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Improving Third Grade Students' Critical Thinking Skills Using Time Bar Media

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Abstract

This study aims to improve the students' critical thinking skills using time bar media in mathematics learning of Grade IIIA of SD Negeri 1 Kotagede – an elementary school in Yogyakarta, Indonesia. It used classroom action research design by Kemmis and McTaggart. The data were collected through observation, written tests, and interviews. The obtained data were analyzed using descriptive quantitative and qualitative techniques. The results showed that the use of time bar media in mathematics learning could improve students' critical thinking skills. The critical thinking skills covered: (1) providing simple explanations, (2) building basic skills, (3) concluding, (4) providing further explanations, and (5) arranging strategies and tactics. The increase in students' critical thinking skills was seen based on the test results in the pre-action (43%) which increased to 80% in the first cycle and increased to 90% in the second cycle.

Keywords: Critical thinking skill, Elementary school mathematics, Time bar media.

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INTRODUCTION

Thinking skills are important and highly required in the 21st century (Dixon, 2017). Ahonen and Kinnunen (2014) argue that critical thinking skills are highly valued in this era in which educational practices emphasize basic skills including reading, writing, and arithmetic with less consideration to equip students with skills to face the current challenges. Students' critical thinking skills are needed to deal with various kinds of problems in the globalization era. Critical thinking is crucial so that it becomes one of the main goals in education (Johnson, 2014).

Based on the results of interviews with teachers and students and observations of the learning process in grade III of State Primary School Kotagede 1, the researcher found several problems in mathematics learning. They covered unavailability of learning media which causing boring learning and low students' participation in learning, less varied learning process, monotonous and conventional learning methods, the dominant use of numerical symbols by the teacher, and low students' critical thinking skills in learning mathematics.

Students' critical thinking skills in mathematics learning are low based on the following evidence. First, no student takes the initiative to answer the teacher's questions and they sometimes only responded to the teacher's questions based on memory while the students' understanding of the concept is limited. Students could not analyze and solve problems in mathematics. It resulted in low critical thinking skills with lower average scores (56) in mathematics learning outcomes compared to other subjects.

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Second, no student volunteers to share the results of their work. The teacher tends to communicate in one way and use monotonous methods dominated by lectures and assignments. Thus, it caused students' lower understanding of learning mathematics. Students only listened to and recorded what the teacher says. Third, only a few students dared to propose questions to the teacher. Fourth, students still waited to be appointed by the teacher to answer questions or express their opinions. Indeed, some students responded to the teacher's questions with incorrect answers. The students' answers were limited to memorization because the concept of learning mathematics was only obtained from the teacher's lectures and thematic books. When students were asked to do the assignment in front of the class, most of them could not do it well. Fifth, there was no question and answer section among students. Sixth, the teacher had not provided evaluation questions to stimulate the students' critical thinking skills. Further, students could not construct their knowledge because they only received materials from lecturing and thematic books. They were not motivated to actively learn due to the application of one-way learning or lecturing method.

Besides, the insufficient availability of media also hinders the effectiveness of learning, especially for low-grade students who need to feel what they see in learning. Media can make the abstract concept more concrete enabling students to learn according to their learning development stages. Nitko and Brookhart (2011) stated that indicators of critical thinking are easier to make and apply to mathematics learning in primary schools by using learning media. Scoot (2008) stated that critical thinking skills should be integrated into other competencies such as the media of learning and mathematical learning. So it can be improved students' critical thinking skills. It is based on the consideration that cognitively, grade III of primary school students are at the concrete operational thinking stage in which critical thinking skills have just developed. There are two factors had caused critical thinking to remain dormant during education. First, the curriculum has generally designed with larges material goals that allow teachers to focus more on completing the material. The material completeness had prioritized over students' understanding of mathematical concepts. Second, the learning activities in the class performed by teachers are nothing but the transmission of information (the methods of lectures), enabling more teachers, while students are passively listening to and copying, where teachers periodically ask questions and occasionally answer (Hendriana, Setiawan, & Aripin, 2020).

Critical thinking skills are important for students. They become an important educational goal to prepare students to be able to identify and analyze the credibility of sources of information, demonstrate prior knowledge, make a connection, and draw conclusions (Duron, Limbach, & Waugh, 2006; Welch, 2015). Critical thinking skill is one that focused on an event or a problem. The events or problem is then analyzed the underlying factors and how the problem can occur, that the critical thinking skills cause students to become more active in searching for information that supports righteousness (Farindhani & Wangid, 2019; Rasiman, 2012). Critical thinking with precise, logical, and fast problem solving is required to prepare students to face personal challenges and future careers (Stephen & Jugje, 2017: 98). Critical thinking is the application of careful reasoning in determining whether a statement is true (Moore & Parker, 2009: 3). The development of critical thinking skills can be done by utilizing learning media. Learning media can increase active participation and develop students' critical thinking skills (Buckingham, 2008). The use of learning media can direct the students' attention, increase motivation, improve learning achievement, and improve critical thinking skills because the present materials clearer and easier to

understand (Courville, 2011: 3; Heo, 2012: 164). Learning media are beneficial to provide more understanding to improve students' critical thinking skills and learning motivation. Association for Educational Communications and Technology (AECT) stated that media are all tools, forms, and channels to convey information.

This study used time bar media. Bars or rulers or are visual-based media are considered as non-projection types of visual media, namely models, print, and graphic media (Smaldino et al., 2019). The time bar media is a substitute for a ruler. In this case, the size of the time frame is enlarged than the common ruler so that it is easily accessible by the students. Time bar media are also included in the type of graphic media as they were first designed using CorelDraw which covers the element of sketch, drawing, and line. Then after the design stage, the media were printed. The time bar media are included in the length measurement instrument. The instrument has the smallest scale of 1 mm or 0.1 cm. The measurement accuracy is half of the smallest scale, namely 0.5 mm. In performing the measurement, the sight must be perpendicular to the scale on the bar and the measured object. If not, it will result in errors with bigger or smaller sizes.

The time bar media functions to make it easier for students to understand the learning material conveyed by the teacher. This is reinforced by the fact that learning media are a tool to convey learning materials to facilitate the learning process based on the Regulation of the Ministry of Education and Culture Number 22/2016; (Adekola, 2010; Permendikbud Nomor 22 tahun 2016; Reigeluth & Chellman, 2018). Educators have to be able to choose the appropriate learning media and method, active and create a conducive learning environment to achieve the learning objectives. One of the most important things to do is to encourage students in the process and model deep thought habits so that their critical thingking skills can be developed through the habit of critical questions provided by teachers and students' regular involvement the actively learning processes (Ingwarni, 2018).

The time bar media were taken from the word bar or ruler or ruler is a typical length measuring tool. In performing the measurements, the direction of sight must be perpendicular to the scale/number on the ruler and the measured object, otherwise, it will result in errors (Widodo, 2009). Meanwhile, time is a whole-time series of past, present, and future (Shihab, 2010). So, the time bar media is a measuring functioned to measure the past, present, and future time to make it easier for students to understand the conveyed learning material. This time bar media is the media used in mathematics learning, particularly in time measurement material. This media is effective for increasing critical thinking skills (Putra & Sudarti, 2015).

RESEARCH METHOD

This Classroom Action Research (CAR) used a model developed by Kemmis and McTaggart which consists of four stages, namely: (a) planning, (b) action, (c) observation, (d) reflection (Kemmis, McTaggart, & Nixon, 2014).

This research was conducted at SD Negeri 1 Kotagede, Kotagede, Yogyakarta in the even semester of the 2018/2019 academic year from January-March 2019. The subjects in this study were 30 students in grade IIIA of SD Negeri 1 Kotagede. This research was conducted based on a cycle and each cycle consisted of four steps as suggested by Kemmis and McTaggart (See Figure 1). The cycle would be stopped if it has reached the predetermined success criteria, otherwise, it would be continued. This classroom action research would be conducted using: (1) planning, (2) action, (3) observation, (4) reflection stages.

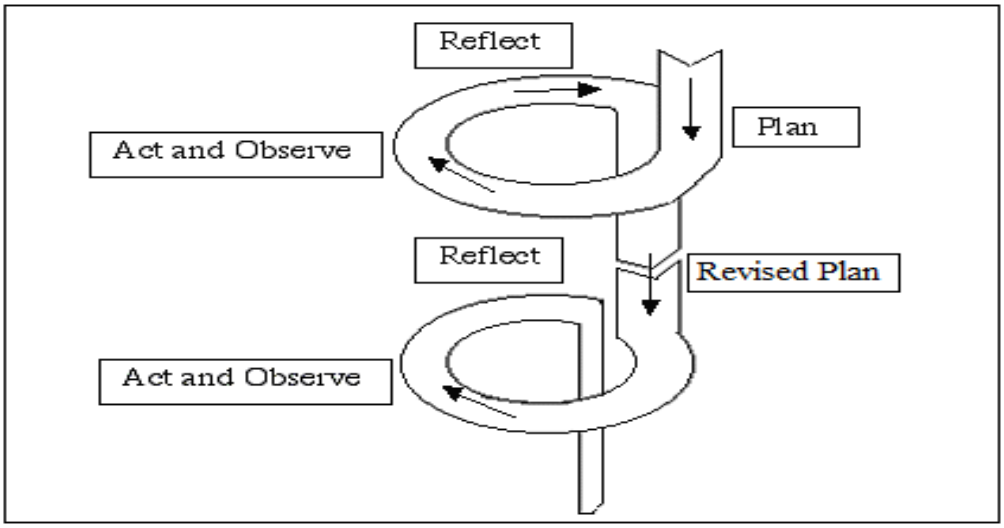

Figure 1. Kemmis and McTaggart's spiral model

Data were collected through observation and tests. The obtained data were analyzed using qualitative and quantitative data analysis techniques. The qualitative data were in the form of a description of the results of observations and evaluation of students' critical thinking skills in mathematics learning in each cycle. Meanwhile, the quantitative data were the result of the evaluation of students' critical thinking skills. The evaluation was carried out at the end of each cycle. The percentage of students' critical thinking skills was counted using the following formula.

$$\text{Percentage of students who pass the KKM} = \frac{\sum students\ who\ pass\ the\ KKM}{\sum all\ students} x\ 100$$

The interpretation of the percentage is categorized into the following table (Arikunto, 2005).

Table 1. Categories of Critical Thinking Skills

No	Category	Achievement Score
1.	Very good	80-100
2.	Good	66-79
3.	Moderate	56-65
4.	Low	40-55
5.	Failed	0-39

RESULTS AND DISCUSSION

The results of the research in cycle I showed that there was an increase in the learning process (See Figure 2). Previously, mathematics learning only used materials from books without attractive learning media. The use of the time bar media could increase the students' motivation and interest in participating in the learning process. They found it easier to calculate the duration of an activity or event by practicing using the time bar media even though there was still some limitation. The results of observations in cycle I related to the teacher's activity in using instructional media showed that it has not reached the standard score in terms of time allocation. However, in general, the teacher has involved the students in the learning activities

using the time bar media. Indeed, the use of learning media makes some students more active in learning. In the pre-action, based on the results of observations and students' test scores in essay questions that required a very low level of critical thinking showed that 43% out of 30 students could complete 30 the questions and 57% of the students could not. It was because the learning process is too teacher-centered without involving students to be more active. The low students' critical thinking skills was caused by the lack of use of learning media. In total, only13 students have passed the KKM. Meanwhile, the other 17 students have not. The KKM at State Primary School Kotagede 1 is 75.

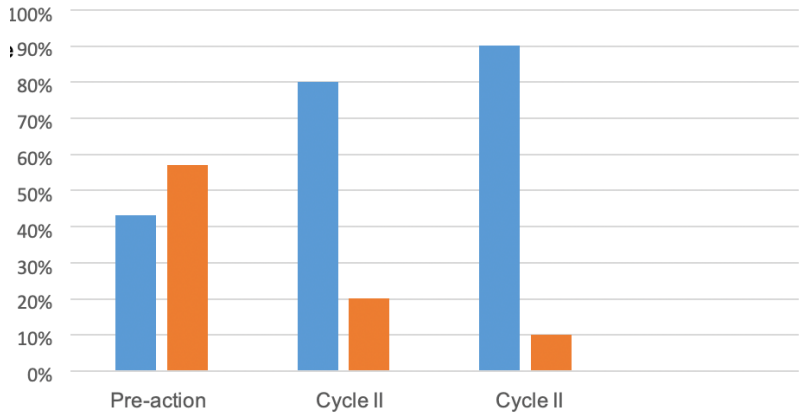

Figure 2. Comparion between students passing grade in pre-cycle and cycle 1

Based on the diagram in Figure 2, the result of the test in cycle I showed a significant change in which in the pre-action action, the students worked on essay questions with 43% of students who passed the KKM (minimum completeness criteria), while in cycle I, only 24 out of 30 students got higher scores than the KKM and 6 students got a score of ≤ 75. The score obtained by the students was 78.2.

The score of the students' critical thinking skill test in mathematics using the time bar media in grade IIIA of SD N Kotagede 1 increased from 13 students (43%) to 24 students (80%) who passed the KKM.

Figure 3. The Time Bar Media

This increase was due to students' enthusiasm for learning mathematics. The content of the learning becomes less boring and less scary after the use of the time bar media. It is in line with Eryilmaz (2015: 45) who states that learning will be more effective, efficient, and creative by using learning media. Learning media are a means to help teachers to transmit and explain materials in an interesting way. Students

observed the time bar media carefully and thoroughly. They could calculate the time of an activity or event using the time bar media (See Figure 3).

In cycle II, the learning process is almost similar to cycle I with some improvements. The teacher used the time bar media well and explained the material clearer compared to cycle I. The learning content that uses the time bar media is in accordance with the material and learning objectives. It is in line with Salvia et al., (2015: 2) who state that the learning process in the classroom highly determines the success of students to achieve learning goals with visual materials that affect students' learning outcomes. Students found it easier to observe and understand the time bar media explained by the teacher. As stated above, in cycle II, the teacher has used the time bar media well to deliver and explain materials to students. The learning process became more attractive and interesting to students so that they can focus more on lessons. It is in accordance with (Abdo & Semela, 2010: 78) in which the use of learning media can maintain the students' attention, support the learning process, and increase class performance through increased acquisition of materials. The teacher involved the students in learning to make them interested, participated, and enthusiastic in learning. It is in line with (Becker, 2006: 23; Gee, 2008; Newby et al., 2011) in which the use of media in the teaching and learning process can arouse student desire, motivation, stimulation, and psychological influence and can facilitate positive learning outcomes. In cycle II, students were more enthusiastic about participating in learning. They listened to the teacher's explanation enthusiastically and were able to calculate the length of time of activities or events out using the time bar media. Some students became more active in proposing questions and participating in lessons. Almost all students have done the assignment given well. They did the assignment quickly according to the given time. They also received the assignment to do critical thinking skills tests in mathematics learning.

In cycle II, the result of the students' critical thinking skills test scores increased significantly. A total of 27 students (90%) have passed the KKM, while three students (10%) had not passed it. The students found it easier to understand and analyze a problem. They also became more enthusiastic about participating in mathematics learning with the use of the time bar media. This study has achieved the specified success criteria in which 75% of the total students have a good critical thinking skill test score. Thus, it can be said that the cycle is successful can be stopped.

The improvement of students' critical thinking skills in Grade IIIA of SDN Kotagede 1 are as follows.

Providing simple explanations

Students' ability to provide simple explanations increased from the pretest to the second cycle test. In this stage, students analyzed questions.

Identification or formulation of questions

The implementation of actions in cycle I - cycle II has improved based on the results of the essay test of critical thinking skills. In cycle I, students still did not understand how to identify or formulate questions. The teacher only explains to the students to identify the point "being asked" in the question by considering sentences with a question mark. Meanwhile, in cycle II, the students' ability to identify and formulate questions has improved based on the students' answers to the critical thinking skill questions. They were able to identify and formulate questions correctly without limited to identify the sentences with a question mark. It is suitable for the

statement of Dunn et al., (2010) who argue that critical thinking is affected by classroom dynamics and better meaningful efforts than worrying about the accuracy. Besides, critical thinking is a conceptualization process to analyze, synthesize, and evaluate data and information obtained from observation, reflection, reasoning, or communication as guidance to take actions (Peter, 2012: 39).

Providing simple explanations

Based on the data obtained from the essay mathematics tests in the first cycle, the answers to these questions showed that most students already understand the questions and provide answers or solutions using simple explanations. Meanwhile, in cycle II, the students' ability to provide further explanation has also increased. It can be seen on the students' answer essay mathematics questions on the provided spaces. Students answer the questions by providing an explanation and solution to the questions. At this stage students adjusted and determined how to solve the questions to get the correct answer. The essay tests to measure students' critical thinking skills should have a high level of difficulty (McPeck, 1981; Wilson, Suzanne. M. Peterson, 2006) in line with the objectives of critical thinking. Faiz (2012: 2) stated that critical thinking aims to provide explanations and guarantee the validity and appropriateness of the explanations or thoughts.

Building basic skills

Reasoning

The data were obtained from the essay test. The test contains indicators and aspects of critical thinking skills enabling the students to analyze problems. In cycle I, the students' ability to answer questions by providing the reasons increased compared to pre-action. However, some students did not give reasons for the answer. Meanwhile, in cycle II, the students' ability to give reasons has increased. Students answered the questions on the provided space by giving reasons for the answer. The reasoning ability is characterized by the ability to assess the credibility of a source and doing and evaluating an observation. Assessing the credibility of a source should be based on certain criteria, so did doing and evaluating an observation. Critical thinking uses valid and reliable sources to solve a problem and to provide clear and logical reasons. Critical thinking is the individual's ability to create, judge, and provide reasons for a conclusion based on evidence (Eggen & Kauchak, 2012: 83). It means developing students' critical thinking skills requires students' basic abilities, for example, observing, assessing, and providing reasons for solving problems. Further, (Kenneth, 2014: 37; Paul & Elder, 2006) stated that critical thinking is not the same as intelligence, but it is an ability to think that can be improved by all people.

Concluding

Concluding the results of the research

Data were obtained from the results of tests in grade IIIA of State Primary School Kotagede 1. The teacher gave questions according to the indicators and aspects of critical thinking skills. Students should be able to analyze the problems in the questions. Students analyzed the questions to solve them. In Cycle I, some students could conclude the answers to the questions. The data showed that the students could formulate new definitions from the answers they got. Meanwhile, in cycle II, students'

ability to conclude increased. It is in line with Arends & Kilcher (2010: 233) in which critical thinking is a reflective thought to analyze arguments, identify mistakes, and to draw conclusions based on evidence. It is supported by Shamir et al., (2008: 338) who stated that critical thinking is a process for analyzing information obtained through experience, observation, reading, and communication. Critical thinking includes the ability to think productively and reflectively and evaluate evidence.

Providing further explanations

Providing further explanations

The data were obtained from the test in cycle I. The test contained questions based on the indicators and aspects of critical thinking skills. In the stage of providing a further explanation, some students answered the questions on the provided space completely by providing further explanations (detailed explanation) in accordance with the instructions and examples given by the teacher. However, some other students did not provide further explanation to the answer for example they only marked or wrote numbers on the time bar media. In cycle II, they could answer with a more complete and precise explanation on the provided space. The purpose of critical thinking is to be able to provide further explanations (Johnson, 2014). An individual who has critical thinking skills is generally curious and able to provide reasons for the answer. It is in accordance with Gambrill & Gibbs (2009: 5) who stated that the ability to think critically produces reasonable answers and makes logical connections between elements and existing problems.

Arranging strategies and tactics

Providing solutions

The data were obtained from the critical thinking test. Some students could answer questions by providing solutions to a problem. They read the questions first, then analyze it. The ability to provide solutions to questions is characterized by the ability to decide the solution to the questions and the ability to analyze them. In Cycle II, the number of students who could provide solutions to analyze questions increased. Critical thinking is to test an opinion or idea. It also aims to assess a thought, assess value, and even evaluate the implementation or practice of thoughts and values (Sapriya, 2015). It is in accordance with (Facione, 2011) who stated that to realize to the ideal citizen, people should be able to develop creativity to think critically and consistently based on democratic rational knowledge and to produce useful insights. Thus, critical thinking skills are crucial for everyone to be able to solve problems and analyze information.

CONCLUSION

Based on the results of the research and discussion above, it can be concluded that the students' critical thinking skills in grade IIIA of State Primary School Kotagede I increased with the use of the time bar media. The increase occurred in the learning process and outcome. The learning process has encouraged students to think critically through the provision of a series of activities with the use of the time bar media. It makes the students more active in learning in analyzing questions. The time bar media can concretize abstract material (with lines and numbers on the time bar) so that students can hold, practice, and use the time bar media directly. Although the media

are large and long, they are colorful and easy to carry and even can be easily folded. The media are also durable with the use of a magnet to attach the number and even fitted with thematic pictures. In terms of outcomes, students' critical thinking skills increase based on the results of the essay test. It increases from 43% in the pre-action to 80% in cycle I and 90% in cycle II. The learning process runs well. Indeed, there are some limitations in cycle I, but they could be fixed in cycle II. The teacher has also used the time bar media according to the method, and function which makes the students be able to use the time bar media as concrete learning media.

Based on the results of the research to improve students' critical thinking skills by using the time bar media, the researcher has formulated some suggestions. Teachers are expected to use the time bar media and other learning media in other subjects and are required to increase their creativity in developing learning media. Students are expected to be able to improve their critical thinking skills.

The results of the study presented are important data obtained from the results of data collection in the field (test results, questionnaires, interviews, documents, etc.). Research results can be supplemented by tables, figures, or graphs to clarify the results of the study. Avoid presenting similar data in separate tables. Tables, figures and graphics must be commented or discussed. All tables, figures and graphics must be centered and numbered consecutively. For qualitative research, the results section contains detailed sections in the form of sub-topics that are directly related to the research focus and categories.

The discussion in the article aims to: (1) answer the problem formulation and research questions; (2) shows how the findings were obtained; (3) interpret research findings; (4) linking research findings to established knowledge structures; and (5) bringing up new theories or modification of existing theories. This part of the discussion should contain the benefits of the research results, not the repetition results. The analysis must address the stated gap.

In answering the formulation of the problem and research questions, the results of the study must be concluded explicitly. Interpretation of findings is carried out using logic and existing theories. Findings in the form of reality in the field are integrated/linked with the results of previous studies or with existing theories. For this purpose, there must be a reference. In bringing up new theories, old theories can be confirmed or rejected, some may need to modify theories from old theories.

REFERENCES

Abdo, M., & Semela, T. (2010). Teachers of poor communities: The tale of instructional media use in primary schools of Gedeo zone, Southern Ethiopia. *Australian Journal of Teacher Education*, *35*(7), 78–92.

Adekola, G. (2010). The Impact of Instructional Media on the Education of Youths on HIV/AIDS in Nigeria Urban Communities. *International Journal of Scientific Research in Education*, *3*(June), 64–72.

AECT. (n.d.). Association for Educational Communications and Technology. Retrieved from https://www.aect.org/

Ahonen, A. K., & Kinnunen, P. (2014). How Do Students Value the Importance of Twenty-first Century Skills ? *Scandinavian Journal of Educational Research*, (May 2015), 37–41.

Arends, R. I., & Kilcher, A. (2010). *Teaching for Student Learning Becoming An Accomplished Teacher*. Madison Aveneu: Routladge Taylor and Francis Group.

Arikunto, S. (2005). *Manajemen Penelitian*. Jakarta: Rineka Cipta.

Becker, K. (2006). Pedagogy in commercial video games. *Games and Simulations in Online Learning: Research and Development Frameworks*, *2006*, 21–47.

Buckingham, D. (2008). *Youth, Media, Identity*. https://doi.org/10.1162/dmal.9780262524834.vii

Courville, K. (2011). Technology and Its Use in Education: Present Roles and Future Prospects. *Online Submission*, 1–19.

Dixon, P. A. (2017). Extensive Listening , Teacher Proficiency and 21 st Century Skills : Interview with Dr Willy A. Renandya. *RELC Journal*. https://doi.org/10.1177/0033688217695658

Dunn, D. S., Beins, B. C., McCarthy, M. A., & Hill, G. W. (2010). *Best Practices for Teaching Beginnings and Endings in the Psychology Major*. New York: Oxford University Press.

Duron, R., Limbach, B., & Waugh, W. (2006). Critical thinking framework for any discipline. *International Journal of Teaching and Learning in Higher Education*, *17*(2), 160–166.

Eggen, P., & Kauchak, D. (2012). Strategies for Teachers: Teaching Content and Thinking Skills. In *NASSP Bulletin* (6th ed., Vol. 72).

Eryilmaz, S. (2015). E-Learning as a Teaching Strategy Actively Used in FATIH Project. *European Journal of Educational Research*, *4*(1), 38–47.

Facione, P. a. (2011). Critical Thinking : What It Is and Why It Counts. In *Insight assessment*. Retrieved from https://www.insightassessment.com/CT-Resources/Teaching-For-and-About-Critical-Thinking/Critical-Thinking-What-It-Is-and-Why-It-Counts/Critical-Thinking-What-It-Is-and-Why-It-Counts-PDF.

Faiz, F. (2012). *Thinking Skill Pengantar Menuju Berpikir Kritis*. Yogyakarta: SUKA Pres UIN Kalijaga.

Farindhani, D. A., & Wangid, M. N. (2019). Scientific-based pictorial storybook with project-based learning method for improving the critical thinking skills of elementary school students. *Jurnal Prima Edukasia*, *7*(1), 94–105.

Gambrill, E., & Gibbs, L. (2009). *Critical Thinking for Helping Professionals A Skolls Based Workbook*. New York: Oxford University Press.

Gee, J. P. (2008). Learning and Games. The Ecology of Games: Connecting Youth, Games, and Learning. *The Mit Press*, 21–40.

Hendriana, H., Setiawan, W., & Aripin, U. (2020). The Effectiveness of Geogebra's Metacognitive Guidance to Develop Critical Thinking Skills. *International Journal on Emerging Mathematics Education*, *3*(2), 129.

Heo, J. (2012). The Effect of Using Three Types of Instructional Media on Comprehension and Motivation of Korean College Students in an Online Course. *ProQuest Dissertations and Theses*, 163.

Ingwarni, S. (2018). *Jurnal Prima Edukasia , 6 (2), 2018 , 157-165 Developing the Sociocultural-Based Thematic-Integrative Learning Module for Improving the Learning Motivation and the Critical Thinking*. *6*(2), 157–165.

Johnson, E. . (2014). *Contextual Teaching Learning: Menjadikan Kegiatan Belajar Mengajar Mengasyikkan dan Bermakna*. Bandung: Kaifa.

Kemmis, S., McTaggart, R., & Nixon, R. (2014). *The Action Research Planner*. Singapore: Springer.

Kenneth, D. M. (2014). *Effective instructional strategies from theory to practice*. Retrieved from https://books.google.co.id/.

McPeck, J. (1981). *Critical Thinking And Education*. New York: St. Martin's.

Moore, B.R. & Parker, R. (2009). *Critical Thinking* (9th ed.). California: McGraw-Hill.

Newby, T. J., Stepich, D. A., Lehman, J. D., Russell, J. D., & Leftwich, A. O. (2011). *Educational technology for teaching and learning*. Upper saddle river: Perason Education, Inc.

Nitko, A. J. & Brookhart, S. M. (2011). *Educational Assessment of Students*. Bostom: Perason Education.

Paul, R., & Elder, L. (2006). The Miniature Guide to Critical Thinking Concepts and Tools. In *Performance + Instruction* (Vol. 34).

Permendikbud Nomor 22 tahun 2016.

Peter, E. E. (2012). Critical thinking: Essence for teaching mathematics and mathematics problem solving skills. *African Journal of Mathematics and Computer Science Research*, *5*(3), 39–43.

Putra, P. D. A., & Sudarti. (2015). Pengembangan Sistem E-Learning untuk Meningkatkan Keterampilan Berpikir Kritis Mahasiswa Pendidikan Fisika (Halaman 45 s.d. 48). *Jurnal Fisika Indonesia*, *19*(55), 45–48.

Rasiman. (2012). Penelusuran Proses Berpikir Kritis Dalam Menyelesaikan Masalah Matematika Bagi Siswa Dengan Kemampuan Matematika Tinggi. *Jurnal Pendidikan*, *Vol. 3*(1), 12.

Reigeluth, C. M., & Chellman, A. A. (2018). instructional Design Theories and Models: Buliding a Common Knowledge Base. In *Sereal Untuk* (Vol. 51). New Jersey: Taylor & Francis Publisher.

Salvia, I. M., Mashudi, & Sulistyarini. (2015). Penerapan metode problem solving dalam meningkatkan keterampilan berpikir kritis siswa mata pelajaran ekonomi. *Jurnal Pendidikan Dan Pembelajaran*, *4*(3), 1–16.

Sapriya. (2015). *Pendidikan IPS*. Bandung: Rosdakarya.

Scoot Sophia. (2008). Perceptions of Students' Learning Critical Thinking through Debate in a Technology Classroom: A Case Study. *The Journal of Technology Studies*, *34*(1).

Shamir, A., Zion, M., & Levy, O. S. (2008). Peer tutoring, metacognitive processes and multimedia problem-based learning: The effect of mediation training on critical thinking. *Journal of Science Education and Technology*, *17*(4), 384–398.

Shihab, M. Q. (2010). *Membumikan Al-Quran, Fungsi, dan Peran Wahyu dalam Masyarakat*. Bandung: Mizan Media Utama.

Smaldino, S. E., Lowther, D. L., & Mims, C. (2019). Instructional technology and media for learning. In *Revista mexicana de investigación educativa* (12th ed., Vol. 15). United States of America: Pearson.

Stephen, P. R., & Jugje, T. A. (2017). *Organizational behavior* (17th ed.). England: Perason Education Limited.

Welch, K. C. . (2015). A systemic approach to teaching critical thinking skills to electrical and computer engineering undergraduates. american Journal of Engineering Education. *American Journal of Engineering Education*, *6*, 113–123.

Widodo, T. (2009). *Fisika untuk SMA/ MA Kelas X*. Jakarta: Pusat Perbukuan Dapartemen Nasional.

Wilson, Suzanne. M. Peterson, P. L. (2006). *Theories of Learning and Teaching What Do They Mean for Educators? National Education Association*. USA: Wahington, DC.