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An Effort to Improve Numerical Literacy Ability through Webcomic that Integrated Challenge Based on Ethnomathematics Learning

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Abstract. In the era of Revolution 5.0 where digital literacy and technological innovation are increasingly important, numerical literacy ability is needed to deal with this problem. Based on the PISA results, it is revealed that the numerical literacy ability of students in Indonesia is still low and tends to decrease every year. To address this issue, innovative educational strategies are needed that can improve students' numerical literacy ability. One alternative solution to handle this problem is to use a Website Comic (Webcomic). Challenge Based on Ethnomathematics Learning (CB-EL) facilitates students to build their understanding of the role of mathematics in everyday life. The innovation of Webcomic that integrated CB-EL is an alternative to improve numerical literacy ability. This study aims to describe the impact of Webcomic that integrated CB-EL to improve student numerical literacy ability. This study was conducted using the literature review method by analyzing existing studies that are relevant. Based on the literature, Webcomic that integrated ethnomathematics enhances cultural relevance and accessibility, making learning more impactful. This innovation will combine with Challenge Based Learning that can makes students build their modelling mathematical concepts, so that this can encourage the development of students' numerical literacy ability. The literature review results show that Webcomic with CB-EL can potentially have a positive impact on students' numerical literacy ability. This innovation can be further developed, especially in improving students' numerical literacy ability to increase the PISA results.

INTRODUCTION

The era of revolution 5.0 is known as the era revolution of super intelligent humans to keep up with the rapid development of technology. The super intelligent human refers to someone who has 21st century abilities to deal with existing challenges. One of the basic abilities of 21st century abilities is numeracy literacy as an ability for a person to solve problems by modeling the problem into a simple form and using systematic procedures.[1].

Numerical literacy ability is a person's ability to understand, apply, and interpret mathematics in a variety of contexts in everyday life [2]. According to Madyaratria et al. (2019), numerical literacy ability can assist people in understanding the use of mathematics in daily life to make a conclusion and using it to create accurate decisions [3]. It is undeniable that numerical literacy is an essential ability that must be developed in the 21st century.

In fact, in the results of the Program for International Student Assessment (PISA) by the Organization for Economic Co-operation and Development (OECD) published in 2023, the mathematical literacy scores of students in Indonesia are still low. Based on the results of PISA 2015 to 2022, it was found that there was a decrease in the score from 386 to 366 so it can be concluded that the score of numerical literacy ability of students in Indonesia has decreased in the last 10 years [2]. This shows that there are serious problems in the education system in Indonesia, especially in teaching mathematics, which has not succeeded in improving students' numerical literacy ability optimally [4]. Therefore, an effort is needed to develop an innovative learning strategy that can improve numerical literacy ability in Indonesia.

One of the learning strategies to reduce low numerical literacy ability is the use of appropriate learning media. The right learning media innovation that can encourage the improvement of numerical literacy ability is Webcomic [5]. Webcomic or e-comic is a combination of text, illustrations, and storylines to deliver information created

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through electronic media. Based on Siregar et al (2019), the selection of Webcomic as a media for learning mathematics is appropriate because students are interested in the visualization shown in the comic so that it stimulates students' numerical ability [6].

In the use of learning media in the classroom, a learning model is also needed to manage the class effectively [7]. The use of Webcomic accompanied by innovative learning models can build students' abiility to solve contextual problem in the real world [8]. One of the learning models that can be integrated in the media to encourage the improvement of students' numerical literacy ability is Challenge Based Learning (CBL) [9]. Challenge Based Learning is a learning model that combines contextual problem-based learning with project-based learning [10]. Johnson et al. (2009) explained that Challenge Based learning (CBL) can support efforts in improve the numerical literacy ability
process, because the problems and challenges in Challenge Based Learning (CBL) are able to train students in interpreting mathematical material that related to real world problem [11].

In providing learning environtment that is relevant to students' daily lives, learning models can be combined with ethnomathematics nuances. Ethnomathematics is a combination of mathematical concepts with cultural approach that provides a more meaningful understanding in mathematics learning as it relates to habits integrated with local culture or traditions which is expected to encourage their numerical literacy ability [12]. Learning model that integrated by ethnomathematics nuances can help students to improve their numerical literacy ability [13]. Therefore the combination of Challenge Based Learning (CBL) integrated ethnomethematics is an effort to improve students' numerical literacy ability.

Based on the background description, the researcher will examine the innovation of Webcomic integrated with Challenge Based on Ethnomathematics Learning (CB-EL) in an effort to encourage students' numerical literacy ability. This study is expected to contribute to the development of innovative alternative learning models in encouraging the improvement of students' numerical literacy ability in Indonesia.

RESEARCH METHOD

The research method used is the literature study method by collecting literature relevant to the research topic. The literature study was conducted by Organization, Synthesis, and Identification stage from various scientific sources such as books, journals, articles, proceedings, and other sources related to the topic of efforts to improve numerical literacy ability through Webcomic integrated Challenge Based on Ethnomathematics Learning (CB-EL) in the last ten years. The aim of this study is to describe the integration of Webcomic that integrated challenge based on ethnomathematics learning to improve numerical literacy ability.

FIGURE 1. Research Model Illustration

Figure 1 explains the stages of literature study in this research which went through three stages. First stage is organization stage which involves collecting literature that relevant with this study and sorting it by keywords including Numerical Literacy, Webcomic, Challenge Based Learning, and Ethnomathematics. After analyzing the keywords, in the synthesis stage that involved structuring the collected data from the selected literature into a literature
summary and find the connection between the literature. In identification stage is the step to analyze the summarize literature that have been described and combine it into a learning design to reach research objectives that expected to improve numerical literacy ability through Webcomic that integrated Challenge Based on Ethnomathematics Learning (CB-EL).

RESULT AND DISCUSSION

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Numerical Literacy Ability

According to the Kemendikbud (2021), to face the 21st century, students' mathematical abilities are needed, one of which is numerical literacy ability [1]. Numerical literacy is defined as a person's skill to understand, apply, and interpret mathematics in a variety of contexts in daily life [2]. Salvia et al. (2022) explained that numerical literacy also includes students' skills in using symbols and numbers in mathematics and the ability to analyze information presented in the form of graphs, tables, and charts to solve problems [14].

According to OECD (2023), there are three indicators of numerical literacy ability, which are formulate, employ, and interpret and evaluate [2] with the framework in Fig. 2 and the indicators of numerical literacy ability in this study are described in Table 1.

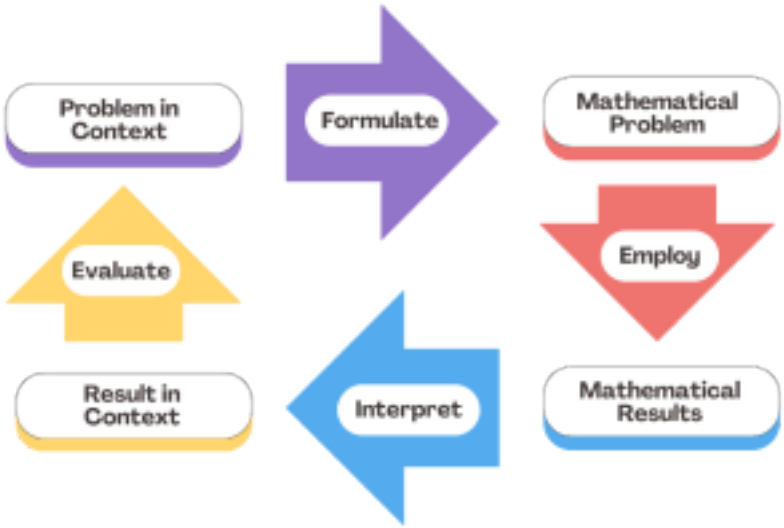

FIGURE 2. Indicator Framework of Numerical Literacy Ability

TABLE 1. Indicators of Numerical Literacy Ability [2]

Indicator	Description
Formulate	Ability to formulate concepts in mathematical problems based on contextual problems
Employ	Ability to solve problems that have been formulated by applying mathematical procedures, facts, and reasoning
Interpret and Evaluate	Ability to implement solutions from mathematical problems to real-world problems

Website Comic

Comics are a visual communication media that combines images and text that are assembled in an image storyline so as to facilitate understanding of the information conveyed [15]. Comics that made through electronic media are called Digital comic, E-comic, Mobile comic, or Website comic (Webcomic). Making comics using a website (Webcomic) has advantages because the website uses an internet connection that can be accessed worldwide easily. Because through website can be accessed easily, website as learning media can make it easier to obtain information for teachers and students [16].

Webcomic provides meaningful learning for students related to the material presented with interesting illustrations [8]. Based on Siregar et al (2019), the selection of Webcomic as a mathematics learning media is appropriate because students are interested in the visualization presented in the comic so that it can stimulate students' numerical literacy

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ability [6]. This is strengthened with a research by Nurjannah et al (2018) which explains that Webcomic as a learning media is the right choice to encourage the improvement of numerical literacy ability [17].

Challenge Based Learning

Challenge Based Learning (CBL) is a learning model that combines contextual problem-based learning and project-based learning [10]. Based on Yoosomboon & Wannapiroon (2015), the stages of Challenge Based Learning (CBL) includes Big Idea, Essential Question, Challenge, Guiding Resorse, Guiding Question, Guiding Activity, Solution Action, Publishing and Reflection [16] which can be seen in Fig. 2.

FIGURE 3. Stages of CBL [16]

Based on Fig. 3, students are provided with a concept that represents the contextual information do deliver information to the material (Big Idea) that follow by Essential Questions. To solve the Challenge, students complete the Guiding Resource, Guiding Questions and Guiding Activities. Next, students interpret the solution into real life (Solution Action). Then, students present the findings of the solution to be published (Publishing). After all of learning is completed, students do reflection (Reflection).

Johnson et al. (2009) explained that Challenge Based Learning (CBL) can support efforts in improve the numerical literacy ability process, because the problems and challenges in Challenge Based Learning (CBL) are able to train students in interpreting mathematical material that related to real world problem [11]. This is strengthened with research by Kurniawati & Miftah (2019) which explains that Challenge Based Learning (CBL) has a positive effect on improving students' numerical literacy ability [9].

Ethnomathematics

Ethnomathematics is one of the mathematics studies with nuances of surrounding culture applied by specific cultural groups [19]. Learning with ethnomathematics nuances allows students to study the culture of the surrounding environment and consider the values that exist in that culture. Thus, students not only understand mathematics but can also appreciate their own culture more and acquire values that affect the formation of national character which is starting to disappear due to the influence of modernization. Emphasizing cultural values is very important for teachers by making these cultural values learnable so that students get used to applying them. Izzulhaq & Ardiansyah (2023) explained that learning with ethnomathematics nuances makes students learn mathematics material while at the same time getting to know and explore the nation's local culture [20].

According to Yohanes et al. (2019), ethnomathematics also provides a more meaningful understanding in mathematics learning as it relates to habits integrated with local culture or traditions which is expected to encourage their numerical literacy ability [12]. Webcomic that integrated ethnomathematics enhances cultural relevance and

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accessibility, making learning more impactful.

Webcomic Integrated Challenge Based on Ethnomathematics Learning to Improve Numerical Literacy Ability

Each literature review indicates that all variables show a positive impact on students' numerical literacy ability. So in this case, it is expected that the integration of Webcomic integrated Challenge Based on Ethno Mathematics Learning (CB-EL) can improve the numerical literacy ability of students in becoming a super intelligent human in the era of revolution 5.0.

At the identification stage, an implementation of learning using Webcomic integrated Challenge Based on Ethno Mathematics Learning (CB-EL) in mathematics learning in the classroom will be explained in the form of learning design. One of them is the design of the application of Webcomic on similarity of triangles and quadrilaterals material with learning outcome and objectives as things to be achieved in learning attached in Table 2.

TABLE 2. Learning Outcome and Learning Objectives for This Media

Learning Outcome	Learning Objectives
Peserta didik dapat menjelaskan sifat sifat kekongruenan dan kesebangunan pada segitiga dan segiempat, dan menggunakannya untuk menyelesaikan masalah.	Through Webcomic integrated Challenge Based on Ethnomathematics Learning (CB-EL), students can: 1. Explain well the properties of similarity in triangles and quadrilaterals. 2. Solve contextual problems related to similarity in triangles and quadrilaterals correctly.

To achieve these learning outcome and learning objectives, the implementation of Webcomic requires a good learning management. The learning management is stated in the Challenge Based Learning (CBL) stages which is integrated with Ethnomathematics in the culture of the Tenun Troso Jepara motif in Challenge Based on Ethnomatematic Learning (CB-EL) is listed in Table 3.

TABLE 3. CB-EL Stages Through Webcomic Integration in the Learning

CB-EL Stages	Implementation in The Learning
Big Idea	Students are given general information about one of the Tenun Troso Jepara motifs related to its relationship to the similarity of triangles.
Essential Question	Students are given essential questions related to similarity material based on the Big Idea given.
Challenge	Students are given challenges related to the material discussed in accordance with the Big Ideas and Essential Questions about analyzing Tenun Troso other motifs.
Guiding Resource	Students are given similarity material through the visualization of Webcomic story.
Guiding Question	Students work on the Answer Box related to problems of similarity through the Webcomic.
Guiding Activity	Students are given some activities based on the given material that will help students complete the Challenges given.
Solution Action	Students implement the solutions to the Challenges they have encountered in the real world.
Publishing	Each group of students presents the solution found and through reflection on the website.
Assessment	publishes it on the website.
Reflection	Students work on questions and evaluate

The stages is contained in a Webcomic that can be accessed by students and teachers. The lesson begins by delivering the Big Idea regarding the exploration of Tenun Troso motifs from two different motifs to see the

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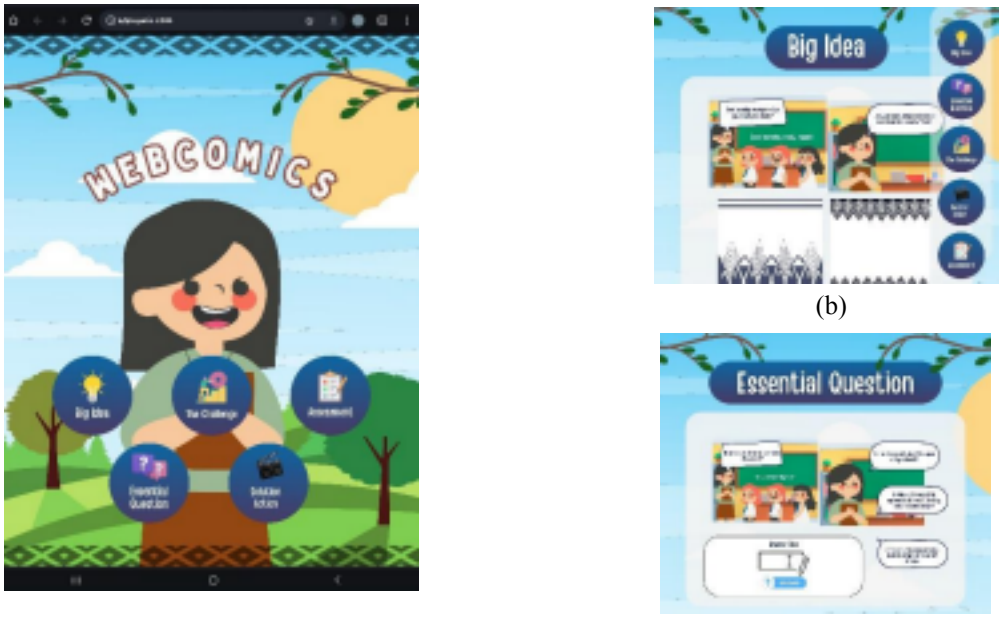
similarity of the two figures, which is attached in Fig. 4 (a). In addition, the Webcomic is also equipped with an Essential Question to help students imagine and understand the Big Idea conveyed in the form of questions, the Essential Question is attached in Fig.4 (b). Furthermore, Fig. 4 (c) shows The Challenge where after understanding the Big Idea and Essential Question, students in group activities complete the Challenge regarding the exploration of similarity material in other Troso motifs.

(a) (b) (c)

FIGURE 4. Big Idea of Exploration (a); Essential Questions (b); The Challenges for Students (c)

The entire stages will be covered in a Webcomic that can be easily accessed by its users. In addition, Webcomic is also equipped with several features to help users' activities in using it. Main Menu is a welcoming feature for users where it is the initial display that will appear and display several parts of the Webcomic to be accessed as shown in Fig. 5 (a). 5 (a). Figure 5 (b) shows the Shortcut Menu feature which is a feature that has a function to switch from one section to another quickly without returning to the Main Menu. Figure 5 (c) shows the Answer Box feature which is another feature in the Webcomic to help students practice numerical literacy ability and participate actively in the story in the comic.



(b)

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(a) (c)

FIGURE 5. Main Menu (a); Shortcut Menu (b); Answer Box (c)

CONCLUSION

Based on the results and discussion, it is found that the Webcomic innovation integrated with Challenge Based on Ethnomathematics Learning (CB-EL) is an innovative solution that can encourage the improvement of students' numerical literacy ability. Numerical literacy ability is one of the abilities needed to face the challenges of the 21st century in the era revolution 5.0 becoming a super intellgent human. The selection of appropriate learning media is needed to encourage the improvement of numerical literacy ability. Webcomic is a digital-based illustrated story that can be the right choice of mathematics learning media because it builds the interest of students in the visualization presented in the comic so that it can build students' numerical literacy ability. Webcomic that integrated ethnomathematics enhances cultural relevance and accessibility, making learning more impactful. Challenge Based Learning (CBL) can support efforts in improve the numerical literacy ability process, because the problems and challenges in Challenge Based Learning (CBL) are able to train students in interpreting mathematical material that related to real world problem. Therefore, further research is needed on the development of learning media through Webcomic innovation integrated with Challenge Based on Ethnomathematics Learning (CB-EL) to improve students' numerical literacy ability so as to improve PISA results.

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