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INSTRUCTIONAL MATERIAL DEVELOPMENT OF LABVIEW BASED VIRTUAL INSTRUMENT USING PROJECT BASED LEARNING DESIGN

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ABSTRACT

The purpose of this research were (1) to develop the instructional material Labview of Based Virtual Instrument, an instructional material based on project for instructor, instructional material based on project for student, Labview Based Virtual Instrument trainer and manual book, (2) to test the feasibility and applicability Labview Based Virtual Instrument instructional material. The developed instructional material were applied for Industrial Instrumentation Course, Department of Electrical Engineering, Universitas Negeri Malang, Indonesia. Dick and Carey development model (1990) was applied for this research. This study used formative evaluation to collect both quantitative and qualitative data. The quantitative data about the feasibility of format and content of the instructional material, were obtained from close questionnaire, while the qualitative data about applicability instructional material on Labview Based Virtual Instrument training which is conducted were obtained from open questionnaire. The result of quantitative data were as follows: (1) one to one evaluation done by the first reviewer is 98.05% very feasible, while done by the second reviewer is 95.11% very feasible, (2) small group evaluation is 92.15% very feasible, (3) field trial evaluation is 90.59% very feasible. While the resume of the result of qualitative data that Labview Based Virtual Instrument instructional material were very feasible and applicable in training class. The implementation of instructional material developed needs further consideration to add more time for learning Labview Based Virtual Instrument using project based learning model to have a better perform.

KEYWORDS: Instructional Material, Project Based Learning, Virtual Instrument, Labview, Feasibility, Applicability.

INTRODUCTION:

Modern instrumentation system often involve the use of Personal Computer (PC) for production process, so the term Data Aqcuisition System (DAQ) appears [2]. Virtual instrument is a field of science that combines sensing, hardware and software technology in creating flexible and advanced instruments for control and monitoring applications [4]. These skill can be obtained from learning activities. To support learning activities required the Instructional Material Development of Labview Based Virtual Instrument (IMDLVI).

To improve ability of learners to produce contextual work, it is highly recommended to use a learning approach that produces problem solving based project or called project based learning (PBL) [7]. IMDLVI is designed and packaged with project based learning strategy where students challenged with project tasks to design simple until complex instrumentation system and data acquisition system. The developed instructional materials can be trained students such as: (1) searching, students are assigned on real problem and encouraged to identify the problem, (2) solving, students are guided find alternatives and formulate problem solving strategies, (3) designing, sudents are guided to design a plan for the project, (4) producing / creating, students are guided to produce / create what they have designed, (5) evaluating, students are guided to evaluate the experience, (6) sharing, students are guided to present their work [5].

The product of IMDLVI were applied on Industrial Instrumentation course, Department of Electrical Engineering, Universitas Negeri Malang, Indonesia (TE UM). Based on the observations of authors, there is no learning of virtual instrumention system and data acquisition system. Unlike IMDLVI, students have been guided by detailed theoretical course, practicum done with detailed work steps, and the lack of projects.

MATERIALS AND METHODS:

The research design used Dick and Carey development method (1990) [3]. From 10 steps Dick and Carey method, the author categorizes the research method into three stages, preparation stage, production/ creation stage and evaluation stage.

The feasibility and applicability of IMDLVI are known based on formative evaluation (Step 9 Dick and Carey) consist of three stage as follows: (1) one to one evaluation by 2 expert reviewer, (2) small group evaluation by from 8-15 students who attended the training on 20-21 April 2016, (3) field trial by from 30-40 students who attended the training on 26 April 2016.

The questionnaire grid adopted from the feasibility standard of textbook according to Badan Standar National Pendidikan (BSNP) [8]. While the guidelines for decision making feasibility criteria refer to Sa'dun Akbar [1].

RESULTS AND DISCUSSION:

The product of IMDLVI can be seen in Figure 1.

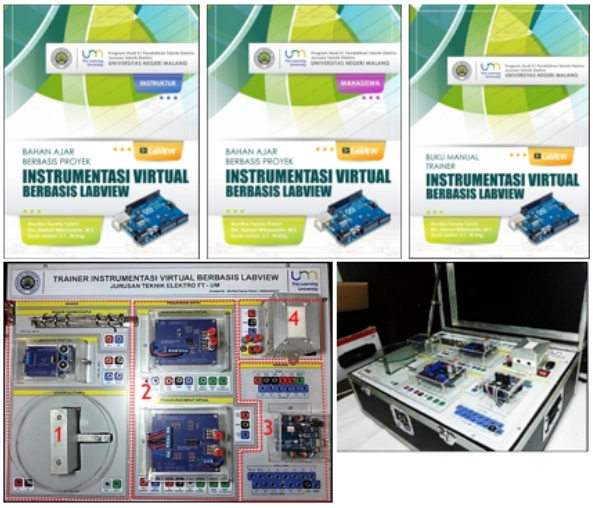

Figure 1. The Product of Instructional Material Development of Labview Based Virtual Instrument

Based on Figure 1 shows that: (1) the instructional material based on project for instructor, (2) the instructional material based on project for student. The difference between the two is on the instructional material based on project for instructor equipped with instructional strategies of learning, project solutions and rubric assessments, (3) Trainer who have been packaged in a suitcase and consists of four part, the sensor part, the signal conditioning part, arduino controller part, and the power part, (4) this trainer also equipped with manual book that contain spesifications trainer, how to maintenance trainer, how to install trainer, safety and health.

The quantitative data which represents the feasibility of product IMDLVI can be seen in Table 1.

Table 1. Quantitative Data of Formative Evaluation Result

Subject	TSe	TSh	Va (%)	Information
Reviewer 1	251	256	98.05%	Very Feasible
Reviewer 2	175	184	95.11%	Very Feasible
Small Group (Evaluation 1)	1430	1600	89.38%	Very Feasible
Small Group (Evaluation 2)	1327	1440	92.15%	Very Feasible
Large Group (Field Trial)	4638	5120	90.59%	Very Feasible
Average			93.056%	Very Feasible

Based on Table 1 shows that the average of subject validation results is 93.056% with very feasible criteria. It can also be seen that the results of the validity of small group evaluation conducted by 2 times of training have a positive impact, increased feasibility of IMDLVI products. The result of validity of evaluation 2 has increased to 92.15% from 89.38% in evaluation 1.

Successful achievement of feasibility and applicability of IMDLVI products can be seen from the success of students using IMDLVI products to make decisions, knowledge and skills independently in complete assigned project task. The successful of IMDLVI products with PBL strategy is important. This is supported by the result of Koch & Klandt's (2006) study, which says that 90% of students who follow the learning process with PBL implementation are confident and optimistic to implement PBL in the world of work and can improve their academic achievement [6].

The qualitative data which represents the applicability of product IMDLVI can be seen in Table 2.

Table 2. Qualitative Data of Formative Evaluation Result

Subject	Opinion & Suggestion	Follow-up
Reviewer 1	IMDLVI products are feasible and applicable in training class. But the lack of training time causes the instructor can not apply the PBL strategy	Adding training time
Reviewer 2	IMDLVI products are good and can be applied in training class. Many students are not familiar with Labview programming so that PBL learning becomes obstructed.	Adding of Labview programming skills prerequisite
Small Group (Evaluation 1)	IMDLVI products are interesting, project corresponding with real field conditions. However, around 4-5 out of 10 students find it difficult to understand the project description, the project activities and the project targets.	Clarifying the project description, the project activities and the project targets.
Small Group (Evaluation 2)	The applicability of IMDLVI products is getting better. Students admitted getting to use it and getting to understand with the given project task	Adding more complex project tasks
Large Group (Field Trial)	Of the 32 students, most opinion that IMDLVI products are feasible and can support the independent learning process	Adding more materials and complex project tasks

Based on Table 2, it can be seen there are some opinions and suggestions from subjects. The opinions and suggestions becomes an input for the improvement of IMDLVI products so IMDLVI products are better.

The feasibility and applicability of IMDLVI products are also influenced by several factors as follows: (1) users (students) who conform the required competency requirements, (2) time required in the application of IMDLVI products in class, (3) robustness of the trainer.

CONCLUSIONS:

Based on the results of research and analysis of data that has been implemented concluded that:

1. The development done successfully develope instructional materials Labview based virtual instrument.

2. The products of this development were very feasible with average is 93.056%. This is avidanced from the results of quantitative data formative evaluation, one to one evaluation done by the first reviewer is 98.05% very feasible, while done by the second reviewer is 95.11% very feasible, small group evaluation is 92.15% very feasible, and field trial evaluation is 90.59% very feasible.

3. The product of this development can be used on Industrial Instrumentation course. This is avidanced from the resume results of qualitative data formative evaluation that IMDLVI products are good, project corresponding with real field conditions and applicable in training class. The implementation of instructional material developed needs further consideration to add more time for learning using project based learning (PBL) model to have a better perform.

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