PROCEEDINGS

4th International Conference on Technical and Vocational Education and Training (TVET)

Theme:
Technical and Vocational Education and Training for Sustainable Societies

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FOREWORD

Welcome for all respected scholars, researchers, post graduate studentsand especially Keynote Speakers to the 4 ICTVET. The theme of the conference focus on Technical and Vocational Education and Training for sustainable societies and consist of six subthemes. i.e Development of learning model on TVET, Workplace Learning and entrepreneurship, Innovationon applied engineering and information technology, Management and Leadership on TVET, Vocational and Technical Teaachers education, and Assessment and Evaluation on TVET.

Sustainable society shoul be followed by the improvement of various factors that have impacts to the quality of vocational and technical education and training, particularly to overcome the competitiveness of the world business. As we have already known the rapid change of technology as well as the change of demography, having a great effects to the life of peoples in this world, The competitiveness need a collaborativeness to survive the life of millions peoples who lost their jobs. Young peoples as aproductive generation have to be creative and innovative to face the competitiveness. So this prociding contents consist of various findings of research in the field of vocational and technical education as well as applied technology and mainly based on the subthemes of the conference.

Finally, we would like to thank a million for all participants of this conference and all parties who support the success of this conference. Hopefully the seminars and scientific work of this seminar can be a reference material for basic education and elementary school teacher education in Indonesia.

Padang, July 2, 2018

Tim Editor

CONTENT PROSIDING ICTVET 2017 REPOSITORY UNP

COLLABORATIVE PROJECT-BASED LEARNING: AN INSTRUCTIONAL DESIGN MODEL IN THERMODYNAMICS ON TECHNICAL VOCATIONAL EDUCATION AND TRAINING (TVET)

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ABSTRACT: This paper explains a collaborative project-based learning in mechanical engineering diploma program on technical vocational education and training (TVET), in Padang. This test is validated through Focus Group Discussion (FGD) and measured by Aiken coefficient 0,840 and limited test to student learning outcomes. Collaborative project-based learning model in thermodynamics consisted of: curriculum analysis and student characteristics; classifying students and provide problems; solve problems together by students in experts group; group students to presentation about problem solving; evaluate learning process of by lecture; plan the project tasks and determine of the project task objectives; making of the project tasks schedule; monitor of the project tasks execution; assessment of the project results and conduct final evaluation of learning outcomes. The result of this research was obtained a collaborative project-based learning (CPJBL) model as a appropriate instructional design in thermodynamics on technical vocational education and training (TVET) with nine syntax and supporting product that validation, practical and effective.

Keywords: Collaborative Project-Based Learning, Instructional Design Model, Thermodynamics, Technical Vocational Education, and Training

1. INTRODUCTION

The 21st century is often referred to as the era of globalization. In this era of vocational education, graduates are required to always be able to adapt to changes in work environment and rapid technological developments in the industry to remain exist and excel. This condition makes the vocational education providers to always seek the formation of competence in vocational education oriented to 21st-century learning skills by developing creative and innovative learning process that emphasizes higher order thinking skills and application of literacy skill development as well as strengthening character education [1]. This is in accordance with the purpose of geared up workforce to accomplish job duty [2]. [3] Vocational education as "organized educational program" which is related to the preparation of individuals for paid or unpaid employment, or for additional preparation for a career requiring.

Thermodynamics is one of the subjects that must be given to students at the Mechanical Engineering Diploma Program, Faculty of Engineering, State University of Padang. But it was based on the observations conducted by the students that it took thermodynamics in Mechanical Engineering Diploma Program were founds that most of the students felt it was difficult to master thermodynamics teaching by well. Whereas the implementation of thermodynamics was often found in the industrial worlds as steam power plants, propulsion and gas power plants, hydro power plants, geothermal power plants, pump installations and piping systems, combustion engines, fluid engines, geothermal power plants, heat exchanger and so on. To understand the concepts and principles of thermodynamics requires the ability of high-level thinking by the students because they are abstract. This is what makes the students difficult to mastering the subject of thermodynamics quickly, turning something abstract into real conditions in the field.

There should be an effort to develop a model of learning that can help students to be able to take thermodynamic material quickly that could to improve motivation, thinking power and creativity of students. The same is explained [4] that quality education can be achieved through improvements in the learning process. Further [4] states that the success of the learning process can not be separated from the role of a teacher. [5] A learning model-material books, films, tapes, and computer-mediated programs and curriculums. Learning model developed should be in accordance with the characteristics of the course, facilitate students in mastering the teaching materials and provide knowledge and skills about the implementation of teaching materials.

The learning model is a reference used by lecturers in delivering teaching materials. [6] a learning models is a plan or a tutorial setting and to shape instructional material-including books, films, tapes, and computer-mediated programs and curriculums (long-term courses of study).

Collaborative project-based learning (CPjBL) is a learning model that can provide reinforcement on cognitive, cognitive and affective aspects to learners. The CPJBL model is a combination of a collaborative learning model with a project-based learning model. Application of learning model by combining several precise methods can be the solution to the problems that occur. One of the effective learning methods to facilitate students in mastering the material was the collaborative learning model. Collaborative learning (CL) model was an umbrella term used for a variety of educational approaches involving a joint intellectual effort by student or teacher [7]. A situation in which two or more people learn or attempt to learn something together [8]. Learning collaboratively in groups refers to an instructional method where the work together toward a common goal [9]. Model of collaborative learning will strengthen student's cognitive competence theoretically**.**

To provide a complex competence about the applicability of the theories studied in the collaborative learning model was to use a project-based learning model. The model of project-based learning (PjBL) is a constructivist pedagogy that intends to bring about in-depth learning by the learner to use an inquiry. PjBL is well suited to helping students become active learners because it situates learning for their learning [10].

Looking at the advantages of CL model and PjBL model above, then the combination of these two learning models called collaborative-project based learning (CPjBL) is suitable for use in thermodynamics learning. The CL model to strengthen student cognition by studying in groups solve the problem given and the PJBL model will train students to think critically to find solutions.

2. VOCATIONAL EDUCATION AND LEARNING MODEL

2.1. Definition of Vocational Education

Vocational education is that part of education which makes an individual more employable in one group of occupations than in another [5]. Vocational education is also designed to develop skills, abilities, understanding, attitudes, works habits and appreciation. [7] also states that vocational education is any education that provides experiences, visual stimuli, affective awareness, cognitive information, or psychomotor skills, and that enhances the vocational development process of exploring, establishing, and maintaining one self in the world of work. Whereas according to [12] vocational and technical education is a program of specialized studies designed to prepare the learner for employment in a particular occupation or family of occupation. It can be concluded that vocational education is education that leads learners to enter the world of work.

2.2. Learning Model and Collaborative Project-Based Learning (CPjBL) Model

The learning model is a plan or a tutorial setting and to shape instructional material-including books, films, tapes, and computer-mediated programs and curriculums (long-term courses of study [13] collaborative project-based learning (CP_JBL) is a learning model combined between a collaborative learning model and a project-based learning model.

[14] Collaborative learning (CL) affords students enormous advantages not available from more traditional instructions because a group - whether it be the whole class or a learning group within the class - can accomplish any meaningful learning and solve problems than any individual can alone.

While project-based learning (PjBL) is well suited to helping students become active learners because it situates learning in real-world problems and makes them responsible for their learning [15]. P_jBL helps students to see that learning and life take place in contexts, context that effect the kind of solutions that are available and possible. The use of the CPjBL model involves students in an active, collaborative, student-centered learning process that develops the problem-solving and self-learning skills needed to meet the challenges of life and careers, in today's increasingly complex environment.

3. RESEARCH METHODS

This research is research and development. [17] Educational Research and Development (R & D) is a process used to develop and validate the educational product. The steps of this process are usually referred to as the R & D cycle, which consists of studying research findings pertinent to the product to be developed, Developing the products based on these findings, field testing it in the setting where it will be used eventually, and revising it to correct the deficiencies found in the field testing stage. In more rigorous programs of R & D, this cycle is repeated until the field test data indicate that the product meets its behaviorally defined objectives**.**

The method of developing Collaborative Project-Based Learning (CPjBL) model in thermodynamics on technical vocational education and training (TVET) at this research was developed using learning descriptions of ADDIE. The ADDIE model is a development model

through the five stages: analysis, design, development or production, implementation or delivery and evaluation. In more detail step of developing model of ADDIE can be seen in figure 1.

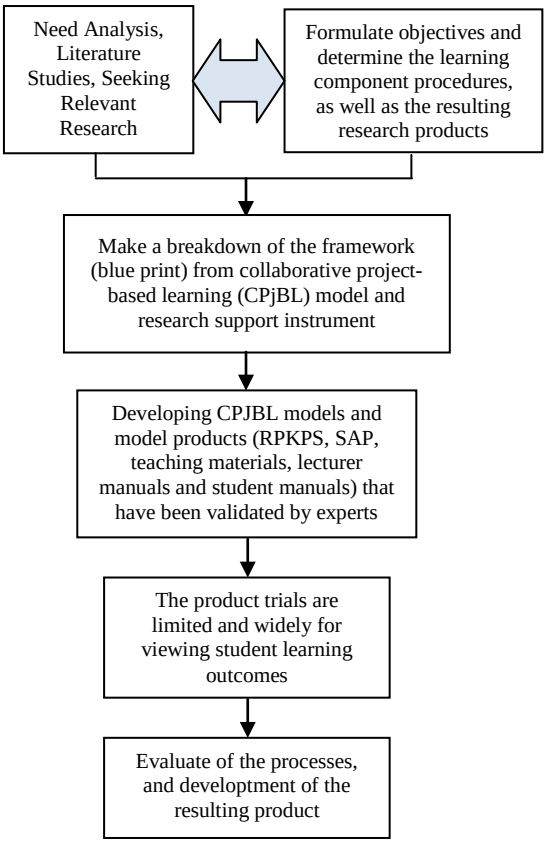
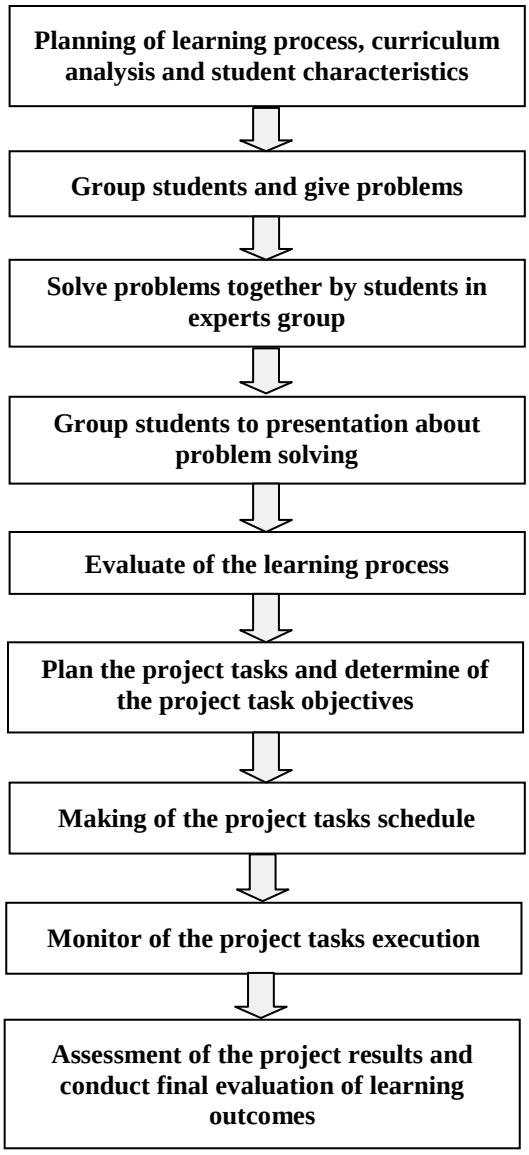


Fig 1. The procedures for developing the ADDIE model

4. RESULTS OF RESEARCH

The result of this research was obtained syntaxs of collaborative project-based learning model in thermodynamics learning process on technical vocational education and training (TVET). The syntax of collaborative project-based learning model (CPjBL) model consists of (1) identifying problems and determining learning objectives; (2) provide problems and create student groups (original and expert groups); (3) solve problems together by students in experts group; (4) group students to presentation about problem solving; (5) lecturers evaluate learning process; (6) plan the project tasks and determine of the project task objectives; (7) making of the project tasks schedule; (8) monitor of the project tasks execution; (9) assessment of the results project and final evaluation of learning outcomes. In the form of flow chart can be explained as in figure 2.



Gambar 2. Nine syntax model CPjBL in thermodynamics on technical vocational education and training (TVET)

5. DISCUSSION

Based on the results of the research of syntax of the collaborative project-based learning (CPjBL) model in thermodynamics on technical vocational education and training (TVET). Implementation of the CPjBL model in thermodynamics was done systematically step as such as:

a. Planning of learning process, curriculum analysis, and student characteristics

The planning of the learning process and curriculum analysis are two of the most important steps. At this stage, the effort is to plan the learning process that will be given to the students. The CPJBL and adapted curriculum are in the Engineering Engineering Diploma Program, Faculty of Engineering, Universitas Negeri Padang. [18] stated that planning is the process of goal setting and that goal. The curriculum analysis aims to identify the teaching materials (problems) that will be distributed to the students [14]. Knowing the characteristics of the students that will be accomplished during the process.

b. Group students and give problems

At this stage, students are grouped into multiple heterogeneous study groups of 4-6 people using a pattern of origin groups and expert groups and each receives problems related to teaching materials [12]. Furthermore, each member of the original group is given a problem that will be solved on this group of experts [13].

c. Solve problems together by students in experts group

At this stage, students in the expert group discuss the same learning materials section, as well as devise a plan how to convey to a friend if they return to the original group [12]. Lecturers facilitate groups of origin and group of experts as long as they learn together to solve problems in the form of provision of teaching materials, study guides and guidance [13]. Each group of experts discussed the problem and sought answers to the teaching materials given after the study guide. Once the problem is solved then they return to the original group to share the results of problem-solving with other members of the original group. Present the problem-solving results in front of the class [14]. Lecturers ask the representatives of each group of origin to present the results of problem-solving that has been obtained according to the given problem.

d. Evaluate the learning process

Lecturers give an evaluation in the form of small test for individual students about teaching materials that have been studied. The process of giving a small test is done at each meeting for 11 weeks. Stages of the learning process from the beginning to the stage of this small test is called a collaborative learning model whose goal is to strengthen students' cognitive competence [15].

e. Plan the project tasks and determine the project task objectives

At this stage, the lecturer assigns project assignments to each group [19]. The lecturer explains the project task framework and determines the objectives to be achieved in the project task. This step is an important step, the task of the project can work well if the purpose of the project task is clear and understood by the students. Making of the project tasks schedule [20].

At this stage lecturers and students jointly develop a project assignments schedule. Preparation of project assignments implementation stages by considering the complexity of the steps.

g. The monitor of the project tasks execution

This stage lecturers always monitor the project tasks assigned to the students. Lecturers help find solutions, if students experience obstacles in doing project tasks [21]. At this stage, the lecturer should also know how far the project work has been done by the students in terms of finding industry relevant to the project task, the achievement of the project tasks, the process of collecting data, analyzing the data and making the final report on the project task.

h. Assessment of the project results and conduct final evaluation of learning outcomes

At this stage, the lecturer facilitates the student in making the project task report, presenting the result of the project task in front of the lecturer and other students. All groups present their project, discuss, and draw the final conclusions of the given project task.

Lecturers and students reflect on the activities and results of project assignments undertaken by students. The reflection process is done both individually and in groups. Lecturers also provide an assessment of the project tasks undertaken by students either individually assessments or group assessments.

Finally, the lecturers give a final evaluation to all students, to measure the mastery of course material by the students during the learning process in the form of final test or also called post-test.

6. CONCLUSION

Collaborative project-based learning (CPjBL) model is an alternative to the instructional design model which is appropriate to TVET. By using this instructional design model, it is expected that the learning process in TVET is more motivating, creativity, innovative and more

fun for students in learning (the learning will be more meaningful).

Further model CPjBl model which has been applied in TVET so as to help students in improving their competence and facilitate them enter the world of work (enter the world of work). Besides this CPjBL model be able to develop of students critical thinking, and having good morale

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9. AUTHOR'S CONTRIBUTIONS

This section should state the contributions made by each author in the preparation, development and publication of this manuscript.

1. **Prof. Dr. Nizawardi Jalinus,M.Ed**i: conception, model design, and interpretation of model to enhance student's learning outcomes and drafting the article.
2. **Krismadinamata, Ph.D**: critical reviewing and final approval of the version to be submitted.

10. ETHICS

This article is original and contains

unpublished material. The corresponding author confirms that all of the other authors have read and approved the manuscript and no ethical issues involved.