RESEARCH
www.commprac.com
ISSN 1462 2815

DEVELOPMENT OF WORKSHOP HEAD MANAGEMENT SYSTEM IN VOCATIONAL HIGH SCHOOL LABORATORIES (CASE STUDY IN INDONESIA)

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DOI: 10.5281/zenodo.11218584

Abstract

Aim: This research aims to develop a management system for heads of vocational high school (SMK) work practice laboratories in the Republic of Indonesia that is feasible and practical. **Methods and Materials:** The research method uses Research and Development from Borg and Gall. Data was collected through interviews, observation, documentation, and questionnaires. The model trial involved 40 vocational school laboratory heads from 40 different schools located in 11 provinces in the Republic of Indonesia. The model was validated by 4 laboratory management experts and vocational learning experts. **Results:** The research results show that: (1) The current management of vocational school laboratory heads is not yet feasible and practical; (2) The SMK work practice laboratory management model that has been developed is feasible and practical with the main model stages and 3 sub-models; (3) The level of feasibility in implementing the SMK laboratory head management model has a score of 87.65% (very feasible); and (4) The level of practicality in implementing the SMK laboratory head management model has a score of 86.29% (very practical). **Conclusion:** The model includes the school's internal management system, recruitment of laboratory heads, external training, performance assessment, and standard operating procedures for laboratory work practices.

Keywords: Education, Laboratory, Management, Vocational, Vocational High School.

INTRODUCTION

Education is a major part of a nation's development because it is related to improving the quality of Human Resources (HR) [1-2]. The good human resources are determined by an effective and meaningful educational process to produce a generation that is intelligent, independent, and has character [3]. In the implementation of education, Indonesia provides education starting from kindergarten, elementary school, middle school, senior high school/vocational school, and higher education [4]. Vocational High School or Sekolah Menengah Kejuruan (SMK in Indonesia) is a level of secondary education that prioritizes developing students' skills to be ready to work in certain fields after they graduate [5-7]. Vocational High Schools provide a variety of skills programs tailored to employment needs, such as engineering, tourism, arts, business, agriculture, etc. [8-9]. Vocational High School is a school level that places more emphasis on students' skill abilities. In contrast to high school where there is more theory in their daily lives, vocational school students will have more practice than theory. The portion for practice reaches 60% while for theory it is only 40% percent [10-12].

One important component in supporting the learning process in vocational schools is the availability of laboratories as a place to conduct practical activities [13-14]. In order to function optimally, vocational school laboratories need to be managed with good management by the head of the laboratory. Currently, the management of work practice laboratory heads in many vocational schools is still a formality and does not follow the principles of effective human resource management. This is characterized by the absence of job analysis, transparent recruitment of laboratory heads, increasing competency through external training, as well as a structured performance assessment and performance reporting system [15-16]. As a result, many vocational school laboratories have a less than optimal role in supporting the learning process. This condition needs attention so that the Vocational School's vision and mission to produce graduates who are competent and ready to work can be realized [17].

The head of the vocational school laboratory has an important role in ensuring the quality and smooth operation of the laboratory [18-19]. Several main tasks conducted by the head of the laboratory are described in this paper to describe their contribution to improving the quality of practical learning in vocational schools [20]. First, the head of the laboratory is responsible for planning the need for practical equipment and materials that are up to date with technological developments in a particular field of expertise [21]. Careful planning is important for the effective implementation of practicum activities. Second, the head of the laboratory manages and supervises the use of laboratory facilities, both hardware and software, to prevent misuse or damage due to negligence. Regular monitoring is needed to protect these expensive facilities [22]. Third, the head of the laboratory coordinates with instructors and laboratory assistants in the preparation and implementation of practicums, including providing job sheets, tools, and materials, as well as scheduling to ensure smooth running [23]. Fourth, the head of the laboratory carries out regular evaluations of practical results and laboratory conditions to identify things that need to be improved, especially those related to occupational health and safety, effectively and quickly [24]. If the head of the vocational school laboratory carries out his duties with discipline and responsibility, the quality of laboratory performance can improve significantly.

Based on these problems and conditions, this research developed an effective and structured management system for vocational high school work practice laboratory heads. The system that will be developed includes an analysis of the needs for laboratory heads, recruitment and selection, training and development programs for laboratory heads, performance assessment systems, as well as reporting and monitoring systems for the performance of vocational high school laboratory heads. It is hoped that the development of a management system for heads of work practice laboratories at Vocational High Schools (SMK) can contribute to improving the quality and relevance between the competencies of vocational school graduates and the qualifications needed in the world of work.

A laboratory head who is professional and has high performance will be able to create a conducive practical learning situation in the laboratory. Furthermore, the process of transferring knowledge and skills from teachers to students can provided optimally. In this way, the achievement of the Vocational School's vision and mission to produce graduates who are competent and ready to enter the world of work can be realized concretely.

LITERATURE REVIEW

A comprehensive work practice laboratory development management model that includes aspects of planning, organizing, implementing, and monitoring has not been thoroughly researched by previous researchers. It is hoped that comprehensive research regarding management models for practical work laboratories in vocational schools will be useful and become a reference for the Directorate of Vocational Schools in general and specifically for Vocational Schools to improve the management of practical laboratories for the formation of skills in their students. The results of previous research show that there is no specific reference for the application of 5S/R in concrete masonry laboratories, so a guidance module is needed. In the design stage, the module content is designed based on expert input. The development stage realizes the module design in printed form. The feasibility test was conducted by material and media experts with valid and reliable results with an average Aiken V value of 0.933. The implementation stage applies the module to 36 experimental class students. Effectiveness data used the N-Gain test and obtained an average increase of 47.59% (medium category) [25]. The second research analyzed laboratory management and the implementation of the Republic of Indonesia Minister of National Education Regulation No. 40 of 2008 in improving the practical work skills of vocational school students in Jambi Province. The research was conducted using qualitative case studies in 3 vocational schools. The results show that vocational schools in Jambi have not conducted laboratory strategic planning that refers to national standards, laboratory management according to management functions can create laboratories according to students' practical needs and has not referred to national standards. Vocational school students' practical work skills depend on laboratory facilities that refer to national standards through laboratory management based on the Minister of National Education Regulation [26].

Other research regarding equipment and laboratory management in vocational schools, research uses a qualitative approach with a case study method. The research results show that laboratory equipment planning is conducted through several procedural stages: needs analysis based on the curriculum, determining the priority scale, and determining the budget. Planning involves all personnel in the organizational structure. In the laboratory, there are several activities conducted: preparation of materials and equipment, borrowing equipment, and use of the laboratory. Practical material preparation is conducted at the beginning of each semester by following the existing curriculum. Equipment borrowing is done by providing an equipment loan card which is filled out before and after practice.

Equipment supervision in the laboratory is controlled by equipment loan and use cards as well as equipment inspection before and after practice. The final result of this monitoring will be an annual report given to the school as an evaluation for future planning [27]. The fourth research develops a structured knowledge management system model for technical vocational education institutions. This model considers important factors such as the internal and external organizational environment, the readiness of the organization's knowledge management infrastructure, learning systems, and the flow of knowledge in the organization. This model also measures the organization's current level of knowledge management to determine strengths and weaknesses that need to be improved [28]. All the results of the previous research described above are important input for redesigning the Management System Development for Heads of Vocational High School Work Practices Laboratories.

Management objectives in vocational schools should ideally include academic and non-academic aspects which include ensuring the quality of input, process, and output components in the process of planning, implementing, and supervising vocational school laboratory management to contribute to learning in the vocational school work laboratory.

METHODS AND METHODOLOGY

The research aims to develop a work practice laboratory management model that is suitable for application by vocational schools, using research and development (R&D) methods using the theory proposed by Borg & Gall. Borg & Gall (1983: 772), R&D is a process used to develop and validate products used in education [29]. This method is the research topic used to develop facilities and human resource management in vocational school laboratories.

Model Development Procedure

The procedures followed in this research were based on the guidelines developed by Borg & Gall. According to Borg & Gall (1983: 775), research and development (R&D) comprises of ten stages. The first stage involves gathering information by conducting a preliminary study and collecting initial data related to the problem that needs to be solved. The second stage is planning, which involves planning a solution or product and determining its specifications and components. In the third stage, the initial product is developed by creating the first product prototype. The fourth stage is the initial field testing, where limited tests are conducted on the initial product to obtain feedback. The fifth stage is the major product revision, which involves making significant changes to the product based on feedback from initial field tests. In the sixth stage, the main field test is carried out to evaluate the effectiveness of the revised product. The seventh stage is the operational product revision, where the product is improved so that it is ready for use or implementation. In the eighth stage, the operational field testing is conducted by testing the product's effectiveness in real conditions. The ninth stage is the final product revision, where final improvements are made to the product. The tenth stage is the dissemination and implementation stage, where the product is promoted and implemented to a wider audience. This process will later be used to develop a vocational school workshop laboratory management model, which will be compared in terms of feasibility and practicality before and after implementing the workshop management model. The R&D stages concept from Borg & Gall is depicted in Figure 1.

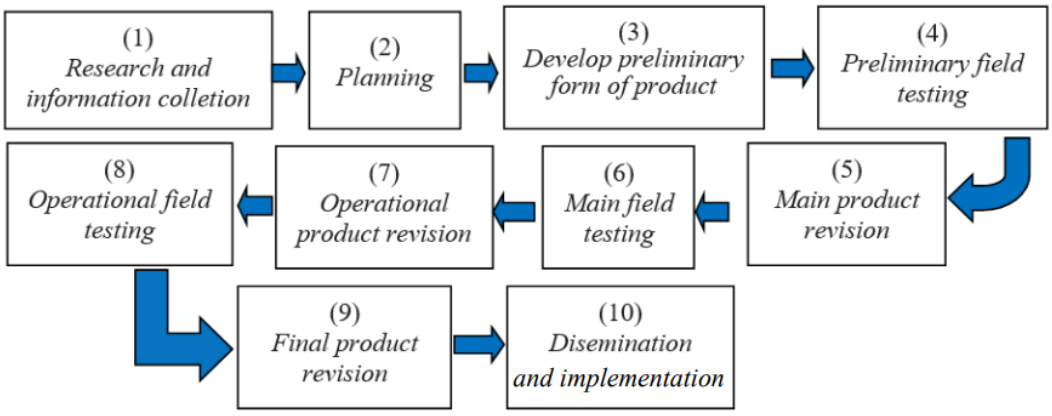

Figure 1: Borg & Galll's Research Development (R&D) model Stages

Research and Data Collection Stage

The initial step is to prepare complete data collection tools by creating a grid, interview guide, observations, and field research activity plans. This information is used as a basis for designing a vocational school work practice laboratory management model that is suitable for implementation.

In addition, a literature study was conducted by examining theories from various sources, field practices, regulations, and research results related to vocational school work practice laboratory management. The results of the literature study produced a conceptual model as a basis for designing vocational school work practice laboratory management models.

The specifications before implementation and after implementation of the vocational school work practice laboratory management model validated by practitioners consist of 9 criteria with 25 question indicators. Quantitative data for model tests or trials came from 40 respondents from heads of vocational school laboratories whose results were obtained.

The model was validated to ensure suitability to practitioners' needs in managing vocational school students' work practice laboratories to be more effective and optimal. The performance assessment process for the Head of the Laboratory for vocational work practices consists of three stages, firstly defining the main duties and functions of the Head of the Laboratory to obtain an agreement on performance standards based on personality, social, managerial, and professional competencies, secondly evaluating the real performance of the Head of the Laboratory with standards using a 360-degree method involving the head of the laboratory in one expertise program, allied teachers, heads of expertise programs, deputy principals, and external stakeholders.

Then, thirdly, feedback from Vocational School leaders and Heads of Laboratoruim for further performance improvement to produce Heads of Laboratoruim who are professional and highly dedicated to realizing the vision and mission of Vocational Schools in improving graduate competency.

Research subjects (respondents) as data sources for testing/validating hypothetical models of vocational school work practice laboratory management. Research subjects (respondents) were determined using a purposive sampling technique according to the characteristics of the research data.

The research subjects were 40 heads of vocational school laboratories from 11 provinces in Indonesia, namely: (1) Bali, there was 1 respondent; (2) Bangka Belitung had 2 respondents; (3) D.I. Yogyakarta had 5 respondents; (4) West Java there were 7 respondents; (5) Central Java there were 8 respondents; (6) East Java there were 5 respondents; (7) Central Kalimantan had 3 respondents; (8) Riau had 2 respondents; (9) South Sulawesi had 4 respondents; (10) West Sumatra there were 2 respondents; and (11) South Sumatra there was 1 respondent.

The graph of the regional distribution of respondents from various provinces in Indonesia can be seen in Figure 2.

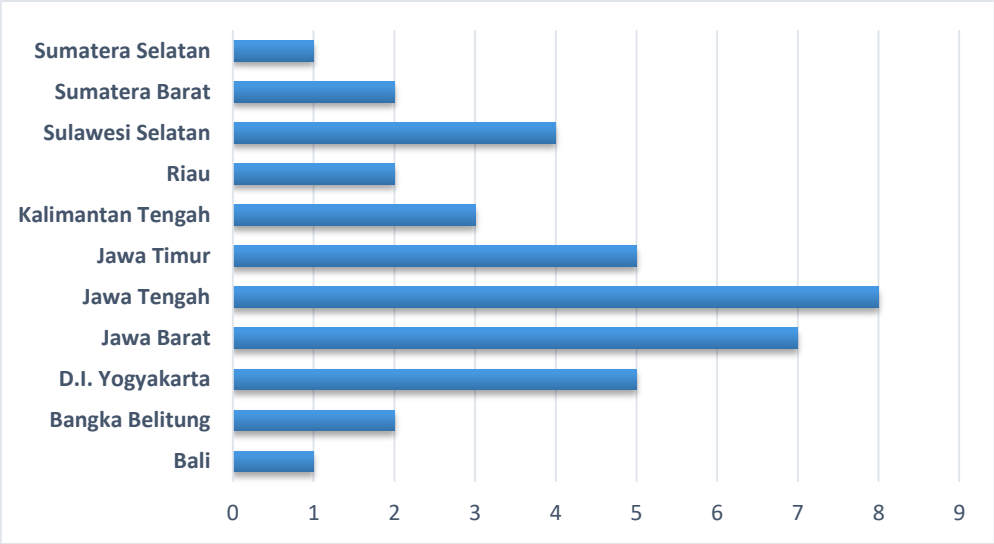

Figure 2: Number and Distribution of Research Subjects for Trial/Validation Vocational School Work Practice Laboratory Management

The research sample consisted of purposive sampling involving 40 workshop heads with demographics as shown in Table 1. Researchers collected data using a questionnaire.

Table 1: Sample Demographic

Information		Amount (People	Percentage (%)
Gender	Male	22	55
	Female	18	45
School Location	City	29	72.5
	Rural	11	27.5
Age	> 25 years old	1	2.5
	25 – 30 years old	2	5
	30 – 35 years old	9	22.5
	35 – 40 years old	9	22.5
	40 – 45 years old	13	32.5
	> 45 years old	6	15
Experience as Workshop Head in Vocational High School Laboratory	< 2 Years	2	5
	2 – 4 Years	4	10
	4 – 6 Years	8	20
	6 – 8 Years	11	27.5
	8 – 10 Years	10	25
	> 10 Years	5	12.5
Highest Educatiom	Undergraduate	31	77.5
	Master	9	22.5
	Doctoral	0	0

Data Analysis Technique

The data analysis technique used in this research uses qualitative data analysis. Furthermore, the assessment scale in this research is a Likert scale which is used to develop instruments that measure the attitudes, perceptions, and opinions of a person or group about the potential and problems of an object, product, product manufacturing process, and the product being developed. Statements on the Likert scale instrument have a gradation from very positive to very negative in word form. The average score (mean) is calculated by adding up all the scores obtained and then dividing it by the

number of subjects (respondents). Mean formula: X = ∑X/N, where Criteria for interpreting analysis results using references: (1) very feasible/practical if X ≥ (Xi + 1.0 SBi); (2) feasible/practical if (Xi + 1.0 SBi) > X ≥ Xi; (3) not feasible/practical if Xi > X ≥ (Xi – 1.0 SBi); and (4) it is not feasible/practical if X < (Xi – 1.0 SBi). This reference is used to conclude the level of feasibility/practicality of the scores for each indicator given by respondents.

$$Percentage\ (\%) = \frac{Number\ of\ answers\ from\ respondents}{maximum\ score \times n\ respondent} \times 100 \quad (1)$$

The interpretation of the calculation results is by using the formula in equation 1 and also taking into account the score range categories written in Table 2.

Table 2: References for Interpreting Feasibility/Practicality Test Analysis Results Management Model for Head of Vocational School Practical Laboratory

Score Range	0% - 20%	21% - 40%	41% - 60%	61% - 80%	81% - 100%
Category	Not very feasible/practical	Not feasible/ practical	Quite feasible/ practical	Feasible/ practical	Very feasible/ practical

(Riduwan, 2009) [30]

Determining the feasibility and practicality of a model qualitatively refers to the essential substance of the model obtained from data analysis, notes, suggestions, input, comments, and proposed improvements from model experts and management material experts during trials before and after implementing the management model. Then, also from the conclusions of discussions and consultations between researchers and experts. All are intended to obtain essential input and suggestions to perfect the research model so that it is feasible and practical to apply to improve vocational school work practice laboratory management.

RESULTS

Management Model for Head of Vocational High School Work Practices Laboratory

A research study was conducted to compare the state of Vocational School Laboratories before and after the implementation of Laboratory Head Management. Prior to the implementation of this model, vocational school laboratories were generally disorganized. The equipment was not stored in its designated place, making it difficult to locate when needed for practical activities. Furthermore, equipment inventory was rarely conducted, which resulted in some damaged or missing equipment going undetected. This had a negative impact on students' practical education, as they lacked access to necessary equipment. Additionally, poorly organized labs pose a potential danger. Vocational high schools must prioritize occupational safety and health in workshops to prevent accidents [31]. The management model for the head of laboratory includes the first step, namely preparing tools and materials, and laboratory layout planning. Preparing tools and materials includes what tools and materials are needed for the laboratory. The workshop head is required to record needs and record incoming and outgoing goods. Meanwhile, for laboratory layout planning, the workshop head is required to determine the PIC (Person in Charge) of the laboratory and the layout of the items in the laboratory. Furthermore, a system needs to be built by the workshop head to be able to organize, direct and coordinate the laboratory well. The next stage is controlling materials in storage and maintenance

tools used for practice to achieve educational goals effectively and efficiently. From the description above, the management diagram can be seen in Figure 3.

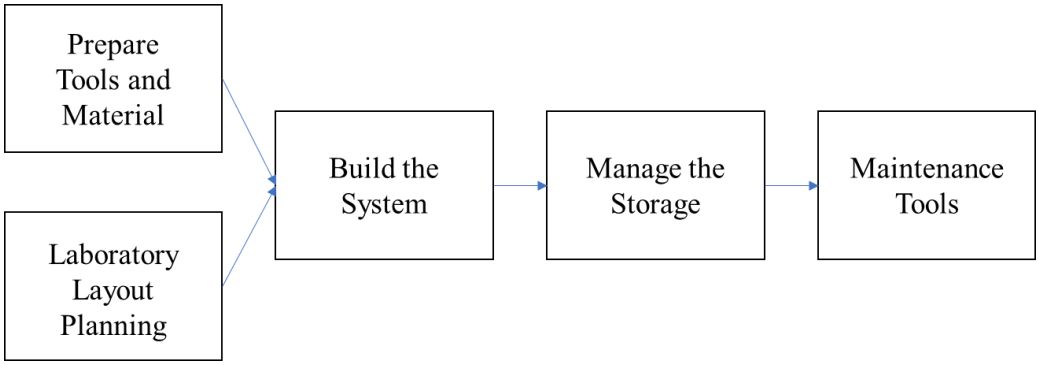

Figure 3: Management Model

Implementing a laboratory management model that begins with careful planning and establishing clear duties and responsibilities of the Laboratory Head can improve this condition. The Head of the Laboratory conduct inventory and rearranges equipment according to the needs of each practice. Apart from that, regular maintenance and calibration are also conducted, so that the equipment is always in ready-to-use condition. By implementing better laboratory management, student practice becomes more effective because all the necessary equipment is available.

Practicality Test Data Before and After Implementation of the Management Model

Based on the results of practical tests before and after implementation, it was revealed that a comparison of the two average scores without testing their significance showed a significant increase. Complete data from the comparative analysis of test or trial can be seen in Table 3.

Table 3: Summary of Initial and Final Model Practicality Test Results in Management Head of the Vocational School Work Practice Laboratory

No	Aspect	Initial Model Practicality		Final Model Practicality		Increase (%)
		%	Category	%	Category	
1	Theory	78.75	Practical	85.50	Very Practical	6.75
2	Syntax	79.67	Practical	86.67	Very Practical	7.00
3	Model Structure	75.67	Practical	87.00	Very Practical	11.33
4	Model Principles	79.50	Practical	86.50	Very Practical	7.00
5	Support System	80.75	Practical	86.50	Very Practical	5.75
6	Instructional and Accompanying Impact	79.00	Practical	84.50	Very Practical	5.50
7	Content Eligibility	77.40	Practical	86.80	Very Practical	9.40
8	Feasibility in Implementation	79.21	Practical	87.64	Very Practical	8.43
9	Appropriateness of Language Use	79.50	Practical	85.50	Very Practical	6.00
Total Score		**709.45**	**-**	**776.61**	-	**--**
Average Score		**78.83**	**Practical**	**86.29**	Very Practical	**7.46**

Feasibility Test Data Before and After Implementation of the Management Model

Based on the results of the feasibility test before and after implementation, it was revealed that a comparison of the two average scores without testing their significance showed a significant increase. The trial comparison can be seen in Table 4.

Table 4: Summary of Initial and Final Model Feasibility Trial Results for the Management of Heads of Vocational School Work Practice Laboratories

No	Aspect	Initial Model Feasibility		Final Model Feasibility		Increase (%)
		%	Category	%	Category	
1	Theory	77.75	Feasible	85.50	Very Feasible	6.75
2	Syntax	78.67	Feasible	86.67	Very Feasible	7.00
3	Model Structure	74.67	Feasible	87.00	Very Feasible	11.33
4	Model Principles	78.50	Feasible	86.50	Very Feasible	7.00
5	Support System	79.75	Feasible	86.50	Very Feasible	5.75
6	Instructional and Accompanying Impact	78.00	Feasible	84.50	Very Feasible	5.50
7	Content Eligibility	76.40	Feasible	86.80	Very Feasible	9.40
8	Feasibility in Implementation	78.21	Feasible	87.64	Very Feasible	8.43
9	Appropriateness of Language Use	78.50	Feasible	85.50	Very Feasible	6.00
Total Score		**700.45**	**--**	**788.85**	**--**	**--**
Average Score		**77.82**	**Feasible**	**87.65**	**Very Feasible**	**9.83**

Based on the vocational high school laboratory management model developed, it has been proven to be effective to implement because it has advantages such as being structured systematically based on the latest theory, supported by educational regulations, there is a commitment from the vocational school and work partners, easy to implement and efficient, increasing the competence of the laboratory head, meeting the needs of stakeholders, ajd increasing capacity.

Vocational High School competitiveness, getting community support, and improving the quality of Vocational Schools sustainably. Therefore, this model is worth recommending to be implemented to improve the quality of vocational schools holistically.

CONCLUSION

Based on the results of model trials and qualitative data analysis, it can be concluded that work practice laboratory management in vocational schools is not yet feasible and practical, as indicated by the school's internal management system related to laboratories does not meet needs, there are no laboratory selection and interview stages, the concept is still rotary, there are no efforts to increase laboratory competency through external training, and laboratory performance assessment has not been well programmed.

The design of the laboratory management development model for vocational high school work practices in this research is feasible and practical to be implemented with five stages, there is a main model of laboratory management, a sub-model of laboratory main tasks, a sub-model of external laboratory training, and a sub-model of laboratory performance assessment.

The level of practicality of implementing the vocational school work practice laboratory management model, which is a combination of the assessment of the main model and 3 (three) sub-models, obtained an average score of 86.29% (very practical). The level of feasibility of implementing the Vocational High School work practice laboratory management model, which is a combination of the assessment of the main model and 3 (three) sub-models, obtained an average score of 87.65% (very feasible).

Acknowledgement

A big thank you to all parties who have helped to conduct this research, especially to the respondents, informants, instrument and model validators, supervisors, examiners, and fellow researchers who have provided valuable input and support in every research process so that it can implement well and produced a laboratory management model for vocational high school work practices which is expected to be useful.

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