Development of an Online Project-Based Learning Assessment Instrument for Vocational Education Students

Pengembangan instrumen penilaian pembelajaran berbasis proyek secara online bagi mahasiswa pendidikan vokasi

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ABSTRACT

Objectives from the study This is an instrument for reliable online project-based learning assessment for vocational education students. Study This uses 10 procedures for the non-ttest instrument developed by Mardapi. The population study covers the whole Electrical Engineering Education student's year at the First Faculty of Engineering, Universitas Negeri Padang. The sample consists of the 250 students selected through two stages: the trial stage, which uses the cluster random sampling method, and the stage measurement, which uses the simple random sampling method. Data analysis was performed using validity tests using the Aiken index as well as validity and reliability tests. Findings study These are (1) instruments. The assessment of project-based learning online consists of 30 valid and reliable items, so it can be used by lecturers. (2) Ability to measure cognitive, affective, and psychomotor skills in the learning process Cognitive, affective, and psychomotor vocational education students tend Good.
Keywords: project-based learning, online assessment instruments, vocational education

ABSTRAK

Tujuan dari penelitian Ini adalah instrumen penilaian pembelajaran berbasis proyek online yang andal bagi siswa pendidikan kejuruan. Penelitian ini menggunakan 10 prosedur instrumen non-ttest yang dikembangkan oleh Mardapi. Populasi penelitian ini meliputi seluruh mahasiswa Pendidikan Teknik Elektro pada Fakultas Teknik Pertama Universitas Negeri Padang. Sampel terdiri dari 250 siswa yang dipilih melalui dua tahap, yaitu tahap uji coba yang menggunakan metode cluster random sampling, dan tahap pengukuran yang menggunakan metode simple random sampling. Analisis data dilakukan dengan uji validitas menggunakan indeks Aiken serta uji validitas dan reliabilitas. Temuan penelitian ini adalah (1) instrumen. Penilaian pembelajaran online berbasis proyek terdiri dari 30 item yang valid dan reliabel, sehingga dapat digunakan oleh dosen. (2) Kemampuan mengukur keterampilan kognitif, afektif, dan psikomotorik dalam proses pembelajaran siswa pendidikan kejuruan kognitif, afektif, dan psikomotorik cenderung Baik.
Kata Kunci: Project Based Learning, instrument penilaian online, pendidikan vokasi

1. Introduction

At the time of this, the project team had become the primary solution in dealing with a large, complex problem. because that ability to carry out projects has become a key skill in overcoming problems in life. because, that is, education tall needs to increase competence in students in projects with methodical and effective teaching so they can succeed in finishing real-world tasks. Approaching learning-based projects (Project-Based Learning, or PjBL) is an instructional strategy that is practically possible to help students solve real problems with

knowledge, skills, and trust in their interdisciplinary selves. PjBL is also proven effective in increasing skills and improving the initial student's own performance (Samsudin et al., 2020). One approach that can be used in integrating approach PjBL to in educational programs tall is with approach Work practice-based project.

Students finish challenge-related new skills that they have learned during projects before and then apply the skills to increase them (Jaime et al., 2016). Problem-based learning (PBL) are different from PjBL because PjBL emphasizes study with do, which helps students finish tasks and projects in an active manner (Barron et al., 1998)Although project-based learning (PjBL) has proven effective, teachers need to make adjustments to the design of eye lessons based on the results of the competence project.

PjBL online is a great teaching method, for teaching students, for participation in construction knowledge at school because of its own feature of communicative online learning(Koh et al., 2010)(Chuang et al., 2015). However, a little study has recommended using the tool report self in the evaluation of competence projects for students. This can be used to customize and repeat design curriculum instructor projects in PjBL online.

Evaluation of competence projects involves various dimensions that are not only related to knowledge and skills but also emotions. Due to the multidimensional nature of competence students, teachers need to adapt their teaching based on competence project students. (Aguinis & Kraiger, 2009) propose scheme classification results. The study composed students from three dimensions of measurement, that is, cognitive, skills-related, and affective. In this study, we define competence as a project that consists of three dimensions: integration knowledge, skills project, and self-efficacy, which are reflected in competence in PjBL. (Aguinis & Kraiger, 2009) also show that evaluation PjBL helps teachers reflect the appearance of students and reduce achievement gaps. In environment learning PjBL, the instrument used to measure competence projects helps teachers understand cognitive, skills-related, and affective performance.

In education, the use of questionnaires has proven effective as one useful method for measuring students' learning and giving support to the inner teacher's efforts to innovate in teaching(Lin, 2018). Ideally, teachers can adapt activity teaching based on results measurements to show competence project students at the right time. A number of studies have evaluated the performance of students in learning-based projects (PjBL) through various approaches to appraisal, like portfolios (Chang & Tseng, 2011), reports, and products (Frank & Barzilia, 2004)With progress in online technology that makes it easy to use in support of PjBL, instructors can easily measure student performance using online instruments. However, some studies only use one instrument to measure cognition, skill, and belief in the context of PjBL online. because that's the goal of the study. This is an instrument that can evaluate competence, project integration knowledge, skills projects, and trust in self in an online PjBL environment. Size scale: cognition, skill, and belief This is defined based on the described perspective _ in studies related to the project and the results of an interview with the project's adviser.

Overview Literature
Evaluation in a Learning-Based Project

The concept initiated by Dewey is the concept of learning by doing. PjBL has proven to be effective learning in learning discussion scientific(Alozie et al., 2010) as well as characteristic understanding scientific (Holm, 2011)as well as having a positive impact on attitude of scientific students, academic achievements, and interests for pursuing a career in science (Kanter & Konstantopoulos, 2010). In high education, PjBL has also proven to be a main means of increasing science learning (Guo et al., 2020)(Gülbahar & Tinmaz, 2006)(Pan et al., 2021)(Y. Lou & Kim MacGregor, 2004) Conclusion from studies This shows that PjBL significantly increases cognition, skill, and emotion in students' science learning.

However, one main challenge in PjBL is appraisal. A number of researchers have used e-

portfolios as a tool to evaluate the results of PjBL students; however, to do so, it is necessary to collect various results from students and clear criteria and judgments(S. J. Lou et al., 2014) (Ralph, 2016).In PjBL, students combine knowledge and skills related to finishing projects and creating artifacts. With the objective of making students realize mistakes and deficiencies in PjBL, assessment is not only done at the end of learning but also during the learning process(Jaime et al., 2016)

Lots of research has described characteristics of participants' education, like preferences, perceptions, beliefs, attitudes, and self-efficacy, as being related to the use of technology for information and learning (Lin, 2018)(Li et al., 2020)(Fang et al., 2008) because that's important for instructor PjBL For evaluating competence projects covering students' three dimensions, that is, cognition, skills, and self-efficacy, as well as adapting design instructions based on the results of the evaluation

Combine three methods of learning, that is, PjBL, spiral learning, and peer assessment, to increase student performance while studying management project knowledge on computers. Although a quality project team can be considered one of the criteria for evaluating performance of students in PjBL, instructors also need to measure competence of individual students using appropriate instruments and understand their progress in learning in the PjBL online environment. Remember the multidimensional nature of the competence project, and rate the competence project student in the PjBL environment as one of the main challenges in the course. Taxonomy of objective learning, which is historically divided into categories cognitive, psychomotor, and affective(Stolk & Martello, 2019), is used to describe and measure various aspects of competence in students.

The taxonomy objective learning developed by Simpson and Bloom has been integrated into the categories of cognitive, based skills, and affective as results learning. For every category, there are relevant constructs, such as organization knowledge, compilation, and self-efficacy, which can be measured through self-report or method evaluation. A number of studies also emphasize that development competence involves the integration of knowledge, skills, and attitudes(Bouw et al., 2019) (Lizzio & Wilson, 2004) (Lizzio & Wilson, 2004). Important To ensure that construct evaluation is used in accordance with objective instructional goals, it can help students reach their objectives.

Besides the necessary cognition for integration knowledge, the learner must also own skills original to finish projects in PjBL online. Skills are required to finish projects, including skills in presentation, people skills, skills related to time, creativity, independence, and skill administration(Milentijevic et al., 2008).

Five abilities of PjBL are also identified (a) organizing, planning, allocating, and identifying source power; (b) working the same with other people; (c) acquiring and using information; (d) understanding complex connections; and (e) working with various technologies(Scarbrough et al., 2004). Students must use skills technology in the PjBL online environment to create native artifacts and interact with others. Learner PjBL online requires intrapersonal skills besides interpersonal skills to finish task projects and talk about task projects with other people.With various approaches to learning, such as planning learning, organizing research, designing questions for yourself, and applying various approaches to learning, PjBL is important for building a learner and thinker self that can solve real-world problems(Scarbrough et al., 2004)(Park Rogers et al., 2011). Project and team projects are tools or very effective tools for learning for individuals and teams. They can help increase learning organization in a holistic manner. Students must finish artifacts, analyze source power online, and use tool technology to finish the project.

2. Methodology

Study This objective is to develop a project-based learning online instrument that has

good validity and reliability. _ Study This is done with an approach that is descriptive and quantitative and constitutes study development. Procedure development instrument in study This refers to the 10 steps proposed for the development of instrument notes. The steps are as follows: first, determine specification instruments; second, write instruments; third, determine scale instruments; fourth, determine system assessment; Fifth, study instruments; sixth, conduct trials; seventh, analyze instruments; eighth, assemble instruments; ninth, measure; and tenth, interpret results from measurement.

Table 1. Indicator of online Project Based Learning assessment instrument

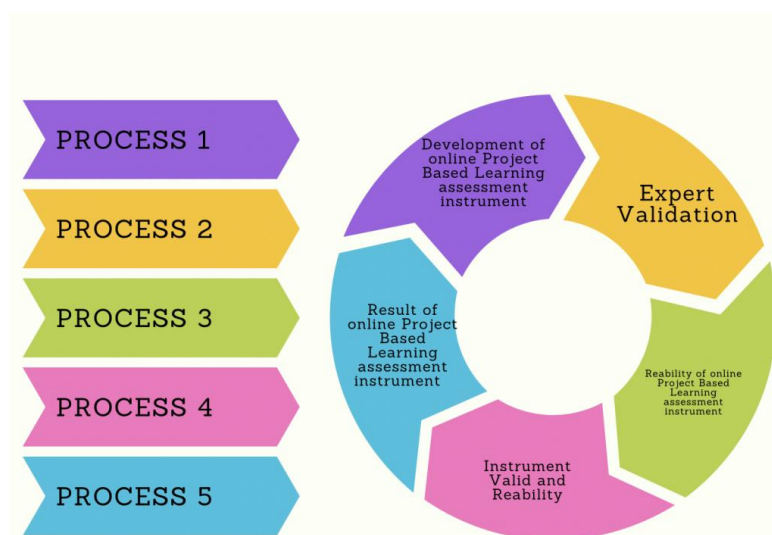| Name	Source	subscale
Knowledge	Chien -Liang Lin (2017)	organizing, planning, allocating identification source Power
Attitude	Farintis jihad Alivi and Widihastuti (2021)	attitude self esteem Interest Value Moral
Skills	Chien -Liang Lin(2017)	Work The same with other people obtain and use information

Fig. 1 Flowchart of methodology

Skills Projects at PjBL Online
Sample and Data Collection

Study This involves a population of 250 people for the entire first year of Electrical Engineering Education. For necessity in research, sample sharing becomes two groups: sample trials and sample measurement. Determination process: trial sample is done with the use of a random sampling method, while determination sample measurement is done with the use of a simple random sampling method. The amount of sample taken in trials and measurements is customized with a small sample, i.e., as many as 100 students. Instrument evaluation for project-based learning online has developed with the use of three aspects and 12 indicators. In aspect knowledge, there are four indicators that include organizing, planning, allocating, identifying, and sourcing power. Aspect attitude has five indicators, namely attitude, self-esteem, interest, value, and morale. Temporary that aspect of psychomotor consists of two

indicators, that is, work the same with others and earn as well as use information. Instrument This uses a Likert scale with four alternative solutions (strongly agree, agree, no agree, and strongly disagree). Alternative presented solutions are relevant events with life students. In total , instruments This has 30 items that measure three aspects(Kusmaryono et al., 2022)

Categories of online project-based learning assessment instruments

Category used in the online project-based learning assessment instrument. Is with the use of the categories "average" and standard ideal deviation .

Table 2. Categories of online project-based learning assessment instruments

Score	Category
$X \geq \bar{X} + 1.5SB_x$	Very Good
$\bar{X} + 1.5SB_x > X \geq \bar{X}$	Good
$\bar{X} > X \geq \bar{X} - 1.5SB_x$	Poor
$X < \bar{X} - 1.5SB_x$	Very Poor

Data Analysis

Validity content refers to the extent to which the elements in instrument measurement are relevant and representative of objective measurement. For ensuring validity of content instrument evaluation, self-awareness developed by three experts has been validated for the arranged items. Experts are chosen based on their field skills, which include research and evaluation chemistry as well as education.

Experts: This evaluates the instrument, delivers a score on each item, and also gives criticism and suggestions through the column of available comments. _ Scores from the validators were then analyzed using the Aiken-based formula equation. Criteria validity, as listed in Aiken tables, and the suggestions provided by the validators were used for repair instrument evaluation. Analysis of validity content done with objective(Gabriela & Susana, 2021).For increased quality, the

$$V = \frac{\sum n_i}{n(c-1)} \dots [1]$$

Reliability, on the other hand, can be counted using Cronbach's alpha formula technique.

$$r_{11} = \left[\frac{k}{(k-1)}\right]\left[1 - \frac{\sum \sigma^2 b}{\sigma^2 t}\right] \dots 2$$

After obtaining the price r count, the next step is to determine whether the instrument is reliable or not. If the price r table shows a level error of 5%, it is possible to conclude that the instrument is reliable and capable of being used for research.

3. Results and Discussion

Instrumental assessment of online project-based learning that has been developed consists of three aspects: cognitive, affective, and psychomotor. Every aspect has several indicators of the 10 question items. Instrument This uses a Likert scale with four alternative solutions. Quality is determined through validity and reliability

Table 3. Assessment of Validity Results by Experts

grain	Evaluator			$\sum$S	V	Ket
	1	2	3			
1—30	66	69	68	203	0.958333	Valid

Table 4 . Reliability Test Instrument

Indicators	R count	R table	Information
cognitive	0.765	0.361	Realiable

| affective | 0.850 | 0.361 | Realiable |
| Psychomotor | 0.456 | 0.361 | Realiable |

Assessment Results Ability Affective Student

Evaluation Ability: affective student addressed For students pursuing affective vocational education. The result of the evaluation of affective students can be seen in Figure 2. Based on the picture, the ability affective students tend to be very good with presentation (77.8%), category good (7.5%).
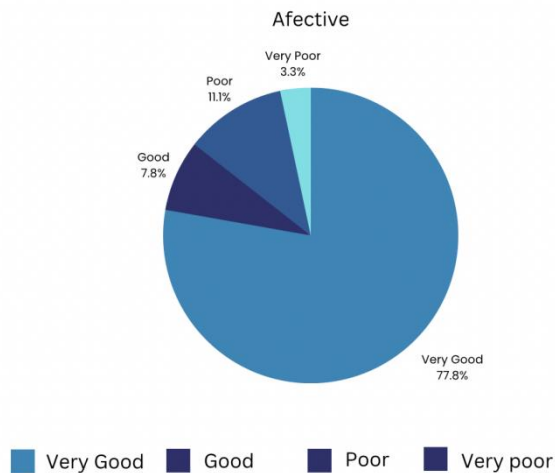

Figure 2. Affective abilities of students

Assessment Results: Students' Cognitive Ability

Evaluation results of the ability of cognitive students with an online project-based learning assessment instrument are seen in figure 3. Ability results for vocational education students: 60% Very good, followed by categories Good with a good 20% presentation.
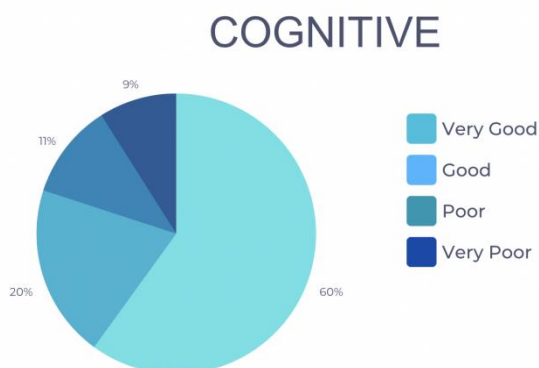

Figure 3. Cognitive abilities of students

Assessment Results: Psychomotor Ability of Students

Ability Psychomotor assessed students using the online Project Based Learning assessment instrument, it was found that 68% were in the very good category and 12% were categorized as good. The result can seen in figure 4.
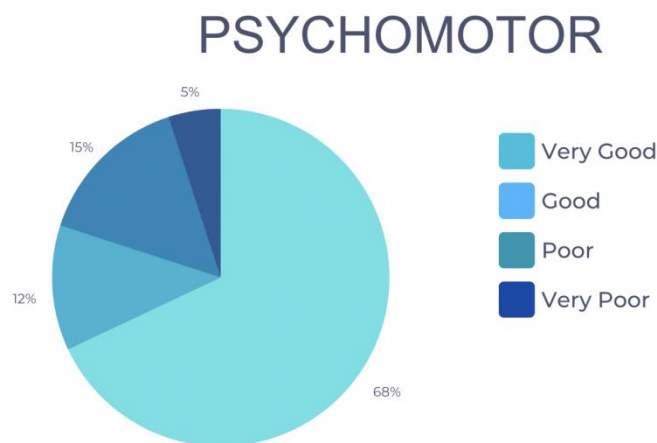
PSYCHOMOTOR

Figure 4. Psychomotor ability students

Research results include the online development of an aligned project-based learning assessment instrument with study validation, where the instrument standard was arranged through a process of validation by an assessment expert for refinement, followed by the empirical validation process to determine validity and reliability of the instrument. There is an assessment process that will increase the attitude of students toward learning(Bangkara et al., 2022). Besides that, other studies reveal a connection between affective and cognitive abilities in which students with good affective abilities tend to have good cognitive abilities. (Moreno-Ruiz et al., 2019)This demonstrates that affective evaluation with a high-quality instrument can be beneficial for cognitive evaluation.

4. Conclusion

The development of an online Project Based Learning assessment instrument is used For measure how far you can effective, cognitive as well as psychomotor students who use the Project Based Learning model. The results of the development of the Project Based Learning assessment online instrument show 30 valid and reliable items for used in measure ability affective, cognitive and psychomotor student. Furthermore, expected assessment from can used by lecturers or inner teacher evaluate ability student.

Next, hopefully instrument evaluation self-affective chemistry This can used by teachers in assessing the learning process. Ability trends realm affective student. The results of the online Project Based Learning assessment also show ability students who use the project-based learning ability learning model affective, psychomotor, cognitive very good students.

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