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Portrait of the Implementation of K13 Learning Principles of Physics Lessons in Vocational High School

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Abstract---Efforts to improve the quality of learning science and technology must be carried out. Teachers must realize 21st century skills-oriented learning in line with K13 learning principles.The aim of research is to identify how the implementation of K13 learning principles. Data collection used was observation and questionnaires. Respondents were four Physics teachers of Vocational High School. Questionnaires were analyzed with simple statistics through range categories in the high and low. From questionnaire analysis, physics learning using a scientific approach had a high category. Integrated physics learning with other subjects, learning using ICT, learning with *hard skills* and *soft skills* combination and using an applicative approach had a low category. Based on the result, it can be concluded that K13 learning principle has not been fully implemented in the standard process of education. The results of research can be used as evaluating matter in the implementation of K13 learning principles.

Keywords: K13, learning principles, vocational high school

I. INTRODUCTION

Efforts to improve the quality of learning science and technology must be carried out. This is in line with the challenges of the 21st century faced by students. Teachers must realize 21st century skills-oriented learning. The principles of 21st century learning include student-centered learning, collaborative learning, learning materials related to problems faced in everyday life, and being able to utilize ICT in learning.

Vocational High School as an educational institution that aims to prepare students to enter the world of work. Vocational schools must improve to meet needs and face future challenges. Improvement is carried out continuously aligned with the development of science and technology and the needs of the business/industrial world.

The K13 learning principles based on process standards including learning are carried out by a scientific approach. Learning is carried out in an integrated manner. Learning activities are carried out towards applicative skills. Learning is carried out by utilizing information and communication technology (ICT). The learning process is carried out with regard to integration between hard skills and soft skills.

The problem raised in this study is how the implementation of K13 learning principles is carried out. This research is important, as an evaluation material for the implementation of K13 learning in Vocational Schools.

II. METHODS

This research is an evaluation study with a qualitative approach. The respondents or samples of this study are vocational physics teachers competency expertise in Automotive Light Vehicle Engineering (TKRO). The problems studied are the learning principles in K13 in accordance with process standards. The instruments used in this study were student questionnaires and observation of learning activities. Validation of research instruments by education expert validators. The questionnaire results were processed with simple statistics.

The process of analyzing questionnaire data is done by grouping the answers with tabulations. Criteria are made by making a scale range (SR) based on the equation (1).

$$SR = \frac{N(M-1)}{M} \quad (1)$$

Where *SR* is scale range, *N* is number of respondents and *M* is number of answers.

The researcher made a questionnaire scale range with criteria never, sometimes, often and always. The results of the analysis were categorized into two, namely high and low. Categories are made by comparing the average value of each item with the averages value of all items as a delimiter. The average value of the questionnaire items that are above the average value of all items has a high category. While the average value of the questionnaire items is lower than the average value of all items has a low category [2]. The results of the analysis are then described in accordance with the conditions in the field.

III. RESULTS AND DISCUSSION

The evaluation implementation principles of learning in K13 based on questionnaire are presented in Table 1.

Table 1. Analysis of K13 learning principles

Num.	Learning principles of K13	Average score (scale 1-4)
1	Learning with a scientific approach	2.92
2	Learning in an integrated manner with other subjects	2.44
3	Learning towards applicative skills	2.37
4	Learning using ICT	2.43
5	Learning by combining hard skills and soft skills	2.46

The high or low category of each item is limited by the average value of all items of 2.52. **Table 1** shows that learning carried out with a scientific approach has an average value above the average of all questionnaire items, so that it has a high category. The frequency of learning with the scientific approach is often done. Based on the results of scientific process observations which consist of observing, asking questions, collecting data, associating and communicating often are done in the learning process.

Learning with a scientific approach has an important role because it can encourage students to diligent, honest, and courageous in expressing opinions and respecting the opinions of other people. The scientific approach can encourage students to develop attitudes through affection starting from receiving, appreciating, living and practicing [9]. The benefits of the scientific approach students get knowledge, skills and attitudes in an integrated manner in the learning process [6]. The scientific approach provides experience to students in learning because students are directly involved in the learning process. Scientific activities make learning more meaningful.

The obstacles faced by teachers with a scientific approach include time allocation is still lacking and there is no available student practice tool in the form of a science laboratory and in group work there are still students who have not actively participated in learning so that it is dominated by active participants.

Physics lessons presented in an integrated manner with other subjects have a low category with occasional frequencies. This condition is because basic competencies (BC) between lessons seem to stand on their own. The results of literature study analysis, that physics subjects are related to mathematics, basic automotive technology (BAT), basic automotive work (BAW) and basic automotive electrical engineering (BAEE). The design of the learning approach that is carried out must combine science, technology, engineering and mathematics (STEM) in a unified learning process. Science, technology, engineering and mathematics aims to connect knowledge, technology, process and numeric. Learning with an integrated approach can improve the ability to think critically, creatively and innovatively. Learning with the STEM approach has an impact on improving critical thinking skills [8]. This ability can answer challenges and characterize 21st century learning.

Constraints faced by physics teachers are still having difficulty doing BC mapping between subjects. This is because most teachers still consider that each subject stands alone. Teachers have not yet done BC mapping on physics subjects, BAT, BAW and BAEE by collaborating. Looking at BC between subjects that are relevant should the teacher be able to collaborate with other subject teachers in learning in the cognitive and skill fields.

Learning towards applicative skills has a low category with frequency sometimes done. This condition is caused by teachers in still textual learning activities. The teacher does not explore the application of theoretical physics in everyday life, especially the benefits of physics in the automotive field. The teacher tends to pursue the target of completing all the competencies in the curriculum structure. The teacher does not bring students to TKRO expertise competencies in real time during learning in each BC.

In learning activities teachers are still found to spend time on the problems of mathematical equations without elaboration of the physical meaning and application. This causes students not to be motivated to learn physics. Physics learning will be more meaningful if done contextually and direct learning. This is active learning that can improve students' soft skills and hard skills [13].

Constraints faced by teachers are less able to formulate learning achievement indicators in accordance with TKRO skills competency needs. This is because the teacher does not do BC mapping between physics subjects, BAT and BAW in the present context in the field of technology and engineering. Thus physics has a link and match with business/industrial field in the supply of ready-made labor which refers to the grand design of the industrialization program.

Learning using ICT has a low category with frequency sometimes implemented. This is because the teacher is still textual learning refers to one source in the form of a textbook. Teachers have not used ICT as a source of information in learning. The teacher utilizes ICT in the learning process as limited as slides to display learning material. The teacher is not used to using virtual laboratories with ICTs. The use of ICT helps students in the scientific literacy process to

understand micro scientific phenomena as virtual laboratories, especially learning materials that require an explanation of digital simulations [4].

The benefits of ICT-based learning are a teaching process directly involving a computer in the presentation of instructional material interactive mode to provide and control the individualized learning environment for each individual student [15]. Learning with ICT can increase learning motivation and understanding students' concepts. The use of ICT can increase learning activeness, learning motivation and understanding of student concepts [3], [7], [16], [17], [18].

There are several obstacles faced by teachers in the use of ICT, namely there are schools that have not installed LCD projectors in each class. In addition, there is no internet network available in every class and teacher resources that have not mastered the use of the internet and ICT for learning needs.

Learning by combining hard skills and soft skills has a low category with frequency often implemented. This is because teachers still prioritize aspects of student knowledge. Learning is done in textual classrooms. Based on books on knowledge BC.

Hard skills and soft skills can be developed through learning in the classroom, environment and in the field of practice work. Schools organize classes as conditions in industry, including the development of hard skills and soft skills. This kind of learning condition, the process runs actively and means of actualization according to the competency of the skills taken by students. The learning process is carried out actively, attracting students' interest and attention, arousing student learning motivation, applying the principle of individuality and collaboration, and demonstration in learning is an effective vehicle to improve the soft skills of vocational students [5], [14].

This combination of hard skills and soft skills is very important for a sustainable career. Number 75% of work success is determined by soft skills and 25% by hard skills [1]. Number 85% of skill and 15% of hard skills are needed in work, career and business [12]. The number 77% of entrepreneurs agree that soft skills have the same important position as hard skills as a consideration in recruiting workers [10].

Soft skills possessed by students are very closely related to hard skills. Students who have good soft skills tend to have good technical skills (hard skills). Students with good communication skills will tend to have good technical skills [11].

IV. CONCLUSIONS

five principles of learning K13 physics subjects in vocational high schools only one has been running optimally with a high category while the others are still low. In general, these principles have not run optimally as in the educational process standards set by the Indonesian Republic's Ministry of National Education. The vice principal of the curriculum section is assisted by the competency chair the skill of organizing subject teacher collaboration that has appropriate BC. Schools must prepare supporting facilities and teacher training in utilizing ICT. The teacher must design active learning to improve students' hard skills and soft skills.

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