Management analysis of workshop equipment and laboratory in vocational education

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Abstract. This study aims to determine the management of workshop and laboratory equipment in vocational education. This research uses a qualitative approach with a case study method. The research subjects were the head of the department, the head of the workshop, the lecturer and the workshop technician. Data collection techniques used are observation, interviews, and documentation. The results showed that the workshop equipment management, namely: Workshop equipment planning carried out through several stages of the procedure: the needs analysis based on the curriculum, determine the priority scale, and determine the budget. This plan involves all personnel in the organizational structure. In the workshop, there are some activities done: preparation of materials and equipment, equipment lending, and use of the workshop. Preparation of practice materials is carried out at the beginning of each semester by following the existing curriculum. Equipment lending is carried out by providing equipment lending cards that are filled out before and after practice. Supervision of equipment in the workshop was controlled by a lending card and equipment usage as well as checking equipment before and after practice. The final results of this supervision will be in the form of an annual report given to the school as an evaluation for future planning.

1. Introduction

Education is one of the most important aspects in the progress of a country. Education is forming the character of the nation; therefore, every citizen has the right to get proper education. Education can make life more prosperous. The current development has demanded every country to create human resources that can compete in the global arena. Types of education include general, vocational, academic, professional, vocational, religious and special education [1]. In the explanation of national education law Article 15 it is stated that vocational education is secondary education which prepares students specially to work in certain fields [1]. Vocational education held is vocational secondary education with the name Vocational High School and Madrasah Aliyah Vocational. In article 20 national education law stated that higher education can hold academic, professional and / or vocational programs [1]. In accordance with national education law above vocational education is held in secondary education and vocational education in higher education. The basic of vocational education includes education in secondary schools and in tertiary education, because the objectives and learning processes are identical.

Vocational education is one form of education in Indonesia that continues to be developed to meet the demands of the needs of skilled workers. This vocational education institution has the task of educating and preparing students to enter and pursue their careers in the world of work. Vocational
education is a special institution that emphasizes the learning process in an effort to provide skills to students so that they have the ability to maintain their existence in life in the world of work.

Management is a system that includes planning, organizing, directing, coordinating, and controlling to achieve certain goals that have been determined in advance and utilizing existing resources, and can be implemented everywhere included in the institution of Education. Some are of the opinion that equipment management will only be done to count the number of workshop equipment that enters and exits or is used. Equipment management is considered an action that wastes time, effort and cost. Procurement workshop is not cheap and requires a large cost so that equipment management is a step that must be taken, can be done by manual management written in the book or programmed with computerized and scheduled as an effort to productive learning. If the management of workshop equipment and materials in vocational education runs in accordance with the planned objectives, the manager is expected to be able to properly manage the workshops that are available.

Problems that can be developed from the aspect of equipment management refer to planning, organizing, implementing, and supervising workshop and laboratory equipment in vocational education. In learning in vocational education practical subjects are needed. In practical learning to be able to develop competencies that are expected to require adequate equipment. Tools in the world of education are: "Unmovable or non-movable units or equipment, in the form of tools, machine tools, kits or sets of goods which have the following conditions: (a) in their original form according to their uses; (b) can’t be enlarged or reduced, but if damaged can be replaced only a few parts do not need to replace the whole; (c) reflects something meaningful enough that makes it usable whenever necessary; and (d) does not lose identity even if released or united with others " [2].

Practical equipment is a set of equipment used to practice in achieving the goal of making finished goods. Facilities and infrastructure standards for workshop practices are regulated in Ministerial Regulation No. 40/2008, while for details on the number and condition of equipment using verification instruments for educational institutions conducting vocational practice tests issued by BNSP. In this study more emphasis on the direction of equipment management. Management is a management system that includes planning, organizing, directing, controlling to achieve certain goals that have been determined in advance by utilizing existing resources. In this case what is meant by resources is 6 M, one of which is a machine (machine or equipment) and materials.

Equipment management and material practice is a management system that includes planning, organizing, directing, coordinating, controlling of material equipment used for practice in order to achieve educational goals effectively and efficiently. From the description above, the equipment and material management diagram as follows:

![Equipment and material management diagram](image)

Figure 1. Equipment and material management diagram.

Planning equipment and practical materials basically need to pay attention to several aspects, among others; (1) What will be done, in this case is the need for equipment and practice materials; (2) Those who carry out, according to Achir who have the right to plan practical needs are instructors, lecturers and candidates who will teach in the practice room, workshop and laboratory management including planning and development, utilization and maintenance of facilities and infrastructure is the responsibility of the leadership in this case is the principal assisted by one or more vice principals; (3) When it is done, good equipment and material planning is carried out at the beginning carrying out
activities namely at the beginning of its establishment and at the beginning of the learning year; (4) How to implement, in planning something including equipment and practice materials [3]. According to Arikunto, it was carried out systematically starting with the elaboration of objectives that had been formulated carefully and in detail, realized in the form of activities, made implementation instructions; (5) Whatever is needed. What is needed for good planning is good personal quality, identification of resources that will be used for all activities, designation of priority scale, setting clear goals [4].

Management of equipment and materials for an institution or organization, there will be the preparation or placement of personnel in work relationships to manage equipment and workshop materials. In organizing good practice equipment, there must be a clear division of tasks regarding planning, procurement, management and supervision. This distribution is based on the authority, responsibilities and qualifications of each member of the organization or institution concerned. According to Pardede the decision about which party will be responsible for the planning and supervision of materials is influenced by one of the following three trends: (1) Grouping all planning and material monitoring activities under one section or department; (2) Give freedom to each department to carry out its own planning and supervision of the materials needed; (3) Form a separate or own section specifically responsible for the handling of materials [5].

The implementation phase, the process continues with the functioning of each according to the planned task description. In this section, the implementation of equipment and materials which will cover several things will be explained, including: (1) procurement of equipment and practice materials, (2) storage of equipment and practical materials, (3) utilization of equipment and practice materials, (4) maintenance of equipment and practice materials.

Supervision is essentially an attempt to give instructions to the implementers so that they always act according to the plan. It is expected that the implementers limit their actions to achieve goals in such a way that they do not deviate from what is permitted [7]. Supervision of equipment and materials consists of supervision of procurement, utilization, and maintenance. Supervision of procurement is intended to ensure the suitability of the process and the budget. Supervision of inventory to ensure the availability of materials in the right amount, price, time so that the practice process is not interrupted. Utilization monitoring is carried out to control that equipment and materials have been used according to plan. Supervision is carried out by direct observation to the workshop, reporting both oral and written.

The workshop is used as a place for students' skills training. In general, the workshop can be interpreted as a place for training, research, maintenance and repair of equipment or production sites. But whatever its activities the use of the workshop must be conceptualized well first so that the workshop will be effective as a means of achieving its objectives. To achieve the effectiveness of the workshop the workshop manager must implement workshop management. Therefore management functions must also be applied to workshop management.

According to Sukardi Workshop is an educational institution facility that is used to foster and enhance skills knowledge, so as to reach the professional level [8]. All workshop components must be managed as well as possible in accordance with the characteristics of the equipment and equipment that is available. There are three types of Bangkel that have been designed for the implementation of vocational education institutions: (1) Unit laboratories, to provide broad, specific and in-depth experiences that cover the scope of vocational training; (2) General unit laboratory, wider than the laboratory unit in nature includes all activities in the industrial field; (3) General laboratory, designed more broadly, more generally, and directed for development, has characteristics that encompass at least three types of industries as equipment, such as a combination of metal, wood and electricity or others. The workshop management function includes the following: (1) Workshop planning, including the arrangement of the workshop; (2) Organizing the workshop (organizational structure); (3) Workshop staff placement; (4) Workshop management mechanisms include workshop administration, procedures for machine/equipment use, machine maintenance and repair.
2. Methods
This research uses a qualitative approach with a case study method. The subjects of this study were vocational school teachers and all sections and personnel involved in learning activities in workshops and laboratories. Determination of the informants in this study was conducted by using purposive sampling method, namely the determination of informants for specific purposes only.

Data collection in this study uses in-depth interviews, observation, and documentation. Criteria that can be used to improve and determine the validity of data, namely the degree of trust (credibility), transferability, dependability and confirmability. In this study, researchers used degrees of trust with triangulation techniques, both in data collection methods and data sources.

3. Result and Discussion
3.1 Mechanical Engineering Workshop Equipment Planning in Vocational Schools
The planning of Mechanical Engineering workshop equipment at SMK as explained by the head of the department and the head of the workshop in the interview that was carried out through a procedure that had several stages. The first stage is needs analysis based on the curriculum, the second stage is determining the priority scale, the third stage is determining the budget. Based on the results of the needs analysis interview based on the curriculum is the first stage in the planning of Mechanical Engineering workshop equipment at SMK. The analysis was conducted by holding a meeting between the head of the department, the head of the workshop, the practice teacher, and the technician. Equipment needs are analysed based on practical worksheets that fit the curriculum, then count what is needed, and get what the needs are. This meeting is not always formal as stated by the Head of Workshop "Major meetings are not held formally or can be said to be daily meetings". Meetings like this are actually not good because the data obtained from the results of this informal meeting are not neatly recorded and when one day will discuss it again must repeat the discussion which would certainly require time.

After analyzing the needs then determine the priority scale. Priority scale is made with the importance of the continuity of practice, not to stop the practice in the middle of the road due to lack of equipment and materials. This priority will be made in order. This priority sequence clearly follows the existing curriculum, so those who are in the order of top priority certainly adjust the basic competencies and core competency existing at the beginning of the school year. Budget adjustments must be made before procurement takes place. A budget that is too large will certainly arise, but by looking at the scale of procurement priorities, it can be done in stages by holding procurement in the order of priority. This planning is done at the beginning of each semester or new school year.

Aspects of planning include (1) what is done; (2) who must do it; (3) when to do it; (4) where done; (5) how to do it; (6) what is needed in order to achieve the maximum objectives. Based on this theory, it can be explained (1) what is done in planning is an element that has been fulfilled in the workshop of Mechanical Engineering expertise program. This element relates to the equipment needed in practical activities in the workshop. This element is the main thing that must be present in the planning of Mechanical Engineering workshop equipment at SMK and has been fulfilled.

The elements are as important as the other elements; (2) who has to do it in the planning of everyone in the organization of the head of the department, head of the workshop, treasurer, teacher, and technician of course there is a division of tasks. Planning must be clear about the purpose and where the plan came from so that it can be known who is responsible for the plan. The right time must be taken for planning so that planned planning can run optimally and be useful; (3) when the planning of this equipment is carried out in formal and informal forums which are carried out almost every day, although it is less than optimal because in an informal forum there is certainly no agenda book or notes on the results of the forum which make it difficult to conduct further discussions. Formal forums are usually held at the end of the school year. Placement of planning must be done very carefully, because it is feared that the planning carried out could have been in vain; (4) where the equipment planning is
carried out in the Mechanical Engineering workshop there are 3 workshops already divided by each workshop and its use so that the placement of the plan can be carried out more easily. Every plan will not happen just like that there are several processes carried out; (5) how to do it, the planning of workshop equipment for the Mechanical Engineering expertise program in Vocational Schools is carried out with several stages, namely the first stage of needs analysis based on the curriculum, the second stage which is determining the scale of priorities, and the third stage of determining the budget. Many things need to be done so that the planning goes well; (6) what must be done in order to achieve maximum goals, of course, the good things start from themselves, therefore everyone involved in planning the workshop of Mechanical Engineering expertise program at Vocational High Schools must have an honest, disciplined, and responsible attitude.

Based on the triangulation of planning data not only carry out planning procedures but also discuss budget issues. The budget for this planning must be clear considering the budget in the practice of learning in the Mechanical Engineering workshop in SMK is not small. The source of this budget was obtained from the government, school operational costs funds, and committees.

3.2 Organizational Structure of Mechanical Engineering Workshop at Vocational School
The organizational structure of the Mechanical Engineering workshop at the Vocational School still looks poor, even though it has been running for years. Seen from the picture of the organizational structure displayed on the wall is very simple without any division of tasks or job description. A clear division of tasks will certainly help each personnel to understand and carry out their respective responsibilities.

The organizational structure of the Mechanical Engineering workshop at the Vocational School was made of course using special considerations. This consideration was made based on a Work Letter (SK) from the headmaster as said by the head of the workshop that "People in the workshop organizational structure were chosen based on a work letter from the headmaster". According to the head of the department for the selection of personnel in this organization, they are chosen based on their competency according to the results of the interview.

The considerations made in selecting personnel for organizational structure are not carried out without purpose, of course having a purpose. This goal is clear, namely to build a developing organizational structure and required a good work attitude that must be possessed by every personnel. The work attitudes that must be possessed by personnel in this organization are honest, disciplined, and responsible.

Organizing includes the distribution of tasks, coordination, and authority. The division of tasks in the organizational structure of the Mechanical Engineering workshop at the Vocational School is indicated by the existence of a work organizational structure such as department heads, workshop heads, treasurers, industries, teachers, and technician. The following is the division of tasks of each person involved in the organizational structure:

3.2.1 Head of the department
The duties of the head of the department compile the work program, coordinate the needs of learning materials and equipment, be able to coordinate with the heads of other program departments, develop learning systems according to curriculum requirements and the world of work needs, manage human resources including the head of the workshop, teachers, and toolmen., plan and carry out all practical teaching and learning activities in the Mechanical Engineering skills study program, inventory the equipment in the Mechanical Engineering skills study program, and report the results of work program evaluations.

3.2.2 Head of the workshop
The task of the head of the workshop is to develop a culture of cleanliness, order and work safety, compile a workshop development plan, plan workshop management, develop a workshop administration system, coordinate practicum activities with teachers, arrange a workshop activity
schedule, monitor the implementation of workshop activities, evaluate workshop activities, compile workshop activity reports, formulating the details of the technician's assignments, determining the technician's work schedule, and coordinating the availability of materials and equipment.

3.2.3 Treasurer
The treasurer here served as a person in charge of finance at the Mechanical Engineering workshop at the Vocational School. The treasurer is a person who works on the basis of orders and approval from the head of the department. The task of the treasurer is to save documents, current accounts or school finances, submit payments, make financial use reports of BOPS, BOS, school committees and other sources, carry out the collection and repayment and payment of state finances in accordance with existing procedures, keep financial files, make financial statements, and report the results of financial statements.

3.2.4 Industry
The industry is an important component in learning at the Vocational High School level. Students who study at the Vocational High School are expected to graduate immediately to work, with the presence of industry the students can feel working while in school namely by apprenticeship. The internship experience of these students is expected to be able to make students aware of future lives and help students find work.

3.2.5 Teacher
The teacher is a very important person in the course of learning. The teacher is a person directly involved in the implementation of learning. Teachers work assisted by a technician for the purposes of preparing materials and equipment preparation. The task of the teacher carrying out learning activities, making completeness of teaching properly and completely, carrying out assessment activities of the learning process, carrying out analysis of daily test results, compiling and implementing improvement or enrichment programs, filling out a list of values, making notes about the results of student learning progress, making teaching aids, take part in curriculum development and socialization activities, and collect and calculate credit points for promotion.

3.2.6 Technician
The main task of a technician is to prepare equipment and materials for practice so that during practice can run well without any obstacles. Inventorying equipment is also the job of a technician. The task of the technician is to maintain cleanliness, order, and work safety, prepare equipment and practical materials, check the appropriateness of equipment and practical materials, serve equipment borrowing and material retrieval, maintain workshop equipment, ensure that all equipment returns to the way it was before being used, and inventory workshop equipment. Evaluation of the organizational structure is carried out every meeting of the new school year as said by the head of the workshop in the interview "Evaluation of the organizational structure exists and is carried out every department meeting held every school year or at least every semester". This evaluation is carried out to find out the results of work that have been carried out and any shortcomings that need to be corrected. The organizational structure certainly has time or is usually called a term of office. Based on the results of interviews with the head of the department "The term of office in the organizational structure of the Mechanical Engineering workshop at the Vocational School is ideally for 4 years or if there is a change of principal and the new headmaster wants it, at the same time socialization is carried out for the organizational structure". The socialization of the organizational structure itself was also carried out in conjunction with the evaluation.

3.3 Implementation in Mechanical Engineering Workshop at Vocational School
Implementation in the Mechanical Engineering workshop at the Vocational School is the application of the plan that has been made. This implementation is related to inventorying tools and materials,
preparing materials, and using equipment. This implementation also aims to the effectiveness and efficiency of the use of workshops.

Based on the results of interviews with the technician inventorying tools and materials carried out by the head of the workshop and assisted by a technician. Inventory is carried out every time goods enter and exit. This inventory is also a report for evaluation at the end of the year. Inventory data is also used to submit maintenance budgets. This inventory data is monitored by the Vice Mayor as representative of the school. The inventory of equipment is carried out so that the number of equipment available and ready for use is known. Not all of the equipment that has been inventoried is used right away there are a number of tools that are still stored.

Existing storage in this Mechanical Engineering workshop with the provision of insulated shelves, then arranged according to a large size under and then getting smaller and smaller. The results of field observations still have unused equipment stored and stacked directly without being placed on an insulated shelf and this is not good because it can damage the existing equipment stacked at the bottom. Preparation of practice materials here is done every beginning of the school year by following worksheets that are tailored to the curriculum. Material that is ready for use is then stored to adjust the material so that when it will be used in good conditions. Simple placement can damage the practice materials that are ready to use, practical materials must be given special treatment so that the practice materials remain in good condition and can be used optimally. The results of field observations show that the storage of practical materials is done by putting it in a practice workshop. Practical material storage will be better if it is made its own room close to the technician room to make it easier for the technician when preparing practice materials.

Practical material is certainly prepared and counted according to the number of students there. The number of students is indeed more than the number of machines available this causes in practice some students have to queue up, but if given the number of machines more worried that the supply of materials will run out faster. If the material runs out, you have to wait for the procurement of materials, so it will take more time.

Control of use is carried out to determine the maintenance that must be carried out on the equipment used. The use of equipment is controlled using a usage card that is filled in before and after practice. Usage card that is filled with equipment routinely will give an optimal picture of the use of existing equipment. Based on the results of observations of the use of this card has not been filled for a long time, it looks like it was last filled in 2018. Things like this are certainly not good for equipment maintenance later.

Equipment borrowing is something that happens every day in learning practice. Borrowing good equipment must be controlled as in the Mechanical Engineering workshop at the Vocational School with the equipment lending card. The equipment lending card will help keep track of who is borrowing the equipment, so the borrower will be responsible for the equipment borrowed, of course this trains students’ work attitude to be disciplined, honest and responsible.

Based on the results of triangulation of data a technician in the implementation process is very important. Inventory is carried out by a technician and the head of the workshop every time there is an incoming or outgoing item. The preparation of materials and equipment used for practice is also prepared by the technician. When the learning practice takes supervision is carried out by the teacher. Indirectly the parties involved in the implementation of the workshop head, teachers, and technician.

3.4 Supervision and Maintenance of Workshop and Laboratory Equipment

Supervision is carried out in order to see the extent to which the existing planning goes, is it appropriate, or it does not work at all. The purpose of the supervision itself is to prevent mistakes, irregularities, and other activities that are not in accordance with the existing plan. Supervision can be carried out every day or within a certain period. Supervision carried out in a more intense period of time is certainly better than supervision carried out in the long term. Supervision carried out intensely requires more effort, but it is certain to have more accurate data.
Guidelines for supervision carried out in the Mechanical Engineering workshop at the Vocational School is to ensure that the existing equipment is used according to its function. The use of equipment that matches its function will certainly minimize the possibility of equipment damage. Supervision of use is clearly seen in the Mechanical Engineering workshop at the Vocational School, namely at rest all machines are turned off to give pause to the use of the engine. Supervision carried out to control the equipment is also carried out using a tool lending card.

Based on data of triangulation of observations and documentation available. Supervision in the Mechanical Engineering workshop in Vocational Schools there are some supervision that does not run intensely, for the supervision of the use of practical aids that have been available on the shelves in the workshop it is carried out every day. In contrast to the supervision of the use of practical machines that are not running intense or can be said not to run because it was last filled in 2018. This supervision is certainly not good because the data from this supervision is the basis for carrying out maintenance.

Supervision relating to maintenance or care. This treatment is carried out with the hope of getting a longer service life. Maintenance of the equipment in the workshop is carried out by the toolman and students after each practice by cleaning the equipment, such maintenance is actually good but it would be even better if carried out regular maintenance so that the condition of the equipment used for practice has a longer service life.

Maintenance for machines that do not work is removed first and collected, when there is a new maintenance budget down justified, or if possible justified without waiting for the budget. Machine maintenance as can actually be anticipated with preventive maintenance methods, so that the machines used can have a longer service life if compared to doing maintenance when the machine can no longer be used. It is undeniable that periodic maintenance will take time, but it will help to age the equipment.

Care or maintenance at these workshops and laboratories has been running for years. The head of the workshop is the person responsible for the equipment in the workshop. Damage is usually handled by the head of the workshop and technicians. Machines that cannot be repaired or the cost of repairs are too large are removed then waiting for removal.

Evaluation is carried out as a treatment effort in the hope that it can give better results than what has been done. The evaluation of the Mechanical Engineering workshop at the Vocational School was held at the beginning of the school year. The results of this evaluation are in the form of reports used to make improvements, so there is effectiveness and efficiency in the use of future workshops. The evaluation report is reported to the school principal to plan the next workshop. This report is made at the beginning of the school year meeting.

4. Conclusion

The planning of Mechanical Engineering workshop equipment at Vocational Schools is already running in a structured manner. Workshop equipment planning involves department heads, workshop heads, teachers, and toolman through deliberations on curriculum-based learning needs. Equipment procurement is done every quarter, following the budget from the government.

The organizational structure in the workshop is chaired by the head of the department that oversees the workshop head, teacher, and toolman. The selection of organizational personnel is carried out by the principal based on competence. The change in organizational structure is ideally every 4 years, but follows the principal because usually when the principal changes, the organizational structure also changes.

Existing in the Mechanical Engineering workshop at the Vocational School, namely inventorying tools and materials, preparing materials, borrowing equipment, and using equipment is carried out using cards that function as data sources to evaluate the implementation.

Supervision in the Mechanical Engineering workshop at the Vocational School in the form of maintenance or maintenance and evaluation. Maintenance is carried out by every time each practice finishes by cleaning the equipment. Evaluation is carried out at the end of each year or the beginning of the school year, it can also be incidental, and at department meetings.
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