24	Kurnia Putri Sepdikasari Dirgantoro, Robert Harry Soesanto. "Analysis of Self-Regulated Learning of Students in Mathematics Education Study Program in Number Theory Course", JIPM (Jurnal Ilmiah Pendidikan Matematika), 2021 Publication	<1 %
25	Lewis Corner. "Production Bonus Schemes: A Cautionary Tale", Journal of the Operational Research Society, 2017 Publication	<1 %

Exclude quotes	On	Exclude matches	< 10 words
Exclude bibliography	On		

Students' Mathematical Literacy of Learning Independence Using PjBL Model with PMRI Approach Based on Blended Learning Assisted by Google Classroom

GRADEMARK REPORT

FINAL GRADE

/0

GENERAL COMMENTS

Instructor

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8