
IMPROVEMENT OF CRITICAL THINKING ABILITY IN ACID BASE MATERIAL THROUGH THE APPLICATION OF EDMODO-BASED DISCOVERY LEARNING MODEL

Nova Cola^{1*} and Murbangun Nuswowati¹

¹Chemistry Education, Faculty of Mathematics and Natural Sciences, Universitas Negeri Semarang, Gedung D6 Lantai 2 Kampus Sekaran, Gunungpati, Kota Semarang, Jawa Tengah, 50229, Indonesia

**E-mail: novacola@gmail.com*

Received: 07 August 2019; Accepted: 11 February 2020; Published: 30 June 2020

ABSTRACT

This study aimed to determine the improvement of students' critical thinking abilities through the application of edmodo's assisted discovery learning model. The study was conducted on students of class XI MIPA 2 high school 2018/2019. This study used a true experimental design in the form of a pre-test and post-test control group design. Sampling was done by a cluster random sampling technique. Data collection used reasoned multiple choice test instruments and questionnaires. The result of test analysis of students' critical thinking skills showed that the average post-test value of the experimental class was lower than the control class. The N-gain test result showed that the magnitude of the increasing of the experimental class was 0.43 lower than the control class which is equal to 0.57. The application of edmodo assisted discovery learning model had a positive effect on students' critical thinking abilities with a low category as indicated by the correlation coefficient of 0.37 and the magnitude of the influence given is 14.08%. The conclusion of this study is the application of edmodo assisted discovery learning model can improve students' critical thinking skills. Furthermore, students agree to use edmodo's assisted discovery learning model for acid base learning.

Keywords: edmodo, critical thinking ability, discovery learning model

DOI: <https://doi.org/10.15575/jtk.v5i1.5406>

1. INTRODUCTION

Education in the 21st century it is demanded to prepare students to be able to face the information age faced with global economic competition (Rahmadani et al., 2018). 21st century learning needs to pay attention to several things, namely the teacher has the main task of learning planners, incorporating

elements of high-level thinking one of which is critical thinking, the application of various approaches and models of learning, and integrated technology (Komara, 2018). 21st century learning in Indonesia is carried out in 2013 curriculum learning by applying innovative learning models and methods to train and integrate 4C (Creativity and Innovation, Critical Thinking and Problem Solving, Communication, Collaboration)

(Kemendikbud, 2017). Learning in the 2013 curriculum uses a scientific approach with several learning strategies, such as contextual learning and learning models that have names, features, syntax, settings such as discovery learning, project based learning, problem based learning, and inquiry learning (Kemendikbud, 2015). One of the 21st century abilities that must be mastered by students is the ability to think critically (Sabekti and Khoirunnisa, 2018).

Critical thinking is a complex concept that involves cognitive skills and self-confidence, requiring logical reasoning that is focused on making decisions about what is done and believed (Noor, 2014; Ennis, 2011). The ability to think critically is part of the results of learning activities. Critical thinking is one of the important high-level thinking skills taught to students (Yotiani et al., 2016). The ability to think critically can help students think rationally in overcoming the problems faced and looking for and developing alternative solutions to these problems (Alghafri and Ismail, 2014).

The result of observations of learning activities in class XI MIPA in SMAN 2 Batang interviews about their interest in chemistry lesson showed that some students thought that chemistry is a difficult subject because students only relied on memorizing concepts and formulas. Students are still lacking in the ability to think critically and construct their knowledge. This is shown when students were faced with different problems so they seemed not to be able to do. About 10% of the questions given by teachers are in the Higher Order Thinking Skill (HOTS) category. The result of interviews with teachers showed that he had never done e-learning based learning, especially edmodo.

Improvement of Critical Thinking Ability in Acid Base Material Through The Application of Edmodo-Based Discovery Learning Model

One of learning model that can change learning conditions of passive students to be active and critical learners is discovery learning model. Discovery learning model influences students' critical thinking skills (Mentari et al., 2015). Makes students become active learners through application of six syntax discovery models (Nurrohmi et al., 2017). Improving students' critical thinking skills apart from the learning model also needs to use technology-based learning media such as edmodo.

Edmodo is a social media platform that is often portrayed as facebook's social media for schools and has many functions according to needs (Priowijanto, 2013). Edmodo is able to provide better and easier learning governance and has the ability to facilitate digital classes and large and effective learning communities (Cherner et al., 2016). Edmodo's main feature is the active support of communication models from online social media with the addition of online learning material and online evaluation features (Dharmawati, 2017). Edmodo provides three special accounts for its users, namely accounts for teachers, students, and parents. Features of edmodo include 1) assignments, 2) quizzes, 3) posts, 4) files and links, 5) groups, 6) folders, 7) grade books, 8) libraries, 9) polls, and 10) award badges (Basori, 2013).

Research by Cankaya and Yunkul (2018) found that edmodo as a medium for communicating and implementing learning can help to complete projects on time and active participation. Other research results state that the analysis of students' critical thinking abilities in the discovery Learning model by HoA based on curiosity shows that the group type of students' epistemic curiosity has been able to master six indicators of mathematical critical thinking ability (Sulistiani et al., 2018). Heryani and Setialesmana's research (2017) states that students become more active and

can find their own concepts through the stages of discovery learning models.

The formulation of the problem in this study was whether critical thinking skills of class XI students who learn with edmodo-assisted discovery learning was increase or not. The research objective was to determine the magnitude of the increasing of critical thinking skills of class XI students who study with edmodo supported by discovery learning models. This study modified the indicators of critical thinking from Ennis and Facione's opinions into edmodo-assisted discovery learning models.

2. RESEARCH METHOD

This research was conducted at SMAN 2 Batang in January 2019. The research method was an experiment. This study used a true experimental design with a pre-test and post-test control group design. The population in this study were students of class XI MIPA in semester 2 of SMAN 2 Batang in the academic year 2018/2019. The research sample were class XI MIPA 4 as an experimental class and class XI MIPA 1 as a control class. The research sample was determined by cluster random sampling technique.

The independent variable in this study was a learning model with variations in the treatment of edmodo-assisted discovery learning models and the method commonly used by the instructor teacher. The dependent variable was the ability to think critically. The control variables were the curriculum used, the teacher who taught, the subject matter, and the number of hours of study or face-to-face time. Data collection techniques using the test method, questionnaire method, and documentation method. Critical thinking ability test was given in the form of multiple choice questions from open questionnaire. It

Improvement of Critical Thinking Ability in Acid Base Material Through The Application of Edmodo-Based Discovery Learning Model

was used to determine students' responses after learning with edmodo-assisted discovery learning model. Documentation was obtained from data supporting research activities.

Analysis of the data used initial data analysis and final data analysis. Initial data analysis consisted of a normality test and a homogeneity test. Final data analysis consisted of normality test, two variance similarity test, hypothesis test, and correlation test, determination of coefficient of determination, gain normality test, and questionnaire response analysis of experimental class students.

3. RESULT AND DISCUSSION

The implementation of learning with edmodo-assisted discovery learning model was begun with conducting the acid-base pretest material for students in the first meeting. In the second to fifth meeting, learning process was done with edmodo aided discovery learning model on acid-base material. The last meeting was the sixth posttest. The first stage in edmodo assisted discovery learning was stimulation, students were given a video that had been uploaded by researchers in the edmodo class group and students could watch the video outside of class time.

Learning videos uploaded included the concept of acid-base, the concept of pH of various solutions, and indicators of acid-base. The second stage was problem identification, students downloaded the student worksheet which contains examples of problems to discuss relating to the material to be studied. The stimulation and identification stage of the problem included indicators of critical thinking, namely providing a simple explanation.

The third stage was data collection, students were divided into 7 groups and announced in edmodo class groups. Students were directed to collect data or information from books or the internet to answer existing problems. Indicators of building basic skills were expected to be trained through this activity. During the discussion activities, students were active to ask questions each other and they provided responses to the answers of their friends in a group. Although there were still one or two students who were less active because they thought that they do not really understand the material being studied.

The fourth stage was data processing by including indicators of critical thinking, namely analyzing. Students practiced writing the relationship concepts that have been obtained to be used in answering questions. The fifth

stage was an evidence. Students did a careful examination to prove the truth of the submitted answer. This stage was in line with indicators of critical thinking ability, namely evaluation. The sixth stage was drawing conclusions, students concluded the concepts they have found with their own sentences that can be used as general principles. From observation by researchers, it appears that students are able to convey what they get from the material they were studying. At this stage students can state and write the final results. The indicator expands in line with this stage. At the end of the lesson, the teacher gives confirmation of the results of the students' answers in accordance with existing theories. Individual students upload the results of their discussions to edmodo class group as shown in Figure 1.

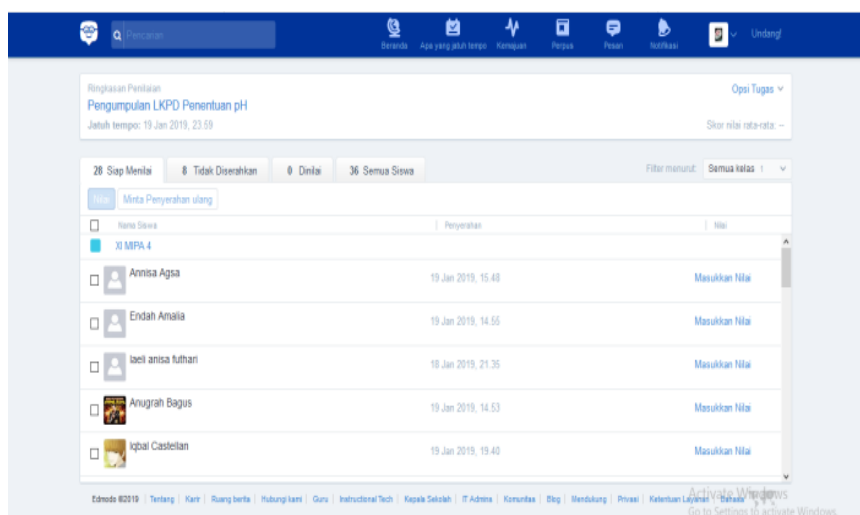


Figure 1. Display Task Upload Individual Students in Edmodo Group

To find out the extent of students' understanding of the material that has been

learned, the teacher conducted a discussion in edmodo class groups, as shown in Figure 2.



Figure 2. Display of Discussion in Edmodo Class Group

The use of edmodo certainly supports the achievement of critical thinking skills indicators. Edmodo itself makes learning independent of time and place and makes learning effective. This is consistent with the opinion of Santoso (2019) which states that the learning process outside the classroom can use edmodo. Although the use of edmodo is quite easy to learn, there were still obstacles such as learners who forget their passwords or forget their usernames. It could happen

because students did not record their passwords or user names to make it easier for them to remember. Or it could be because the password they wrote might be random.

The increasing of students' critical thinking skills in the experimental class and the control class were analyzed using the gain normality test or the N-gain test. The result of the N-gain critical thinking skills can be seen in Table 1.

Table 1. N-Gain Test Results for Critical Thinking Ability

Class	Average Pretest Value	Average Posttest Value	N-Gain	Category
Experiment	38.41	65.07	0.43	Medium
Control	31.93	70.52	0.57	Medium

The N-gain test result indicated an increase in the value of the experimental class was lower than the control class. N-gain for the experimental class was 0.43 while the N-gain of the control class was 0.57. The result of the N-gain of the two sample classes were categorized that the increase of students' critical thinking skills from both classes was

included in the medium category. It was because the gain index values of the two classes were in the range of 0.3 to 0.7.

The result of the average value of the control class pos-test was higher than the average post-test value of the experimental class.

Data analysis showed that the average critical thinking ability of students learning with edmodo-assisted discovery learning models was the same as the average critical thinking ability of students learning with conventional methods. The N-gain result is 0.43 with the moderate category, so it can be concluded that learning in the experimental class is not effective with edmodo-assisted discovery learning models.

Critical thinking ability of students is also tested for improvement according to each indicator of critical thinking ability from the results of the pretest and posttest. The results of the N-gain test for each indicator of critical thinking ability of students in the experimental and control classes are shown in Figure 3.

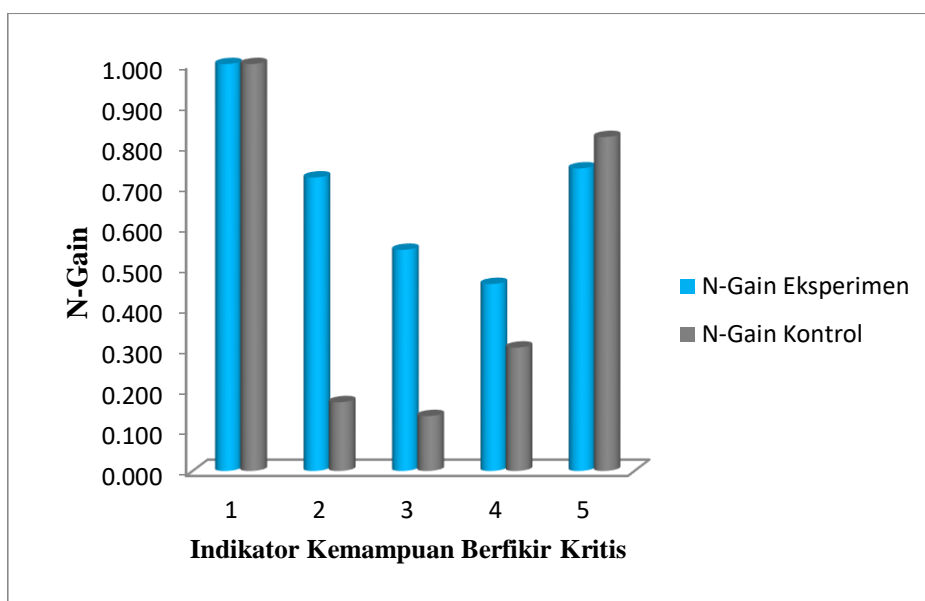


Figure 3. Increasing the Critical Thinking Ability of Experiment and Control Classes Based on Indicators

The indicators of critical thinking ability in this study were 1) providing simple explanations, 2) building basic skills, 3) analyzing, 4) evaluating, and 5) explaining. Indicator 1 was related to material acid-base properties and acid-base indicators. Indicators 2 and 3 related to the solution pH material, acid base concept, and acid base indicator. Indicators 4 and 5 were related to the calculation of pH of acid-base solutions. The indicators were a modification of the combination of critical thinking indicators according to Ennis and Facione.

This modification was carried out because the indicators were in accordance with the application of edmodo-assisted discovery learning models. Discovery learning has appropriate syntaxes to practice students' critical thinking skills, through stimulation activities, identifying problems, collecting data, processing data, proving, and drawing conclusions. The use of edmodo itself supports learning to run more effectively, where students can learn without limited space and time. This is in accordance with research conducted by Durak (2017) which states that edmodo supports collaborative learning because it allows working in small

groups and allows students to share their ideas and material freely.

Indicator (1) provided a simple explanation of obtaining the highest N-gain compared to the other four indicators. The experimental class and the control class both obtained N-gain of 1 with a high category. The same N-gain results from both classes were reasonable because both classes had a homogeneous initial state that can be said to have the same ability. In indicator (2) building basic skills, the experimental class obtained an N-gain of 0.721 which was included in the high category while the control class was included in the low category with an N-gain of 0.168. Students in the experimental class had practiced exploring data with their groups through the stage of data collection in edmodo's assisted discovery learning model.

Indicator (3) of the analysis was developed through edmodo assisted by four-step discovery learning model, namely data processing. In this activity, students got information not only from the chemistry reference book they have but also from the learning videos they watched in edmodo class group. N-gain for the analysis indicator in the experimental class is 0.543 included in the medium category. For the control class obtain an N-gain of 0.134 with the low category.

N-gain indicator (4) evaluated for the experimental and control classes equally in the medium category. The experimental class obtained an N-gain of 0.459 while the N-gain control class of 0.302. Students who learned using edmodo-assisted discovery learning models were invited to reason and communicate through the fifth stage, namely verification. Students not only communicated through problem solving but also by discussing in edmodo class groups. This discussion was conducted to find out the extent of students' understanding of the material. Indicator (5) implemented also included in the high category for the experimental class and the control class, but the control class got a little higher. It is because the experimental class students are not careful and thorough in writing the final results so that the choice of answers they choose becomes inappropriate.

Questionnaire responses of students to the application of edmodo-assisted discovery learning models were given to the experimental class. The results of the questionnaire responses of students to learning with edmodo-assisted discovery learning model are shown in Figure 4.

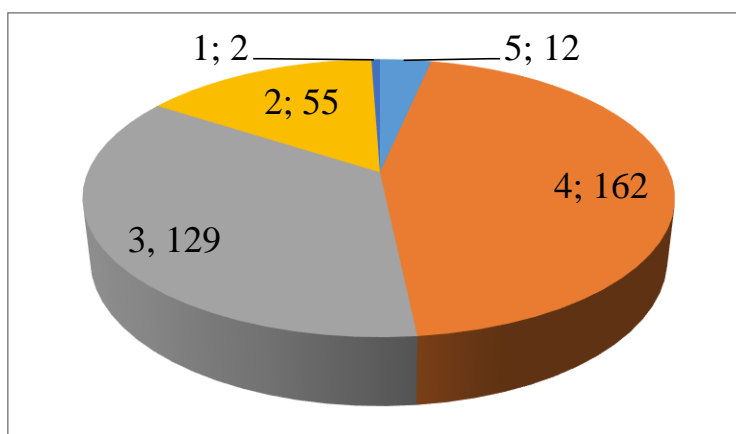


Figure 4. Results of Questionnaire Responses of Students Note: 1) Strongly Disagree, 2) Agree, 3) Doubtful, 4) Agree, and 5) Strongly Agree

Based on Figure 4, overall, students gave positive responses to the application of edmodo-assisted discovery learning models in learning. It was indicated by the acquisition of the most votes in the answer choice 4 that was agree with the acquisition of 162 votes. These results indicated that students agreed with the application of edmodo-assisted discovery learning models to improve their critical thinking skills. Judging from the aspects of enthusiasm, attitudes, readability, interests, and ease of learning with discovery learning models edmodo assisted students expressed agreement.

4. CONCLUSION

The critical thinking ability of class XI students learning with edmodo-assisted discovery learning models was increased. It was indicated by the classical N-gain score for the experimental class of 0.43 in the medium category and n-gain of the control class by 0.57 in the medium category. Learners agreed to use edmodo-assisted discovery learning model to improve critical thinking skills.

REFERENCES

- Alghafri, A. S., & Ismail. (2014). The Effects of Integrating Creative and Critical Thinking on Schools Student's Thinking. *International Journal of Social Science and Humanity*, 4(6), 523.
- Basori. (2013). Pemanfaatan Social Learning Network Edmodo dalam Membantu Perkuliahan Teori Bodi Otomotif di Prodi Ptm Jptk FKIP UNS. *Jurnal JIPTK*, 6(2), 99-105.
- Cankaya, S., & Yunkul, E. (2018). Learner Views about Cooperative Learning in Social Learning Networks. *International Education Studies*, 11(1), 52-63.
- Cherner, T., Lee, C.Y., Fegely, A., & Santaniello, L. (2016). A Detailed Rubric for Assessing the Quality of Teacher Resource Apps. *Journal of Information Technology Education: Innovations in Practice*, Vol 15.
- Dharmawati. (2017). Penggunaan Media e-Learning Berbasis Edmodo dalam Pembelajaran English for Business. *Query: Jurnal Sistem Informasi*, 1(1).
- Durak, G. (2017). Using Social Learning Networks (SLNs) in Higher Education: Edmodo Through the Lenses of Academics. *International Review of Research in Open and Distributed Learning*, 18(1), 84-108.
- Ennis, R. H. (2011). The Nature of Critical Thinking: An Outline of Critical Thinking Dispositions and Abilities. *University of Illinois*, 2(4).
- Heryani, Y. & D. Setialesmana. (2017). Kontribusi Penggunaan Model Discovery Learning Terhadap Peningkatan Kemampuan Koneksi dan Komunikasi Matematika pada Mahasiswa Program Studi Pendidikan Matematika Angkatan 2015-2016. *Jurnal Siliwangi Seri Pendidikan*, 3(1): 190-196.
- Kemendikbud. (2017). *Silabus Revisi Tahun 2017*. Jakarta: Kementerian Pendidikan dan Kebudayaan.
- Kemendikbud. (2015). *Materi Pelatihan Guru Implementasi Kurikulum 2013 SMA Mata Pelajaran Matematika*. Jakarta: Kementerian Pendidikan dan Kebudayaan.
- Komara, E. (2018). Penguatan Pendidikan Karakter dan Pembelajaran Abad 21. *SIPATAHOENAN: South-East Asian Journal for Youth, Sports & Health Education*, 4(1), 17-26.
- Mentari, W., Achmad, A & Yolida, B. (2015). Pengaruh Model Discovery Learning terhadap Kemampuan Berpikir Kritis dan Hasil Belajar Siswa. *Jurnal Bioterdidik: Wahana Ekspresi Ilmiah*, 3(6).
- Noor. (2014). Peningkatan Kemampuan Berfikir Kritis Matematis Siswa Melalui Model Pembelajaran Discovery Learning. *Tesis: Universitas Muhammadiyah Surakarta*.
- Nurrohmi, Y., Sugeng U., & Dwiyono, H.U. (2017). Pengaruh Model Pembelajaran Discovery Learning Terhadap Kemampuan Berfikir Kritis Mahasiswa. *Jurnal Pendidikan: Teori, Penelitian, dan Pengembangan*, 2(10), 1308-1314.

Priowijanto, G. (2013). *Materi Simulasi Digital*. Jakarta: Seamolec.

Rahmadani, Y., N. Fitakurahmah., N. Funky., R. Prihatin., Q. Masjid, & B.A. Prayitno. (2018). Profil Keterampilan Literasi Sains Siswa Sekolah Menengah Atas (SMA) di Karanganyar. *Jurnal Pendidikan Biologi*, 7(3), 183-190.

Sabekti, A. W., & Khoirunnisa, F. (2018). Penggunaan Rasch Model Untuk Mengembangkan Instrumen Pengukuran Kemampuan Berfikir Kritis Siswa Pada Topik Ikatan Kimia. *Jurnal Zarah*, 6(2), 68-75.

Santoso, E. (2019). Kelas Virtual Menggunakan E-Learning Berbasis Edmodo (Virtual Classes Using E-Learning Based on Edmodo). *Jurnal THEOREMS (The Original Research of Mathematics)*, 3(2), 160-177.

Sulistiani, E., S. B. Waluya, & Masrukan. 2018. The Analysis of Student's Critical Thinking Ability on Discovery Learning by Using Hand on Activity Based on the Curiosity. *Journal of Physics: Conference Series* 983, 1-7.

Yotiani, Y., Supardi, K. I., & Nuswowati, M. (2016). Pengembangan Bahan Ajar Hidrolisis Garam Bermuatan Karakter Berbasis Inkuiri Terbimbing untuk Meningkatkan Kemampuan Berpikir Kritis Siswa. *Jurnal Inovasi Pendidikan Kimia*, 10(2).