



Chemistry Learning: Perception and Interest of Vocational High School Student of Automotive Engineering Program

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Abstract. This study explored the implementation of chemistry learning in vocational high school regarding of interest and perception of students of Automotive Engineering Program. Descriptive studies have been conducted. There are 112 students of automotive engineering as research samples from one public vocational high school in Yogyakarta. Samples were determined by cluster sampling technique. Two instruments were used to collect the data, namely closed questionnaire for perception and open questionnaire for interest. Perception questionnaire has 20 items statement, while the interest questionnaire has 6 open ended questions. The data of perception were analyzed descriptively quantitatively with the ideal rating category. Interest data was analyzed qualitatively by analyzing the answers of the research subjects, coding the answers and grouping them into the specific theme. The results showed that most vocational high school students of automotive engineering are not interested in chemistry. The biggest cause of disinterest because the student just want to focus on vocational materials, chemistry unrelated to the automotive field, learning is not interesting, and chemistry is difficult to understand. In general, the perception of vocational high school students in learning chemistry is sufficient. In particular, student perceptions are good for teacher role indicator and sufficient category for indicators of student engagement and meaningfulness of learning. The important implications for the development of chemistry learning in the context of vocational are discussed.

Keywords: chemistry learning, interest, student perception, vocational high school

1. Introduction

The lowering of high school students' interest in chemistry is becoming a growing issue today. This condition also happens to vocational school students. Some of the engineering students lack motivation in chemistry learning [1]. This situation is certainly less profitable given the essence of chemistry lesson in engineering vocational schools. Chemistry is a basic subject given at vocational school of an automotive engineering program. Chemistry is aim at not only understanding and mastering "what" and "how" a job is done, but also understanding about "why" it should bedone. Mastery of chemistry influences the development of vocational competencies of the student in the future.

Low motivation also shows that students' interest in chemistry learning is low. Interest is keyto the success of chemistry. Interest is a unique psychological state that occurs during interaction between persons and their object of interest [2]. In the context of chemistry lesson, objects can be learning situations, content and resources, teachers, and personal interaction. The dimension interest that gives more influence to student's interest in learning is personal aspect. Personal interest was relatively stable interest associated with tend to enjoy or engagement with specific topics, subject areas, or activities [3, 4].

Students interested in chemistry learning may be affected by different factors. Someof studies have pointed various factors responsible for declining students' interest. These factors include pedagogical aspects [5], content that taught [6],the role of teacher, personal traits and choices [7] and prior learning experience [8]. Personal interest development is related to student's constraints individually. The psychological dimension that affects individual nature is perception.

Perception refers to attaching meaning to environmental inputs received through the senses [9].This meaning is related to the ability of the student to give response either positive or negative to something received, viewed or felt.Previous studies have shown that students have a perception that





chemistry is irrelevant to the vocational field [1,10]. This wrong perception is likely to be the cause of the low interest of vocational high school students toward chemistry learning. Whereas a lot of chemistry content that is relevant to the field of vocational. For example in the automotive engineering program, chemistry is applied in studying fuel, batteries, chemical materials, metals, electroplating and environmental pollution. Some factors can affect of students' perception are something is being perceived, the context of the situation and personal experience [11], gender, ethnic background, experience, cognitive ability and grade level [12]. Thus it is necessary to explore furtherer the perception of automotive engineering students on learning chemistry regarding of theories of learning perspective. Theoretical perspective on chemistry teaching includes content, learning activities and interpersonal perspective [13].

Student perceptions of the chemistry learning are important. Student perception can be reporting the quality of interactions and processes of chemistry learning. Measurement of student perception is an important strategy forevaluating and developing of chemistry lesson. Beyond providing firsthand impressionof the quality of student-teacher interactions and classroom processes, result of student observation possess naturally acquired expertise through their lived, everyday experiences in classrooms.Exploration of perception followed by an analysis of interests and supporting factors inhibitors perceived by students. Thus will get the whole describe about what, how and implication of result of perception analysis of student of the vocational high school of the automotive engineering program to chemistry learning.

2. Research Method

Descriptive studies have been conducted in this research. There are 112 students of automotive engineering in 11th grade of academic year 2015/2016 and 2016/2017 as research samples. The samples were taken fromone of the public vocational high school in Yogyakarta.It was the one of school laboratory ofUniversitasNegeri Yogyakarta. In Yogyakarta were only two public vocational high schools with automotive engineering study program. Samples were determined by cluster sampling technique.

Research data was taken from two instruments. The closed questionnaire that had four alternative options were used to obtain students' perception data on chemistry learning. Measured aspects were elaborated from the theoretical perspective in teaching [13], and dimension of tripod survey [14] According to [14] developed the Tripod student perceptions surveyto measure teaching quality. The "tripod" describes the component of learning effectiveness i.e. (a) content knowledge, (b) pedagogic knowledge and skills, and (c) the ability to connect with students on a personal level. In another hand, [13] stated that quality of teaching couldbe measured based on content, learning activities and interpersonal perspective. Based on the two theories, aspects of perception questionnaire were developed. There was three aspects i.e.students engagement (with six indicators), meaningfulness of learning (nine indicators) and role of teacher (five indicators). The questionnaire had 20 itemsof statements. The second instrument was open questionnaire with six questions. The questions were developed emphasizedin personal interest as the one of the dimension of student's interest in learning[3, 4] and the factor that affected students interest in chemistry learning [15]. The instruments were judgement to chemistry learning experts to ensure the accuracy of them.

Analysis of quantitatively descriptive was used to determine the category of students' perception. The steps of data analysis were calculated the mean score both in total or each aspect of students' perception, and then categorize the measurement result based on ideal scoring criteria. The criteria were very good, good, in sufficient, less good and very bad. Interest data was analyzed qualitatively by analyzing the answers of the research subjects, coding the answers and grouping them into specific theme and also displayed in percentage.





3. Result and Discussion

3.1 Perception of Vocational High School Students to Chemistry Learning

Vocational high school students' responses to the 20 items of perception questionnaire have a mean score of 52,84; meanwhile, the ideal score is 80. This value is categorized in sufficient. The percentage of student perception category is displayed in Figure 1. Most of students in automotive study program have a perception in sufficient category to chemistry learning. Among 23.21% students have a good perception and only 4,46% students in very good perception about chemistry learning in vocational school. In the other hand, there are about 13.39% students not as good perception to chemistry learning.

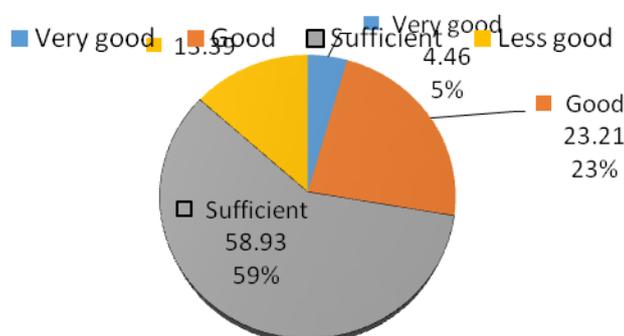


Figure 1. The Distribution of Percentage of students in the categories of perception

Perception of vocational high school students was explored to know the extent of successful implementation of chemistry learning according to student opinions. The results showed that there are still vocational high school students of automotive program students who have a poor perception to chemistry learning. It indicates that there are still deficiencies in the implementation of chemistry learning in vocational high school. Students' perception is related to the process of attaining awareness or understanding of sensory information in their learning. But the ability of each student to respond to the stimulus is not the same. There are students who are very easy to accept something new and there is a relatively long time. Ease is not independent of the readiness of students in following the learning. Students with conditions that are not ready both physically and psychically tend to not enjoy the situation. It is given the impact to students' perception of the learning situation. The perception of students is also influenced by the condition of the stimulus. It is in the form of components of chemistry learning. The classroom atmosphere, the character of the subject matter and the classroom interactions clearly affect how students view the whole the chemistry learning. Not good interaction of students and teachers tends to cause negative perceptions for students'. This tendency will be more visible if the content is delivered in the learning does not match the needs of vocational students, Vocational School students tend to appreciate more positively on vocational subjects. According to [16] if students do not form a positive connection with their teacher, it is within their control to minimally learn core content or refuse to learn anything at all. Positive relationships that are not formed in learning chemistry will affect the willingness of vocational high school students to learn chemistry better. It becomes the task of the chemistry teacher to establish a positive interaction in chemistry learning. Thus the perception of students of vocational high students becomes better. This is very important considering that student perceptions of the learning environment are likely indicative of the motivational aspects of classrooms [17].



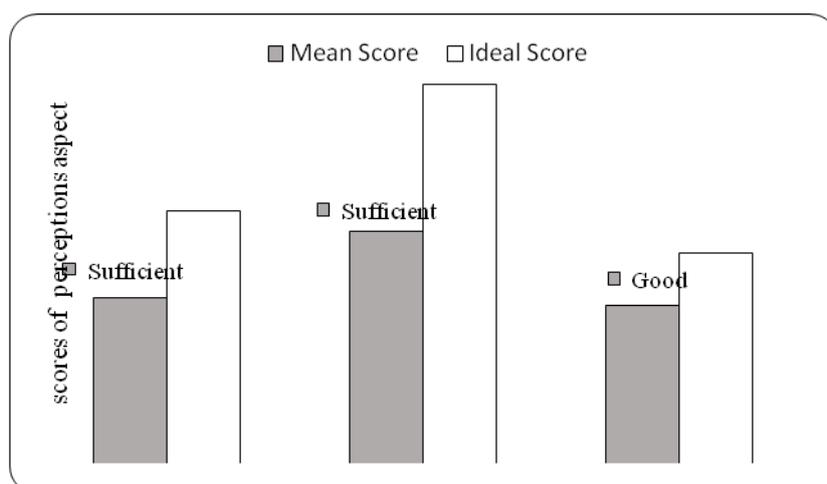


Figure 2. Categories of students' perception in each aspect

The study of vocational high school students' perceptions of chemistry learning is sharpened by analyzing each aspect in perception. It can be known in more detail things that are perceived well or enough. Figure 2 presents the categories of students' perceptions for each aspect. Aspects of students' engagement and meaningfulness of learning were perceived sufficient by students. As for the aspect of role teacher, the students have a good perception. Good students' perceptions of the role of teachers indicate that chemistry teachers in vocational high schools have successfully established positive relationships with students. Students feel comfortable because they be noticed, and their teachers give scaffolding when they need it. This is supported by previous research which states that student' perceptions of teachers effect on learning motivation [18]. This factor becomes the main basic to realize the expected quality of chemistry learning. In regulating student learning, teachers are considered to be the crucial part of the reform process [19]. Teachers must continue to develop themselves to play a better role as part of the process of improving the quality of chemistry education.

The other aspect is perceived poorly by the students. Student engagement is relatively better perceived by students of a vocational high school. This aspect describes that in the chemistry learning the teacher emphasizes student activity. Teachers engage students in identifying essential concepts, discussions, frequently asked questions and self-assignments. This learning is more opened to the students' minds to engage in constructing knowledge. Active learning such as problem-based learning provides students with opportunities to reflect and engage in feedback processes, so that students feel comfortable learning by experience. According to [20] stated that active learning increases the self-efficacy and understanding concept of vocational high school students.

The lowest category of student perception is in the meaningfulness learning aspect that emphasizes in the meaningful of chemistry content. This can't be underestimated because the content becomes the main object that students will learn. If the students' appreciation of the content taught is not good then it is feared will have an impact on chemistry learning process and result. A previous study has shown that low chemistry achievers became less optimistic about the relevance of chemistry to nursing as the course proceeded [10].

3.2 Description of Vocational High School Students' interest in chemistry learning

The interest of vocational high school of automotive students to chemistry learning is analyzed based on students' answers to open questions. The six questions related to interest and whether, difficulties, frequency of learning, beliefs of usefulness, and expectations related content and learning strategies. The analysis results are discussed for each question

3.2.1. Question 1: "Are you interested in studying chemistry more?"





The results show that most of the vocational high school students of automotive engineering are not interested in chemistry subject. As many as 84.38% of vocational students of automotive engineering program are not interested in studying chemistry (Figure 3). Various reasons put forward by students as the cause of such disinterest.

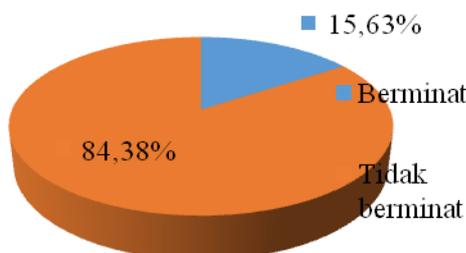


Figure 3. Percentage of students interest

The biggest cause of disinterest because the student just want to focus on vocational materials, chemistry unrelated to the automotive field, learning is not interesting, and chemistry is difficult to understand. Learning content factor becomes the main problem to explore student interest in vocational high school. The selection of inappropriate chemistry content causes the students not to be interested in learning. Chemistry is only considered a compulsory subject that is not relevant to the field of student's vocational. These results have implications for the need for chemistry teachers in vocational high school to map out relevant chemistry learning content to the automotive field. For example the problem of gasoline and diesel fuel in the discussion of petroleum. Likewise, learning about the fraction of petroleum in the form of lubricants. Recent studies have shown that the transfer of chemistry to the engineering education context and its material should be presented in a familiar and related context [21]. The context in learning in vocational schools is of course associated with student vocational competence. The context-based learning in vocational schools improves the positive attitude, interest and meaningfulness of learning for students [1, 22, 23]. Interest is a specific quality that is individual. Previous research states that vocational field of learning is one important dimensions for developing students' interest in science [6, 24]. The results indicate that teachers are more emphasis on basic chemistry theories and do not provide applicative subject matter which is directly related to the students' vocational competencies.

The next cause is related to chemistry learning that students find unattractive. According to [5] states that pedagogical issues are the main factors affecting students' interest in learning a particular subject. Teachers must be able to choose the right learning strategy in accordance with the character of the subject matter and the student. Characteristics of vocational education are the emphasis on practical work. Vocational high school students will tend to get bored if the teacher just lectures and gives practice questions. Vocational students need to be invited to explore to construct their knowledge. This is in line with the results of [7] research which states that although teachers were not a major cause for declining students' interest in chemistry, students' interest could be enhanced by appropriate approaches of pedagogical techniques.

In another hand, the small part of vocational school students expressed interest in chemistry subjects. The reasoning of it are; (1) chemistry is important to learn. (2) Want to understand chemistry applications; (3) chemistry is interesting (4) chemistry support areas of expertise. This factor should be developed so that it will affect all students of vocational high school. How teachers package the content and how to deliver subject matter in learning to foster students' awareness of the importance of chemistry in support of vocational competencies.

3.2.2. Question 2: "Is chemistry a difficult lesson?"



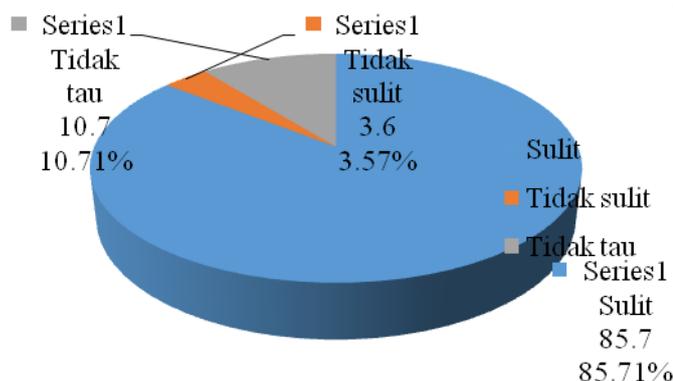


Figure 4. Students' opinions about the difficulty of chemistry

The next question is about whether chemistry is difficult or not. The results of the analysis in Figure 4 show that most of automotive engineering vocational students state that chemistry is difficult. According to student answers, the source of difficulty lies in the number of formulas and terms that must be memorized. Based on the content characteristic, chemistry involves different terminologies, structures, and calculations. The learning of these elements may cause difficulties for the students. The teacher's job is to convey the subject matter as clearly as possible with the appropriate assistance for the individual. The process is expected to overcome the learning difficulties experienced by students.

3.2.3. Question 3: "When do you study chemistry? Is it every day?"

The low data of student interest in learning chemistry is supported by the frequency data of learning. The results of the analysis show that 84% of students stated that they only study chemistry if they face repetition and if there is a task. As many as 15% of students study chemistry once a week, the night before a chemistry lesson and 1% of students say they never study chemistry at home, just remember what the teacher in class. This condition indicates that students have not looked at chemistry lessons as things to be mastered. The effort given by the students has not been maximized, just getting the value without perceiving the benefits. In addition to the results of less good learning, this situation also affects the not applied chemistry in solving automotive problems by students later in the world of work.

3.2.4. Question 4: "Are you sure that chemistry learning is useful for supporting your vocational competencies?"

The next question in the questionnaire is related to vocational high school students' belief in the benefits of chemistry learning. This benefit is attributed to its support for achieving students' vocational competencies. As many as 87.5% of students stated sure the chemical would be beneficial. Other students as many as 10.7% said they were not sure and the rest did not answer. These results provide a good basic for developing quality chemistry learning. Students who are convinced of the benefits of learning something will do their best to achieve success.

3.2.5. Question 5: "What content do you need to give in chemistry learning?"

Based on the results of the analysis of the fifth question, can be known what material is expected or suggested by students of vocational high school to be studied in chemistry learning. Most of students expect the material taught in chemistry learning is applicative and related to their skills. Nevertheless, the questionnaire data also shows that there are 18 students who do not give an opinion, just state just follow what subject matter will be given according to the applicable curriculum. The most answers to the chemistry subject matter that students will learn in a row are fuel chemistry, lubricating oils, batteries, reactions to the battery, electrolyte solutions, elements and compounds,





metals and their properties, chemical reactions and dangers, constituents of tires and accessories of vehicles and chemicals in the industry. Nevertheless, there is an interesting note from the student's answer, which is four students of vocational high students stated that no important chemistry content is learned for vocational students of automotive engineering. The answer is very unintelligible because in vocational subjects students of vocational automotive engineering also got material about battery construction.

3.2.6. Question 6: "What do you suggest for more interesting chemistry learning?"

About the learning atmosphere, in open questions, to make learning chemistry interesting and fun they provide some suggestion. The answer of the vocational student to the last question about the expected learning strategy is quite varied. The answer with the most percentage is learning is balanced with the practice of laboratory, the content is reduced and directly applied in the automotive field. The next great answer is that not to give countless and theoretical homework assignments. The third percentage is the answer to the need for special textbooks, not just a few copies. The next answer is learning made fun, group learning as well as a friendly and communicative teacher in learning.

4. Conclusion

Exploration results show that not all vocational high school students have a good perception of chemistry learning. Low perceptions can be attributed to the analysis of students' interest in chemistry studies that are still low. The cause of the low perceptions of students stems from the meaningfulness of the subject matter that has not been felt. This implies the need for the development of context-based chemistry learning. The context in question is the content of vocational subjects closely related to student competence. The selection of appropriate content in context-based learning is expected to have a positive impact on improving students' chemistry learning interest. Students with high interest tend to have a good perception that will ultimately improve the quality of chemistry learning in vocational high school

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