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Model Laboratory Industry Project Based Learning (LAINPROBALE)

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Abstract

This research is based on the selection and application of learning methods that are not appropriate with the conditions of students at the University of Ibnu Sina Batam, most of whom are students who work during the day and study at night with very short study times resulting in low student learning outcomes in courses Basic Computer Hardware. Development of a learning model to improve student learning outcomes through the Lainprobale learning model by applying learning in the laboratory, in the Industrial World Business and providing work projects. This study aims to develop a Lainprobale model for the Basic Computer Hardware course that is valid, practical and effective. The method used is Research and Development (R&D) from the Center for Educational Policy and Innovation Research (Puslitjaknov) based on Borg & Gall. The research subjects were Informatics Engineering students at the Faculty of Engineering, Ibnu Sina University Batam, even semester of the 2020/2021 academic year, consisting of 15 students in the control group and 15 students in the experimental group. The data collection instrument used an objective test, a Linkert scale questionnaire and an observation sheet. Analysis of data validity using V-Aiken calculations for product validation, practicality and effectiveness analysis using percentage techniques, hypothesis testing on effectiveness using Independent Sample t-test analysis. The results of this study indicate that the Lainprobale model applied to the Basic Computer Hardware course has been developed with a syntax arrangement consisting of six phases. Model development is supported by the Lainprobale model book product, Basic Computer Hardware course modules, teaching guidebooks, and study guidebooks. The results of the product validity analysis stated that all products were valid in all aspects and sub-aspects of the assessment. The product has very practical practicality and has effectiveness in influencing learning outcomes in the cognitive, affective and psychomotor domains. Based on the analysis it can be concluded that the Lainprobale model in the Basic Computer Hardware course has proven validity, practicality and effectiveness so that it is suitable for use in the Basic Computer Hardware course and in other courses. The implications of this research increase the motivation and way of learning of students.

Keywords: *Model Laboratory Industry Project Based Learning (Lainprobale), Basic Computer Hardware, Puslitjaknov, Borg and Gall.*

INTRODUCTION

Universities, which are the backbone of education in Indonesia, have an obligation to deliver students to succeed towards their future (Anggadwita, Dana, Ramadani, &

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Ramadan, 2021). Higher education and vocational education must be able to change the paradigm that has been developing, that college graduates must successfully get a job, but now the paradigm should change that students are able to create jobs (Ganefri & Hidayat, 2017). Especially in the era of the 21st century global market, so tight market competition that occurs due to the industrial revolution 4.0, where companies / industries are required to continue to innovate products that have competitive value to be able to compete in the market. To achieve this, the industry really needs skilled workers, especially graduates from vocational universities who not only bring applicative provisions but are more directed towards the ability to create and innovate (Syahril, Jalinus, Nabawi, & Arbi, 2019).

According to the Indonesian Central Bureau of Statistics (2023), the number of students in Indonesia in early 2023 reached 7.8 million students, consisting of around 3.3 million students in public universities and 4.4 million students in private universities. Of the millions of students who are graduated each year by public or private universities, most students hope that after graduating from college they will get a job that matches their level of degree. Although the reality is that it takes time for the work to be done according to the field of expertise. So that if in the following years, if the student does not immediately get a job, of course this will also contribute to the number of open unemployment in the area (Bruun & Duka, 2018).

The Open Unemployment Rate (TPT) in Indonesia is indeed relatively decreasing from year to year, however, Indonesia's TPT compared to neighboring countries, such as Malaysia is still double, while if compared to Singapore it is even three times (Grundy-Warr, Peachey, & Perry, 1999). The high unemployment rate, which is also partly contributed by college graduates, shows that the job market is still not able to provide sufficient information compared to the number of job seekers, although most of them are still dominated by secondary graduates (SMA / SMK). Indeed, not all college graduates are in a position to look for jobs, especially college graduates in Riau Islands Province (Fikry, Larasati, & hayu Dimawati, 2019). Because almost the average student who is studying in Riau Islands (KEPRI) is working status. These students work during the day either in government agencies or in companies. Batam is an island located on the outer side of Indonesia and is very close to two large countries, Malaysia and Singapore.

The Central Bureau of Statistics of Batam City in 2022 reported that the Human Development Index (HDI) has indeed increased from year to year (Hutabarat & Arka, 2023). Batam Human Development Index based on BPS survey results in 2022 reached 81.67. This figure grew by 0.45 points compared to the previous year. This increase is also the contribution of schools or universities in participating in the success of human resource development, especially universities in Batam City. On the other hand, in addition to the increase in HDI, the unemployment rate in Batam City has also increased from year to year. Data on labor statistics in 2022 states that the development rate of the Open Unemployment Rate (TPT) from 2018 to 2021 has increased significantly, but in 2022 it has decreased slightly (Essien, Trask, & Feng, 2022).

There are almost no companies or offices that do not utilize information and communication technology, especially computers (Gelb, Gal, & Wolfson, 2009). Every office has at least one or two computers, either used as a means of typing or as a data storage unit. In fact, it is not uncommon, in these companies there is an office room that is indeed every desk of the workers is equipped with a computer. Computers are now indeed a basic necessity in the company, starting from the use of stand alone or networking (Armbrust et al., 2010). So this is where the role of computer undergraduate graduates takes part. The fields that can be worked on include: as installation or maintenance networking personnel, big data managers, programmers, system analysts and also Information Technology (IT) Support. In accordance with the objectives to be achieved and the strategies used by the Informatics Engineering study program to produce informatics engineering graduates who are of high quality, have expertise that is

globally competitive, virtuous, Islamic moral and competent in their fields (Vision and Mission of Informatics Engineering Study Program, 2019-2024).

One of the subjects of the Informatics Engineering Study Program, Faculty of Engineering, Ibn Sina University is the Basic Hardware (Work Expertise) course with the subject code 355KB155 and Basic Hardware Practicum (PHD) with the subject code 155KB165 which has a weight of 3 credits for theory and one credit for practice. It is expected that after taking this course, students are able to trace, repair damage and be able to operate computers properly and correctly. These skills are needed in every office / company. IT support work is work that is directly related to computers, starting from determining the type of computer that suits the field of work, how to use computer hardware to maintenance and repair when damage occurs.

The learning method that has been applied in the Basic Hardware course is more inclined to theory and very little practice. The theory in question is starting from the introduction of computer architecture, hardware support software, work support software, damage tracking and damage repair. While the learning model that has been widely applied is the Problem Based Learning Model. The Lainprobale Learning Model (Laboratory Industry Project Based Learning) in Basic Computer Hardware Subjects is considered very suitable to be applied and there is no doubt that if this model is applied, it will produce competent graduates who are ready to work because students get direct knowledge / skills according to field / work needs. The system and procedures in the learning process are carried out in three basic stages, namely the first stage: experiments in the laboratory, the second stage: practical tests at industrial sites / computer workshops and the third is real project work. The sequence of work is carried out so that students are able to / get effective learning so that learning objectives can be achieved and graduate competencies are obtained. Therefore, research and development (Research and Development) is certainly very absolute to be carried out on students who take the Basic Computer Hardware course at the Informatics Engineering Study Program, Faculty of Engineering, Ibn Sina University.

LITERATURE REVIEW

Learning Theory

Learning theory is an approach to a field of knowledge used to study, analyze, discuss and research learning. The choice of learning theory in a teaching and learning process plays an important role in improving the quality of education. By understanding the right learning theory, the delivery of learning material to students will be absorbed more optimally. However, it is not only the learning method that determines the success rate of the learning process, but also the supporting tools/media used. (Sukardi, Puyada, Wulansari, & Yanto, 2017) the need to improve the quality of education through improving the quality of learning with the approach of updating teaching methods, and selecting learning media that are in accordance with the material presented. (Refdinal, Ambiyar, Sukardi, & Febriyanti, 2018) in order to improve the quality of vocational learning as stipulated in Perpu number 19 of 2005 article 26 paragraph 3, concerning the competency standards of graduates at the higher education level in an effort to prepare students who have intelligence, knowledge, personality, attitudes, noble ahlaq and skills to live independently, it is necessary to improve the quality of learning by improving the learning process and educational facilities. In this study, there are four learning theories that are used as study materials, namely Behaviorism, Cognitiveism, Constructivism and Contextual theories. These four learning theories will be more dominantly used in the learning process with the model being developed.

Learning Model

Model literally means "shape", in general use the model is an interpretation of the results of observations and measurements obtained from several systems. Meanwhile, according to (Suprijono, 2011), a model is defined as an accurate representation of an actual process that allows a person or group of people to try to act based on that model. Indeed, lecturers often experience problems in the learning process, to overcome these various problems, it is necessary to have learning models that are considered to be able to help lecturers in the teaching and learning process. The model is designed to be able to match the real reality, even though the model itself is not the reality of the real world. A learning model is a pattern used as a guide in planning learning in study groups or in tutorials (Suprijono, 2011). (Kokom, 2013) define a model as a plan or pattern that can be used to form a curriculum, design learning materials, and guide learning in the classroom or others. The learning model is basically a form of learning that is illustrated from start to finish which is presented characteristically by the teacher/lecturer. Thus, the model can be interpreted as a wrapper / frame of learning / application of an approach, method and learning technique.

Project Based Learning (PjBL)

The Project Based Learning (MPBP) model in (Abidin, 2007) explains that: A learning model that is carried out directly and involves students in the learning process through research activities to work on and complete a specific learning project. Actually, this project-based learning model is not new in learning. Although MPBP can be said to be an old model, this model is still widely used and continues to be developed because it is considered to have certain advantages compared to other learning models. One of these advantages is that MPBP is considered to be one of the excellent learning models in developing various basic skills that students must have including thinking skills, decision-making skills, creativity, problem-solving skills and at the same time it is considered effective for developing students' self-confidence and self-management. (Nurfu'adiyah, 2021) defines Project Based Learning as a learning model that organizes the class in a project. Meanwhile, according to NYC Department of Education (2009), Project Based Learning is a learning strategy where students must build their own content knowledge and demonstrate new understanding through various forms of representation.

RESEARCH METHOD

This research is an R & D (Research and Development) study. According to (Sugiyono, 2015) the definition of research and development is a way of obtaining data scientifically with the aim and function of validating and developing products by testing their effectiveness or validity so that they become more practical, effective and efficient. Research and development in this model is based on Borg & Gall with the aim of developing and certifying educational products. The initial research and development is based on the development model in the learning environment, finding product design findings and procedures, which are then carried out by field trials, then evaluated and refined to meet the criteria of effectiveness, quality and specific standards (Ambiyar & Dewi, 2019).

The product was then tested in two stages, namely expert trials and field trials. The place for conducting research trials was on the campus of the Faculty of Engineering, Ibn Sina University, Informatics Engineering study program. The subject of the Lainprobale model research trial in the Basic Computer Hardware course is divided into three stages, namely: 1). Expert test subjects for construct and content; 2). Subjects of limited trial; 3). Expanded trial subjects. After data collection is complete, the data is analyzed. In research and development, the amount of data analysis depends on the level of research, the type and number of problem formulations and the number of hypothesis formulations

(Sugiyono, 2015). In terms of data analysis techniques used in the development of the Lainprobale model include validity, practicality and effectiveness analysis.

RESULT AND DISCUSSION

This research uses the R&D method from Puslitjaknov (2008) consisting of five steps adopted from Borg and Gall theory. The research subjects were students of Informatics Engineering, Faculty of Engineering, Ibnu Sina University Batam. The goal is to develop, produce and test the model being built, namely the Lainprobale learning model applied to the learning of Computer Basic Hardware courses. In chapters 1, 2, and 3, the root of the problem, objectives, literature review, research and development methods have been presented, then at the beginning of chapter 4 the data and how to process them have also been displayed. The following are the final results of the research and development of the Lainprobale model:

1. Data Presentation

This descriptive research data is applied with the R&D research method from Puslitjaknov (2008) which consists of five steps with the following description:

Step 1: Preliminary Research

In this stage-1 there are four activities that have been carried out, namely initial investigations about: (the learning model being used, learning objectives and content, student characteristics, and learning resources). The results of the initial investigation found that: the model that has been used in learning Basic Computer Hardware in the Informatics Engineering Study Program still uses the lecture method of lecturers in class, learning modules have never been reviewed and developed, the unavailability of lecturer teaching guides, the absence of student study guides, case studies for practicum in the laboratory are still very limited, learning is only in the campus environment, lectures at night while during the day students work, supporting facilities, especially laboratories, are not sufficient according to the number of students, more than 50% of student GPAs are still below 3.00, distributing a linkert scale questionnaire (1-5) expectations and reality to students to find out the ability of students to follow Basic Computer Hardware learning obtained a value of 3.38 still in the category of competent enough. However, the enthusiasm of students in attending lectures is extraordinary, this is evidenced by the attendance attendance still averaging above 80% of the total meetings of 16 meetings each semester and active students on campus until the evening at 22.00 WIB. This shows that there is a gap between student expectations in attending lectures and the teaching and learning model that has been used so far, for this reason it is very necessary for the teaching and learning model in the Informatics Engineering Study Program, Faculty of Engineering, Ibn Sina University to be developed. One of the solutions offered is the application of the Laboratory Industry Project Based Learning (Lainprobale) learning model.

Step 2: Designing and Developing Products

This research designs a learning model developed from three basic models, namely PBL, WBL, and PjBL models so as to produce a new model called the Lainprobale model (Laboratory Industry Project Based Learning). PBL is adopted from the values of learning in problem solving. WBL is adopted from the values of workplace-based learning. PjBL is adopted from the values of project-based learning. Learning is divided into three periods, the first third of which maximizes discussion and problem solving starting in class and in the laboratory. The second third of learning according to the topic of discussion in the workplace (Industry). The last third is a trial of project work (Project). From the three names, namely Laboratory + Industry + Project, added to education-based

(Based Learning), the naming of this model is Laboratory Industry Project Based Learning and abbreviated as Lainprobale.

This research began in mid-2018 with field observations to get an initial picture of the learning model at the research site. While making observations, a literature review was also carried out with the assumption of finding an initial solution to the problems found. Furthermore, it was documented in the form of a research proposal and was disseminated on February 7, 2019. The design results are in the form of Lainprobale learning model with Lainprobale model book products plus model syntax, Computer Basic Hardware course module books, teaching lecturer guides, and student learning guides. The research product as intended has been printed in book form outside the contents of this research report, the following is given an overview of the Lainprobale model product cover.

Figure 1. Cover of Lainprobale Model Research Product

There are 4 (four) main products that have been designed and developed, namely the Lainprobale model, teaching module books, teaching guides and student study guides. The following is a brief description of each product that has been developed:

a) Lainprobale Model

The model is designed and developed from three basic models, namely PBL, WBL, and PjBL. The Lainprobale model produces 6 (six) syntaxes, namely: 1). Orientation, 2). Finding the problem, 3). Determining the best solution, 4). Exploration, 5). Project work, and 6). Evaluation. Syntax 1, 2, 3, 4, and 6 are the syntax of the development of PBL, WBL, and PjBL models while the 5th syntax, namely Project Work, is a new syntax resulting from the development of this research. With the 5th syntax, namely Project Work, where students are given the opportunity to learn by being tested working on real projects in the community, it is believed that student learning outcomes will be maximized as evidenced in the test results of this study.

b) Basic Computer Hardware Module Book

The Basic Computer Hardware learning module book consists of three chapters to be allocated in one semester of 14 meetings. Chapter I for 6 (six) meetings (T1-6) totaling 76 pages, chapter II for 4 (four) meetings (T7-10) totaling 59 pages, chapter III for 4 (four) meetings (T11-14) totaling 17 pages, the total thickness of the Computer Basic Hardware module book is 167 pages. The content of the module contains knowledge, skills and work attitudes in the computer field including how to operate, maintain, trace and repair damage.

c) Lecturer's Guide to Teaching

Lecturer's guide in teaching the Basic Computer Hardware course is packaged in a 50-page book. It contains learning steps according to the syntax of the Lainprobale model. Also given weekly teaching guides (week 1 to week 16) which have been adjusted to the availability of teaching modules and in accordance with the RPS (Semester Learning Plan).

d) Student Learning Guide

The student guide in learning the Basic Computer Hardware course is packaged in a 45-page book. In it there are guidelines for studying the Computer Basic Hardware module book from meeting 1 to meeting 14 outside of UTS and UAS. Also given guidance in following the learning allocation per meeting in a week (week 1 to week 16) which has been adjusted to the availability of teaching modules and in accordance with the RPS (Semester Learning Plan).

Step 3: Expert Validation and Revision

Research products in the form of Lainprobale models, teaching module books, teaching guides and student study guides along with assessment instruments have been validated by experts in their fields by presenting 7 (seven) experts in a Forum Group Discussion (FGD) on March 25, 2021 on the Padang State University campus. The 7 experts are Prof. H. Ganefri, Ph.D, Prof. Dr. Wakhinuddin S., M.Pd, Dr. Fahmi Rizal, M.Pd, MT, Dr. Ir. Gunadi Widi Nur Cahyo, M.Sc, Prof. Dr. Hasan Maksum, M.T, Prof. Dr. Ambiyar, M.Pd, and Prof. Dr. Yasnur Asri, M.Pd. The results of the FGD found that some of the contents of the product needed to be improved both content and writing. After the product was improved and revised again to the experts, the product was declared ready to be tested.

Step 4: Model Trial and Evaluation

After the product is validated by experts, then the product is tested on a small scale involving 6 (six) students who are taking Basic Computer Hardware learning in the even semester of 2020-2021 in the Informatics Engineering Study Program, Faculty of Engineering, Ibn Sina University with very good results but there are several findings for improvement. Among the suggestions and suggestions for improvement by users in this case lecturers and students are the contents of the module so that reference sources are added to each chapter, learning evaluations are added at the end of each meeting, and video-based learning links (youtube) are added. And the module has been revised as suggested.

Step 5: Field Test (Final Product) and Report

The last step of research and development as in R&D Puslitjaknov (2008) is to test the product in the field on a broad scale. At this stage the product is tested and applied to two groups of students taking the Basic Computer Hardware course for one semester, namely the even semester of 2021-2022. The treatment group was applied in class 4A as many as 15 students and the control group was applied in class 4C as many as 17 students. At the end of the semester, data on cognitive, affective and psychomotor learning outcomes were obtained. Furthermore, these data are tested for practicality and effectiveness to obtain the final results of the application of the development model.

2. Validity Test Results

The validity test of the development product has been carried out by experts according to their fields of expertise, namely model experts, language experts, assessment experts, and computer experts. To get product validity as described by (Sugiyono, 2015), the Aiken V validity coefficient, if you get rCount> rTable then the statement item is significantly correlated to the total score and declared valid. This validation was carried out by five experts, namely: Prof. Dr. Ambiyar, M.Pd., Prof. Dr. Wakhinuddin, M.Pd., Prof. Dr. Hasan Maksum, MT., Dr. Gunadi Widi Nurcahyo, M.Sc., Dr. Fahmi Rizal, M.Pd., MT. Validators as many as 5 (five) experts, then obtained rTable of 0.878. If the acquisition value (rResult> 0.878) then the item value is declared significantly correlated and valid. The following are the results of the calculation of each product development item.

a) The results of the validity test of the validation instrument by experts on the aspect of the feasibility of the instrument content have an average score of 0.963 with a

valid category, the feasibility aspect of the instrument language has an average score of 0.974 with a valid category, and the instrument's graphic aspect has an average score of 0.891 with a valid category. Thus the validation assessment instrument used in this study can be declared valid from all aspects of the assessment.

b) The results of the validity test on the practicality instrument from the validator on the aspect of the feasibility of the instrument content have an average score of 0.999 with the valid category, the feasibility aspect of the instrument language has an average score of 0.996 with the valid category, and the instrument's graphic aspect has an average score of 0.999 with the valid category. Thus the instrument of practicality used in this study can be declared valid from all aspects of the assessment.

c) The results of the validity test of the effectiveness instrument from the validator on the aspect of the feasibility of the instrument content have an average score of 0.995 with the valid category, the feasibility aspect of the instrument language has an average score of 0.996 with the valid category, and the instrument's graphic aspect has an average score of 0.997 with the valid category. Thus the effectiveness instrument used in this study can be declared valid from all aspects of the assessment.

d) The results of the validity test of the Lainprobale model by experts with the following summary: 1) the format aspect of the model book has an average score of 0.931 with a valid category, 2) the content aspect of the model book has an average score of 0.936 with a valid category, 3) the language aspect of the model book has an average score of 0.943 with a valid category, 4) the graphic aspect of the model book has an average score of 0.904 with a valid category, 5) the syntax aspect of the model has an average score of 0.949 with a valid category, 6) the syntax aspect of the model has an average score of 0, 949 with a valid category, 6) the social system aspect of the model has an average score of 0.949 with a valid category, 7) the reaction principle aspect of the model has an average score of 0.949 with a valid category, 8) the support system aspect of the model has an average score of 0.958 with a valid category, 9) the learning impact aspect of the model has an average score of 0.975 with a valid category. Thus the Laboratory Industry Project Based Learning model that has been developed in this study can be declared valid from all aspects of the assessment.

e) Summary of Assessment Results and Analysis of Model Syntax

f) The syntax of the model in addition to being tested with validity before being applied needs to be analyzed. This is intended to determine that the phases that have been developed can confirm the overall model construct.

1) The summarized results of the experts' assessment of the Lainprobale model syntax are as follows: Phase 1 (Orientation) has an average score of 0.979 with valid categories, Phase 2 (Finding Problems) has an average score of 0.935 with valid categories, Phase 3 (Determining the Best Solution) has an average score of 0.946 with valid categories, Phase 4 (Exploration) has an average score of 0.938 with valid categories, Phase 5 (Project Work) has an average score of 0.954 with valid categories, Phase 6 (Evaluation) has an average score of 0.937 with valid categories.

2) The results of the assessment of the variables analyzed have the feasibility of being used as forming factors that have been carried out with the KMO test and Barllet's test obtaining the Kaiser Mayer Olkin Measure of Sampling Adequacy value shows a score of 0.625 with a significance of 0.000. Because the value obtained by MSA is above 0.600 (MSA>0.600) and the Significance value is far below 0.050, it is stated that all variables are suitable for further analysis. The Barllet's of Sphericity test results show a Chi-Square of 75,954 with Sig. 0.000 indicates a correlation between variables, it can be concluded that the factor test analysis can be continued.

3) Next, the factoring test was carried out to determine the number of factors formed. The results obtained that there are two syntaxes that form factors that have Eigen

values> 1, namely syntax-1 with a value of 2.903 and syntax-2 with a value of 1.798. Syntax1 can explain 83.8% by the model formed, Syntax2 can explain 79.6%, Syntax3 can explain 87.8%, Syntax4 can explain 80.2%, Syntax5 can explain 58.8%, and Syntax6 can explain 80%. This value shows that the greater the communalities of a variable, the more closely it will be related to the factors formed.

4) The results of the loading factor test and factor structuring show that syntax1, syntax3 and syntax6 are positively correlated with factor one, while syntax4 is more positively correlated with factor two. Thus factor one is more dominant in influencing the Lainprobale model because it correlates more with syntax than factor two. This shows that there are two dominant groups of form factors that have strong correlations across all phases of the Lainprobale syntax.

The results of syntax testing from step one to step four above show that all phases are valid to form a unified model, namely the Laboratory Industry Project Based Learning (Lainprobale) model. So it can be concluded that the Lainprobale model is valid based on the analysis of the formation of phases in a new model unit.

a) The results of the validity test of the Computer Basic Hardware learning module book from the validator in the aspect of the book structure has an average score of 0.947 with a valid category, the aspect of the feasibility of book content has an average score of 0.956 with a valid category, and the aspect of book construction has an average score of 0.929 with a valid category. Thus the Basic Computer Hardware module book used in this study can be declared valid from all aspects of the assessment.

b) The results of the validity test of the Computer Basic Hardware teaching lecturer's guide book from the validator on the aspect of the feasibility of the book content has an average score of 0.939 with the valid category, the linguistic aspect has an average score of 0.953 with the valid category, and the graphical aspect has an average score of 0.934 with the valid category. Thus, the lecturer's manual used in this study can be declared valid from all aspects of the assessment.

c) The results of the validity test of the student guidebook for learning Basic Computer Hardware from validators in the aspect of the feasibility of book content have an average score of 0.949 with a valid category, the linguistic aspect has an average score of 0.943 with a valid category, and the graphical aspect has an average score of 0.950 with a valid category. Thus, the student manual used in this study can be declared valid from all aspects of the assessment.

3. Practicality Test Results

The practicality test in this study was assessed through the use of the Lainprobale model in the perception of lecturers and students. Practicality by lecturers with aspects of the use of models, modules and teaching guides, while practicality by students with aspects of the use of models, modules and student study guides.

a) Practicality test results of lecturers' perception with the following results: 1) the practicality of the Lainprobale model has an average score of 87.33% with a practical category, 2) the practicality of the learning module has an average score of 90.67% with a very practical category, 3) the practicality of the teaching guide has an average score of 88.00% with a practical category.

b) Practicality test results of student perceptions with the following results: 1) the practicality of the Lainprobale model has an average score of 87.73% with a practical category, 2) the practicality of the learning module has an average score of 89.60% with a practical category, 3) the practicality of the student study guide has an average score of 91.20% with a very practical category.

4. Effectiveness Test Results

This effectiveness test was conducted to assess the effectiveness of the use of Lainprobale model products applied to the treatment group (15 students) whose scores were analyzed and compared with the scores of the control group (15 students). There are three aspects of assessment taken, namely cognitive aspects, affective aspects and psychomotor aspects. Each aspect is tested through three stages, namely the first stage of data description, the second stage of normality test as an analysis requirement using the One-Sample Kolmogorov-Smirnov Test, and the third hypothesis test to reveal any differences in the values obtained from the two groups using the Independent Sample T-Test test. The following are the results of the effectiveness test of the three aspects:

a) Cognitive Aspect

1) The results of the cognitive test obtained the lowest score of the treatment group was 69 while the highest score was 91 and the average score of the treatment group obtained 84.33. While the lowest value of the control group is 62 and the highest value is 76, the average value of the control group is 70.07.

2) The normality test results for cognitive scores that the treatment group has Asymp. Sig of 0.067 the value has passed the lowest critical limit of 0.050, as well as for the control group has Asymp. Sig of 0.200 where this value is much greater than 0.05. Thus it can be concluded that the cognitive scores of the two classes are normally distributed and have unequal variances.

3) The result of the tcount score of 8.095 when compared with the critical price of ttable for df 28 at a significance of 0.05 which is 2.048 so that the tcount> ttable (8.095> 2.048) means the hypothesis that reads: there is a difference in the score of learning outcomes in the cognitive domain between the Treatment group and the Control group at a significance level of 0.05.

b) Affective Aspect

1) The results of the affective aspect assessment obtained the lowest score of the treatment group was 75 while the highest score was 98, and the average score of the treatment group obtained 89.47. While the lowest score of the Control group is 70 and the highest score is 88, the average value of the Control group is 81.20.

2) The normality test results for affective scores that the treatment group or control group both obtained Asymp. Sig of 0.200 where this value is much greater than 0.05 (0.200>0.05) as a critical threshold. Thus it can be concluded that the affective scores of the two classes are normally distributed and have unequal variances.

3) The result of the tcount score of 3.941 when compared with the critical price of ttable for df 28 at a significance of 0.05 which is 2.048, so that the tcount> ttable is obtained (3.941> 2.048) means that the hypothesis reads: there is a difference in the score of learning outcomes in the affective domain between the Treatment group and the Control group at a significance level of 0.05.

c) Psychomotor Aspect

1) The results of the assessment of psychomotor aspects obtained the lowest score of the treatment group was 80 while the highest score was 95, and the average score of the treatment group obtained 88.20. While the lowest value of the control group is 70 and the highest value is 90, the average value of the control group is 79.20.

2) The normality test results for psychomotor scores in the treatment group or control group both obtained Asymp. Sig of 0.200 where this value is much greater than 0.05 (0.200>0.05) as a critical threshold. Thus it can be concluded that the psychomotor scores of the two classes are normally distributed and have unequal variances.

3) The result of the tcount score of 5.384 when compared with the critical price of ttable for df 28 at a significance level of 0.05 which is 2.048, so that the tcount> ttable is obtained (5.384> 2.048), meaning that the hypothesis reads: there is a difference in the score of learning outcomes in the psychomotor domain between the Treatment group and the Control group at a significance level of 0.05.

CONCLUSION

Based on the data analysis and discussion previously described, the research and development of the Laboratory Industry Project Based Learning (Lainprobale) model for the Basic Computer Hardware course is concluded as follows:

1. The Lainprobale model in the Basic Computer Hardware course has been developed through the Puslitjaknov (2008) procedure from Borg and Gall (2003) and has produced a learning model that has 6 (six) syntaxes, namely: 1) Orientation; 2) Finding the problem; 3) Determining the best solution; 4) Exploration; 5) Project Work; 6) Evaluation, as well as producing a good model tool to maximize the achievement of Computer Basic Hardware learning objectives supported by a complete support system (product).

2. The validity analysis results state that the Lainprobale model in the Basic Computer Hardware course is valid in all aspects and sub-aspects of the assessment and is supported by a valid product device. The product has a very high practicality and has a very high effectiveness in influencing the learning outcomes of Basic Computer Hardware courses in the cognitive, affective and psychomotor domains.

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