

## Online learning system during pandemic covid-19 at supporting mathematics literacy: problem face by Islamic-based school at junior high level at Jember, Indonesia

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**Abstract.** Quality human resources are an important factor in development in the current era of globalization. Quality human resources can only be realized with quality education, including mastery of mathematics and its holistic understanding. Therefore, a society with all its unique individual intelligence must have mathematical literacy skills and adequate mathematical connections. Someone who is literate in mathematics does not only understand mathematics but is also able to use it in solving everyday problems. In this case, mathematical literacy can foster mathematical connection skills. The problem is, the mathematics literacy skills of Indonesian students, from the results of the international mathematics ranking, are very poor compared to other countries. This research aims to explore the problem faced by Islamic-based school at junior high level in Jember Indonesia. This is a case study which the data were gathered from six schools with the basic of Islamic studies in Jember Indonesia. Those schools were from private and public school in Jember Indonesia and there were nine teachers and 126 students as the informant at this research. The data gathered by using questionnaires and interview to the all participants by using online activities. Our analysis showed that there were internal and external factors which affect the mathematics literacy faced by Islamic-based school in Jember Indonesia. The internal problems from 126 students consist of there was three types of curricula; a gap between the ratio of students' understanding, understand to do not understand, decrease up to 0.91, and the ratio of students' score based on standard completeness, increase about 0.75. While the external problems consist of the bad of internet connection ratio, bad (Poor, accessibilities, etc) compare to good, up to 1.6; students' focus in online learning around 0.19; and other facilities which played important factors for learning mathematics numeracy by online media. Those data affect teachers in using mathematics literacy based in their class from rare to never.

### 1. Introduction

Nowadays the quality of Indonesian human resources is due to the low quality of education, especially mathematics. This can be seen from various indicators. At the national level, evaluation of mathematics learning in schools is carried out using the National Examination (UN) standard. Meanwhile, at the international level, there are currently two main assessments assessing students' mathematical abilities, namely TIMSS (Trend in International Mathematics and Science Study) and

PISA (Program for International Student Assessment). In terms of mathematical abilities, a survey of the results of the Trends in International Mathematics and Science Study (TIMSS), which is conducted every 4 (four) years starting in 1999, in 2011 places Indonesia in the 36th position out of 40 countries. In 2015 the results showed that Indonesian students had not shown satisfactory achievements.

The low quality of education can also be seen in the 2015 Study Program for International Student Assessment (PISA) study report Indonesia Ranking for Science 62, Mathematics 63, and Reading 64 of 70 countries [1]. In 2012 PISA, the Science and Mathematics ranking was 64 out of 65 while Reading was 61 out of 65 countries. The average scores for PISA 2015 (and 2012) are Science scores of 403 (382), Mathematics 386 (375) and Reading 397 (396). Mathematical literacy is very important. This is because mathematical literacy emphasizes the ability of students to analyze, reason and communicate ideas effectively to the mathematical fractions they encounter [2]. This is what connects mathematics learned in the classroom with a variety of real-world situations. According to the OECD Mathematical literacy is the ability of individuals to formulate, apply, and interpret mathematics in various contexts. In this case including mathematical reasoning and using mathematical concepts, procedures, facts and mathematical tools to describe, explain and predict phenomena / events [3].

According to Kern, he then defines the term literacy comprehensively as follows: "Literacy is the use of socially, and historically, and culturally-situated practices of creating and interpreting meaning through texts [4]. It entails at least a tacit awareness of the relationships between textual conventions and their context of use and, ideally, the ability to reflect critically on those relationships. It draws on a wide range of cognitive abilities, on knowledge of written and spoken language, on knowledge of genres, and on cultural knowledge. "

Another understanding of mathematics literacy, as cited in the 2012 PISA report, is the ability of individuals to formulate, apply, and interpret mathematics in various contexts. This ability includes mathematical reasoning and the ability to use mathematical concepts, procedures, facts and mathematical functions to describe, explain and predict a phenomenon [3]. With the mastery of mathematical literacy, each individual will be able to reflect mathematical logic to play a role in his life, community, and society. Mathematical literacy makes individuals able to make decisions based on constructive mathematical mindsets.

The TIMSS survey, conducted by The International Association for the Evaluation and Educational Achievement (IAE) based in Amsterdam, takes focus on the domain of mathematical and cognitive content of students. The content domain includes Numbers, Algebra, Geometry, Data and Opportunities, while the cognitive domain includes knowledge, application, and reasoning. Meanwhile, PISA's three annual study, organized by the Organization for Economic Cooperation and Development (OECD), a UN agency based in Paris, aims to find out the mathematical literacy of students. The focus of PISA studies is the ability of students to identify and understand and use the basic mathematics needed in daily life. The TIMSS and PISA studies basically lie in the power of students' mathematical reasoning and the ability to apply them in everyday life. This shows the weaknesses of students in connecting formal mathematical concepts with real-world problems. Noting the low ability of Indonesian students in the survey, the Government of Indonesia, in this case the Ministry of Education and Culture has actually anticipated it by making some curriculum changes. Until in a pandemic condition like now learning must still be done, namely by learning online.

Corona Virus Disease or Covid-19 was declared a pandemic on March 11, 2020, a disease that is endemic in almost all countries in the world. The spread of this virus is very fast and recorded 188 countries in the world infected with Covid-19 [5]. The World Health Organization recommends that one of the steps to spread Covid-19 is to impose travel restrictions, quarantine, curfew restrictions, control of hazards at work, and closure of public facilities. This pandemic causes severe disruption in various social and economic fields. The education sector also experienced a significant disturbance. Schools and universities have been closed, either nationally or locally on a scale in some countries

affected by Covid-19. Social distancing carried out by local governments greatly affects the conditions of learning in schools. Learning in schools must still be carried out in order to meet the needs of students. The solutions currently offered are online learning or online learning from their homes.

Covid-19 urges testing of distance education that has almost never been carried out simultaneously for all elements of education namely students, teachers to parents [6]. So that distance learning becomes a solution to overcome difficulties in implementing direct learning face to face. This presents a challenge to all elements and levels of education to keep the class active even though the school has closed. The health crisis caused by the Covid-19 outbreak has pioneered online learning simultaneously. Online learning tsunamis have occurred almost throughout the world during the Covid-19 pandemic [7]. Teachers and educators as important elements in teaching are required to carry out unprecedented massive migrations from traditional face-to-face education to online education or distance education [8]. This is supported by technological developments that are not limited to the current 4.0 industrial revolution. Online learning is effective for implementing learning even though educators and students are in different places [9]. This is able to solve the problem of students' delay in gaining knowledge.

Pandemic Covid-19 suddenly requires the education element to sustain online learning. The current condition urges innovation and adaptation related to the use of available technology to support the learning process [10]. The practice requires educators and students to interact and transfer knowledge online. Online learning can take advantage of platforms such as applications, websites, social networks and learning management systems [11]. These various platforms can be utilized to support knowledge transfer supported by various discussion techniques and others. The variety of benefits obtained certainly has constraints felt by educators and students in online learning. It also allows the use of the internet to have a high effect on students' health. Other constraints found are the ability of parents to provide online education facilities [12]. Such as the use of internet networks that require funds [13]. From the explanation above, it can be seen that there are several obstacles experienced in online learning, during Pandemic Covid-19 at Supporting Mathematics Literacy: Problems Faced by Islamic-Based Schools at Junior High Level at Jember Indonesia.

## 2. Method

This is a qualitative research, with a field-study research as the approach. This approaches was used because researchers want to explore several limitation faced by Islamic-based school in Jember Indonesia in designing literacy in mathematics base in their learning activities during the pandemic covid-19 condition. The research instruments were interview sheets as the guidance to do interview, documentation to look previously achievement of the students, and questionnaires to find the recent data. To validate the data, researchers used those ways such known as triangulation of methods. The participants in this research are nine teachers and 126 students coming from six schools both private and public school at junior high school level in Jember, Indonesia. All the schools are Islamic-based school. Researchers used ratio as the approach to calculate the ratio of several aspects such can be seen in the formula below. To find the information, researchers used both online and offline approaches to collect the data.

$$r_{xy} = \frac{N_x}{N_y}$$

$r_{xy}$  = ratio for variables x to y  
 $N_x$  = the number of variable x  
 $N_y$  = the number of variable y

## 3. Research Results

As the analysis from the data, researchers found that there were two aspects that influence the way of Islamic-based school in teaching mathematics literacy in pandemic era of covid-19. Those are internal and external aspects. At the internal aspect, curricula, Gap between students' understanding and score,

became the main problems. Meanwhile at external aspects, students faced the bad of Internet connection, the lack of students' focus and other facilities problems.

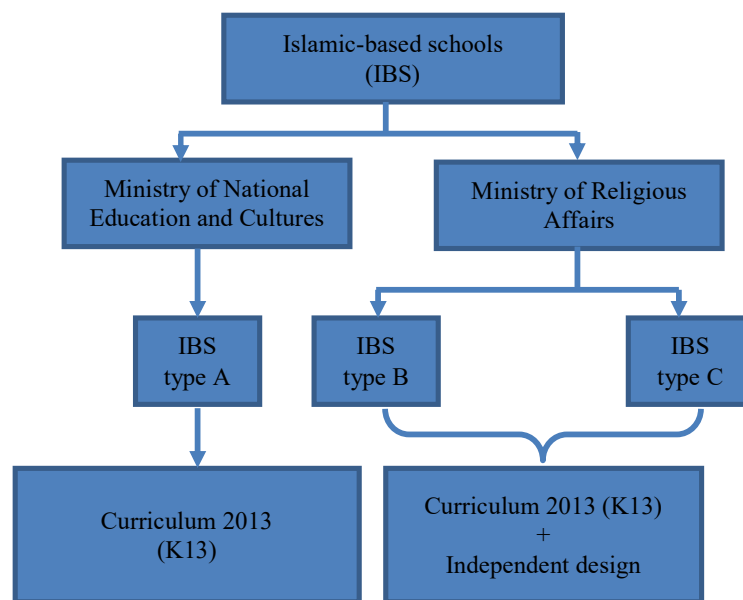
### 3.1. Internal

Internal factors plays the crucial factors in learning numeracy at pandemic covid-19 condition. There are some factors exist in this part, those are curricula, and gap between understanding and score.

#### 3.1.1. Curricula

This types of internal factors caused the major things for Islamic-based school in teaching mathematics literacy at senior high school levels. Actually, there were three types of curricula in teaching mathematics at Islamic-based of junior high school.

From the data, researchers found there were three types of mathematics curriculum in Islamic-based schools. The curricula can be seen in the picture bellow



**Figure 1.** The path of Indonesian Curriculum for Junior High Level School for Islamic-Based Schools

There were three types of Islamic-based school in Jember Indonesia. It also caused there were three types of curriculum in every types of school. Actually all of the curriculums are coming from K13 curriculum, especially for mathematics. The first curriculum is faced by IBS type A. This curriculum comes from the Ministry of National Education and Cultures. This type of school is totally implementing the curriculum of 2013. In another part, there is IBS type B which is coming from the Ministry of Religious Affairs. This type of school just implements part of curriculum (K13). Meanwhile, type C IBS, coming from the Ministry of Religious Affairs, implements part of K13 with modification. This modification cause crucial effect to mathematics subject as the main subjects for junior high school level. The differences of every curriculum can be seen from the table below.

**Table 1.** The differences of Mathematics Curriculum in Junior High School Level at Islamic-based School.

Aspect	Type of IBS		
	A	B	C
<i>Number of hours per week (meeting hours)</i>	5 mh	4-5 mh	3-4 mh

<i>Bloom taxonomy</i>	C <sub>1-6</sub>	C <sub>1-6</sub>	C <sub>1-4</sub>
<i>Real Math Approach</i>	Usual	Seldom	Rare
<i>Learning activities</i>	Process + Result	Process + Result	Result
<i>Typical teaching strategy</i>	Mixed method (teacher + student center)	Mixed method (teacher + student center)	Teacher center + drill

It can be seen from the table above, the number of teaching mathematics per weeks varies each other. For type A, it is five meeting hours (mh) per week, type B is 4-5 meeting hours, and IBS type C has the lowest hours for mathematics, which is about 3-4 meeting hours. Those school which has 3-4 meeting hours per week actually comes from Islamic-boarding school which requires their students to stay at the boarding house with various religious activities in their daily life. While for the taxonomy bloom used in their daily activities is C1-6 for IBS type A and B. Meanwhile, IBS type C only used C1-4 which is no reasoning in their learning activities. The worst thing is that IBS type C, rarely give their students a chance to find their mathematical concept by them self. Mostly they did it by using drill by explanation of the teacher. This type of curriculum influences teachers when they will design a mathematics literacy-based learning.

Beside such kind of conditions, some schools in Jember Indonesia do not implement mathematics literacy learning based. They did not transfer and teach mathematical content by using realistics problems. Before the covid-19 pandemic, Only two schools under six school which implement such learning method by greater than 25% for every academic years. Meanwhile, four others schools only implement such methods by under 15%. Those percentage was getting lower during this pandemic. All schools just used mathematics literacy at their class by only under 15%.

### 3.1.2. Gap between students' understanding and score

Based on K13 which is implemented by IBS A, numeracy based learning is strongly recommend. However, most of teacher did not implement it well. In other side, those who implement it still put high effort to design the learning. During the pandemic covid-19, some teachers already designed good question to support students' mathematics literacy skills. Teachers' question can be seen from the Figure 2 below.

The COVID-19 outbreak that hit South Korea forced Song Jong Ki to flee to a villa in Bali. The following is the floor plan occupied by Song Jong Ki



If Song Jong Ki wants to spray disinfectant only on the part of his villa building, determine the area of the building that Song Jong Ki will spray

**Figure 2.** Teachers Question during Pandemic Covid-19 which Post into Online Worksheet

Students' understanding before and after the pandemic covid-19 were collected by using questionnaire. Those questionnaires arranged based on Likert scale with several modification. The data is got from 126 students whom were coming from six schools. The questionnaires were given to

the students directly without any intervention from the teachers. The data of students' understanding before and after pandemic covid-19 can be seen from the table 2 below.

**Table 2.** Students' Understanding Before and After Pandemic Covid-19 of 126 Students

Understanding levels	Number of students	
	Before	After
5 (Really understand)	19	1
4 (Understand)	27	12
3 (Moderate)	35	31
2 (Less understand)	25	45
1 (Do not understand)	19	37
Total	126	126
Ratio understand to do not	1.09	0.16

It can be seen from the table that the ratio of students whom understand and do not understand respectively 1.09 and 0.16 at before pandemic covid-19 and after. It shows that there was significant discrepancy of students' understanding, about 0.91, for mathematics subject. It shows that the number of students who understand the material was getting lessen during the pandemic. However, those data contradict to teachers' document about students' daily test result. The number of students who passed the minimum criteria of completeness was getting increase. For clear illustration, the data of students' daily achievements can be seen from the table 3 below.

**Table 3.** Students' Daily Score Before and After Pandemic Covid-19 of 126 Students

Score ranges	Number of students	
	Before	After
95 – 100	28	27
85 – 94	26	34
75 – 84	33	53
65 – 74	22	12
Etc	17	0
Total	126	126
Ratio of complete to do not	2.42	3.17

It is clearly seen from the table that the ratio of students who passed the minimum criteria of completeness is increase significantly from 2.42 to 3.17. it increased about 0.75 What is more is that, during pandemic covid-19, there were no students who got under 65 for their daily test. It is truly contradict with the data of students' understanding. Afterward, researchers tried to find the fact under the data that most of students, about 0.9 students, asked for help during the test. Most of them asked their parents, brothers, furthermore going to mathematics private course just for getting great score for the test. It shows there are mistakes for learning activities here. It shows that learning activities during pandemic covid-19 still final result oriented not process oriented.

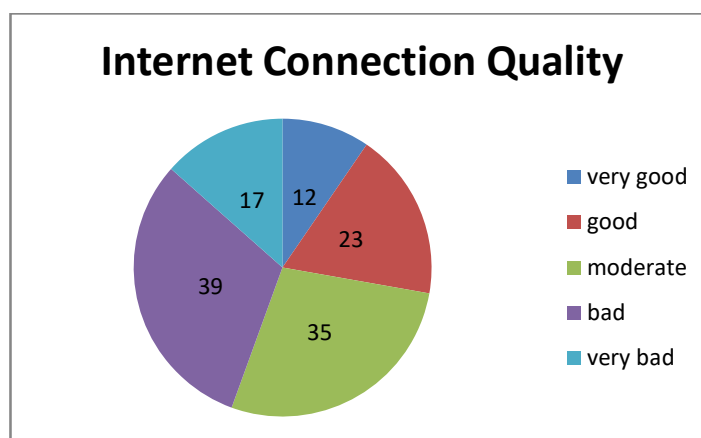
This result a bit different to Guerrerorresult research, he said that the concept during online mathematics learning activities was no significant differences to face-to-face activities, he showed that can be reach by the students at higher level [14]. O'Donoghue also support this, he explained that mathematics online learning class is effective during higher class students result. They much

responsible to them self about their learning activities. He added that online learning class a bit inappropriate to lower class especially in mathematics result [15]. Moreover, some aspect in learning activities cannot be reach to online class such as social interaction, collaboration, and decision making dimension. OECD already stated that The evidence provided by the OECD's Programme in International Student Assessment (PISA) shows that most of the education systems participating in the most recent administration of PISA in 2018 are not ready to offer most students opportunities to learn online [16]. It means that, even though teacher gave numeracy problem during their mathematics online learning activities to train their creativity, it seems that it cannot be reached.

### 3.2. External problems

#### 3.2.1. Internet connection

Internet connection in supporting online learning system for students in Jember Indonesia is quite various. Thruely, this aspect is crucial in supporting online learning activities [17]. Therefore, researchers generate likert scale of five scale to find out the quality of internet connection used by students. The result of giving questionnaires to respondent can be seen from the pie figure 3 below.



**Figure 3.** The Internet Connection Quality in Jember Indonesia

It can be seen that, from 126 students the number of students who has bad connection was still dominant at 39 people for bad, and 17 for very bad connection. This number then followed by moderate connection which stand at 35 people. While another remaining people has good and very good at 23 people and 12 people respectively. The ratio among bad and good internet connection can be calculated, then it is gotten 1.6. It shows that the internet connection quality still did not support online learning system in Jember Indonesia. Dube said that in rural area, or not supported area must be fully concerned by the governor, especially for the educators and the learners [17]. They should have easy access data that allows them to engage in an online learning process.

To gather deeper data, researcher did interview to the respondent. The main causes of the bad internet are coming from 1) the living area of the students. Not all students comes from city center, however they comes from very rural area, 2) Besides, it is caused by some students use mobile-phone internet-based which is unstable and difficult to access in certain location. It is happened because of students' parent economic condition.

#### 3.2.2. Students' focus

Using internet for learning is quite good as long as it is can be responsible. Based on the questionnaires, some students learned the main material, while others were doing another activities. There are some activities, either relevant or irrelevant, during the learning activities, in the same times.

The usage of internet access during learning activities somehow cause several distractor for students. There were some irrelevant activities which were doing by students at the same time of

online learning activities. Some of them open social media and some others opened websites which was related to the learning activities. The sources which were used by students during the learning activities can be seen from the table 4 below:

**Table 4.** The Percentage of Students who Used Online Resources (Relevant and Irrelevant to The Study).

Resources	Students (%)	Average	Rate
<i>Whatsapp</i>	1.00		
<i>Instagram</i>	0.81		
<i>Facebook</i>	0.50	0.73	
<i>Other websites (irrelevant)</i>	0.60		
Email	0.04		
Ruang guru	0.09		0.19
Wolfram	0		
Wikipedia	0.15		
Google (search engine)	0.25	0.15	
Brainly	0.29		
Other websites (relevant)	0.18		

It can be seen from the table 4 that the average of students who used in-appropriate apps was around 0.73. Meanwhile those who used supported apps for learning activities were 0.15. When this average was compared, appropriate to in-appropriate, researchers got 0.19, it shows that the number of apps which was supporting the learning activities much more lower rather than in-appropriate apps.

### 3.2.3. Other facilities

There are some another facilities which is support online learning system at mathematics literacy for students during pandemic covid-19. Some of them are 1) the existence of mobile phone, 2) The existence of notebook, 3) Support from parents, and 4) Economic condition of the parent. The data related to this are measured by using likert scale and then arranged by using table 5 below.

**Table 5.** The Number of Support at Every Aspects

Scale	Aspect			Support
	Existance of mobile phone	Existance of notebook	Economic condition	
5	24	5	7	10
4	35	19	29	25
3	37	71	24	49
2	20	12	32	25
1	12	19	34	17
Total	126	126	126	126

In the first facilities, mobile phone, it did not really mean to students, because it seems that it is normally distributed. there is no significant discrepancy among all criteria, which is approximately 24 students. This contrast to economic condition, which is the number of students who stood at low income condition is much greater than those who have high income condition, about 66 compare to 36. While the existence of notebook also did not really problem to students, because they have supported mobile phone as the substitution. The support of parent factors mean that parent do not give students hard responsibilities during the online learning system. It can be seen from the table 5 that there were almost 42 students answered at two scale. It means that they have another responsibilities



besides studying. According to the survey, students still have responsibility in finding and supporting economic condition by helping their parent at workplace.

Guerrero believes that the advance of technology in teaching is currently really beneficial in some aspects. Its flexibility in terms of location, time, support and costs, makes it the most appropriate option for training and evaluating students. However, it is also have several debatable aspects. This also happened to Jember Indonesia. For more, he emphasized that well learning online design will be nothing without well pedagogical aspect design. It shows that even mathematical concept is trained by using online, teacher should additionally doing evaluation such as face-to-face learning activities.

#### **4. Discussion**

This result actually equivalent to OECD which said that to start with the very basics. On average across OECD countries, 9% of 15-year-old students do not even have a quiet place to study in their homes, and in Indonesia, the Philippines and Thailand this figure is over 30%.pandemic [16]. Mailizar emphasized that the most crucial obstacles for Indonesia were at the student itself related to student lack of knowledge and skill in e-learning use, and their lack of access to devices and internet connection [18]. Actually this research also support in the area of Jember Indonesia. The quality of internet connection in Jember Indonesia was varies from district to district. In some part, the quality was bad, but in another was good. However, this was not the main cause in this area.

Againts to that, Ulbrich et al believed that during pandemic or not, online learning activities in math can be done well by preparing the material or supplement well. Further, educators can lean on literacy lessons from earlier in the school year [19]. This statement also supported by Ackerman (2018)who said that online learning system actually can be done as long as the supporting system is good, well done design of lesson material by teachers and professional of IT leaders [20]. This strategy of course also support for rural area all around the world. Therefore, all component must be working together. In contrast, Guerrero et al, were actually partly agree to online learning activities to support mathematics literacy [14]. It can be done well by using very supporting aspect, but it just touched for some learning aspect such as cognitive aspect, but not for another learning aspect such as collaboration, social activities and soon.

Those all condition around the world were quite different to Jember Indonesia especially for Islamic-based school. Even though it was still debatable whether mathematics literacy can be learned during covid-19 pandemic, Indonesia, especially Jember region, tried their best. Giving some literacy based problem to their students have been tried to train students' creative and logical thinking. Even though some obstacles happened, in line with spain such as the honesty, the social interaction, and soon [14]. Junior high school teachers at Islamic-based school at jember Indonesia, already put high effort to support students numeracy skills. Nevertheless, it cannot be evitable that well design learning activities was not the main problem. There were another problem which influence online learning activities which were facilities, students' understanding, final score base assessment, support from parent, and students' commitment in doing online class still became big obstacles. Therefore, it must be solved to support qualified learning activities during covid-19 pandemic moment. It is in line with Kuhfeld et al who said that all component, researchers, policy makers, teachers and school have to work together to understand the policies and practices for recovery [21].

#### **5. Conclusion**

For conclusion, there were internal and external factors which affect the mathematics literacy faced by Islamic-based school in Jember Indonesia. The internal problems from 126 students consist of: 1).there were three types of curriculacoming from two different-ministry-based school, which are real K13, modified K13 with independent design, and real K13 with reduction of meeting hours per week; 2). There was a gap between the ratio of students' understanding, understand to do not understand, decrease up to 0.91, and 3). the ratio of students' score based on standard completeness, increase about 0.75, this is caused by students used online search engine and do their work by asking for help from their private teacher. That shows that there was opposite each other for both aspects, therefore there

was gap between those aspects. While the external problems are: 1). Ratio of internet connection of bad (Poor, accessibilities, etc) compare to good, up to 1.6; 2). Students' focus in online learning around 0.19; and other facilities which played important factors for learning mathematics numeracy by online media. Those data affect teachers in using mathematics literacy based in their class from rare to never.

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