Validity And Practicality Of The Cooperative Project Based Learning Model On Smart Learning Environment In Java Programming Courses

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Abstract :

Cooperative-based learning using projects in the Java Programming course, it is hoped that each student will have competence in the field of source code analysis and be able to create programs in the Java programming language. In fact, in the field students tend to have difficulties in mastering Java programming teaching materials and their application in the laboratory. Cooperative Project Based Learning on Smart Learning Environment is a collaborative learning model that makes it easier for students to understand learning. This research is an R&D research as a development method using the Borg and Gall model. This research produced a product in the form of a new learning model accompanied by a guidebook for teachers, prospective students, and model books. The result of this research tell that this cooperative project based learning on smart learning environment is valid and practical to use as learning model at Java Programming course.

Keywords: Cooperative Project Based Learning, Smart Learning Environment, Java Programming, Validity, Practicality

INTRODUCTION

The development of Information and Communication Technology (ICT) in the 21st century has resulted in significant changes to human life that have affected nearly all parties on a global scale (Krismadinata, et, al, 2020); (Yuliardi, dkk, 2022); (Simeru, & Lubis, 2022). The role of ICT affects various aspects of life and human civilization including in the education sector. (Vitriani, et, al, 2020).

Therefore, it is hoped that ICT will enhance the quality of education (Verawadina, et, al, 2020). The escalation of the quality of education is most important in the development of education. The future success of the citizens' civilization is highly dependent on the quality of the nation's education. Vocational education at the level of a senior high school known as Vocational High School prepares students to work on their vocational competencies and become skilled, competitive, and powerful employees in their respective fields (Hendriyani, et, al, 2020); (Rizal,et, al, 2022); (Kurnia et, al, 2022).

In cooperative-based learning utilizing projects in Programming Language I (Java) courses, students are expected to have expertise in the area of source code program analysis and the ability to create programs in the Java programming language. In fact, students tend to have difficulties mastering the Programming Language I course materials and their application in the laboratory. In this case, it is obvious that an integrated learning model capable of providing solutions pertaining to comprehension and mastery of Java Programming Language course material is required.

A scientific approach is used to learn the programming language courses. This approach applies a science-based practicum or experiments with specific goals and rules with the main goal of providing skills to understand and explain basic programming concepts, analyze program source code, and make correct programs individually by using the Java programming language.

The scientific method consists of several processes, including the following: observing, formulating hypotheses or questions, associating ideas or conducting experiments, gathering or analyzing data, and communicating findings. The process of learning the experimental method is essentially a scientific method for proving hypotheses through logical reasoning. Several studies have demonstrated that cooperative students can achieve higher grades than students who work alone (Nagappan, et al., 2003: 361; McDowell, et al., 2002: 42; Williams, et al., 2002: 197), in addition to making programming more efficient, fostering self-confidence, and instilling a sense of responsibility (Layman, 2005: 36).

The learning model is an initiative to facilitate education by utilizing a set of specially regulated activities. This model is intended to promote specific learning outcomes related to academic discipline standards (Kilbane & Milman, 2014). In addition, this model according to (B. Joyce et al., 2015) is a description of the learning environment

explaining curriculum planning, courses, learning unit designs, learning equipment, textbooks, multimedia programs, and learning aids through computer programs. Based on this definition, the essence of teaching, according to Joyce and Weil, is the effort to enable students to comprehend information, ideas, and skills, and to enable them to think and learn in order to comprehend what is expected.

The learning model is the steps that are applied in the learning process. These characteristics are: (l) The logical theoretical thinking of the creator or developer, (2) the learning objectives achieved, (3) teaching behavior (4) learning environment (Kardi Soeparman, 2000). Richard I Arends, (1997:7) contains goals, syntax, environment and management. Furthermore Arends states that the learning model consists of direct instruction models, cooperative learning models, problem based learning models, discussion learning models, strategy learning models.

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The CPjBL learning model is an integration between Cooperative Based Learning (CBL) and Project Based Learning (PjBL). Integrating these two learning models is necessary to synergize the CBL model with the PjBL model in learning process. The project-based innovative learning model (PjBL) is a learning model that can effectively stimulate and motivate students to solve problems and develop their potential. This model necessitates that students have a solid grasp of knowledge concepts before beginning the model project.

Project-based learning is problem-solving-oriented and innovative learning emphasizing contextual learning through the implementation of multiple stages of complex activities to solve problems related to real-world issues based on constructivism theory (Doppelt, 2003). Students construct knowledge and skills in order to acquire learning experiences and actively hone their own skills. This model encourages students to engage in meaningful learning activities, complete assignments and problems in groups, and learn in an enjoyable manner. Students are permitted to work independently with their teams, explore and construct knowledge, and seek learning experiences in order

to produce original, valuable, and realistic work and creations (Okudan & Sarah E, 2004).

The collaborative learning is unlike traditional learning. It facilitates student learning; by exchanging ideas and taking responsibility for the outcomes of group and individual learning, students are able to exchange ideas and learn more efficiently through group work. While conventional learning has the characteristics of traditional systems of instruction. Cooperative and collaborative learning models are innovative and purposeful learning, learning that prioritizes collaboration, trains students to communicate, learn in groups, and interact socially in order to achieve learning objectives.

Smart learning environment (SLE) is a form of development from electronic learning shifting to network use, so that all subsystems in the learning process can be properly integrated to support learning interactions that occur anytime, anywhere, and with anyone. According to (X. Liu, R. Huang, 2016), it is defined as an open, intelligent space and learning process that is integrated with constructivism learning theory. SLE shares conceptual similarities with online learning, which allows learning activities to be conducted anywhere and at any time as long as the device is connected to the internet (Horn, Michael B., and Staker, 2011).

According to (Lawlor, 2012), the best way to comprehend learner behavior is to consider learning and interaction analysis. Students' behavior in the management of the learning process is monitored by a number of intelligent digital devices that provide direct feedback about their learning behavior and assist students in determining the value of their studies. In SLE, the lecturer performs analytics or analysis of intelligent student learning that interacts with other students and the technology used for effective and intelligent (smart) interaction activities.

The CPjBL based on the SLE learning model is based on constructivism and connectivism learning theory. (Asnur, et, al, 2020); (Simanungkalit, & Tarigan, 2022). In its implementation, students are divided into small groups that collaborate to complete an agreed-upon project. They will employ a variety of skills, project completion procedures, and critical thinking.

This learning begins by presenting real problems where completion requires collaboration among students collaboratively.

The Lecturer's role in the CPjBL On SLE learning model is to act as a student guide in deconstructing problem-solving plans into activity stages. Lecturers provide examples of the required skills and strategies to complete the tasks. Here, lecturers play a role in fostering a flexible and student-project-focused environment in the classroom.

The relevant model development must accommodate 21st century and vocational learning For the development of the Cooperative Project-Based Learning on the SLE learning model, the Project-Based Learning slice with cooperative STAD type should be utilized in conjunction with the Smart Learning Environment methodology. The explanation of syntax is as follows: Motivating and establishing learning objectives and accomplishments, at this stage the lecturer provides motivation so that there is stimulus and metacognition encouraging students to be more enthusiastic in learning activities. Additionally, the objectives and learning outcomes are described so that students are aware of the required learning outcomes. In order to create technology-based groups and formulate problems, the division of groups will be determined using technology built through the Smart Learning application with the concept of login validation through student face detection therefore the students are able to enter the system. Moreover, the initial ability test questions will be available to classify student groups based on the results of the initial test. Then, at this stage, the problem is also formulated and the topic of the case is selected for discussion in the group.

METHOD

Research and development (R&D) is structured and systematic research that begins with analyzing, designing, developing, implementing, and evaluating processes to produce an empirical basis for the creation of newly developed products. According to Sugiyono (2009), the purpose of R&D-based model development is to produce and evaluate learning products. In the implementation of learning in the classroom or laboratory, analysis of development needs to produce learning products can be conducted via survey techniques or qualitative research. Experimental research is used to examine the effectiveness of product development results.

The Borg & Gall development model is an instructional development model based on research and development (R&D). This type of model is also used by model developers to develop or create educational products. Borg & Gall (1989) stated that “Research and

development in educational instruction is the process used to develop and to validate some educational product". The learning model of educational products must be examined to determine their level of validity and applicability. Research and development aim not only to improve existing products but also to create new products in solving learning problems.

The product's validity is evaluated by experts and practitioners. A product is considered valid if it developed with sufficient theory, also known as content validity, and if all product components are consistently interconnected, also known as construct validity (Hafiz, 2013).

Model validity data is gathered via questionnaires including (1) model books; (2) lecturer's handbook; and (3) student handbook. The data that can be in the form of qualitative and quantitative data. Quantitative data comes from filling out questionnaires while qualitative data is in the form of suggestions from the validator.

After the research product has been validated, the next test is its applicability. This experiment is conducted to determine the applicability of the teaching and learning tools employed by educators and students. Practicality data are obtained from practicality questionnaires by educators and students on the implementation of Java Programming Course using the Cooperative Project Based Learning on SLE model.

RESULTS AND DISCUSSION

This study develops a Cooperative Project Based Learning (CPjBL) model based on SLE Learning in the Java Programming course at the level of tertiary institutions. This model is created using procedural development stages based on needs analysis to identify learning problems. Before developing Cooperative Project-Based Learning on the SLE learning model, it is necessary to conduct a curriculum analysis and a needs analysis to ensure that the development process yields the best possible outcomes. This analysis serves as a guide during its development.

The relevant model development must accommodate learning needs based on 21st century skills and vocational philosophy. The development of the Cooperative Project Based Learning on SLE learning model in the Java Programming Language Course takes a slice of Project Based Learning cooperatively using the Smart Learning Environment approach. The syntax is as follows:

1. Motivating and establishing learning goals and achievements. At this stage, the lecturer provides motivation to students to bring up stimulus and metacognition.
2. Creating technologically-based groups and formulating problems. At this stage, the Smart Learning application will be used to divide students into groups.
3. Conducting a review and analysis of cases. In this stage, reviews are conducted from a variety of sources utilizing the provided information technology as part of smart learning.
4. Designing a project. At this stage, a group of students designs a project in the form of a prototype or draft.
5. Creating projects and establishing online monitoring, at this stage, projects are created in accordance with their design stages, and project results are collected using intelligent learning applications.
6. Project presentation. At this stage, the presentation of the project results is carried out.
7. Evaluation. At this stage, an assessment is performed to determine the score of the student projects' learning outcomes.
8. Reconition and Reflection, in which students are recognized for their excellent academic accomplishments.Designing a project. At this stage, group of students design a project in the form of a prototype or draft.
9. Creating projects and establishing online monitoring, at this stage, projects are created in accordance with their design stages, and project results are collected using intelligent learning applications.
10. Final project presentation. At this stage, the presentation of the project results is conducted
11. Evaluation. At this stage, an assessment is performed to determine the score of the student projects' learning outcomes.
12. Reconition and Reflections, in which students are recognized for their excellent academic accomplishments.

In order to produce a valid learning model, the stage of development is accelerated based on the learning model's components. According to Rusman (2012), the learning model's components include syntax, social systems, reaction principles, and support systems. This study is conducted also based on these components. Then the validation of Cooperative Project-Based Learning on SLE is performed by experts with the necessary knowledge and skills in accordance with the development of learning models for the Java programming course. The steps involved in validating this model uses a Likert scale questionnaire.

The level of validity of the developed product for this study is determined through a validation test. The test of validity includes (a) model validation, (b) module validation, (c) lecturer guide validation, (d) student guide validation, (e) product validation, (f) product usability validation, and (g) syntax validation. Validation is performed by several experts in related fields who act as validators, and this validation questionnaire includes elements that must be present in order to conduct product validation.

Figure 1 shows the book cover of Cooperative Project Based Learning on SLE. Moreover, its validation results are presented in Table 1. At the validation stage, the model assessment is carried out by 5 experts from all aspects as presented in Table 1, the validity score of the Cooperative Project Based Learning on SLE model is 0.89, indicating that this model is declared valid.

Figure 1. The Model Book of Cooperative Project Based Learning on SLE

Table 1. The validation results of the Model of Cooperative Project Based Learning on SLE

Aspect	Average Score
Rational model	0.87
Model supporting theory	0.92
Model characteristic	0.85
Model syntax	0.89
Social system	0.90
Reaction principle	0.90
Support system	0.90
Instructional impact and accompaniment	0.87
Average score	0.89

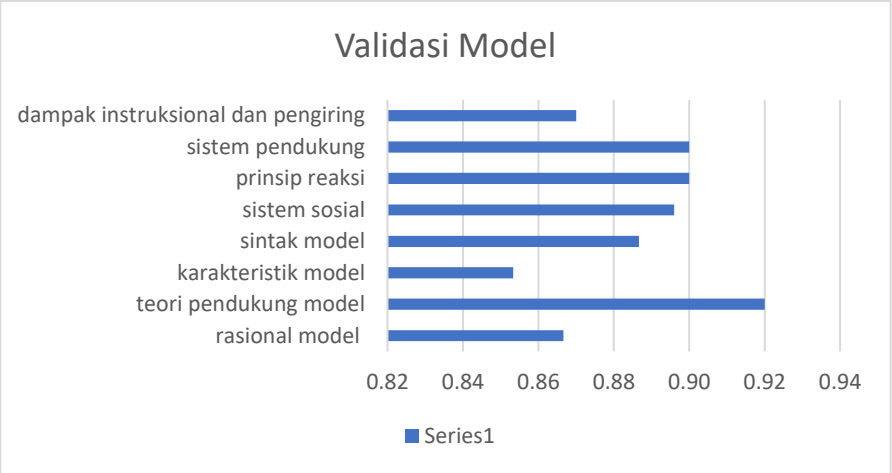

Figure 2. Validation Results of Cooperative Project Based Learning on SLE Model

.Figure 3 depicts the module cover for the Java Programming course. This module is also evaluated by 5 validators including several aspects presented in Table 2. According to validation results, this module can be classified as valid with the overall score is 0.89.

Figure 3. Modul of the Java Programming Course

Table 3. Validation results of the Cooperative Project Based Learning on SLE Module

Aspect	Average Score
Self instruction	0.90
Self contained	0.87
Adaptif	0.86
User friendly	0.90
Graphical aspect	0.88
Language aspect	0.90
Evaluation system	0.89
Average score	0.89

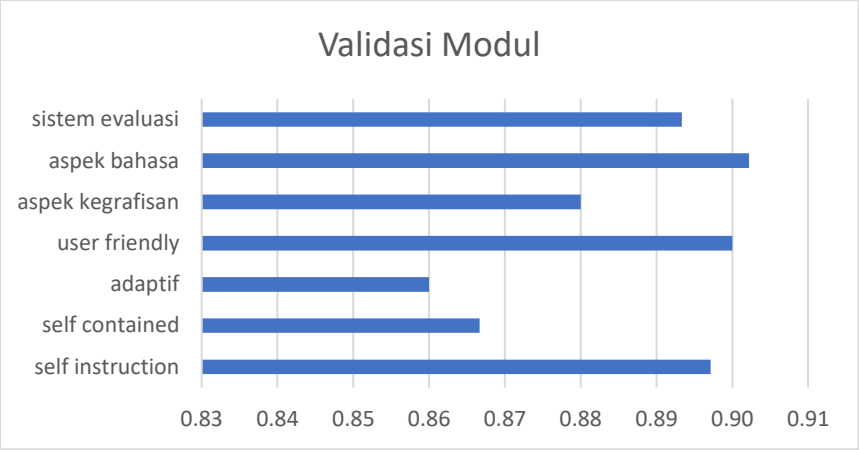

Figure 4. Validation Results of Cooperative Project Based Learning on SLE Module

The following validation is carried ouu to define the valifity of lecturer's handbook with the same validators. Table 4 demonstrates that this manual is also classified as valid, with an average score of 0.88.

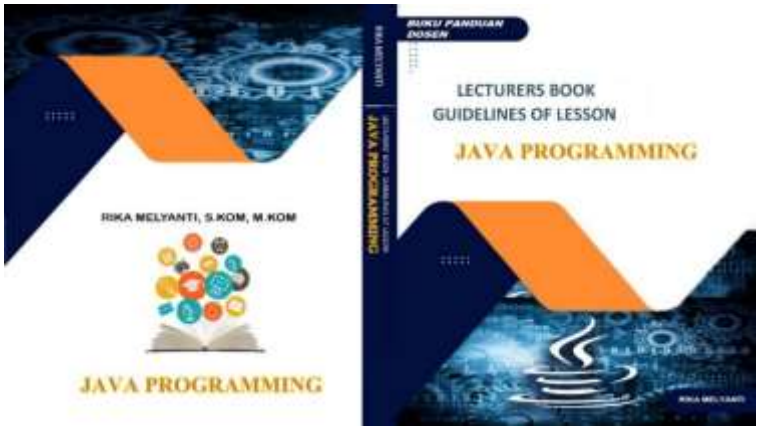

Figure 5. Lecturer's Handbook

Table 4. Validation results of Leacturer's handbook

Aspect	Score
Writing format	0.89
Language use	0.89
Introduction	0.87
Content	0.87
System of assessment	0.89
Average score	0.88

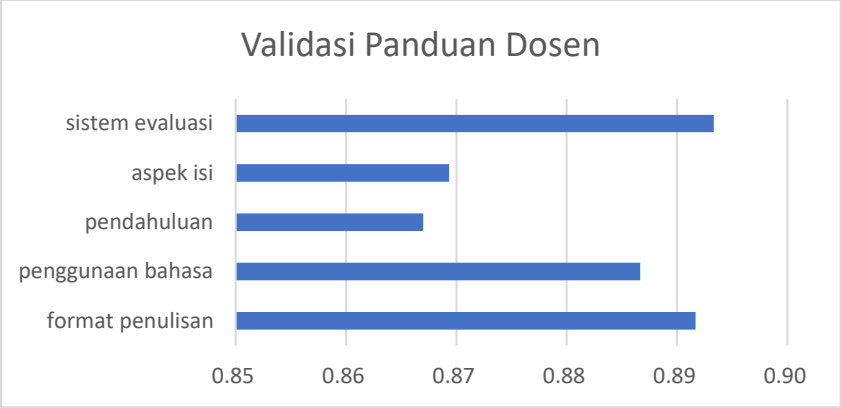

Figure 6. Results of Lecturer's Handbook

The next validation is established to observe the validity of the students' handbook which is evaluated by the previous validators. This validation also acquires a satisfying result that is 0.87 for an overall score. The detailed results can be seen in Table 5.

Figure 7. The of Students's Handbook

Table 5. Validation results of Student's handbook

Aspect	Score
Writing format	0.87
Language use	0.88
Introduction	0.87
Content	0.85
System of assessment	0.86
Average score	0.87

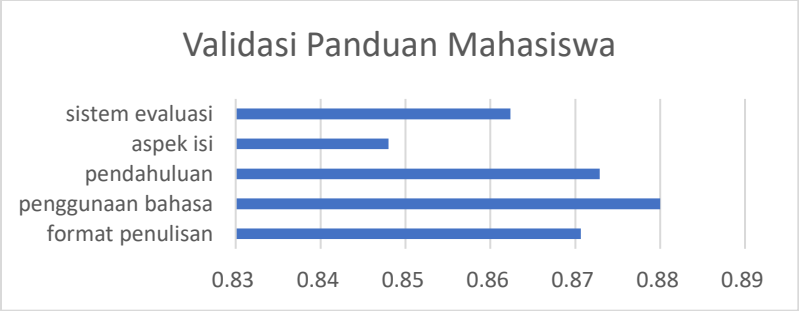

Figure 8. Validation results of Students's Handbook

The further evaluation is to validate the Smart Learning Environment Handbook. This validation is also done by 5 experts with all obtained results classified as a valid category as presented in table 6.

Figure 9. Smart Learning Environment Handbook

Table 6. Validation results of Smart Learning Environment Handbook

Aspect	Score
Feasibility of the validity instrument contents	0.87
Appropriateness of the validity instrument language	0.87
Appropriateness of graphic aspect	0.90
Average score	0.88

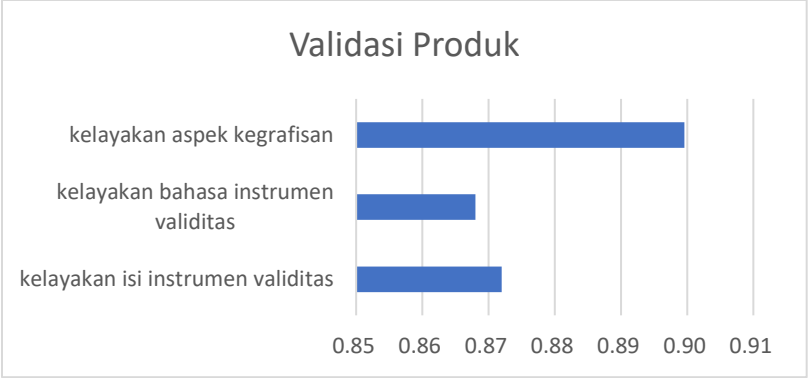

Figure 10. Product validation results

The next test is to verify the Product Practicality Instrument. This validation is also performed by the same validators covering three aspects as presented in table 7. In this test, the obtained average score is 0.89.

Table 7. Validation of Product Practicality Instrument

Aspect	**Score**
The contents feasibility of the practicality instrument	0.89
Feasibility of practicality instruments	0.88
The feasibility of graphical aspects	0.90
Average Score	0.89

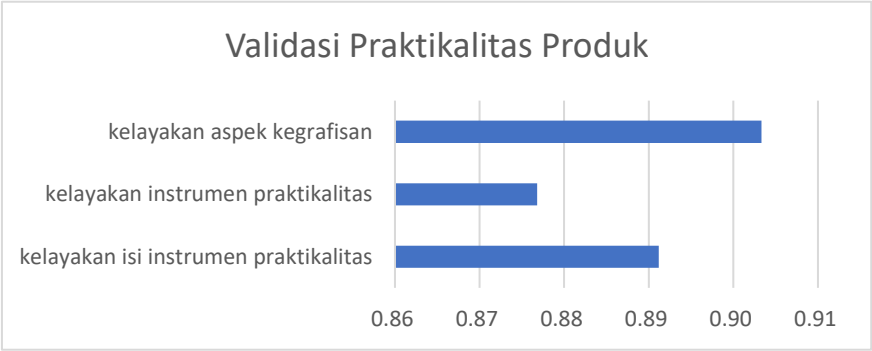

Figure 11. V**alidation of Product Practicality Instrument**

The final validation is conducted to determine the validity of the built - syntax. The obtained results indicate that all aspects have been declared valid, with an average score of 0.87.

Table 8. Syntax Validation Results

Aspect	Score
Motivating and establishing learning objectives	0.87
Creating group based on technology and formuating issue	0.88
Conducting review and analyzing case	0.87
Creating project and performing online monitoring	0.89
Establishing project presentation	0.86
Evaluation	0.86
Recognition and reflection	0.83
Average score	0.87

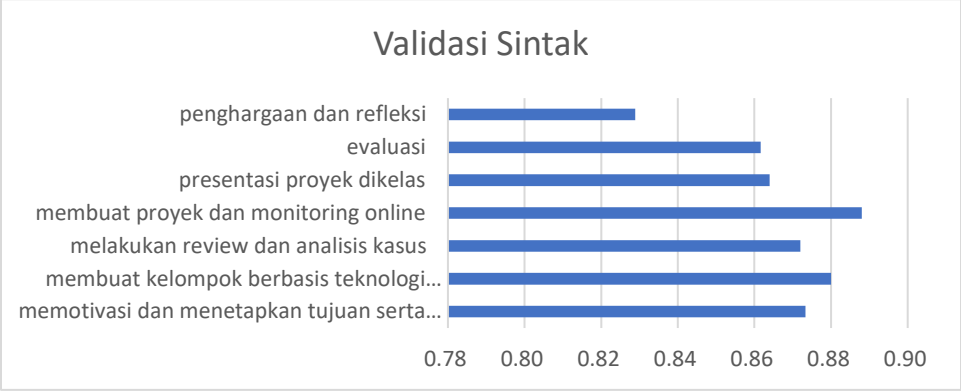

Figure 12. The results of syntax validation

The practicality test used in the research and development (R&D) process is obtained based on the assessment of practitioners and observers by educators and students after all of the learning tools have been validated, revised, and the results have been declared valid. A practicality test is used to determine the viability of the developed model in order to meet the research questions. The practicality test is carried out by distributing questionnaires to lecturers and students who were involved in the model's development.

All products resulting from the development of the Cooperative Project Based Learning on the SLE learning model are evaluated and tested for practicality including (1) the learning model book, (2) the lecturer handbook, (3) the student handbook, and (4) the module book. The lecturer's response questionnaire includes questions about the practicality of the lecturer's guidebook, the teaching modules, and the learning model. Whereas student responses include aspects of the practicability of the student

guidebook, the teaching modules, and the learning model, respectively.

Table 9. The practicality test results toward Lectures responses

Aspect	Score
Practicality of the learning model	0.88
Practility of the learning module	0.88
Practility of the lecture handbook	0.91
Average score	0.89

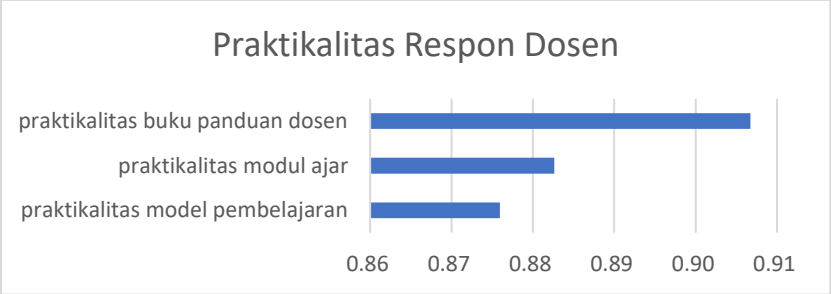

Figure 9. The practicality test results toward Lectures responses

Based on the results of the practicality test of the lecturer's response to the image, which was conducted by distributing a questionnaire on the lecturer's perception of the developed model, the test group, which consisted of five lecturers supporting the Java Programming course, obtained an average result value of 0.89, indicating that the lecturer's response to guidebooks, models, and learning models is categorized as highly practical.

Table 9. The test results' practicality of students' responses

Aspect	Score
Practicality of the learning model	0.88
Practility of the learning module	0.87
Practility of the lecture handbook	0.87
Average score	0.87

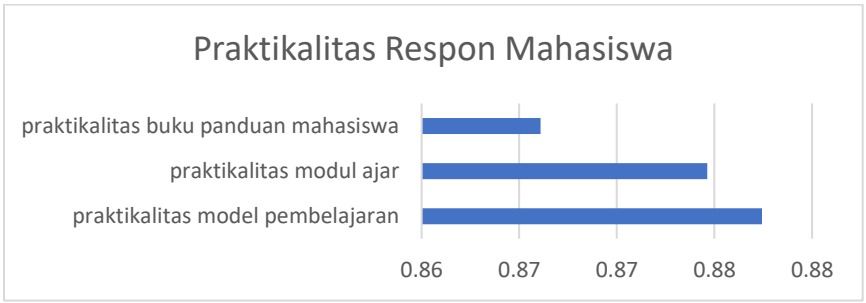

Figure 10. The practicality test results toward Students responses

Based on the results of the practicality test of student responses, which was conducted by distributing questionnaires on student perceptions of the model developed This test involves 10 students who took the Java Programming course. The average result is 0.87, implying that student responses to the guidebook, models, and learning models are classified as very practical.

Hasil uji validitas dan praktikalitas produk pada penelitian ini memperlihatkan, bahwa tingkatthe validity and practicality of all products from all aspects have valid and practical categories for use in learning java programming. The results of this study show that the quality of the Cooperative Project Based Learning on SLE learning model that has been selected and applied in the development method has been fulfilled.

CONCLUSIONS AND RECOMMENDATIONS

The Cooperative Project-Based Learning On the SLE learning model is a learning model that combines the STAD-type cooperative model with PJBL by applying the SLE approach. This model incorporates the concept of learning in heterogeneous groups of four to five students. The model development entails project learning, online and offline project monitoring, 4C-based project planning design, and information system-based development, in which projects are created utilizing information systems.

Project reports and presentations, in which students present the results of completed projects and make reports in the form of portfolios, include evaluations to carry out assessments to obtain value results about learning achievements as well as rewards and reflections to excite and motivate students in their learning, and to reflect learning outcomes for the improvement of future learning. After testing, it was determined that the Cooperative Project Based Learning On the SLE learning model is valid and applicable.

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