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Evaluation of Critical Thinking Ability with Discovery Lerning Using Blended Learning Approach in Primary School

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Article Info	Abstract
	2013 curriculum suggests an active learning model for the learners. During this COVID-19 pandemic, it should go in line with online learning so the learners' skills would be upgraded. This research aims to analyze and evaluate the critical thinking skill improvement of the learners taught by e-learning integrated into the discovery learning model. This research is classroom action research. The subjects consisted of the fifth graders of SD Negeri 2 Wonodoyo. There were 36 learners. The applied materials in this research consisted of heat-content science learning. The data were taken by observation and critical thinking skill test of the learners. The technique of analyzing data was N-gain. The obtained results were the learners' critical thinking skill improvement with the N-gain score, 0.485, categorized as moderate. The improvement occurred due to the discovery using blended learning approach made learners interact in a small group in online learning. Then, teachers could also interact during the learning.

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INTRODUCTION

Based on the era development, the technology advancement makes humans easily do something. Technological advancement should be utilized in education to engage with the 21st challenges. The objectives of 21st-century education are to master science, metacognitive skills, critical and creative thinking skills, and communication skills (Greenstein, 2012; Sanders, 2016). One of the lessons taught in the 2013 curriculum and must be improved in terms of critical thinking skills in science.

Learning should be adjusted to the real situation. In 2020, the corona virus outbreak reached Indonesia. According to Etikasari et al. (2020), the Novel coronavirus (COVID-19) is a new disease with a high and quick transmission level. Mustikaningrum, et al (2020) stated that the influence of COVID-19 on education could be seen from the absence of offline learning at schools. All learning is changed into online learning activities. Therefore, although Indonesia is affected by the pandemic, teachers are expected to carry out their tasks optimally.

The promoted online learning should be in line with the era development. In the 21st century, the skill aspects to master by learners consist of 4Cs: critical thinking, communication, collaboration, and creativity. Komara (2018) shared his findings on 21st-century learning development. They consisted of several matters to considers, such as the main job of teachers as planners. Teachers could have instilled higher-order thinking skills for learners especially dealing with their critical thinking skills.

It is important to improve learners' critical thinking skills. Based on the PISA result (2018), the average score achieved by Indonesia on science learning was still low. It was ranked 70 among 78 countries OECD (2019). It was due to a lack of stimulus for learners to think critically at the primary school level. Therefore, there is a need to apply a learning model to improve the learners' critical thinking skills. The model should have aspects, such as (1) analyzing the argument, (2) focusing on a question, (3) asking-answering, (4) creating and determining the consideration, (5) providing a simple explanation, (6) drawing a conclusion, and (7) generalizing the conclusion (Ennis, 2018). One of the appropriate learning models for this COVID-19 pandemic is integrated e-learning with discovery learning.

Besides the problem, based on the observation results at SD Negeri 2 Wonodoyo, Kalitengah, Wonodoyo, Cepogo, Boyolali, Central Java Province. At present, face-to-face meetings at schools are not promoted every day. When the learners did not have offline face-to-face meetings, teachers would give homework for them to do. The homework was given before learners went home during the offline meetings. It was done because teachers had not found an appropriate strategy to use online learning for the fifth graders. Based on the interview with the fifth graders, they stated that they preferred offline meetings. The reason was they could receive pocket money and play with their schoolmates. It was the reason motivating them to learn. They would learn when they obtained what they liked. Then, during the home-learning, they only worked on the tasks. Some learners admitted that they were assisted by their parents. The reason was they disliked working on their homework.

From the problem, there should be an innovation of learning activity. Since the primary school could promote the face-to-face meeting, then it applied discovery using blended learning approach. It is defined as monitored learning that its problem-solving process is based on the scientific investigation method. Thus, students are encouraged to learn concepts and principles through their explanations both in online and offline (face-to-face) manners.

The innovation brought by the discovery using blended learning approach is such as using the technology of the 21st century for the teaching-learning process. According to Park (2020), technology could provide wider opportunities for learners to learn. Blended learning strategy becomes part of the technological advancement utilization to

improve learning quality (Perdana, 2020). Then, technological advancement influenced the educational world and learning. The use of learning technology has been adopted and adapted new findings for the learning process (Saputra, 2020). However, on the other hand, teachers still had difficulties using the technology effectively (Azwandi, 2019). Integrated conceptual learning could be the alternative for the teachers (Ananda, 2018). Blended learning combines the traditional lecturing method is a new method, they collaborate with technology (Sun, 2017). Besides that, the use of appropriate technology as the media to reach excellent outcomes is important.

From the problems, the applied innovative learning, and the previous findings, this research aims to analyze and evaluate the critical thinking skill improvement of the fifth-graders at SD Negeri 2 Wonodoyo during this COVID-19 pandemic.

METHODS

This research applied classroom action research with three cycles and was initiated by observation. The research population consisted of the fifth graders of SD Negeri 2 Wonodoyo, Boyoyali, in the even semester of the 2020/2021 academic year. The participants consisted of 36 persons. The sampling technique was saturated sampling. It resulted in 36 participants.

This research used critical thinking skill questions as to the instrument and heat as the material. The instrument was validated and tested in terms of reliability. The instrument test was done for the sixth graders. The results showed that four essay questions were valid. Then, on the reliability test, the r-count obtained a score of 0.694. Thus, the instrument was valid and reliable.

This research collected the data by observation and assessment of critical thinking skills that were integrated into the essay questions. The data analysis technique was N-gain.

RESULTS AND DISCUSSION

The findings, the observation of critical thinking skills of the learners based on the previous material, the heat transfer with four question items. Each item had a maximum score of 20. The observation results were used as the actual minimum accomplishment with the formula: critical thinking skill score average added by a fourth of the standard of deviation. The actual accomplishment functions as the substitution of the minimum mastery standard. Table 1 shows the learners' critical thinking skill observation results.

Table 1. Observation Results of the Learners' Critical Thinking Skills

Types	Achievement
Numbers of the learners	36
The average score of critical thinking skills	52.1
Standard of deviation	9.4
Actual accomplishment	61.5

The table shows that the score is lesser than 62.6, unaccomplished.

The findings of critical thinking skills consisted of the discovery using blended learning approach with stages of (1) preparing the online class for all learners, (2) stimulating learners about the problems of science learning, (3) creating a smaller group consisting of 4-5 members via WhatsApp, (4) providing online student worksheet to be discussed with the teachers, (5) explaining the results, (6) discussing the results in the class, and (7) providing evaluative questions.

The learning results of the pre-cycle until the third cycle are presented in table 2.

Table 2. The Learners' Critical Thinking Skill Results

	The critical thinking skill average	The accomplished learners	The percentage of accomplished learners
Pre-cycle	52.42	18	49
Cycle 1	6.,2	21	59
Cycle 2	63.4	25	69.5
Cycle 3	65.2	28	77.8

From the table, during the pre-cycle, the discovery of blended learning had not been applied. The table shows that the accomplished learners are 18 and their critical thinking skills do not reach the applied minimum mastery. However, the table shows that each cycle gains creative thinking skill improvement and accomplishment.

From the pre-cycle until the first cycle, the learners' critical thinking skills had not reached the applied minimum criteria. However, there was significant improvement based on the learners' numbers, three learners or 5.6%. It was due to the learners had applied discovery using blended learning approach. Thus, they needed adjustment during the learning activity.

From the first cycle into the second cycle, the learners' critical thinking skill average had surpassed the applied minimum criteria. Then, there were improvements of accomplished learners, four learners. It was due to the learners had been adapting with the applied learning, discovery blended.

In the second and third cycles, the number of accomplished learners increased from 28 to 36 learners with an average score of critical thinking skill was 65.2. It meant that the proportion of the accomplishment by applying discovery learning using blended learning approach for the learners' critical thinking skills was higher than 75%. It meant the critical thinking skills of the learners on science learning content could be improved by applying discovery learning using blended learning approach.

The proportion of accomplished learners increased to 25.1% from the pre-cycle until the third cycle. It indicated that online learning activities, with e-learning integrated into discovery learning, could improve the

learners' critical thinking skills on heat material if it was applied continuously. It was due to discovery learning using blended learning approach could attract the learners to learn in a smaller group of online network.

It was since the smaller group learning involved heterogeneous learners' skills. Thus, learners that were considered to have higher mastery could teach their friends via WhatsApp group. According to Menanti & Rahman, A (2018), Astuti, W (2017), and Graff & Clark, M (2019), the learners' groupings heterogeneously could make learners active since the eligible learners had responsibilities to tell their friends. E-learning also made learners able to find the material explanations. It made them more autonomous.

The discovery learning model made learners participating actively to learn and find the theories. By posting questions related to the concepts, learners could find the general principle. They were also more confident with their ideas. It was in line with the previous finding that Internet use could make learners feeling comfortable and improve their confidence (Saadati, 2014; Arif et al., 2017). Therefore, the use of the Internet is needed to keep up with the era and provide meaningful learning to attract the learners (Effendi, 2016; Wardani et al. 2018; Cahyani et al. 2020; Alwan, 2018).

Then, the N-gain was done to analyze the improvement. Here are the results of the N-Gain test from the pre-cycle until the third cycle.

$$\text{Gain} = \frac{\text{mean of Cycle 3} - \text{mean before cycle}}{\text{maximum score} - \text{mean before cycle}}$$

$$\text{Gain} = \frac{65.8 - 52.42}{80 - 52.42} = 0.485$$

The N-Gain score was 0.485. It meant the learners' critical thinking skills were categorized as moderate. Based on the analysis of the pre-cycle until the third cycle, the learners' critical thinking skills were improved. The initial score had not reached the minimum criteria. After being taught by discovery learning using blended learning approach, the average score achievements obtained the minimum criterion accomplishment.

The critical thinking skill improvement was categorized as moderate because the applied learning, discovery learning using blended learning approach, was done in three meetings. According to Ridlo (2020) and Ulinnuha et al. (2021), the learners' critical thinking skills taught with the learning method could be improved into a higher category if it was done continuously. Therefore, the discovery of blended learning had to be done a little bit longer to improve the learners' critical thinking skills.

The improved critical thinking skills cannot be separated from the applied learning method (Kusumadewi et al., 2019). The model implementation could take daily life problems as the topics to facilitate learners to understand. Posamentier et al., (2010) argued that the taken problems in daily life could increase the importance of the learning and improve their learning qualities. The findings of Padmavathy & Mareesh (2013) and Jaisook, Chitmongkol, & Thongthew (2013) showed the understanding and skills in applying the concept in daily life by using problem-based learning. Thus, the promoted problem-based learning uses could make learners' critical thinking skills improved.

The discovery of blended learning made the learners autonomous to learn (Abdillah & Solihatin, 2020). It made the applied learning model emphasize the learners' creativity, initiation, and activeness to solve problems related to science learning with heat material. However, learners could also ask for guidance or assistance from the teachers or eligible friends in certain situations. In this case, teachers had roles as facilitators for the learners to find the solution. A related study by Herlina & Mustain (2019) found that the 2013 curriculum was a learning model to train learners' skills in solving problems with real-life problems as the discussion. Then, the learners were expected to obtain more knowledge and essential concepts of the materials. Thus, the Internet uses could make learners having initiation to learn autonomously and actively to improve their critical thinking skills.

Learners also had weaknesses in their critical thinking skills. The weaknesses were found in online test or evaluation activity processes. Thus, teachers could not ensure the answers of the learners while working on the critical thinking skill science questions from their thought. It was due to the possibility to cheat during online learning. The learners could find answers from Google.

CONCLUSION

By using integrated e-learning with discovery learning, the learners' critical thinking skills could be improved into a moderate category. The results of the learners' critical thinking skills showed there was an improvement. The use of discovery learning using blended learning approach also made the proportion of the accomplishment in solving learners' critical thinking skills on science learning, higher than 75%.

REFERENCES

Abdillah, A., & Solihatin, E. (2020). Analysis of the Needs for Blended Learning Development on Instructor Training at Basarnas. *Journal of Education Research and Evaluation*, *4*(4).

Alwan, M. (2018). Pengembangan multimedia e-book 3D berbasis mobile learning untuk mata pelajaran geografi SMA guna mendukung pembelajaran jarak

jauh. *At-Tadbir: Jurnal Manajemen Pendidikan Islam*, *2*(1), 26–40.

Ananda, R., & Fadhilaturrahmi, F. (2018). Analisis Kemampuan Guru Sekolah Dasar dalam Implementasi Pembelajaran Tematik di SD. *Jurnal Basicedu*, *2*(2), 11-21.

Arif, N, A., Putra, R, W, Y., Putra, F, G., & Sazali, M. (2017). Pengembangan Blog Sebagai Media Pembelajaran Matematika. *At-Tadbir: Jurnal Manajemen Pendidikan Islam*, *8*(2), 197–203.

Astuti, W., W. (2017). Perbandingan Hasil Belajar Biologi Antara Model Pembelajaran Kooperatif Tipe Student Teams Achievement Devision (Stad) Dan Mode Pembelajaran Kooperatif Tipe Think Pair Share (Tps) Siswa Kelas Xi Ipa Sma Negeri 5 Makassar. *Jurnal Biotek*, *5*(2), 235–250.

Azwandi, A., Harahap, A., & Syafryadin, S. (2019). Penyuluhan dan pelatihan ict-enhanced teaching–learning sebagai model pengembangan profesional guru di kota Bengkulu. *Jurnal Pengabdian Masyarakat Ilmu Terapan (JPMIT)*, *1*(1).

Cahyani, A., Listiana, I, D., & Larasati, S, P, D. (2020). Motivasi Belajar Siswa SMA pada Pembelajaran Daring di Masa Pandemi Covid-19. *IQ (Ilmu Al-Qur'an): Jurnal Pendidikan Islam*, *3*(1), 123–140.

Effendi, M. (2016). Integrasi Pembelajaran Active Learning dan Internet-Based Learning dalam Meningkatkan Keaktifan dan Kreativitas Belajar. *Nadwa*, *7*(2), 283–309.

Ennis, R. (2011). Critical thinking: Reflection and perspective Part II. *Inquiry: Critical thinking across the Disciplines*, *26*(2), 5-19.

Etikasari, B., Puspitasari, T, D., Kurniasari, A, A., & Perdanasari, L. (2020). Sistem Informasi Deteksi Dini Covid-19. *Jurnal Teknik Elektro Dan Komputer*, *9*(2), 101–108.

Graff, D., & Clark, M, A. (2019). Communication modes in collaboration: an empirical assessment of metaphors, visualization, and narratives in multidisciplinary design student teams. *International Journal of Technology and Design Education*, *29*(1), 197–215.

Greenstein, L. (2012). *Assessing 21st Century Skills:a guide to evaluating mastery and authentic learning*. London: Sage Publications Ltd.

Herlina, Y., & Mustain, I. (2019). Model Problem Based Learning Berbasis Budaya Pesisir untuk Meningkatkan Kemampuan Pemecahan Masalah. *Jurnal THEOREMS (The Original Research of Mathematics)*, *4*(2), 169–178.

Jaisook, S., Chitmongkol, S., & Thongthew, S. (2013). A mathematics instructional model by integrating problem-based learning and collaborative learning approaches. *Humanities, Arts and Social Sciences Studies (Former Name Silpakorn University Journal Of Social Sciences, Humanities, And Arts)*, 271–294.

Komara, E. (2018). Penguatan pendidikan karakter dan pembelajaran abad 21. *Sipatahoenan*, *4*(1).

Kusumadewi, R. F., Ulia, N., & Ristanti, N. (2019). Efektivitas Model Pembelajaran Discovery Learning Terhadap Kemampuan Literasi Matematika di Sekolah Dasar. *Sekolah Dasar: Kajian Teori dan Praktik Pendidikan*, *28*(1), 11-16.

Menanti, H., & Rahman, A, A. (2018). Perbandingan Kemampuan Pemahaman Konsep Matematika Siswa Menggunakan Model Pembelajaran Kooperatif Tipe Student Teams achievement division (STAD) Dengan team game tournament (TGT) di SD Islam Khalifah Annizam. *Bina Gogik: Jurnal Ilmiah Pendidikan Guru Sekolah Dasar*, *2*(1).

Mustikaningrum, G., Pramusinta, L., Buamona, S. A. M. U., Cahyadi, E., & Istiqomah, W. (2020). Implementasi Pendidikan Karakter Terintegrasi Kurikulum Dan Metode Pembelajaran Pada Masa Pandemi Covid-

19. *AULADUNA: Jurnal Pendidikan Dasar Islam*, *7*(2), 154-164.

OECD. (2019). *Organization for Economic Coorporation and Development. (2019). Education at a Glance 2019*. Retrieved from https://doi.org/10.1787/f8d7880d-en

Padmavathy, R, D., & Mareesh, K. (2013). Effectiveness of problem based learning in mathematics. *International Multidisciplinary E-Journal*, *2*(1), 45–51.

Park, C., & Kim, D. G. (2020). Exploring the Roles of Social Presence and Gender Difference in Online Learning. *Decision Sciences Journal of Innovative Education*, *18*(2), 291-312.

Perdana, D. R., & Adha, M. M. (2020). Implementasi Blended Learning Untuk Penguatan Pendidikan Karakter Pada Pembelajaran Pendidikan Kewarganegaraan. *Citizenship*

Posamentier, A, S., Smith, B, S., & Stepelman, J. (2010). *Teaching secondary mathematics: Techniques and enrichment units (8th ed)*. Allyn & Bacon: Pearson.

Ridlo, S. (2020). Critical Thinking Skills Reviewed from Communication Skills of the Primary School Students in

STEM-Based Project-Based Learning Model. *Journal of Primary Education, 9*(3), 311–320.

Saadati, F., R, A, T., & A, F, M, A. (2014). Utilization of information and communication technologies in mathematics learning. *IndoMs-JME*, *5*(2), 138–147.

Sanders. 2016. "Critical and Creative Thinkers in Mathematics Classrooms". Journal of Student Engangement: Education Matters, (6)1: 10-27.

Saputra, A. (2020). Pendidikan Dan Teknologi: Tantangan Dan Kesempatan. *Indonesian Journal of Islamic Educational Management*, *3*(1), 21-33.

Sun, Z., Liu, R., Luo, L., Wu, M., & Shi, C. (2017). Exploring collaborative learning effect in blended learning environments. *Journal of computer assisted learning*, *33*(6), 575-587.

Ulinnuha, R., Budi Waluya, S., & Rochmad, R. (2021). Creative Thinking Ability With Open-Ended Problems Based on Self-Efficacy in Gnomio Blended Learning. *Unnes Journal of Mathematics Education Research*, *10*(A), 20–25.