Effectiveness of Expository Based on Digital Learning Repository for Critical Thinking Skills of Vocational Students in Digital Simulation and Communication Subjects

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**Abstract.** The ability to think critically is one of the skills that students must possess in the 21st century. This study aims to determine vocational students' critical thinking skills in digital simulation and communication subjects using expository based on digital learning repository. This research using quantitative descriptive. The samples of this study were students of class X SMK N 2 Surakarta. The instrument used is a multiple-choice test that developed based on indicators of critical thinking skills, according to Facione, which consist of interpretation, analysis, evaluation, inference, explanation, and self-regulation. The results of this study showed that the average percentage of students' critical thinking skills is in the sufficient category. The results of each indicator of critical thinking skills can be described as follows: (1) The interpretation indicator is 46.8% in the sufficient category, (2) The analysis indicator is 49.5% in the sufficient category, (3) The evaluation indicator is 60.5% in the sufficient category, (4) The inference indicator is 48, 4% in the sufficient category, (5) About 56.5% for the explanation indicator in the sufficient category, and (6) The self-regulation indicator is 64.5% in the high category. The results showed that students' critical thinking skills were still quite or moderate. Students' critical thinking skills need to be improved with innovative learning models and methods that will affect learning motivation and critical thinking skills towards various student problems in teaching and learning activities.

Keywords: critical thinking, Facione, teaching and learning activities, innovative

# INTRODUCTION

One of the 21st-century skills is the ability to think critically. Critical thinking is a set of capabilities or skills needed for intellectual and personality development. The word critical thinking comes from the Greek word "Kritikos", which means wisdom or sharpness, the ability to judge or make decisions. Critical thinking teaches more how to think than what to think. Critical thinking skills are skills to carry out various analyses, assessments, evaluations, reconstructions, and decision-making that lead to rational and logical actions [1]. Another understanding of critical thinking is a person's way of dealing with problems with facts and based on good considerations [2]. There are six indicators of critical thinking skills involved in the critical thinking process. These indicators include interpretation, analysis, evaluation, inference, explanation, and self-regulation [3].

Critical thinking is critical in the learning process in the 21st century. Students' critical thinking skills are needed to solve problems faced by students in the learning process [4][5][6]. With the many problems faced both in education and in society in general, each student must continue to make decisions, solve problems and obtain various types of information throughout their lives. When making a decision, the individual requires critical thinking to be able to find the best solution.

It is related to critical thinking; there are several facts about the ability of students in Indonesia. The 2018 PISA study released by the OECD show that the ability of Indonesian students to read achieved an average score of 371, with an average OECD score of 487. Then the average score for mathematics reaches 379 with an OECD average score of 487. This result explains that the mathematical ability of students in Indonesia is ranked 72 out of 78 countries [7].

Furthermore, for science, the average score of Indonesian students reaches 389 with an average score. The OECD is 489. This result explains that the scientific ability of students in Indonesia is ranked 70 out of 78 countries. PISA data for Indonesia related to the ability to read, math, and science shows that the condition of the ability of students in Indonesia is below average or low performance.

The interviews and observations conducted at SMK N 2 Surakarta show that learning on digital simulation and communication subjects is still less effective. The teacher uses an expository learning model, where the expository learning model emphasizes delivering material verbally. The expository strategy is a learning strategy that combines lecture, question and answer methods, and demonstrations. By combining these various methods in learning activities, students are expected to understand the teaching material [8]. The Expository Method is a learning method that emphasizes delivering material verbally from a teacher to a group of students with the intention that students can master the subject matter optimally [9]. However, when this model is applied, students become less active during learning and cause students' critical thinking skills to be less honed. Student daily score data, were in taking the value of the teacher giving essay test questions to measure students' critical thinking skills showed low results. There are 42% of students who pass the minimum graduation criteria (KKM) with a score of 73, and the remaining 58% of students do not pass. It can conclude that students do not understand the learning material to get a less than maximum score.

This study still uses the old learning model, which is expository learning. But, there are some modifications related to learning materials. The material provided is enrichment material already available online and collected in the learning management system (LMS). The digital learning repository (DLR) is a system that manages access to reusable learning content [10]. Meanwhile, the digital materials that are freely and openly offered to educators, students, and independent learners to use and reuse for teaching, learning, and research. It is contributing to the trend of sharing and reusing learning. Materials and reflect strategic opportunities to improve the quality of teaching and learning [11].

This article aims to describe the critical thinking skills of vocational students in one of the subjects. It will be easier to map the critical thinking skills possessed by students. It is one of the considerations in determining the most suitable learning strategy for vocational students.

# METHODS

The method used to determine students' critical thinking skills in this study is descriptive quantitative. The research sample was class X SMK N 1 Surakarta with 62 students. The sampling technique in this study is cluster random sampling. The data were obtained through research instruments using multiple-choice questions, which developed from six categories of critical thinking skills according to Facione.

The validity and reliability of the instrument showed: (1) The validity of the critical thinking instrument was tested on 30 students from class X TKJ at SMK Negeri 2 Surakarta with rtable = 0.361. Items are considered valid if the value of rcount > rtable. From the results of the tryout, 25 questions were obtained, which were declared valid; (2) The item reliability test aims to test the questions before they are used to retrieve data whether the questions are reliable and consistent. The reliability test provisions are said to be good if the Cronbach's Alpha value is > 0.05. The result of Cronbach's Alpha value shows 0.808, which is declared reliable.

The results of the study were categorized to the criteria for achieving students' critical thinking skills according to Riduwan [12]. The grouping criteria consist of very high, high, sufficient, low, and very low criteria.

The categorization of critical thinking skills criteria can be seen in table 1

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| **TABLE 1.** The category of critical thinking skills (Riduwan) |
| **No** | **Percentage (%)** | **Category** |
| 1 | 81-100 | Very high |
| 2 | 61-80 | High |
| 3 | 41-60 | Sufficient |
| 4 | 21-40 | Low |
| 5 | 0-20 | Very low |

# RESULTS AND DISCUSSIONS

The result of the study showed that the condition of students' learning achievements with critical thinking skills is still low when compared to the KKM. Meanwhile, the KKM limit for the digital simulation and communication subjects in Surakarta is 73. The following is a summary of learning achievements on the digital simulation and communication subjects.

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| **TABLE 2.** The learning achievements of the critical thinking skill test on the digital simulation and communication subject |
| **Score** | **Frequency** | **Persentage (%)** |
| 40 – 44 | 6 | 9.7 |
| 45 – 49 | 9 | 14.5 |
| 50 – 54 | 13 | 21.0 |
| 55 – 59 | 11 | 17.7 |
| 60 – 64 | 21 | 33.9 |
| 65 – 69 | 2 | 3.2 |
|  | 62 | 100 |

Based on table 2, obtained 100% of students were tested using the digital simulation and communication subjects questions characterized by this critical thinking skills. None of them has been completed according to the KKM.

**Figure 1.** Diagram of the learning achievement of the critical thinking skill test on the digital simulation and communication subjects

The critical thinking skills of students when viewed from each indicator can be shown in table 3.

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| --- |
| **TABLE 3.** Category of students' critical thinking skills for each indicator (Facione) |
| **Indicator** | **Percentage (%)** | **Category** |
| Interpretation | 46,8 | Sufficient |
| Analysis | 49,5 | Sufficient |
| Evaluation | 60,5 | Sufficient |
| Inference | 48,4 | Sufficient |
| Explanation | 56,5 | Sufficient |
| Self-regulation | 64,5 | High |

Table 3 shows the different percentage scores of each indicator of critical thinking skills. Self-regulation is the indicator with the highest percentage value, 64.5%, while the lowest percentage value is obtained by the interpretation indicator, 46.8%. Meanwhile, the value achieved by the analysis indicator is 49.5%, the evaluation indicator is 60.5%, the inference indicator is 48.4%, and the explanation indicator is 56.5%.

The results of students' critical thinking skills measured based on these six indicators can be explained as follows:

Interpretation is communication that aims to understand and appreciate the meaning of various objects. Every object, whether it is a book, poetry, situation, data, and much more, can be an object of interpretation. The interpretation indicator in this study obtained a percentage of 46.8% with a sufficient achievement category. This interpretation indicator students can explain the meaning of events by connecting the causes and impacts that will occur. However, in this indicator, some students are still confused about solving the problems presented.

The analysis is an activity to identify the relationship between statements, questions, concepts to be grouped according to specific criteria in order to find meaning and relationships. The analysis indicator gets a percentage of 49.5%, but on this indicator, students are quite able to identify the relationship between the actual concept of the problem. Some students have not been able to find a solution or the right way to solve the problem. Testing the indicators of students' critical thinking skills is done by giving questions about digital citizenship material. In this indicator, students are expected to be able to identify the intentions that occur with logical and appropriate reasons and be able to provide further explanations. However, some students still look confused in expressing their arguments and analyzing the causes—the result of an event.

Evaluation means assessing the credibility of someone's statement, such as comparing the results of the activities made. The evaluation indicator obtained a percentage result of 60.5% with a sufficient category. Some students have been able to assess the right statements and solve problems according to the problems presented, but some students have not been able to express and conclude their opinions into a statement.

Inference means identifying elements to form hypotheses and conjectures by drawing reasonable conclusions. Inference indicator obtained the percentage result is 48.4% with sufficient category. This indicator shows students capable enough to identify and solve problems until finding a conclusion. The conclusions on this indicator is done so that students are able to interpret what has happened and been observed [13].

The explanation presents a reasonable and coherent result of one's opinion. It is to strengthen an opinion or argument, conceptual, methodological, and contextual considerations are needed. Explanation indicators obtained percentage results that are equal to 56.5% with sufficient category. Students are quite able to explain the results in accordance with the problems presented. There are still some students who have not been able to answer the questions by explaining according to the existing statements, according to the material, and complete with explanations.

Self-regulation means monitoring one's cognitive activity, significantly improving analytical skills by evaluating questions, correcting or validating one of one's results, one of the reasons or one's results. The self-regulation indicator obtained a percentage result of 64.5%, so that this indicator is in the high category. This self-regulation indicator is related to the student's ability to control himself and manage its existence in the face of problem-solving. Students can control their faces problems by applying their skills in analyzing and evaluating the results that have been developed by themselves. In this self-regulation indicator, students are faced with questions related to their ability to express their ideas to solve problems. This indicator is high because students are very able to describe and conclude their opinions to solve a problem able to answer questions and solve existing problems, according to the material, according to his opinion. Self-regulation is self-reflection, making self-assessments, and correcting mistakes according to themselves.

The ability to think critically is one of the factors that make students successful in learning. The better the ability, the students will find it easier to solve the problems encountered in learning. However, if the ability is lacking, students will have difficulty in mastering learning problems. Critical thinking can predict a student's general cognitive ability. In addition, students can also understand well between theory and practice, as explained by[14][15][16][17]. This will facilitate students in learning [18]. Clarity of concepts, in theory, will provide mastery in practice [6]. Overall ability in theory and practice will give superior competence to students in the learning process.

# CONCLUSION

Based on the results of the research and discussion described previously, in general, students' critical thinking skills in the aspects of interpretation, analysis, evaluation, inference, and explanation are included in the medium category. Meanwhile, the high category is only the self-regulation indicator. It shows that students are still not trained in indicators of critical thinking skills in learning.

After reviewing the results and conclusions drawn from this study, suggestions are proposed to teachers in learning activities to empower indicators of critical thinking skills both through the preparation of teaching materials, learning models, and learning methods so that students' critical thinking skills can increase.

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