HABITUATION OF DIGITAL LITERACY AND CRITICAL THINKING IN MATHEMATICS IN ELEMENTARY SCHOOL

Meggy Novitasari, Sutama, Sabar Narimo, Achmad Fathoni, Laili Rahmawati, Choiriyah Widyasari

Abstract—In this cyber era, digital literacy is needed to train critical thinking. Digital literacy needs a high-level thinker to trigger the students for thinking critically. There are two aims of this research. 1) To describe the process of digital literacy habituation in Mathematics at the elementary level. 2) To describe the profile of critical thinking ability in Mathematics at the elementary level. This research is categorised as qualitative research. The research took place in SD Negeri Kleco 1 Surakarta, academic year 2019/2020. The methods used in this research were participative observation, interview, and document analysis. The data validation was done using source and time triangulation. The data validation was conducted by using reciprocal. Regarding the findings, the analysis found: 1) the habituation of digital literacy in elementary level in Mathematics using media such as video, Microsoft PowerPoint (PPT), Photo MTh would trigger the students to analyse relevant information or data, to evaluate and to build information in the form of questioning and answering; 2) students’ profile of critical thinking could be seen by giving simple answer, scaffolding some basic skills such as observing, concluding in both deduction and induction, elaborating further answer, arranging strategies in regards to decide the proper action and interaction with others.

Index Terms—digital literacy, critical thinking, mathematics, habituation, elementary school, students profile, strategies

1 INTRODUCTION

Critical thinking is essential for students in this cyber era. In this transparent and fast time, habituation of digital literacy is extremely needed to train critical thinking in Mathematics. Digital literacy needs high-level thinkers to be able to trigger critical thinking in learning Mathematics, and eventually, provide them with competitiveness. This is reflected by an analysis result of students’ ability achievement in the global study of PISA (Programme for International Students Assessment) and Puspendik Kemendikbud INAP (Indonesia National Assessment Program). In PISA which was done in 2015 and involved students with a maximum 15-year-old age, Indonesian participants got mark 386. This put Indonesia in the rank of 64 out of 72 PISA registered countries [1]. PISA is aimed to measure basic literacy and students’ critical thinking in Mathematics to build conducive learning activities and effective learning process. Digital literacy becomes a long-term UNESCO program. Roadmap UNESCO (2015-2020) states that digital literacy becomes a benchmark and foundation for future education. Digital literacy requires students to think critically in every learning action [2]. The result of the PISA study shows that literacy is still on a low level. This is caused by the failure of the students in achieving the digital literacy components such as information or data analysis, effective information evaluation and construction [3]. Finally, teachers should pay attention to provide supervision or affirmation in terms of digital literacy components, and stimulating the students to analyse problems.

The result of previous studies which were conducted by the researchers in Public Elementary School (SD N) Kleco 1 Surakarta shows that the students could operate in learning media properly. However, they could not analyse and solve certain problems optimally. This observation result was done by observing a video and material on Microsoft PowerPoint (henceforth PPT) via a laptop, and realia which were used during the learning process. This implicitly means that digital literacy was yet to be implemented optimally in that elementary school. Mathematics is one of the studies which could develop self-potencies, character, and students’ skill [4]. This potential is a foundation in industrial revolution 4.0 era which requires students to master the basic literacy (sciences, Mathematics, reading, and technology), and the skills of thinking critically and creatively, communicating, collaborating, and building the students’ character [5]. The teachers in Public Elementary School (SD N) Kleco 1 Surakarta tend to have difficulties in implementing and creating learning media in the technology basis due to internal and external factors. This is in line with Kriessandi & Rusmanwan [6] statement, which argues that teachers’ obstacles include creating learning media, understanding in digital literacy, combining learning content in thematic learning, and mastering the technology and information. Hence, the students’ critical thinking in Public Elementary School (SD N) Kleco 1 Surakarta might not reach the optimum level yet. Students would not be able to think critically if they do not comprehend the Mathematics concept yet, also if there are not supporting facilities and infrastructure. One of the alternatives in helping the students to comprehend the Mathematics concept is giving them materials which are related to their real world. This argument is supported by Alfiah, Khoiri and Qomaria [7] who state that Mathematics teachers must integrate the basic concept of Mathematics to the real-life, and communicate using the concept and nature of Mathematics. Another alternative is narrative reading. This fits the Regulation of Ministry of Education and Culture Number 23 the Year 2015 which states that the culture of literacy is raised by habituation of narrative reading from the elementary level. Hence, students must have high creativity, innovation, and strategy in facilitating themselves to have an active, independent, and optimum literacy. This critical thinking requires teachers’ innovation and creativity to achieve proper digital literacy habituation. Each teacher always has a proper effort during the learning process which suits the students’ character [8].

Index Terms—digital literacy, critical thinking, mathematics, habituation, elementary school, students profile, strategies

* Meggy Novitasari is currently pursuing masters degree program in basic education in Universitas Muhammadiyah Surakarta, Indonesia. E-mail: meggy151013@gmail.com
* Sutama (corresponding authors) is a Professor in basic education in Universitas Muhammadiyah Surakarta, Indonesia. E-mail: sutama@ums.ac.id
elaborating further answer, and arranging strategies. This is argued by Pangaribowosakti [9] who identifies critical thinking indicators such as 1) giving simple answer in problem-solving activity, giving reasons, and questioning or facing a challenge; 2) Scaffolding basic skills related to related source, adapting, observing, and considering the final result; 3) Concluding in both deduction and induction; 4) Elaborating further answer in defining certain terms and identifying particular assumption; 5) Arranging strategies in deciding an action and communication towards others. Based on that theory, the aims of this research are: 1) to describe the process of digital literacy habituation in Mathematics at the elementary level; 2) to describe the profile of critical thinking ability in Mathematics at the elementary level.

2 RESEARCH METHOD
This research adopts qualitative method and guides the researchers to explore and picture the social situation [10] in the digital literacy habituation and identify the profile of students’ critical thinking. Scope of this research comprises SD Negeri Kleco 1 Surakarta, the academic year 2019/2020. The technique of data collection was done by participative observation, an interview which was related to the digital literacy habituation and the ability of critical thinking, and document analysis which was related to the lesson plan archives, learning media and students’ result. The data validation in this research was carried out using source and time triangulation. Regarding the data analysis, it was done by reciprocal, namely, the data collection, reduction, presentation, and conclusion were being done reciprocally [11]. The process from data collection to data analysis in this research was illustrated in Picture 1 as below.

Picture 1. The research process from data collection to data analysis

3 RESEARCH METHOD
3.1 Digital Literacy Habituation
The teachers used video and Microsoft PowerPoint (henceforth PPT) as their media in the introduction stage of Learning to promote the digital literacy habituation in the Mathematics learning process. The video was used for apperception and learning motivation. Before airing the video, the students greeted the teacher, followed by a prayer led by one student. This was one of the classroom rules to prepare the students before they start learning. The video prepared by the teacher contained material comprehended by the students and new material which they would learn as well as its aims. The activity of using video as learning media is presented below in Picture 2.

Picture 2. The presentation of video usage in the introduction stage

The interview done with the teacher has shown that video was an important component in digital literacy. Through video, students could have digital literacy to trigger their critical thinking in analysing information, evaluating and building information through questioning as well as answering questions. This is argued in a research conducted by Julia and Isrokatun [12] who have concluded that students need to be guided in training their digital literacy to think critically and in raising their technology awareness through the learning process. Thus, according to research carried out by Otieno [13]; Forsström & Kaufmann [14], the finding suggests that teachers should be pushed to integrate digital technology to the learning process so that this can improve students’ learning motivation and works in the process of Mathematics learning. Lesson aims and process of Mathematics learning which was done by the teacher using digital literacy habituation, specifically using PPT are illustrated below. The activity using PPT in the introduction stage is presented in Picture 3 as below.

Picture 3. The implementation of PPT in the introduction stage

The sample of questions and answers activity (henceforth Q and A) between the teacher and students in comprehending the lesson aims and the process of Mathematics learning are presented below (T=teacher; S=students).

T: Do you recognise the variety of solid figures?
S: Yes, cube, rectangular prism, prism, pyramid, cone, cylinder, and sphere.

T: What do you do to comprehend from those solid figures?
S: Looking for real samples, finding out their characters, analysing the examples, finding out the formula of surface area and volume of solid figures, and analysing the problem in daily life related to solid figures area and volume.

Based on Picture 3 and interview sample, with the teacher’s help, students developed what they remembered and understood to be key words which helped them to solve problems. This shows that digital literacy could trigger the students to develop their critical thinking well. This habituation activity aims to cultivate the students in comprehending the
concept before analysing a problem since this is a proper action in comprehending the problem concept. This is different from As’ari’, Kurniati & Subanji’s [15] research finding which suggests that Mathematics teachers tend to ignore the analysis of students’ thinking process, but the final result. In terms of the digital literacy habituation in the main stage of the learning process, the teacher used PPT, video and Photo Math. PPT was used to develop the students’ comprehension in Mathematics concept. The following is Picture 4 which presents the sample of PPT used within the classroom.

Below is the sample of Q and A between teacher and students

Through Q and A, students were enthusiastic to find out the surface area of a con.

T: Do you comprehend the idea of con surface area showed on the screen?
S: Yes, con surface area = White Surface Area + Green Surface Area.
T: What do you do to find out the con surface area?
S: Creating a circle with radius s, and then the con surface area is got from the comparison between the con surface area and the circle area, it equals to the comparison between the con base surface area and the circumference.

Based on Picture 4 and the sample of Q and A, with the teacher’s help, students developed what they observed to be key words which could help them in solving problems. This is suggested by Mercer, Sara, & Paul [16] who state that thinking together and sociocultural theory provide some strong ways that allow the learning process using digital technology to serve dialogic pedagogy and to develop students’ participation in both quality and quantity. This means that the use of digital technology in developing the comprehension of the basic concept could improve the quality of the students’ critical thinking.

Picture 5 is the presentation of the main stage which helps the students to solve problems. Picture 5. Video usage in the main stage of learning

In the main stage in which the teacher showed the video, the students were given an activity to analyse the exercises both in a group and individual. This activity was used to analyse the students’ critical thinking in understanding the Mathematics basic concept. In order for the students to fully comprehend, they were helped by their peers as their tutor consecutively within the group activity (also called controlled exercise). This aimed to build responsibility in the students to their own learning. Thus, in their individual activity, this aimed to help them build their own confidence. Munthe and Naibaho [17] state that the implementation of peers tutor method involves students who have high ability to help the students who have lower ones. This means, by implementing peers tutor method consecutively, the students might have a high level of critical thinking. In addition to the main stage, other than using PPT and video, the teacher also introduced Photo Math. This was delivered by the teacher orally, meaning, the camera was directed to smartphone screen which pictured the chosen Mathematics exercises. Photo Math would solve the counting and show the result on the screen. In research conducted by Fitriyadi [18] states that the use of modern technology gives a positive impact on teachers’ knowledge and skills. This is supported by Kilicoglu [19] who states that the teacher determines the whole learning result independently. It means that teachers’ creativity in the learning process is needed. This also supports the development of students’ critical thinking. Ultimately, the habituation of digital literacy in the closing stage by using PPT was aimed for reflection, conclusion, and post-test as well as video usage further implementation. Through Q and A, the students reflected the material that was delivered; both material that the students already comprehended and did not yet, the reason why they did not yet comprehend, and further learning alternatives. They also wrote the learning conclusion. Via PPT, the students did post-test independently, in other words, they did closed-book post-test. As the further learning alternatives, together with parents, the students were asked to observe the video which contained certain material and to take note of the basic concept as well as to identify some problems to be solved together in the classroom. The lesson was ended by prayers and greets.

3.2 The profile of critical thinking ability in Mathematics

The critical thinking in learning Mathematics started to be visible after the digital literacy habituation was successfully implemented. The students’ critical thinking ability is described as the following. The critical thinking indicator number 1, that is giving simple explanation could be specifically seen in their ability to identify problems, to identify the similarity and the difference of the plane figures, to question and answer the plane figures exercises. Picture 6 is the sample of their works which shows their critical thinking indicator in giving simple explanation (indicator number 1).

Picture 6. Indicator number 1: giving a simple explanation

Below is the sample of interview transcript between the researcher and the student (R=Researcher; S: Student)

R: Do you understand the problem?
S: Yes, the problem that must be solved is looking for the
area I + area II + area III
R : What do you do to understand the problem?
S : Trying to find out relevant data to plane figures, the
formula which can be used and needed.

Based on Picture 6 and the interview transcript sample
presented previously, the students developed what they
remembered and comprehended to be key words which
showed their critical thinking, specifically in indicator number 1
(giving simple explanation). This critical thinking improved their
understanding of the basic concept; hence, they would have a
better final result. This is argued by Setyaningrum [20] who
states that students’ result would be better due to their basic
concept comprehension. In regards to the critical thinking
indicator number 2, that is scaffolding the basic skills, the
students were able to use proper procedure and to observe as
well as to consider the observation result. Picture 7 below is
the example of students’ works which shows their ability in
indicator number 2.

Picture 7. Indicator number 2: scaffolding basic skills

Based on Picture 7, with the help of digital literacy and
material observation, the students were able to scaffold basic
skills related to the use of the right procedure in solving
Mathematics problems. This indicator might develop the
students’ communication skills and independence in solving
the problems. This is supported by Retnawati [21] who states
that the use of digital media could develop students’
communication skill and their learning independence.
In terms of critical thinking ability in indicator numbers, 3 to 4,
which are being able to conclude, to elaborate further answer
and to arrange strategies are presented in Picture 8 below.

Picture 8. Concluding, elaborating further answer, arranging
strategies

The students were able to use proper procedure and to
observe as well as to consider the observation result.

In terms of the critical thinking indicator in arranging strategies,
this can be identified by the way the students decided their
action and interaction with others which could be seen during
the process of working from the beginning to the end as well
as the ceramic total cost. Based on Picture 8, it could be seen
that raising the students’ awareness of their own weaknesses
and strengths were necessary. The students who have
metacognitive could control themselves to take a certain
action. This statement is in line with Sutama’, Anif’, Prayitno’,
and Sari’s [22] idea, which suggests that students who have
metacognitive knowledge would achieve better than those who
do not have. In addition, Kankam [23] states that the more
references the students read, the faster their metacognitive
develop. This means that this is an honoured duty for a
teacher to help the students in achieving their metacognitive
knowledge.

4 CONCLUSION
The habituation of digital literacy in Mathematics was practised
by teachers in SD Negeri Kileo 1 Surakarta using learning
media such as video, Microsoft PowerPoint (henceforth PPT),
and Photo Math. This habituation process was carried out in
four stages: 1) introduction, 2) main, 3) closing, and 4) assignment which should be done with the help of students’
parents. In addition, this habituation which was done in the
classroom and home could trigger the students to analyse an
information/ data, to evaluate, and to build information in
questioning and solving problems in Mathematics learning.
Eventually, this habituation could develop students’ critical
thinking in Mathematics learning. In terms of students profile
after the digital literacy habituation researcher found out that
the students were able to give a simple answer, to scaffold
their basic skill, to conclude, to elaborate further answer, and
to arrange learning strategies. In giving simple answer
indicator of critical thinking, the students were able to find out
the problems, to identify the similarities and the differences of
plane figures, and to question and solve the problem related to
the plane figures. In regards to the critical thinking indicator in
scaffolding the basic skills, the students were able to use the
correct procedure and to observe as well as to consider their
observation result. Meanwhile, the critical thinking indicator in
concluding could be seen in the students’ ability to conclude in
both inductive and deductive as well as to make and to
consider the decision. Thus, the critical thinking indicator in
elaborating further answer could be seen in the way they
defined certain terms and assumed. Finally, the critical thinking
indicator in arranging strategy could be seen in the way the
students decided their action and interaction with others.

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