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Analysis on Instructional Design Instruments of Metacognition based Electronic Industries Expertise in Vocational Schools

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Abstract: This study aims to develop an instrument of instructional design based industrial electronics using metacognition approach for Vocational Schools (SMK) Makassar City. This type of research is Reseach and Development (R&D) to develop learning device includes lesson plans, teaching materials user guide practicum, jobsheet, worksheets learners and instruments instructional design. Based on the Plomp development model, it obtained the following results. Firstly, the results of earlier investigations have examined theoretically and requirements analysis for device designs based learning metacognition, namely the purpose of learning methods of learning the character of students in SMK and learning problems associated with metacognition-based learning activities. Secondly, the validation results of expert found that the instrument of instructional design based industry expertise electronics metacognition have valid criteria to be implemented broadly on the same family in SMK.

Key words: Instrumental analysis, design learning, metacognition, electronics industry, method, industry

INTRODUCTION

The competence of vocational graduates is currently became the main focus of educational program in Indonesia. Based on a data subset of the statistics in 2014 showed that the unemployed graduates of vocational school until August 2014 was 1.332.521 people and 1.962.786 people were from high school graduates, a difference of 630.625 people was fairly small, considering vocational graduate has been equipped with various skills. In 2012-2014 there was an increase of unemployment in August periodic, this is because recent graduates of vocational schools on every July has led to new unemployment (Anonymous, 2015).

The statistics Indonesia report, provides important information about the graduates of educational institutions that have not been accepted in business and industry. These conditions provide a criticism of national educational institutions, especially in the field of vocational education in order to improve the education program management in general and specifically learning activities. One of them improve components of the learning model and devices.

The learning activities are not the only factor in learning system, other factor are learning tools such as teaching material, jobsheet, practical guides, instructional media and assessment of learning. Moreover, facilities and infras-tructure, curriculum, teachers, principals and school environment. Quality learning tools should be equipped with instruments that meet the content and construct validity. The validity of the content that has been conducted by experts and specialists in relation with the productive sectors by providing correction and feedback on the learning device designed has been shoved valved condat has shown good condition empirical validation is a validation of the analyzed based on the instruments test in trials class.

The analysis of each semester learning instruments, that performed the review to obtain results, correspond to the learning objectives. According to Arikunto (2002) and Kurniasari and Sunarmi (2014) state that, a good instrument or learning assessment should have validity, reliability, level of difficulty and different power for measuring student competency. Furthermore, remediation efforts have been implemented including the quality of learning with coaching through subject teachers congress (MGMPs) and some training has been carried out, either by the government or the schools in each field of study. The results of these activities has been contributed heavily in fixing one of the components of learning system. However, there are still obstacles that need to be solved and resolved. One of them by reviewing the syllabus, lesson plans and indicators underlying the formulation of metacognition based instructional design instrument. Then to conduct a review of the grating instrument based on indicators compiled the learning based on metacognition. The results of the study was

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followed up by doing Focus Group Discussion (FGD) to provide feedback based on the improvement of expert validation.

Instructional design of instrument of electronics industry is based on metacognition in learning device. The commands of metacognition in learning has been stated by Bryant (2006), Coutinho and Neuman (2008) and Sungur and Senler (2009), describes the three types of knowledge, namely declarative knowledge about facts and concepts owned by a person or factors that affect their thinking and attention in learning a procedural refers to a person's consciousness about how to use a strategy and the conditional refers to one's awareness of the condition that affect learning.

Metacognitive skills refer to a person's cognitive activity in solving problems (Gama, 2005). Coutinho and Neuman (2008) states that the metacognitive skills (regulation) refers to activities that controlling one's learning such as planning, information management strategy, monitoring comprehension, debug strategy and evaluation of progress and goals. Meijer *et al.* (2006) distinguishes four categories of metacognitive skills, i.e., firstly, orientation which is supposed to precede the planning secondly, systematic order includes planning Thirdly, the evaluation includes monitoring and fourthly, elaboration, consisting of recapi-tulation, draw conclusions and reflection. Furthermore, Dawson (2008) defines metacognitive skills conceptualized as a set of inter-related with the competence to learn and think including many of the skills needed for active learning, critical thinking, decision-reflective, problem solving and decision making. Based on that statement, this study examines and analyzes the instruments of learning that involves metacognition commands in the learning of industrial electronics expertise in vocational schools.

MATERIALS AND METHODS

This research is development research model that develop and portray the results of instruments analysis based on expert opinion and trial classes. This study uses Plomp and Nieveen (2010) Model of development and quality criteria.

Draft of instrument is validated by six experts in electronics industry, then this draft is performed for the trial class of vocational student grade 9 at SMK Negeri 2 Makassar by the number of 35 students. The research data was collected using descriptive analysis to describe the instrument validation results of instructional design, so that, it is used to test the practicality of learning medias design in metacognition based industrial electronic expertise.

Analysis of instructional design instruments: Metacognition based learning design in its development stages using Plomp Models, the stages are pre-development phase, the design phase, the realization phase and the development phase. The design phase of designing activity contains learning devices and instruments. In addition the instrument is designed based on the indicators of instructional design as follows. Instrument of metacognition based instructional design.

Instrument of instructional design

Validation sheet of instructional design guidelines:

- Validation sheet of learning device, namely
- Competency test on student learning outcomes
- Assessment sheet on practicality and effectiveness of instructional design
- Observation sheets of learning practicability
- Observation sheet on the ability of teachers to manage learning
- Observation sheet of student activity
- Questionnaire of students responses to learning

Translation of each instrument indicator to explain the theory underlying the instrument. Each standard of competence and basic competences describes a number of competencies that must be mastered before students enter business and industry. Experts and specialists contribution is crucial in order to insert the instrument improvement and then provide information and analysis on which part needs to be improved. All the instruments used in the development of metacognition-based instructional design has previously been assessed for feasibility by experts and practitioners with regard to commands of metacognition. A feasibility assessment of each instrument is reviewed by three aspects including: instructions for use the materials (content) and language. The results of the study summarizing feasibility assessment of instruments are presented in Table 1.

Referring to the data in Table 1, it can be stated that eight instrument fit for use without revision and three instruments used with the revised feasibility. Things need to be revised from the validation sheet are the legibility, systematic writing and language. Thus the instrument, after a revised can be used to collect data validity, practicality and effectiveness of instructional design based on metacognition.

The results of the validity assessment form (validation) on instructional design guidelines: Validation sheet of the learning design guidelines of an instrument evaluation sheets (validation) is used by experts and practitioners to assess the instructional design guidelines. Instruments is

Table 1: Results of instruments feasibility

Type of instrument	Assessment result of validator 1	2	3	4	5	6	Frek. LD/LDR	Frek. TLD	Ket.
Validation sheet design guidelines	LDR	LDR	LDR	LD	LDR	LDR	6	0	LDR
Validation sheet learning implementation plan	LD	LD	LD	LD	LD	LD	6	0	LD
Validation sheets of lab Guideline	LDR	LDR	LD	LDR	LDR	LDR	6	0	LDR
Validation sheet of Teaching materials	LD	LD	LD	LD	LD	LD	6	0	LD
Validation sheet of Jobsheet	LD	LD	LD	LD	LD	LD	6	0	LD
Validation sheets of competency test on student learning outcomes	LD	LD	LD LD	LD	LD	LD	6		
Assessment sheet on practicality and effectiveness of instructional design	LD	LD	LD LD	LD	LD	LD	6	0	
Observation sheets of learning practicality	LD	LD	LD	LD	LD	LD	6	0	LD
Observation sheet the ability of teachers to manage learning	LD	LD	LD LD	LD	LD	LD	6		
Student activity observation sheet	LDR	LDR	LD	LD	LDR	LDR	6	0	LDR
Questionnaire of students responses to learning	LD	LD	LD	LD	LD	LD	6	0	

LD Description: LD (Proper to use); LDR (proper to use with revision) and TLD (do not proper to use)

Table 2: Results of instrument validation

Type of instrument	$\bar{X}$	PA	Description
Validation sheet of instructional design guidelines	0.85	0.80	Very valid
Validation sheet of learning instrument are:			
Learning implementation plan	0.90	0.83	Very valid
Lab guidelines	0.88	0.75	Very valid
Teaching materials	0.85	0.70	Very valid
Jobsheet	0.90	0.85	Very valid
Competence test of student's learning outcomes	0.85	0.71	Very valid
Assessment sheet of practicallity and effectiveness of the learning design	0.95	0.80	Very valid
Observation sheet of instructional design practicality	0.90	0.85	Very valid
Observation sheet of teacher's ability in managing the learning	0.85	0.80	Very valid
Observation sheet of students activity	0.85	0.79	Very valid
Questionnaire of students response to the learning	0.92	0.83	Very valid

$\bar{X}$ = Everage validation value and PA is Percentage of Agreement

validated by six experts and practitioners. The validation ratings are reviewed by three aspects, namely: instructions for use materials (content) and language. The results of the data analysis in Table 2 concluded that the instrument of evaluation sheets (validation) on instructional design guidelines declared a valid criteria. Thus the instrument can be used for data collection validation of instructional design guidelines. Assessment sheet (validation) of instructional design guidelines can function properly to judge the validity of the instructional design guidelines.

Suggestions for improvement and refinement of the assessment form (validation) are the introduction, especially with regard to the supporting theory such as metacognition (metacognitive knowledge and metacognitive skills) and problem solving an evaluation instruments needs to be compatibility between the assessment instruments with the items consideredn and the validity criteria do not need to use a scale but using valid or invalid (0) criteria. The next level of consistency and stability of the validator against instruct-tional design guidelines coefficient obtained Percentage of Agreement (PA) of 0.80. These results show the level of consistency and stability of the validator to validate the results of the assessment form on instructional design guidelines.

The validation sheet assessment (validation) results of learning device: Assessment sheets of learning device, namely assessment sheet of learning plan assessment sheet of practical guidelines assessment sheet of teaching materials assessment sheet of jobsheet and assessment sheet of competency test results to learn, before it is used to first be validated by experts and practitioners. The validation sheet contains three aspects of assessment including the user aspect, the material and language. In addition, the validator is asked to comment on the assessment form of learning device.

According to the results of the analysis in Table 2, it shows that assessment sheet of lesson plan assessment sheet of practical guidelines assessment sheet of teaching materials assessment sheet of jobsheet and assessment sheet of competency test study results are valid criteria. Thus, the assessment sheets can be used in assessing validity of the learning device. Assessment sheet of each have a level of reliability coefficient with the coefficient Percentage of Agreement (PA), namely: the lesson plan has a PA of 0.83 practical guidelines has PA 0.75 the teaching material has a PA of 0.70 jobsheet has PA 0.85 and learning outcomes competency test is 0.71. These results above shows the level of consistency and stability of the validator. Furthermore, corrections and suggestions

for improvements made to the assessment sheet validator (validation) is written on a sheet of validation while the other validator gives notes on the manuscript. Among the corrections and suggestions from the validator are assessment criteria previously used 5 point scale (very low = 1, low = 2, moderate = 3, good = 4 and very good = 5) is recommended to use a scale of two (valid = 1 and invalid = 0).

The results of the validation assessment sheet of practicality and effectiveness of the instructional design: Assessment sheets of practicality and effectiveness is an instrument used by experts and practitioners to measure the practicality and effectiveness of instructional design. But before used, it first be validated by experts and practitioners. The validation sheet contains three aspects of assessment, namely the user aspect, the material (content) and language. In addition, the validator is asked to comment on the assessment sheet of practicality and effectiveness of instructional design.

Based on the analysis in Table 2 shows that, the assessment sheets of practicality and effectiveness of instructional design is valid criteria. Thus, the practicality and effectiveness of assessment sheet of instructional design can be used in assessing the practicability and effectiveness of instructional design. Practicality and effectiveness assessment sheet of instructional design has a level of reliability coefficient Percentage of Agreement (PA) is 0.80. Furthermore, corrections and suggestions for improvements made to the practicality and effectiveness assessment sheet validator of instructional design is written on a sheet of validation, while the other validator gives notes on the manuscript. Among the corrections and suggestions from the validator are: assessment criteria previously used 5 point scale (very low = 1, Low = 2, moderate = 3, good = 4 and very good = 5) is recommended to use a scale of two (valid = 1 and invalid = 0).

The results of the validation observation sheet practicability of the instructional design and observation sheet teacher's aility to manage learning: Observation sheet of instructional design practicability and observation sheet of teacher's ability to manage learning is one of the instruments used to mea-sure the practicality of the instructional design implementation. The instrument is in validation by six experts and practitioners who assess based on 3 aspects user aspects, content and language and also provide a general assessment of the instrument.

Based on the analysis of data in Table 2, it is concluded that the observation sheet of instructional design practicability and observation sheet of teacher's ability to manage learning can function appropriate to describe the practicality of design in vocational learning. Therefore, the instrument is declared invalid. This instrument has a degree of reliability coefficient Percentage of Agreement (PA), respectively of 0.85 and 0.80. These results show the level of consistency and stability of the validator to the observation sheet of instructional design practicability and observation sheet of teacher's ability to manage learning. Corrections and suggestions for improvements are made to the validation a validation sheet and another validator gave a note on the manuscript. The revised terms are: repair instructions and easily understood language for observer.

The results of the validation of student activity observation sheet: Student activity observation sheet is one of the instruments to obtain data about effectivity supporting the implementation of instructional design. These instruments validated by six experts and sheet directly on practitioners who are judged based on three aspects: user aspects, content and language and also provided a general assessment of student activity observation sheet.

Based on the analysis of data in Table 2 and the criteria, it concluded that the observation sheet of students in learning activities can function properly to illustrate the effectiveness of the implementation of instructional design in the SMK. Therefore, the instrument is declared invalid. This instrument has a degree of reliability coefficient Percentage of Agreement (PA) by 0.79. These results show the level of consistency and stability of the validator to the observation sheet of students in learning activities. In addition, there are some improvements and suggestions made to the validation sheet, namely aspects of the students activity requires the language sharpening to see the differences of activity to be measured the activity of active students adjusted to the activity in the RPP time spent on the activity of the students is not too long, so that, the student activity should be recorded as much as possible during the learning process and give space to the observer to write another activity that emerged in addition to the activity that has been set.

The results of the validation questionnaire responses of students to learning: Questionnaire of students responses to the application of instructional design is one of the instruments to obtain data supporting the effectiveness of the implementation of instructional design. These instruments are validated by six experts as judgment validator including three aspects: user aspects, content and language and also provide an overall assessment of the student responses questionnaire.

According to the results of the analysis of the data in the table that meet the specified criteria concluded that the questionnaire of students responses to the instructional design application can function properly to illustrate the effectiveness of the implementation of instructional design in the SMK. Therefore, the instrument is declared invalid. The next level of consistency and stability of the validator to the questionnaire of students responses coefficient of Percentage Agreement (PA) is 0.83. These results show the level of consistency and stability of the validator to validate the results of student responses questionnaire to the application of instructional design. As with the other validation sheet, some improvements and suggestions are made to the validation sheet such as language and grammar is improved in order to be easy to understand by students.

RESULTS AND DISCUSSION

Preliminary results of the investigation, the design of the underlying instruments in the study of instructional design produces instructional design instruments by entering commands with syntax metacognition systematically arranged. Metacognition orientation that emphasizes independent learning and learners have packed every syntax coloring. The instrument is designed with a grating that has been validated by the validator gives an idea of the feasibility of assessing the design pembelajaan well. The results of the analysis instrument in this study suggests that some of the instruments eligible for use in assessing the design based learning metacognition. Results of research by Sternberg (1998) reported that metacognition is an important part of human capabilities and format to develop expertise.

In addition, the involvement of the metacognition commands in instruments can be understood when one part of the indicators lead to membership of student ability. Medium Bryant (2006) conducts research on educational improvement interpreneurship through self-regulation skills shows that the regulatory framework is an important factor in interpreneurship cognition, decision-making, education and training. Self-regulation is part of metacognition. Cornford (2005) states the importance of theory and metacognitive skills in the learning process effective and competent. Metacognitive skills such as planning, monitoring and evaluation is a major part of the performance of skilled professionals for the working world of adults. This is the basis for the establishment of metacognition because there is concrete evidence showing that metacognitive skills that have been taught widely or effectively improve learning outcomes at all levels of education in the school or outside the school.

Everson and Tobias (2001) reported that there are differences in the ability of effective and ineffective student's metacognitive ability in learning. Noornia (2009) research results found that students who master metacognitive skills will be more capable of dealing with problems. Students will also benefit mainly confidence and become more independent as learners, even a lowability students who learn metacognitive teaching standards are better to solve problems than those who do not learn by metacognitive teaching.

Metacognition based instructional design instrument had a mean of validation by 0.88 and Percentage of Agreement (PA) 0.79. These results include learning plans, books teaching materials user practicum guide, jobsheet, worksheets learners (LKPD) and a valid competency tests of learning outcomes used to do further testing. Validator improvement suggestions regarding the instructions for use, the materials (content) and language. These instruments apply ideas learned that involve metacognition in the workplace. This can be achieved by relatively simple conceptualization steps in the workplace as a learning environment. Most of these challenges to define the domain or the right framework. Furthermore, the concept of routines can be explored to show that the conceptual framework of metacognition things is considered ideal for learning in the workplace.

Winters *et al.* (2008) describes the role of independent learning in computer-based learning environment and Maggioni and Parkinson (2008) discusses the beliefs of teachers on metacognition, self-regulation and self-regulated learning. The results of these studies, recommends six item in the study of metacognitive, self-regulation and self-regulated learning, namely provide a clear definition, identify the theories that are relevant, ensure the assessment reflection process clearly the link with academic results do more research on the development of education and 6 strong relationship of process and teaching methods.

CONCLUSION

Analysis of metacognition based instructional design Instruments is worthy to use for developing instructional design that meet the theoretical and empirical requirements. The instrument includes the analysis, validation sheet of instructional design guidelines, validation sheet of learning device, evaluation sheets of practicality and effectiveness, observation sheets of learning practicability, observation sheet of teachers ability, student activity observation sheet, questionnaire of student responses to learning.

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