Student perceptions on air conditioning practicum services in vocational education

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Abstract. This study aims to determine student perceptions of air conditioning practicum services in vocational education. The scope of practicum services study is laboratory facilities, human resources, and laboratory support components. This study uses survey methods to obtain data and quantitative descriptive methods to analyze data. The type of data in this study is mainly based on the responses of respondents representing the population of refrigeration and air conditioning study programs at a vocational education institution in Bandung, West Java, Indonesia. The results show that laboratories in vocational education can serve air conditioning practicum with good results. This study shows that laboratory facilities, human resources, and laboratory support components in vocational education can accommodate the implementation of air conditioning practices. In general, students stated that air conditioning practicum activities in the laboratory could be carried out well, even though the ratio between the number of equipment and students was still low and the evaluation of practicum activities was not yet comprehensive.

1. Introduction
Vocational education has a very strategic role in preparing young people to have superior knowledge, skills, and character so that they become workers who are ready to enter the industry or become individuals who are capable of entrepreneurship according to their competencies [1-2]. Vocational education has priority in applying practical aspects supported by appropriate theory. The accuracy of the composition between practice and supporting theory is the key to the successful implementation of the educational process in vocational education. The composition of practice that is more dominant than theory becomes a characteristic of vocational education. So it can be said that vocational education is a place to train students' maturity and skills [3].

The existence of a laboratory is needed to support practicum activities. Practicum activities in the laboratory are very important activities in vocational education [4], as well as science-based education and engineering [5]. Practicum is a multi-faceted activity that involves observing activities, raising various questions, conducting tests, collecting data, analyzing data, and communicating results [6]. Practicum is an activity to introduce conceptual, procedural, and skills knowledge. Practical experience in the laboratory is a key achievement of learning objectives which include improving problem-solving
skills, habits of scientific thinking, understanding the nature of science, scientific reasoning, and application of scientific knowledge [7]. In addition, practicum activities are useful in strengthening, constructing, and reconstructing scientific knowledge [8]. The practicum can equip students’ practical abilities [9] and can be used as a channel to confront students' preconceptions [10]. The experience of applying practical knowledge can make it easier for students to solve problems in their work in the future [11]. Practicum activities in the laboratory can be carried out optimally if supported by complete facilities, competent human resources, and good laboratory support components [12]. These three components can optimally support practical activities if laboratory management is implemented well.

Air conditioning practicum activities in vocational education in the field of refrigeration and air conditioning are arranged based on a learning program plan that has been prepared for one semester. Subjects in practical learning include measurement of temperature and humidity, distribution of temperature and air velocity, sensible cooling and heating, estimation of cooling load, air conditioning performance, and air mixing. All practicum activities are adjusted to the real conditions so that students can realize that the material they are learning is relevant to the work that will be done after they graduate. However, there are several obstacles that cause practicum activities to be suboptimal, including a) Practicum instructions are general instructions that must be carried out without the opportunity for students to be creative, b) Practicum activities are often not measured adequately and accurately, c) Practicum equipment is often inadequate in terms of quantity and specifications, d) Practicum activities require a long time e) Requires more expensive costs for providing practical tools and materials f) The unavailability of adequate laboratory facilities so that practicum activities cannot be carried out g) Lack of supporting staff for practicum implementation, and h) Lack of instructor's ability to design and implement practicum [7,13]. Based on this description, this study aims to determine students' perceptions of air conditioning practicum services in vocational education.

2. Methods
This study uses survey data collection techniques and quantitative descriptive methods for data analysis. This is based on primary data obtained by distributing questionnaires to respondents who aim to explore information about air conditioning practicum services in vocational education. The populations in this study were students of refrigeration and air conditioning study programs at a vocational education institution in Bandung, West Java, Indonesia. Samples were selected as many as 54 students who had carried out the air conditioning practicum and filled out the questionnaire. The data collection steps were carried out as follows: (a) compiling a list of questions in the Google form for students, (b) distributing a list of questions via WhatsApp and email to lecturers in the air conditioning course, and (c) tabulation and analysis of data in Microsoft Excel in accordance with the responses obtained proportionally.

3. Results and discussions
Information to find out air conditioning practicum services in vocational education which includes laboratory facilities, human resources, and laboratory support components, we conducted a survey by distributing questionnaires via Google form to students of refrigeration and air conditioning study programs in Bandung, West Java, Indonesia. The results and discussion of the study are presented as follows:

3.1. Laboratory facilities
Referring to the national standard of higher education in Indonesia, it is explained that laboratory facilities are facilities and infrastructure that support practicum activities in laboratories including rooms, equipment, materials, medical devices, and occupational safety. In this study, the following statements were asked to the respondents and the results of the survey of laboratory facilities are summarized in Figure 1:

1) The laboratory room is neatly arranged and comfortable for practicum activities.
2) The condition of practicum equipment is proper to be used for practicum activities.
3) The number of practicum equipment is sufficient with the number of students practicing.
4) The type of equipment available in the laboratory is in accordance with the practicum material being worked on.
5) Practicum material is available in the laboratory according to the needs of the task.
6) The laboratory has medical devices and occupational safety.

![Figure 1. The laboratory facilities of vocational education](image)

Figure 1 shows in general, students agreed that the laboratory facilities were able to serve the air conditioning practicum. More than 50% of students think that the laboratory room, the condition of practicum equipment, the type of practicum equipment, the availability of practicum materials, and the availability of medical devices and occupational safety can serve the practicum of air conditioning. On the other hand, 44% of students said they less agree with the statement about the number of practicum equipment that is sufficient with the number of students who carry out the practicum in the laboratory and 11% of students said they disagree with the statement. The low ratio between the number of practicum tools and students is a major problem causing students to lack practical experience in learning [14,15]. The learning process is not optimal because of the minimal availability of laboratory equipment [16]. However, these obstacles do not eliminate practical activities because students can still do it in groups [17].

### 3.2. Human resources

Human resources are personnel who have the knowledge and skills to manage all activities in the laboratory consisting of at least instructors and laboratory assistants. In this study, the following statements were asked of respondents:

- The lecturer explains the practicum material well.
- Lecturers are responsible for practicum activities.
- The lecturer evaluates all practicum activities.
- Laboratory assistants can explain practicum procedures well.
- The laboratory assistant prepares all laboratory equipment and materials needed.
- Laboratory assistants regulate the use of practical tools and materials used by students.

From Figure 2 it can be concluded that in general, students' opinions on human resources managing laboratories can serve the air conditioning practicum activities, namely, 16% of the criteria strongly agree, 66% agree, and 14% less agree. Almost all students agreed that the lecturers and laboratory assistants served the practicum well. More than 70% of them stated that they agreed that the lecturer explained the material and evaluated the practical activities well. Meanwhile, students who agreed that the lecturer was responsible for practicum activities were 55% and the remaining 25% strongly agreed.
and 15% less agree. Likewise, opinions on laboratory assistants, more than 50% of students agreed that laboratory assistants could explain practicum procedures well, always prepare all laboratory equipment and materials needed for practice, and laboratory staff also regulates the use of laboratory tools and materials used by students. Laboratory management carried out by qualified human resources can serve practicum activities well.

3.3. Laboratory support components

Laboratory support components are facilities to support practicum activities which include practicum instructions, practicum schedules, learning resources, and practicum evaluation tools. In this study, questions related to the laboratory support components as mentioned in the following statement:

1) The laboratory has rules of practicum.
2) The laboratory has a scheduled practicum agenda.
3) The duration of the practicum is in accordance with the given assignment.
4) Availability of textbooks/handouts/modules as a reference source for practicum activities.
5) Availability of practical worksheets.
6) Availability of assessment forms or evaluation tools for practicum activities.
Figure 3 indicates that the laboratory support components for air conditioning practicum activities in the opinion of students are in the criteria of 22% strongly agree, 52% agree, and 21% disagree. Furthermore, more than 50% of students agreed with the laboratory regulations, scheduled practicum agenda, the availability of learning resources, and worksheets. Meanwhile, around 29% of students stated that they less agree with the duration of the practicum allocated by the laboratory and only 9% stated strongly agree with that item. Interestingly, at the point of availability of the practicum evaluation form, 44% of students stated that they less agree and only 35% agreed with the statement.

4. Conclusions
Based on our survey, it can be concluded that laboratories in vocational education can serve air conditioning practicum with good results. From the results of this study, it was found that laboratory facilities, human resources, and laboratory support components in vocational education can accommodate the implementation of air conditioning practicum. In general, students stated that the air conditioning practicum in the laboratory could be done well, even though the ratio between the number of equipment and students was still low and the evaluation of practicum activities was not yet comprehensive.

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