The Development of Worksheets and Evaluation Tools through the Machine Tools Training

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Abstract. The aims of this research is to develop worksheets as training guidelines and cognitive, affective and psychomotor evaluation tools used as guideline practices for the machine tools education and training at the Training Center (BLK) of Sleman Regency.The subjects in this research were metal machine instructors. The focus of the development was the worksheets and evaluation tools.The research was conducted within evaluation stages of findings by applying a qualitative descriptive approach product design: worksheets; attitude observation sheets; process observation sheets, product evaluation guidelines and product design validation; product repairs and product reports.The research results show (a) visual worksheets and verbal worksheets; (b) questions to measure cognitive abilities; (c) observation sheets to measure affective abilities; (d) observation sheets to measure process skills as part of psychomotor abilities; and (e) product measurement sheets as part of a tool to measure psychomotor abilities.

Keywords: Visual Worksheets, Verbal Worksheets,Attitude Observation Sheets, Evaluation Tools, Training of Machine Tools

1 Introduction

As a Job Training Center, the Sleman-based Vocational Training Center (BLK) in Purwobinangun, Pakem is a stakeholder whose task is to organize trainings using state budgets and regional budgets of Sleman Regency. The implementation of metal machining skills training at the BLK is a process of interaction between trainers, training participants and learning resources in the training workshop. The training is carried out in the theory room and practice room. The evaluation of education and training program held in August, October 2017 in the machinery practice room went smoothly [1]. However, some unexpected findings include: (a) the implementation of training has used an individual and group approach and a combination of lectures and demonstration methods, but it has not considered the characteristics of training participants, their diverse educational backgrounds and varied levels of education backgrounds. Consequently, the implementation has not reached the maximum result; (b) only one job sheet is provided and taped to the boarding board in the practice room, so that each participant must draw on his or her own, or see on the bulletin board in the practice room. This hampers the smooth practice and productivity of work; (c) attitude competency measurement is measured without using measurement guidelines or without the observation sheets if measuring attitudes and processes during the practice as stated by [2]. The measurement results allow unacceptabilities between one participant and the others; (d) measuring aspects of machinery processes as part of measuring skills do not use

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process observation guidelines; (e) product measurement is not attached to the job sheet, so that the training participants do not know what and how the measurement of practice results are used as a basis for product evaluation.

Referring to such findings, researchers identify the following problems: (a) there is no group of training participants based on their levels of background and types of education; (b) there is no jobsheet for each training participant that can be installed on each machine, so that it can be used as a guide and practice guideline; (c) there are no instructions about the steps or stages of work in the practice; (d) there are no instructions regarding the components to be assessed and the portion of the grade of each component; (e) there is no guideline for assessing attitudes throughout the training and practice; (f) there is no process observation sheet as part of the skill measurement component; (g) there are no evaluation guidelines about the portion of grades from cognition, affective and psychomotor criteria for achieving the competence.

Paying attention to available facilities and human resources for instructors and technician workshops is related to the practice of machine tools in Sleman BLK, and it is impossible for group training participants to acknowledge the types and levels of their respective backgrounds. Therefore, the development of this research will focus on worksheets, attitude measurement sheets, process measurement sheets and guidelines for the portion of cognitive, affective and psychomotor grades as a unit of competence.Worksheets and evaluation tools are developed accordingly: (a) Worksheets or worksheets can be used as clear guidelines and instructions for training participants about work drawings, information or instructions concerning what must be made, the size of the material, the size of the object, what machines and tools are used, how to install the equipment, start working on what parts, how to do activities; and the work safety; (b) Training participants can choose verbal worksheets or visual worksheets according to their potentials (verbal human or visual human), so that they quickly understand written or illustrated information or instructions on the worksheet so as to achieve the maximum competence effectively and efficiently because the training time is limited. (c) Instructors can measure attitude aspects, process aspects and products accurately, steadfastly, transparently and can be accounted for academically. The product specifications in this development research are verbal worksheets and visual worksheets as guidelines and instructions in carrying out practical activities for training participants and complete the machine tool practice assignments, observation sheets measuring the training participants' attitudes during the implementation of machine tools, process observation sheet as a guideline for measuring process skills of machine tool training participants, criteria for measuring each product component as a result of the practice of training tool participants; and criteria for the portion of assessment between cognitive, affective and psychomotor aspects as a whole unit.

The development of this instrument is useful for some reasons: (a) Verbal worksheets can be used as effective guidelines for training participants who are categorized as linguist humans in completing practical assignments; (b) Visual worksheets can be used as effective guidelines and instructions for training participants who are categorized as linguist humans in completing practical assignments; (c) Product valuation guidelines attached to the worksheets can be used as assessment guidelines for instructors as well as providing a transparent description of each component for training participants, so that they can plan target values with regard to the standards set; and (d) observation aspects of attitude aspects, observation sheets of process aspects are useful as measurement guidelines based on standard, steady, fair, transparent and accountable results.

2 Learning Tools for Machine Tool Practices

A student is said to be successful in following the practical learning of machine tools if he has knowledge of how to turn, has a positive attitude about the practice of machine tools and has the skills to operate machine tools. A person's ability in pieces can be seen through measurement of machine tool knowledge as a positive aspect; observations of work discipline, self-confidence, work safety as an affective aspect and observations of machine tool work steps and skillfulness using tools as part of psychomotor abilities and practical workpiece measurements as integral capabilities of psychomotor aspects. The theoretical ability of machine tools is measured using written test questions. Work steps, skills in using tools, work discipline, self-confidence and work safety are measured by direct observation when the practice is carried out based on observation sheets that must be prepared by the instructor before the practice begins [2]. While psychomotor abilities from the aspect of the product are measured through the workpiece produced after completion of the practice. Affective abilities (including attitudes towards tools, attitudes toward the environment, work safety, work discipline and confidence, time discipline, process discipline); and psychomotor abilities (covering process aspects and installing painters, and how to operate machine tools by paying attention to the safety of the equipment, safety of the environment and the safety of the practitioner and students's practices) individually under the supervision of the instructor.

The ability to practice machine tools as learning outcomes can be evaluated using test questions for positive aspects; observation with the guideline of the observation sheet (a check list) to measure affective aspects and process aspects as part of the psychomotor aspect, and by measuring workpieces as a result of practice turning (product aspects) as part of the psychomotor aspect.

Research by [11] entitled *The Influence of Workshop Method and Worksheet on the Achievement of Students' Lathe Engineering Ability, Department of Production Machinery, STM II Yogyakarta* found that (a) workshop direction methods and types of worksheets affect the achievement of students lathe techniques; (b) the visual worksheet has a better influence on the achievement of lathe techniques than on the verbal worksheet. Therefore, this study inspires the development of verbal worksheets and visual worksheets for the machine tool training in Sleman BLK.

Research by [1]entitled *Evaluation of Case Study Training Program on Metal Machining Parts at Sleman Yogyakarta BLK* provides recommendations that (a) worksheets can be used as practice guidelines for each training participant effectively; and (b) the measurement sheet for process aspects and attitude aspects as long as the training participants carry out the practice.

In line with the literature review and relevant research studies, the following frameworks can be put forward: (a) Complete and detailed worksheets can be used as guidelines and instructions for participants and training to carry out work effectively and efficiently; (b) Verbal worksheets will be chosen and become guidelines and instructions for training participants who are categorized as verbal humans to carry out work effectively and efficiently; (c) Visual worksheets will be selected and become guidelines and instructions for training participants who are categorized as visual humans to carry out work effectively and efficiently; (d) Observation sheet attitude becomes a guideline for measuring attitudes by the instructor who produces a valid, transparent and accountable attitude; (e) Process observation sheet becomes a guideline for measuring processes as part of the skills of individual training participants by instructors who produce a process that is valid, transparent and accountable; (f) Guidelines for the portion of assessment to be a proportional guideline between the values of

cognitive, affective and psychomotor aspects to determine the final value of training competency of participants' achievement.

Referring to the framework, the research questions arise as follows: (a) What are the verbal worksheets and visual worksheets used as guidelines and instructions in carrying out practical activities for training participants to complete the task of practicing machine tools; (b) What is the observation sheet measuring aspects of the training participants' attitudes during the practice of machine tools; (c) What is the process observation sheet used as a guideline for measuring the process skills of participants in the machine tool training; (d) What are the measurement criteria for each product component as a result of the practice of tool machine training participants; (e) To what extent the portion of the assessment between cognitive, affective and psychomotor aspects is used as a whole.

3 Method

This research used a method called Development Research. As the approach indicates, this research is categorized as a qualitative research. The process of collecting data is advanced in two ways: (1) interviews with machinery instructors; (2) documentation to see worksheets and questions used by instructors while conducting work education and training at Sleman BLK. The collected data was analyzed qualitatively with standard norms [2].

The flow of research activities can be made, as follows:

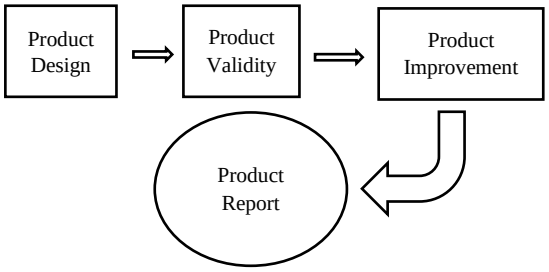

Fig. 1. The flow of research activities can be made

As a preliminary study, the product design was continued with a validation. Validation is applied in a qualitative descriptive approach to assess whether or not the product design in the form of worksheets, observation sheets, product assessment guidelines and portions of cognitive, affective and psychomotor values based on rational thinking are more detailed and more complete than the old instruments. Product design validation is carried out in discussion forums with experts and practitioners.

Product Analysis. Based on the comments, the input obtained during the validation of the product design was analyzed qualitatively. Through discussions with BLK experts and practitioners, weaknesses and shortcomings were detected. The lack of design was complemented and design weaknesses were reduced by improving the design.

The study was conducted in the Machine Tool unit at the Training Center (BLK) of Sleman Regency, Yogyakarta. The study was conducted in June, and in August 2018 after obtaining an approval from LP3M of Universitas Sarjanawiyata Tamansiswa Yogyakarta with

the issuance of a research contract and a permission from the authorities namely BAPEDA Sleman Regency, Special Region of Yogyakarta.

4 Results and Discussion

Based on the data of preliminary research in relation to the machine parts of the Sleman BLK production in 2017, (1) there was only one visual worksheet as part of the work sheet used as a practice guide for the trainees drawn by the instructor and posted on the board, so that training participants must see and draw on their own; (2) the worksheets were incomplete in terms of (a) a written instruction about the work steps to be taken by the training participants; (b) the worksheet was not accompanied by instructions on the work safety; (c) the worksheet was not equipped with product assessment guidelines; (3) training participants were not given written information about the assessment of attitude aspects; (4) training participants were not given an explanation of the portion of grades between positive aspects, affective aspects and psychomotor aspects.

4.1 Validation of Product Design

Product design in the form of worksheets, both visual worksheets and verbal worksheets and measuring instruments or measurement instruments for process aspects, attitude aspects, product aspects and positive aspects was carried out at the research setting. Some inputs were obtained in line with the validation in the field of research by metal machine instructors and BLK head, as shown below:

Table 1.W.A.P. Instructors

No.	Fill out the Form of Correction and Suggestion	Page
1	an average diameter of 18 mm that does not match the working picture. It should be 20 mm in diameter.	30
2	sides is done from the center of the workpiece and moves backwards, and it should be done from the edge to the center unless the workpiece has been drilled.	31-32
3	thread of M 12 x 1.75 by setting the screw transmission, so that the tool can move automatically from left to right, and it should set the screw transmission, so that the tool can run automatically within a row of 1.75.	32

Table 2.WS. (BLK Head)

No.	Fill out the Form of Correction and Suggestion	Page
1	It is better to pay attention to the appropriateness between working picture and verbal information	

Table 3. Instuctor S

No.	Fill out the Form of Correction and Suggestion	Page
1	Turn the hole of 12 mm in diameter. The drill bit of 6 mm in diameter is written on the center of the road and tied it with bolts installed in 6 mm diameters at the center of the head off.	37
2	It is written that turning a hole of 12 mm in diameter, and it should drill a hole of 12 mm in diameter with a lathe.	37

4.2 Product Repair

In terms of input from instructors and head of Sleman BLK on worksheets, it is necessary to make adjustments and improvements between the information written on the image and the information written on the verbal worksheet and on the visual worksheet. Improvements to this information are elaborated, as follows:

1. Adjustment between images and verbal information in worksheets, as shown in Table 4 and Table 5.

Table 4. Improved information on the validation of the first instructor

No.		
1	Leveling 20mm in diameter 20mm it flat Make even	The workpiece clasps automatically remain 100 mm to support the hollow end with the center of the road. Change the side tool with the right flat tool. The position of the flat chisel must be as high as the center of the road and perpendicular to the workpiece. Mark the length of 80 mm from the end supported by the center of the road to be a turned flat Flat lathe with right flat chisel to 18mm in diameter and 80mm long. This turning must be done from right to left because the tool used is the right tool.
2	Turn the other side	Remove the object and pinch the **20 mm** rod in diameter on the automatic lathe until it remains 10 mm. Change the flat tool with the right hand tool. The position of the side chisel must be as high as the center and form of an angle of 8-10º with the side of the workpiece. Turning the side from **the edge of the workpiece to the center of the workpiece** Install the drill center at the center of **the loose head** to make the center hole on the side of the workpiece as deep as 2/3 x a taper length in the center drill
3	Turn thread of M12 x 1.75	Replace the tool with the metric thread tool (tool at an angle of 60º). Set the position of the chisel as high as the center of the road and perpendicular to control the screw mall. **Adjust the threaded transmission so that the tool can run automatically at a row of 1.75** Carry out the thread turning carefully from right to left to the groove In terms of the screw turning, feeding is only done on the tool movement to the left, and in the right move the tool must be free of incision. This happens if the tool has been withdrawn from the workpiece. Do this turning until the screw shapes as requested. Check the thread shape with the screw mall when the engine is off

Table 4. Improved information on the validation of the second instructor

No.		
1	**Drilling a hole of 12 mm in diameter with a lathe**	• Install the drill bit of 6mm in diameter **at the center**, head off and tie it with the existing bolt. • Drill the workpiece with the diameter of the drill bit. Drilling is done until the workpiece

	is translucent. Drilling with an 8 mm diameter drill bit and then with a 12 mm diameter drill bit.

5 Conclusions

The conclusion is drawn from the analysis of product development in the form of worksheets, cognitive gauges, affective observation sheets, process observation sheets and product measurement sheets for the practice of machine tools in the Production Machinery Section of the Sleman Regency Training Center, as follows:

a. There is an adjustment between the image and verbal information in the worksheet, such as turning a flat 18 mm in diameter that does not correspond to the working image repaired with a diameter of 20 mm.
b. There is an improvement in terms of information on the validation of the first instructor namely turning a hole of 12 mm in diameter with a drilling to form a diameter of 12 mm with a lathe.
c.There is an information adjustment about the side turning from the center of the workpiece and moving backward, making the side turning from the center edge unless the workpiece has been drilled.
d. There is information adjustment for thread turning of M12 x 1.75 by adjusting the threaded transmission, so that the tool can move from the left and right automatically, to adjust the thread transmission, so that the tool can run automatically in a curve of 1.75.

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