The effect of laboratory knowledge, teaching practice experience, and work motivation on laboratory management

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Abstract. The objectives of this research are to describe laboratory knowledge, teaching experience, work motivation and laboratory management, to know the influence of knowledge, teaching experience, and work motivation on the laboratory management either independently or collectively, and to know the contents of the laboratory, teaching experience, and work motivation in terms of the laboratory management organized either independently or collectively. This research is an ex post facto research along with a correlational approach. The population of samples comprised 36 teachers of the Dress Fashion in Yogyakarta City. The results showed a significant influence of the laboratory knowledge on the laboratory management with the f count of 15.597. There was a significant influence of teaching practice experience on the laboratory management with the f count of 5.119; there was a significant influence of work motivation on the laboratory management with the f count of 17.207, and there was a significant influence of laboratory knowledge, practical teaching experience, and work motivation on the laboratory management at the Vocational School teachers of Yogyakarta City with the f count of 10.848, and laboratory knowledge variables, practice teaching experience and work motivation (50.4%) simultaneously influenced the laboratory management.

1. Introduction

Education is the spearhead of a country's progress and contributes to the development of its human resources. A country must be able to improve the quality of education of its citizens. Thus, education is used as a reference for advancing the quality of human resources in a country. The demands in modern times are to realize the basic functions and objectives of the Republic of Indonesia law on the national education system, and the formal education provider authority in society as applied in schools. Schools will succeed if they are organized to encourage, regulate, and direct all the elements in it to achieve organizational goals namely the goals of the school and national education. One indicator of leading schools is having educators who are responsible and professional in their fields, require high moral values, and work motivation.

A vocational high school is a form of formal education unit that organizes vocational education at secondary education level as a continuation of junior high school, Islamic junior high school or other similar forms. Secondary schools have a variety of expertise packages to suit the demands of the job market. In the learning process, vocational schools apply the theory and practice of learning systems both in schools and in industry. To be able to produce quality vocational graduates in terms of knowledge, attitudes and skills, the role of vocational teachers is needed. Teachers not only educate and
change knowledge in the classroom but also have high work motivation which will have a positive impact on the achievement of specified goals.

One indicator of the quality of a vocational school is determined by the completeness and quality of its laboratory provision. According to Government Regulation Number 19 of 2005 concerning Education National Standards Article 42 paragraph (2), each educational unit is required to have facilities and infrastructure that include land, classrooms, leadership space for educational units, teaching space, administration room, library room, laboratory room, work unit rooms, canteen rooms, power installations and services, sports venues, places of worship, playgrounds, recreation areas and other places or spaces needed to support an orderly and continuous learning process. Likewise, Prosser’s theory emphasizes that several factors of vocational education will be effective if the tools, machines and work assignments are in accordance with the needs of the graduates where they will work.

This support this research, the Copriady’s notions are of paramount importance, as follows: The study shows that teachers are still inefficient in handling laboratory equipment and could not manage a systematic and effective experiment. This might be due to the fact that they fail to plan and the lesson is not organized and structured effectively. That teachers’ competency in designing is moderate, as it only contributes 47% to the planning of Chemistry practical. This situation also illustrates that Chemistry teachers are still unable to prepare and design a robust practical or experiment for the Chemistry lesson. This finding means that designing competency is only accounted for 34.7% of all the practical competency assessment. This illustrates that teachers competency in designing practical activities is at a low level. The results show that teachers competency in planning for Chemistry practice is at a moderate level (46.3%). Weakness in planning can affect the effectiveness of teaching and learning [1].

Studies show that teachers remain less efficient in handling the laboratory equipment as they cannot manage systematic and effective experiments. This is because they fail to plan lessons so that they are not well-organized and effectively structured. This is seen from the teacher’s competence in designing the lesson plans moderately, merely contributing 47% to practical chemistry planning. This situation also illustrates that chemistry teachers are still unable to prepare and design strong practices or experiments for Chemistry lessons. The design competence only accounts for 34.7% of all practical competency assessments. This illustrates that the teacher’s competency in designing practical activities is at a low level. The results show the teachers’ competence in the planning of practical Chemistry at a moderate level (46.3%) including the weaknesses in planning that can influence the effective teaching and learning.

The Shedrack’s observation shows that: The Effect of Laboratory Works in Teaching and Learning of Physics in Onitsha North, Anambra State indicated that the teacher’s provision in the sciences was examined in many countries and found that 45% of the schools surveyed indicated insufficient laboratories. This finding agreed with the finding in Saudi Arabia which indicated inadequacy in the provision of laboratory facilities in schools. The findings were also consistent with those found in Uganda which indicated that science education is faced with the problem of lack of resources with half the schools having no real laboratory [2].

Science teachers in several countries found that 45% of schools surveyed are in inadequate laboratory conditions due to the inability to provide laboratory facilities in schools. These findings are congruent with findings in Saudi Arabia. Other findings in Uganda show that science education is faced with the problem of lack of resources, for example, some schools do not have real laboratories. The main concern is that the teacher's knowledge is to manage the laboratory. Laboratory management plays an important role in managing and developing laboratories, especially fashion laboratories. This is because a good teacher's knowledge of laboratory management will facilitate the teacher in managing the laboratory so that it can be used for practical learning processes efficiently and effectively. For this reason, a study of laboratory management is needed, so that it can be developed in a better direction, so as to improve the quality of laboratory management. Laboratories in vocational schools need to be managed properly. The laboratory should be managed and used quickly, accurately, safely, and comfortably so that it can support practical work productivity, efficiency and productivity. Students can use the laboratory optimally to improve the quality of processes and the results of practical learning. If the maintenance
system of the laboratory management is carried out professionally, the laboratory can function optimally.

Based on the pre-survey at Yogyakarta-based vocational schools, practical learning is not fully organized in accordance with management standards. Some laboratory equipment is dormant so that it is not suitable for use. This happens because many schools do not carry out inappropriate laboratory management. Several schools have fashion laboratories. Still, many tools are not functioning or they are damaged because the knowledge of laboratory management is important to the teacher as a laboratory assistant, so that he or she must know what to do. Laboratory management has not been carried out maximally, especially in the storage and maintenance of laboratory equipment, and laboratory safety.

In the learning process at the Vocational School, the function of the laboratory is to provide students' work skills, to provide proof of theoretical lessons, to overcome the gap between concepts and skills, to cultivate the courage to search for the scientific truths of a job in industrial society, to foster and build self-confidence and innovation from the results of the skills he acquired. This is relevant to international journals from Norman Reid and Iqbal Shah, that in laboratories get more knowledge and experience by conducting experiments [3]. John Dennehly conducted research on safety aspects in school laboratories. The results showed that in the aspect of safety in the school laboratory the teacher had a duty of care, to be responsible for the safety of students [4].

Teachers are an attempt to develop their own untapped potentials in pursuing their profession, but some of them have not updated their knowledge. It can be viewed from a few teachers who are motivated to undertake research on laboratory management, write scientific papers, conduct educational research and make creative visual media. This is in line with Prabha's research that during their initial training most of the teachers did not have the laboratory work effectively resulting in fragility and fear to use any kind of laboratory work [5]. This is relevant to the international journal from Olufunke, which shows that the results showed that the optimal utilization of physics laboratory equipment is effective in the teaching of Physics [6]. The results showed that the optimal use of physics laboratory equipment was very effective in teaching physics. Management is a process of utilizing resources effectively and efficiently to achieve an expected target optimally by taking into account the sustainability of the resource function. The management function is as a series of reasonable activities that have been determined and have interdependent relationships between one another. In line with the changing times, Henry Fayol in Barnawi & M. Arifin proposed various management functions known as POCCC, namely: Planning, Organizing, Commanding, Coordinating, and Coordinating Controlling (supervision) [7]. Bateman and Snell interpreted Planning is the conscious, systematic process of making decisions about goals and activities that an individual, group, work unit, or organization will pursue in the future. [8] Apart from that all management systems are very dependent on the ongoing habitus. That habitus is a mental structure used by a person to deal with his or her social life. Habitus also describes a number of trends that encourage social actors to react in certain ways [9].

In addition, the determining factor for the teachers’ success in managing learning is teaching experience in the past and it has an impact on the current situation. The teachers’ experience can be seen from the period of today’s appointment and development carried out formally such as the responsibility mainly concerned with the training/upgrading, study assignments, workshops and so on. As proven in Siti Zuhriyah’s research, out of 250 elementary school teachers are in pity in Bantul District. The respondents who had experienced the teaching experience increased by 18% because teachers attended training, seminars, additional tasks such as conducting research and continuing their studies [10]. Some problems arise in the process of practical learning in vocational education institutions that provide adequate and effective knowledge and skills for students. Vocational education will be effective if it is supported by good facilities and infrastructure and vocational teachers administer teaching and learning activities in the laboratory. Laboratory management does require knowledge and experience, so that teachers at least manage practical subjects by attending a training program on the laboratory management. This was confirmed in Subamia’s study that several school principals and heads of the education offices in the district of Buleleng state that training in basic laboratory skills for staff assigned to the laboratory is necessary [11].
In short, particular learning practices and learning objectives require support from various aspects. These aspects seek to build more deeply connections in managing vocational school laboratories. Therefore, it is important to conduct research on the effect of laboratory knowledge, teaching practice experience, and work motivation on the laboratory management of fashion vocational teachers in Yogyakarta city.

2. Methods
This study used the ex post facto research along with a correlational approach whereas the researched phenomenon occurred in the past or it is ongoing in the learning process based on existing data to determine the relationship between two or more variables. This research was conducted at public vocational high school (VHS) 4 Yogyakarta, public VHS 6 Yogyakarta, VHS BOPKRI Yogyakarta, VHS PIRI 2 Yogyakarta, and VHS Muhammadiyah 4 Yogyakarta. The research timeframe began in August 2017. The population of this study was the vocational school teachers consisting of 36 fashion teachers in Yogyakarta City (VHS Depok), namely X-XII grade teachers. Data collection techniques used tests, questionnaires, and interviews. The test of the teacher's ability was used to see the teacher's knowledge of laboratory management. This questionnaire was used to obtain variable data (X) on the laboratory knowledge, teacher’s work motivation, and dependent variable (Y) on the management of fashion laboratories. The interview is a supplement and reinforcer of the data obtained from the teacher’s experience of teaching practice in the school towards laboratory management. The analysis technique used non-parametric inferential statistics starting with descriptive analysis and the hypothesis testing along with a correlation coefficient and the regression test to see whether or not there is a partial or simultaneous influence of the independent variable on the dependent variable.

3. Results and Discussion
3.1. Description of Research Results Teacher’s Knowledge
Laboratory knowledge variables can be categorized into four categories as presented in table 1. Table 1 shows that 9 teachers (25.0%) have very high laboratory knowledge competencies, 6 teachers have high laboratory knowledge competencies (16.7%), 18 teachers (50.0%) have low laboratory knowledge competencies, and 3 teachers (8.3%) have very low laboratory knowledge competencies. Thus, the majority of teachers with laboratory knowledge are in a low category (50.0%).

| Category     | Interval      | Freq. | F  | %  |
|--------------|---------------|------|----|----|
| 1            | Very high     | 11.4–15.0 | 9  | 25.0|
| 2            | High          | 7.6–11.3   | 6  | 16.7|
| 3            | Low           | 3.9–7.5    | 18 | 50.0|
| 4            | Very low      | 0.0–3.8    | 3  | 83  |
| Total        |               |         | 36 | 100.0|

3.2. Teachers’ Teaching Practice Experiences
The teaching practice experience variable can be categorized into four categories as presented in table 2. As Table 2 indicates, no teachers have a practical teaching experience in the excellent category (0.0%), 28 teachers have a practical teaching experience in the quite good category (77.8%), 7 teachers have a teaching practice experience in the average category (19.4%), and 1 teacher has a teaching practice experience in the unfavourable category (2.8%). In short, the majority of teachers having teaching practice experiences are in a good category (77.8%).
Table 2. The distribution of categorization variables of teaching practice experiences.

| Category      | Interval   | Freq | F | %  |
|---------------|------------|------|---|----|
| 1 Very good   | 81 - 100   | 0    | 0 | 0.0|
| 2 Good        | 61 - 80    | 28   | 77.8|
| 3 Average     | 41 - 60    | 7    | 19.4|
| 4 Below average | 0 – 40   | 1    | 2.8|
| Total         |            | 36   | 100.0|

3.3. Work motivation

Work motivation variables can be categorized into four categories as presented in Table 3. Table 3 proves that 17 teachers have a very high category of work motivation (47.2%), 11 teachers have a high category of work motivation (30.6%), 8 teachers have a low category of work motivation (22.2%), and no teachers have a very low category of work motivation (0.0%). In a nutshell, the majority of teachers have a very high category of work motivation (47.2%).

Table 3. The distribution of categorization of work motivation variables

| Category       | Interval   | Freq | F | %  |
|----------------|------------|------|---|----|
| 1 Very high    | 87.9 – 108.0 | 17   | 47.2|
| 2 High         | 67.6 – 87.8 | 11   | 30.6|
| 3 Low          | 47.4 – 67.5 | 8    | 22.2|
| 4 Very low     | 27.0 – 47.3 | 0    | 0.0|
| Total          |            | 36   | 100.0|

3.4. Laboratory Management

Trends in the assessment of laboratory management variables are categorized into four categories as presented in Table 4. Table 4 highlights that no teachers have a very high category of laboratory management ratings (0.0%), 13 teachers have a high category of the laboratory management (36.1%), 23 teachers have a low category of the laboratory management (63.9%), and no teachers have a very low category of the laboratory management (0.0%). In other words, the majority of teachers have a low category of the laboratory management (63.9%).

Table 4. The distribution of categorized laboratory management variables

| Category     | Interval   | Frequency |
|--------------|------------|-----------|
| 1 Very high  | 131.0 – 160.0 | 0 0.0    |
| 2 High       | 101.0 – 130.0 | 13 36.1  |
| 3 Low        | 71.0 – 100.0  | 23 63.9  |
| 4 Very low   | 40.0 – 70.0   | 0 0.0    |
| Total        |            | 36 100.0 |

3.5. Prerequisite Test Analysis

The results of the prerequisite test analysis are presented below. Normality test, the results of the normality test for each variable and research variables are presented in Table 5. Normality test results in Table 5 show that all variables have a significance value greater than 0.05 (sig > 0.05), and this indicates that all research data variables have a normal distribution.
Table 5. Normality test results

| Variable                      | Sig  | Note   |
|-------------------------------|------|--------|
| Laboratory knowledge          | 0.065| Normal |
| Teaching practice experience  | 0.057| Normal |
| Work motivation               | 0.224| Normal |
| Laboratory management         | 0.066| Normal |

3.6. Linearity Test

A series of linearity test can be presented in table 6. Linearity test results in Table 6 prove that all variables have a significance value greater than 0.05 (sig > 0.05), and this shows that all research variables are linear.

Table 6. Results of Linearity Test.

| Variable                      | Sig  | Note |
|-------------------------------|------|------|
| Laboratory knowledge          | 0.169| Linear |
| Teaching practice experience  | 0.135| Linear |
| Work motivation               | 0.710| Linear |

3.7. Multicollinearity Test

The results of the multicollinearity test for the regression model are presented in table 7. Table 7 shows that all variables have tolerance values above 0.1 and VIF value is below 10, so that in terms of the regression model, there is no multicollinearity in this research.

Table 7. Multicollinearity Test Results.

| Variable                      | Tolerance | VIF  | Conclusion                        |
|-------------------------------|-----------|------|-----------------------------------|
| Laboratory knowledge          | 0.855     | 1.169| No multicollinearity happened     |
| Teaching practice experience  | 0.874     | 1.145| No multicollinearity happened     |
| Work motivation               | 0.826     | 1.210| No multicollinearity happened     |

Laboratory Knowledge, the results of the analysis of the F test prove the significant influence of the laboratory knowledge and laboratory management on fashion design vocational teachers in Yogyakarta City. The results of the F test statistics in terms of laboratory knowledge variables show the F value of 15.597 along with a significance level of 0.000 < 0.05, and the proven hypothesis is "There is a significant influence of laboratory knowledge and laboratory management on Fashion Vocational School teachers in Yogyakarta City."

3.8. Teaching Practice Experience

The results of the F test analysis prove a significant influence of teaching practice experience and laboratory management on fashion design vocational teachers in Yogyakarta City. The results of the F test statistics concerning teaching practice experience variables show the F value of 5.119 along with a significance level of 0.000 < 0.05; the proven hypothesis states, "There is a significant influence of the teaching practice experience on the laboratory management for teachers of fashion design vocational schools in Yogyakarta City."

3.9. Work motivation

The results of the F test analysis prove a significant influence on work motivation and laboratory management for fashion design vocational school teachers in Yogyakarta City. The results of the F test statistics for work motivation variables show the F value of 17.207 along with a significance level of 0.000 < 0.05; the proven hypothesis states, "There is a significant influence of work motivation and laboratory management on the fashion design department and vocational school teachers". The test results obtained from the F value of 10.848 have a significance value of 0.000 because it is smaller than 0.05 (0.000 < 0.05). Thus, the proven hypothesis states, "There is a significant influence of laboratory
knowledge, teaching practice experience and work motivation on the laboratory management for fashion design vocational school teachers in Yogyakarta City”.

3.10. The Coefficient of Determination (R2)
The R2 test results have a value of 0.504. This shows that laboratory management is influenced by variables of laboratory knowledge, teaching practice experience and work motivation (50.4%), while the remaining 49.6% is influenced by other factors that are not discussed in this study.

4. Conclusions
Vocational school teachers in Yogyakarta City have a low category of the laboratory knowledge (50.0%), a good category of teaching practice experience (77.8%), a very high category of work motivation (47.2%), and a low category of the laboratory management of fashion design vocational schools (63.9%).

The laboratory knowledge variable is the lowest factor that influences the laboratory management for the fashion design vocational school teachers. Therefore, laboratory managers are advised to increase the laboratory knowledge by following the development and upgrading training on the laboratory management. It is expected they further add insights in managing the fashion laboratory, so that they are better at managing the laboratory. The next researcher is suggested to further develop this research by examining other factors that can influence the laboratory management, for example, the work safety, teachers’ competence, teachers’ abilities, and basic laboratory skills training. Further researchers can also use other methods in researching the laboratory management, for example, through in-depth interviews with laboratory managers, so that the information obtained is more varied than the questionnaire for which the answers are available.

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