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The Analysis of Critical Thinking Achievement of Primary School Students Taught by Online Learning

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Abstrak. The science learning at primary schools for learners should refer to the Ministerial Regulation of Cultural and Educational Ministry Number 24 about Core Competence and Basic Competence. This research aims to: 1). Analyze the critical thinking skills of primary school students taught with online learning, and 2) analyze the cause of critical thinking achievement problems in science learning at primary school. This qualitative descriptive research took the data from the in-depth interview. The researchers promoted the research at four primary schools in Banjarbaru on December 1, until December 30, 2021. The researchers took the data source from the Quality Assurance Agency of Education Department in Southern Borneo, the school advisors, the principals, the primary school teachers, the fourth graders, and the parents. The applied analysis was Miles & Huberman (2014), starting from the data reduction, data display, and data verification. The results showed most teachers applied science learning online but the learning could not reach the critical thinking target for the learners. The fact predicting factors of the problems were 1). Learning scenario plan without Core Competence analysis and without considering the Core Competence, 2) The problem of designing the online learning, and 3) The mindsets of the teachers and principals about the learning objectives to accomplish the curriculum materials instead of reaching the core competence.

Keywords: Critical thinking, learners, primary schools, online learning

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INTRODUCTION

Science learning at primary schools ideally should train and develop the cognitive, critical, and scientific attitude aspects of the learners. The science learning at primary schools for learners should refer to the Ministerial Regulation of Cultural and Educational Ministry Number 24 about Core Competence and Basic Competence. Core Competence refers to the set of minimum skills and learning materials for the learners to achieve and master for each lesson. A primary school teacher must design the learning objectives based on competence instead of content to realize discovery-based science learning and to develop the learners' thinking skills.

The educational world must prepare learners to deal with the complexity of the 21st century. Education should not only provide the learners with knowledge and simple thinking skills, such as recognition but also prepare the learners with essential skills of the current century, such as critical thinking skills. Critical thinking skills can be improved with an appropriate learning model. Learners could realize critical thinking skills by applying flexible, creative, active, and challenging learning, such as inquiry-based learning(Duran & Dökme, 2016). Inquiry-based learning provides opportunities for learners to gain experience and investigate problems with scientific-based skills (Mahardika et al., 2020). Inquiry-based learning provides opportunities for learners to develop their science processes (Schmidt & Fulton, 2016). The science process includes observing, measuring, collecting data, and drawing conclusions to realize the critical thinking skills of learners.

The government policy of Indonesia regarding the graduates' competencies, in terms of critical thinking skills, demands the learners to engage with the 21st century's challenges. As the consequence, the teachers must have comprehensive pedagogical competence to guide the learners to develop their higher-order thinking skills. Primary school teachers had difficulties designing learner-centered learning and discovery-based learning. This incapability made the learners passive and could not develop their critical thinking skills (Upadani et al., 2021). Thus, teachers must develop their HOTS-aspect competence to develop the learners' HOTS (Fanani, 2020). Thus, teachers must have critical thinking skills to design the learning based on basic competence.

Since March 2020, Indonesia's learning system occurred in an online manner due to the COVID-19 pandemic. The learning process at Primary Schools in Indonesia encounters many hindrances in terms of mastering the appropriate strategy and approach for online learning. Thus, the learning may highly fail to realize the basic competence. A scholar or an expert of Widyaiswara quality assurance agency in Southern Borneo explained that "The sudden pandemic and lack of information about online learning and effective learning by the teachers made the teachers were not ready to prepare the competence-targeted orientation."

The national education system of Indonesia, since 2020, has been emphasizing the school and educational institutions' freedom to select face-to-face or online learning. This freedom allows schools and educational institutions to apply hybrid learning. Widikasih et al., (2021) found the most experienced problems during online learning dealt with low understanding and lack of learning motivation. Fauzi & Khusuma (2020) found that primary schools in Western Java had problems devising plans and promoting online learning. The current research found the learning quality had to be improved by applying competency-based learning. Many challenges of online learning to realize critical thinking skills should be investigated. Thus, the researcher promoted a study titled " The Analysis of Primary School Learners' Critical Thinking Skills Taught by Online Learning."

This research aims to: 1). Analyze the critical thinking skills of primary school students taught with online learning, 2) Analyze the cause of critical thinking skill achievement difficulties in science learning at primary schools.

METHODS

This research applied a descriptive qualitative approach. Creswell (2013) explains that the descriptive qualitative approach is a research strategy to investigate the life of individuals by asking them to tell their life stories. After collecting the data about the life stories, the researchers make narrated chronology. At the end of the research process, the researchers must combine the varied life perceptions of the individuals by narrating the researchers' perceptions.

The researchers promoted the research at four primary schools in Banjarbaru on December 1, until December 30, 2021. The researchers took the data source from six elements. They were the Quality Assurance Agency of the Education Department in Southern Borneo, the school advisors, the principals, the primary school teachers, the fourth graders, and the parents.

Table 1. The research respondents

Number	The elements of the respondents	The number of the respondents
1	Widyaiswara (Quality Assurance Agency of Education Department)	1 respondent
2	The school supervisors	2 respondents
3	The principals	2 respondents
4	The primary school teachers	6 respondents
5	The fifth and sixth graders	12 respondents
6	The learners' parents	12 respondents

The in-depth interview was useful to find the truth of the obtained information and data. The researchers applied the in-depth interview with the standardized instrument based on certain rubrics. Table 2 provides the interview guideline for this research.

Table 2. The interview guideline

Variables	Sub-variables	Indicators
The Basic Competence of science learning at the primary school (the basic and core competence pair)	The Basic Competence: analyzing the heat impacts on the temperature and shape changes of any objects in daily life	Designing the experiment of heat impacts on objects Experimenting with the heat impacts on objects
	The Core Competence: reporting the experiment results of heat impacts on objects	Reporting the experiment results Finding the correlation between heat, temperature change, and

	object shape based on the experiment Analyzing the heat impact on the temperature and shape changes in daily life

Analyzing the data with Miles & Huberman's model (2014), starting from reducing, displaying, and verifying the data Here are the promoted data analyses.

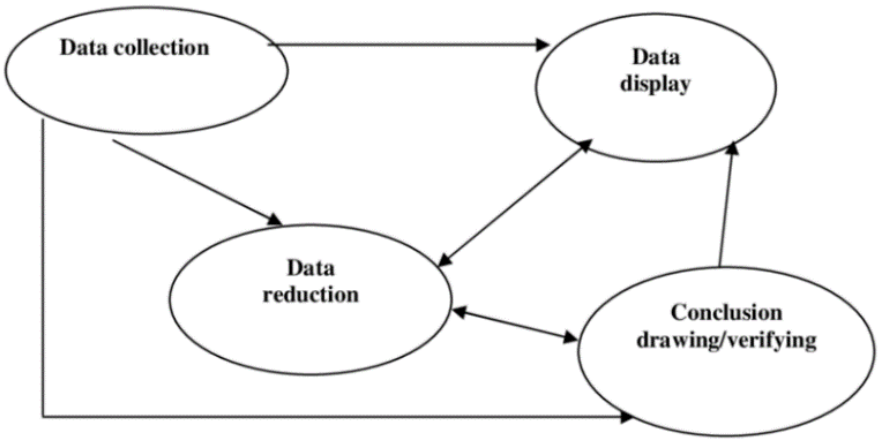

Figure 1. The analytical design of the research data
Source: (Miles & Huberman, 2014)

The data analysis steps of the interactive analysis model (Miles & Huberman, 2014) consisted of some stages: 1). Collecting the data with interviews The collected data dealt with hindrances and problems of Basic Competence achievement in science learning at the primary school, 2) Reducing the data Data reduction or reducing the data refers to screening, focusing, simplifying, abstracting, and transforming the raw data of the interview and documentation results, 3) Data presentation or presenting the data deals with composing the set of obtained information by drawing the conclusion and taking actions, and 4) Determining the existing pattern by elaborating the drawn conclusion in detail.

RESULTS AND DISCUSSION

The Critical Thinking Skill Competence Achievement in Science Learning at the Primary School

Table 3 shows the interview results of learners' critical thinking competence achievement in science learning at the primary school, based on the scholar of quality assurance agency in Southern Borneo, the principals, the school teachers, the fifth and sixth graders, and the parents.

Table 3. The summary of the interview results

Respondents	Interview Results
The scholar of quality assurance agency of education in Southern Borneo, Widyaiswara.	"Science learning should be applied at primary schools level by developing the critical thinking skill competence. Primary schools must also train the learners to analyze the correlation among three or more variables simultaneously.
The fifth-grade teachers of primary school	The interview results with six teachers revealed the learning designs to reach critical thinking skills. The results indicated various methods of the teachers. A few teachers, only two teachers, designed the learning with scientific learning stages. The teachers analyzed the Basic Competence about the heat impact on objects. They also guided the learners to design, promote, and report the experiment. The teachers also encouraged learners to determine the correlation between heat,

	temperature change, and shape change of objects based on the experiment results. The remaining teachers, four teachers, designed the learning without scientific stage implementation. The teachers did not analyze the basic competence and did not promote any experiments with the learners. Thus, the learners did not think critically.
The principals	The interview results with two principals found that "Most teachers did not analyze the basic and core competencies before designing the learning scenarios. Most teachers also did not promote online science experiments so that the learners could not think critically."
The primary school supervisors	The interview results with two supervisors found that: “Most teachers taught the science online without promoting analysis of the targeted competence. They also did not apply inquiry-based learning so the learners could not think critically.”
The fifth and sixth graders’ parents	"Online learning made us have limited experiment classes, limited learning, and only focused on test-based items to check our understanding."

Critical thinking skill is one of the higher-order thinking skills that learners must master (Mukaromah, 2018). Learners with critical thinking skills will not directly believe or imitate anything done by other people. These learners will think, analyze, and evaluate to find the guaranteed reasons. Brookhart (2010) explains that education human characteristics include reasoning, reflecting, and making decisions without other individuals' insistence. Learners are educated people so they must think critically.

A scholar or an expert of Widyaiswara quality assurance agency in Southern Borneo explained that “Science learning applied for higher grades, IV, V, and VI, should develop the critical thinking skills of the learners. They must be trained to analyze the correlation among three variables simultaneously. In this era, learners could access various information easily and quickly from the Internet. Thus, teachers' role is to develop their critical thinking skills and technological implementation creativeness accurately and optimally."

Learning by developing critical thinking skills should be applied by understanding the cognitive competence of critical thinking. The cognitive process categories consist of 6 levels. They are *knowing* (C1), *understanding* (C2), *applying* (C3), *analyzing* (C4), *evaluating* (C5), and *creating* (C6). The six levels of thinking skills begin from the low level, C1, into the highest level, C6 (Anderson & Krathwol, 2001). Learners' thinking skills should include analyzing and evaluating as parts of critical thinking skills. Thus, teachers should ideally have the capability of designing learning to improve the learners’ critical thinking skills by answering critical questions (Sani, 2019). Therefore, teachers must create and choose the triggering questions for the learners to think critically, for example: "When you cook water on a stove, why does an aluminum pot feel hotter than a plastic-based pot?"

The analyses of learners' critical thinking skill problems during science learning at primary school

The interview results with the supervisors, principals, and teachers in Banjarbaru about the competence achievement during online learning found that: 1). Most teachers taught online science without promoting experiments, 2) Teachers did not analyze the basic competence while designing the learning, and 3) The learning process had not applied the critical thinking skills. The interview results with the fifth and sixth graders and the parents found that "online learning made us have limited experiment classes, limited learning, and only focused on test-based items to check our understanding." Learners had to work on the cognitive test questions during the online learning assignment at home. The questions were Lower-Order Thinking Skill questions, starting from knowing (C1), cognitive understanding (C2), and cognitive implementation (C3).

The difficulties to reach the critical thinking skills for science subjects at primary schools happened due to some factors. Firstly, the mindsets of the principals, teachers, and supervisors that science learning should focus on content-based completions instead of competence-based achievements. A few principals and supervisors had the mindset of competence-based achievements. They assumed

the implementation of science learning should be based on basic competence, context, and discovery. The second factor dealt with the difficulties to design the online learning scenario based on critical thinking competence. Primary school teachers had difficulties designing learner-centered learning and discovery-based learning. This incapability made the learners passive and could not develop their critical thinking skills (Upadani et al., 2021).

Ideally, science learning at primary schools should involve the learners in the discovery process so that the learning will be effective. Teachers that applied inquiry-based learning would make the learners active (Sani, 2019). The learning model would make the learners responsible to find the evidence, analyzing the related knowledge, and answering the questions. Inquiry-based teaching is an effective learning model to develop the reasoning and critical thinking skills of the learners because the learning begins with some questions. Primary school teachers could facilitate the learners to find the answers to challenging questions by experimenting.

The results showed some hindrances to realizing critical thinking skills were: 1) the teachers' difficulties to design the experiment or praxis during the online learning (Rusdiyana et al., 2021), lack of teachers' experience in designing the experiment and analyzing the experiment results patterns (Fanani, 2020), lack of inquiry-based learning implementation during the science class due to lack of experience of implementing inquiry-based learning (Saglam & Sahin, 2017). Inquiry learning is effective learning for learners to think critically(Cleovoulou & Beach, 2019) ; (Duran & Dökme, 2016) so the learning model is important for both offline and online learning to realize critical thinking competence and answer the 21st-century challenges.

The 21st-century educational concept requires collaboration between teachers and learners to create strong pedagogy. However, not all science teachers could apply the inquiry strategy. The empirical evidence found that science learning had to be based on inquiry-based learning (Capps & Crawford, 2013). Promoting inquiry-learning for the learners allowed the learners to obtain information, improve their critical thinking skills by discovery and investigation, and build knowledge as scientists did (Corlu & Corlu, 2012). Studies about inquiry learning proved that the model could improve critical thinking skills and allow learners to explore and experiment in a real-world, offline manner (Ahmed & Parsons, 2013). Learning with the combined online-offline inquiry approach is important to develop the learners' critical thinking skills. Thus, teachers must have textbooks as references.

CONCLUSION

The results showed most teachers applied science learning online but the learning could not reach the critical thinking target for the learners. The fact predicting factors of the problems were 1). Learning scenario plan without Core Competence analysis and without considering the Core Competence, 2) The problem of designing the online learning, and 3) The mindsets of the teachers and principals about the learning objectives to accomplish the curriculum materials instead of reaching the core competence.

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REFERENCES

Ahmed, S., & Parsons, D. (2013). Computers & Education Abductive science inquiry using mobile devices in the classroom. *Computers & Education, 63*, 62–72.

Anderson, L. W. & Krathwhol, D. R. (2001). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. Addison Wesley Longman, Inc.

Brookfiled, S. D. (2012). *Teaching for critical thinking tools and techniques to help students question their assumptions*. New York: Jossye-Bass

Brookhart, S. M. (2010). *How to Assess Higher Order Thinking in Your Classroom.* Alexandria: ASCD.

Capps, D. K., & Crawford, B. A. (2013). Inquiry-Based Instruction and Teaching About Nature of Science: Are They Happening? *Journal of Science Teacher Education, 24*(3), 497–526.

Cleovoulou, Y., & Beach, P. (2019). Teaching

critical literacy in inquiry-based classrooms : Teachers ' understanding of practice and pedagogy in elementary schools. *Teaching and Teacher Education, 83*, 188–198.

Corlu, M, A., & Corlu, M, S. (2012). Scientific Inquiry Based Professional Development Models in Teacher Education. *Educational Sciences: Theory & Practice* , *12*(1), 514–521.

Creswell, J.W. (2010). *Research Design Pendekatan Kualitatif, Kuantitatif, dan Mixed*. Yogyakarta: Pustaka Pelajar.

Duran, M., & Dökme, I. (2016). The effect of the inquiry-based learning approach on student's critical-thinking skills. *Eurasia Journal of Mathematics, Science and Technology Education*, *12*(12), 2887–2908.

Hwang, G. J., & Chang, H. F. (2011). A formative assessment-based mobile learning approach to improving the learning attitudes and achievements of students. *Computers and Education*, *56*(4), 1023–1031

Fanani, Z. (2020). Kemampuan Guru dalam Berpikir Tingkat Tinggi dan Faktor-faktor yang Mempengaruhinya. *Jurnal Riset Dan Konseptual*, *5*(1), 113–127.

Fauzi, I., & Khusuma, I. H. S. (2020). Teachers' elementary school in online learning of COVID-19 pandemic conditions. *Jurnal Iqra' Kajian Ilmu Pendidikan, 5*(1), 58-70.

Mahardika, I. K., Wardani, P. O., Yushardi, & Prasetyaningsih, A. (2020). Inquiry-based physics textbooks with multi representation to practice hypothetico deductive reasoning for senior high school students. *Journal of Physics: Conference Series, 1465*(1).

Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). Qualitative data analysis: A methods sourcebook. Sage Publications : London.

Mukarroma, A & Sartono, E K. (2018). Analisis Kemampuan Berpikir Kritis pada Model Discovery Learning Berdasarkan Pembelajaran Tematik Indonesian. *Journal of Primary Education, 2* (1), 38-47.

Upadani, N. M., & Agustiana, I. G. A. T. (2021). Tingkatkan Berpikir Kritis Siswa Belajar Tema Berbagai Pekerjaan dengan Fun Thinkers. *Jurnal Mimbar PGSD Undiksha 9*(3), 450–458.

Permendikbud (2016). Peraturan Menteri Pendidikan Dan Kebudayaan Nomor 24 Tahun 2016 Tentang Kompetensi Inti Dan Kompetensi Dasar Pelajaran Pada Kurikulum 2013 Pada Pendidikan Dasar Dan Pendidikan Menengah.

Rusdiyana, R., Indriyanti, D. R., Hartono, H., & Isnaeni, W. (2021). *Analisis Kendala Guru dalam Menerapkan Pendekatan Saintifik Berbasis Inkuiri pada Sains Sekolah Dasar*. Paper presented at the Prosiding Seminar Nasional Pascasarjana (PROSNAMPAS).

Saglam, M. K., & Şahin, M. (2017). Inquiry-based professional development practices for science teachers. *Journal of Turkish Science Education, 14*(4), 66-76.

Schmidt, M., & Fulton, L. (2016). Transforming a Traditional Inquiry-Based Science Unit into a STEM Unit for Elementary Pre-service Teachers: A View from the Trenches. *Journal of Science Education and Technology*, *25*(2), 302–315.

Sani, R.A. 2019. *Pembelajaran berbasis HOTS (Higher Order Thinking Skills)*. Tira Smart. Tangerang.

Widikasih, P. A., Widiana, I. W., & Margunayasa, I. G. (2021). Online Learning Problems for Elementary School Students. *Journal of Education Research and Evaluation, 5*(3), 1-10.