



## **Analysis of Critical Thinking Skills in Vocational High School Automotive Engineering Students**

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### **Abstract**

The 21<sup>st</sup> Century demands that every human being be able to solve the problems faced by thinking creatively and critically and be able to use information and communication technology wisely. The business world and industry needs workers who have the ability of the 21<sup>st</sup> century so that market needs can be met. Vocational Schools are educational institutions that are expected to produce graduates who are ready to work and can compete in the business world and the industry. Supposedly, the implementation of learning in SMK is oriented to the reality of future work needs. This study uses descriptive qualitative methods and aims to analyze the findings related to the level of critical thinking skills of vocational students, especially automotive engineering expertise programs, the factors that influence, and the steps that can be taken to improve students' critical thinking skills. The results showed that as much as 58.34% had a level of critical thinking skills that were lacking, even 5.56% of them were classified as very less. Some previous research states that the factors that influence critical thinking skills of vocational students are classified as low, namely student input, quality of learning, and support in learning. Actions that can be taken to improve students' critical thinking skills include improving teaching methods or models, familiarizing students with questions that demand critical thinking, and using teaching materials that support critical thinking skills.

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## INTRODUCTION

Vocational education is one form of educational investment that is expected to contribute to the development of the quality of Human Resources (Hidayati, 2015). Vocational High School is one form of investment in vocational education. The implementation of the Vocational High School (SMK) aims to meet the needs of the workforce and equip students with knowledge and skills as a provision of life (Soenarto et al., 2017). That is, SMK graduates are expected to be able to work and compete competently in certain fields according to the needs of the business world and the industrial world.

The results of educational institutions are human resources capable of managing natural resources and other resources effectively and efficiently for the welfare of society. Educational institutions must always innovate in order to produce products that can meet the needs of the community. Increased global competition that occurs at this time requires vocational schools to develop in the direction of the development of the world of work.

Based on information that continues to grow until now, the world of work requires workers who have the skills and competencies in accordance with the times and economic demands (Boahin & Hofman, 2013). The demands of the world of work regarding work skills and the ability to develop self-competence highlight the importance of creative thinking, critical thinking, problem solving, as well as the use of information and communication technology (ICT) skills. The skills and knowledge needed to prepare competent students in the world of work cannot be developed through traditional learning because this learning often ignores the reality of market needs (Lainema & Nurmi, 2006). Coaching work skills and student competencies can be done through problem-based learning and involves teamwork (Boahin & Hofman, 2013).

The workforce needed by the business world and the industrial world are those who have the ability to think critically and solve problems. This results in learning in schools that still rely on thinking at a lower level and are not oriented to improving critical thinking skills will endanger the

performance of graduates (Kiener et al., 2014). Therefore, HOTS (high order thinking skills), which includes creativity, critical thinking, and problem solving is very important for vocational students. Implementation of learning oriented to future work needs and skills development will affect the professional career of a workforce.

Supposedly, the curriculum in SMK is adjusted to the development of the world of work so that the graduates produced are in line with expectations. Intellectual, emotional, social, and motoric aspects of students must be a concern in order to produce the expected graduates. Graduates' competencies related to work skills in certain fields are determined by the curriculum at the Vocational School. Graduates' vocational competency abilities are obtained through curriculum in productive programs based on values in normative programs and scientific basis in adaptive programs (Purwana, 2010).

Based on the description above, this article aims to analyze the findings related to the level of critical thinking skills of vocational students in particular the automotive engineering expertise program, the factors that influence it, and the steps that can be taken to improve students' critical thinking skills.

## METHODS

The method used in this research is descriptive qualitative which aims to describe the results of the analysis of critical thinking skills of vocational students, especially automotive engineering expertise programs. Subjects in this study were 36 students of class X TKRO in one of the state vocational schools in Semarang. The instrument used to measure the level of critical thinking skills on petroleum material in the form of 11 essay questions that are adjusted to the critical thinking skills indicators according to (Ennis, 1993). The instrument was validated by conducting content validity by requesting the assessment of three experts in the measured field. Before being used, the questions were tested on students of class X TKRO of SMK Negeri Jateng, then the Cronbach's alpha coefficient was calculated to determine the reliability of the questions. The results of the calculations produce a Cronbach's alpha coefficient of 0,938 so that it is

interpreted that the question of critical thinking skills has very high reliability. The questions that had been validated by experts were then given to 36 students of class X TKRO in one of the state vocational schools in Semarang to work on. Scores obtained by students were analyzed by the formulation as follows:

$$Score = \frac{score\ obtained}{maximum\ score} \times 100$$

Based on the scores obtained by students, it can be seen the level of critical thinking skills of students by using the interpretation of the scores presented in Table 1.

**Table 1.** Interpretation of Student Critical Thinking Skill Criteria Scores

Score	Criteria
0-24,9	Very less
25-49,9	Less
50-74,9	Enough
75-100	Good

**RESULTS AND DISCUSSION**

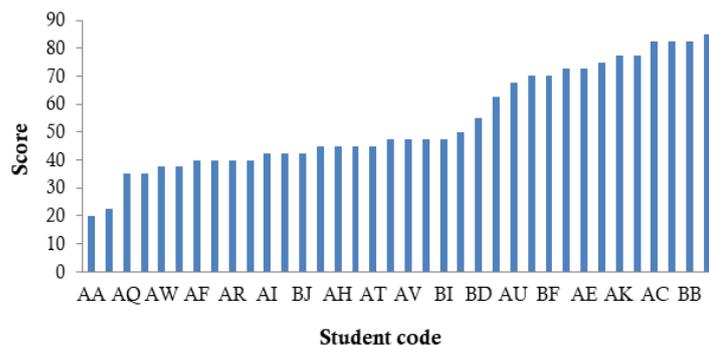
Simply put, critical thinking is a person's ability to analyze and evaluate information. People who think critically will raise important questions and problems, formulate them clearly, gather and assess relevant information, use abstract ideas, think openly, and communicate effectively with others. Whereas passive thinkers experience a limited and ego-centric worldview. Passive thinkers tend to answer questions with a yes or no and see their perspective as the only one that makes sense and their facts as the only relevant. Critical thinking is a very important skill because it is needed in the workplace. Critical thinking skills can help someone to evaluate people, policies, and institutions to avoid social problems (Duron et al., 2006).

Vocational education is education that emphasizes the skills of students with the aim of being able to work and be competent in the world of work. Vocational education is also stated as a special program that provides values and norms that are integrated with skills to students at various levels of education. In the vocational training process, students who have been exposed to scientific trends and technological advances, their skills and ideals will lead to better adjustments to work with innovation and problem solving (Nwazor & Nwaukwa, 2015).

Vocational students have an age range between 16-19 years. The age range is classified into the stage of formal operational growth. At this stage, vocational students are able to solve complex and abstract problems with their own mindsets. Desmita stated that the ability possessed at that age range includes the ability to think logically, think flexibly and complexly, as well as abstract thinking (Retnowati et al., 2016). With these capabilities, vocational students should be able to adapt to their environment.

Many SMK students are less able to explain the results of the reasoning process related to problem solving activities for logical reasons. In addition, they are also less able to find alternative solutions to a problem. Only students with high initial ability are able to think critically at each stage of the critical thinking process (Retnowati et al., 2016). That is, students who have low initial ability will experience difficulties when faced with the stages of critical thinking skills.

The results of the assessment of students' critical thinking skills were analyzed descriptively quantitatively. Data on the results of assessing students' critical thinking skills is presented in Figure 1.



**Figure 1.** Graphic Assessment of Students' Critical Thinking Skills

Based on Figure 1, it can be seen that more than 50% of students have critical thinking skills in the poor category, even some of them are classified as very less. More details are presented in Table 2.

**Table 2.** Recapitulation of Students' Critical Thinking Skills Test Results

Criteria	Score Range	The Number of Students	Percentage (%)
Very less	0-24.9	2	5.56
Less	25-49.9	19	52.78
Enough	50-74.9	8	22.22
Good	75-100	7	19.44

The results of the analysis carried out show that most students have difficulty in observing and considering the results of observations, making and determining the results of considerations, as well as defining terms and considering a definition. It can be concluded that most students are not able to complete the five aspects of critical thinking skills well so that it can be classified as low or low levels of critical thinking skills of students. The average level of critical thinking skills of vocational students is still relatively low in almost all indicators of critical thinking (Kharisma, 2018).

Vocational high schools are concerned with the development and training of technical skills related to work. The existence of SMKs is very important to increase employment and ensure economic stabilization (Inayat et al., 2013). As such, most countries rely on some form of vocational education to develop a competent workforce and provide alternatives for students who want to immediately find work after graduation. However, two main challenges faced by teachers in vocational schools are low student motivation and learning with an old-fashioned approach. These two challenges cause the failure to create graduates who are ready to meet market demands (Yang, 2015).

Often, students who enroll in vocational schools are students who have low academic achievement and motivation to learn (Lee et al., 2010). Vocational schools have several shortcomings including the lack of emphasis on job training and learning approaches that are more oriented to evaluation (national exams). This encourages students to prefer continuing high

school rather than entering the market. In addition, SMK graduates also tend to get lower wages. Along with the lack of vocational student achievement results, many students are unable to solve a problem and do not have critical thinking skills that are highly valued by the owner of a company (Yang, 2015).

Many factors underlying the lack of critical thinking skills of vocational students, such as the quality of learning, facilities, and student input. In the learning process, the relationship between teachers, students, learning models/methods, and learning media is very closely related. Teachers need appropriate models/methods and learning media so that the learning material delivered can be understood by students easily.

Students who are not accustomed to working on problems with indicators of critical thinking skills will experience difficulties and are unable to solve problems well. Learning environment that is able to produce students with high critical thinking criteria is a learning environment that accustoms students to practice critical thinking. Students who are not accustomed to working on story problems with the problem solving model require the teacher to continue to encourage students to practice understanding the problem first (Fatmawati et al., 2014).

Critical thinking skills are one of the skills that must be developed according to the revised 2013 curriculum mandate. There have been many definitions of critical thinking over the years. Critical thinking is to rationally decide on something that is not trusted (Norris, 1985). There are five steps in learning to get students to think critically, namely determining learning objectives, starting with questions, active learning, collecting student feedback, and learning assessments (Duron et al., 2006).

Analysis of discussions and case studies conducted in a class aims to evaluate the role of critical thinking in developing the professionalism and priorities needed in the world of work (Kiener et al., 2014). The findings show that the emphasis on critical thinking skills provides an important contributor to student development from a professional perspective. In the context of business or vocational education, simulations offer several advantages, including linking learning with

authentic assignments, offering opportunities for collaboration and sharing experiences, and introducing students to the complexities of the real world that allow them to experiment and take risks in safe contexts (Siewiorek et al., 2012).

One way that can be done to grow and improve students' critical thinking skills is to improve the learning methods or models used in the learning process. The use of descriptive learning cycle learning models with interesting learning media can stimulate children's motivation to be able to understand concepts and practice students' critical thinking skills (Mulyasih, 2015). Learning with the DGBL approach in collaboration with teaching aids can improve the high-level thinking skills of vocational students (Yang, 2015). In addition, students' critical thinking skills improve better after discovery inquiry learning (Salbiah, 2017). Creative Problem Solving learning model can also be used as one of the learning models to improve students' critical thinking skills (Purwati et al., 2016).

In addition to more creative models or learning methods, the teaching materials or modules used can also have the potential to improve critical thinking skills. Learning will be more effective if active learning methods and models are used and supported by the availability of teaching materials that fit the needs of students (Nugraha & Binadja, 2013). Textbooks or textbooks are one of the learning media that are often used in schools. Textbooks are one of the means of the success of the teaching and learning process (Lamb & Annetta, 2013). That is, teaching materials can be used as a means to improve students' critical thinking skills.

Materials or textbooks that are appropriate for critical thinking skills can be arranged so that students can use them well. The use of problem-oriented e-modules causes the students' critical thinking skills to increase (Suarsana & Mahayukti, 2013). Guided inquiry-based character teaching material can significantly enhance students' critical thinking skills (Yotiani et al., 2016). In addition, a critical thinking based module that is accompanied by effective argument mapping can train critical thinking skills (Wijayanti et al., 2016).

Students can work on critical thinking questions if they are familiar with and are familiar

with the questions of critical thinking criteria. Therefore, students need to be given some questions that get used to critical thinking so that students' ability to solve critical thinking problems increases (Kharisma, 2018). Teachers should more often give complex problems or questions that require students to think critically (Hayudiyani et al., 2017). This is very necessary for students who have low initial ability to be able to practice the critical thinking process.

Vocational students tend to have less learning motivation and activeness in learning. Learning support for students can be done by: a) communicative environment and feedback, b) pleasant learning activities from the teacher, c) the provision of learning services inside and outside of learning, and d) peer support through the context of collaborative learning. Students can be made into groups and given the support needed to think critically. The support provided optimally will help students improve their critical thinking skills.

## CONCLUSION

The business world and the industrial world need workers who have 21st century abilities such as creativity, critical thinking, and problem solving. However, many students are unable to solve a problem and do not have the critical thinking skills that are needed in the workforce. Vocational students tend to have low critical thinking skills. Factors underlying the lack of critical thinking skills of vocational students include the quality of learning, support in learning, and student input. Various supports in learning can be done to improve the quality of learning and produce students who are able to think critically well. The steps that need to be done include improving the method or model of learning, using teaching materials that support critical thinking skills, and familiarizing students with questions that demand critical thinking.

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