



Development of Virtual Learning Environment Using Canvas To Facilitate Online Learning at a covid-19 era.

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Abstract

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It is not known the Covid-19 pandemic will end. Covid-19 has brought drastic changes in the education system not only in Indonesia, but also throughout the world. The selection of the right media in learning during the pandemic is able to produce good output according to existing needs and conditions. Problems that arise during the implementation of online learning at home experienced by students make learning ineffective. The results of the study for Learning during a pandemic, several studies have resulted in dissatisfaction with the existing online learning system. This dissatisfaction is because the implementation of existing online learning is not well planned and structured. Online learning only transfers face-to-face learning to virtual face-to-face. This study aims to develop virtual learning environment (VLE) to help students learn independently and study with lecturers and friends online, following predetermined learning outcomes. The research design uses Research and Development, which uses a combination of three (3) models, the Borg & Gall model, *the Step of System Approach Model of Educational Research and Development*, and the Rowntree model. This research conduct at the Universitas Nasional. The research subjects were students of Electrical Engineering. Data collection techniques used are questionnaires, involving Instructional Design experts, Materials experts, Language experts, Design and Media experts, one-to-one evaluation, also testing, and evaluation in large groups. The study also used pre-test and post-test questions to determine the effectiveness of VLE and the learning materials developed. The data obtained from the results is divided into two parts, namely qualitative data and quantitative data. During the test, revealed four important things from the developed VLE, namely the interaction of discussion forums, face-to-face interaction through video conferences, time management, and problem-solving that directly received feedback. The test results show that students are happy, motivated to do practice questions, and always follow the learning process on time. The results of the pre-test and post-test showed an increase of 20.40%.

Keywords: Virtual Learning Environment, online learning, Pandemic, covid-19

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INTRODUCTION

It's been more than a year, the Covid-19 National disaster has occurred in the world and in Indonesia, with a rapid spread so that the government is trying to break the chain of transmission by imposing restrictions on community activities, because the scope of changes is wide ranging from business, culture, social to education and learning. . In accordance with the Circular of the Minister of Education and Culture (Mendikbud RI, 2020) number 4 of 2020 concerning the Policy for Learning from Home, distance learning must still be implemented with various solutions that must be decided by the school. The use of online learning tools such as WhatsApps, Telegram, Google Classroom, Edmodo, Schoology, Moodle, and others can be considered a solution for now. It is not known when the Covid-19 pandemic will end. Covid-19 has brought drastic changes in the education system not only in Indonesia, but also throughout the world. During the pandemic, many researchers have produced research on online learning and have published them in national and international journals. The keyword online learning during the pandemic resulted in 6,719 articles on ScienceDirect and 208,000 articles on GoogleScholar.

Based on the literature that has been carried out, online learning research during the current pandemic, some of which are divided into three major groups,; First, regarding the availability of supporting technology devices (Akuratiya & Meddage, 2020; Bri et al., 2009; Hakim, 2020; Wangdi et al., 2021), internet quotas (Budiman, 2020; Thandevaraj et al., 2021), internet access (Aziza, 2021; Singh et al., 2020), electricity availability (Dangal & Maharjan, 2021; Hakim, 2020; Pal et al., 2020; Pallathadka, 2021), selection of learning platforms (Almahasees et al., 2021; Ha, 2021; Hakim, 2020; Pal et al., 2020; Pallathadka, 2021) and how to carry out the learning process (Nambiar, 2020).

Second, the impact of online learning that is being carried out is not fully planned, but a sudden and forced conversion (Ahmed Masud & Nesa Suborna, 2021; Martín et al., 2021; Nambiar, 2020; Thandevaraj et al., 2021; Watnaya et al., 2020), online learning cannot replace face-to-face (Xhelili et al., 2021).

Third, the priority of learning achievement and learning evaluation (D'Souza et al., 2013; Faize & Nawaz, 2020; Khan et al., 2020; Mukhtar, Javed, et al., 2020). Mastery of material in a lesson (Jhon et al., 2020; Kimkong & Koemhong, 2020; Mukhtar, Mulyono, et al., 2020). The form of activity in learning is both in the planning stage such as choosing a strategy (Alshehhi et al., 2021; Zeng & Wang, 2021) and the learning media that will be used (Saadiah & Wahid, 2020), to the implementation stage such as building friendly interactions (Jhon et al., 2020; Pasaribu & Dewi, 2021) and fun so that reflection on learning is carried out in the hope that the target for mastering a material is achieved (Feldman, 2020).

Research in the field of learning technology reveals that not all materials are effectively taught using online learning (Milla et al., 2021). There are certain materials that are more effective if they are taught directly through face-to-face learning (Xhelili et al., 2021). For example, the type of material that is procedural and principled will be more effective and attractive if it is taught directly through face-to-face (Hussein et al., 2020).

Dale's cone of experience (Dale, 1946) illustrates that the learning experience gained can be through a process of action or experiencing what he learns for himself. The selection of the right media in learning during the pandemic is able to produce good output according to existing needs and conditions. Problems that arise during the implementation of online learning at home experienced by students make learning ineffective. These problems include the lack of an internet network, data packages, the availability of learning devices, which can now be resolved, with government assistance in the form of internet quotas, learning facilities in the form of smartphones or computers are available. The biggest difficulty experienced by students is the level of understanding of the material, because the learning style of each student affects the level of understanding in the absorption of learning materials, for that we need a platform in the form of a Virtual Learning Environment (VLE) that is integrated, easy and accessible to students and lecturers at any time. and from anywhere so that learning can run effectively, and be able to accommodate students and lecturers in online learning during the new normal.

METHODS

The research design used to develop VLE is Research and Development, using a combination of 3 development models, namely: preliminary research using research and information collecting, from the Borg & Gall model (Gall et al., 2015), VLE design using the Step of System Approach Model of Educational Research and Development (Gall et al., 2015), and the Rowntree model (Rowntree, 1995) for the development of online learning materials, is expected to produce VLE and learning materials that are effective and in accordance with learning needs. The steps used in Figure 1 are as follows:

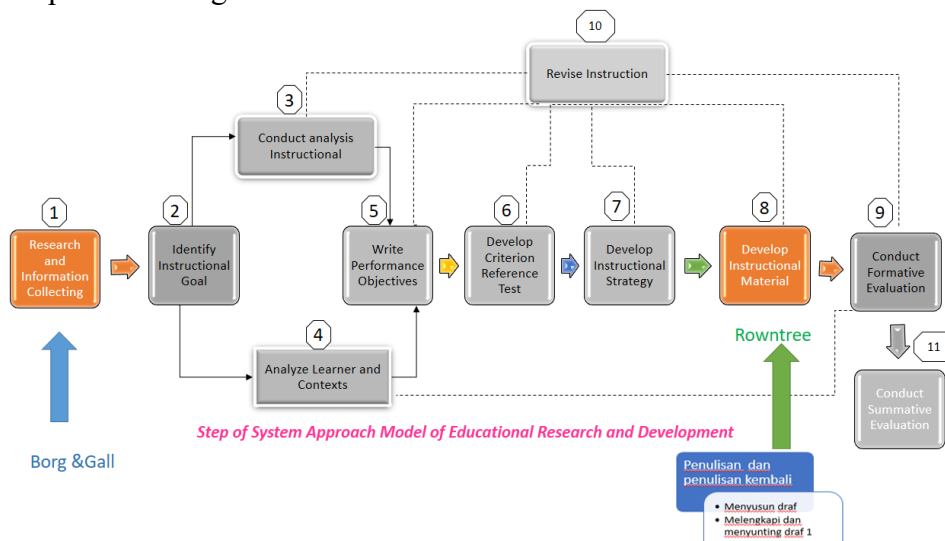


Figure 1 Stages of VLE research and development.

This research was conducted at the National University, during the research period March - August 2020. The subjects of this research were students of Electrical Engineering, with object-oriented programming courses.

Data collection techniques using questionnaires. Questionnaires were used to validate the research instrument, expert evaluation involving instructional design experts, materials experts, language experts, design and media experts, one-to-one evaluation with 3 students, small group evaluation with 9 students and large group trial with 20 students. Pre-test questions and post-test questions in each learning activity are used to determine the effectiveness of VLE and the learning materials developed.

The data obtained from the results of this study are divided into 2, namely qualitative data and quantitative data. Qualitative data were obtained from instrument validity testing and input when conducting formative evaluations to improve the developed product. Quantitative data uses the data from the questionnaire in the form of statements. Learning outcomes data were obtained when large group trials were conducted using pre-test and post-test questions. The pre-test and post-test questions before being used have been tested on 25 students in order to determine the level of difficulty of the questions to be used.

RESULTS & DISCUSSION

Results

Identify Instructional Goal

Before the VLE was developed, a meeting was held with the Head of Study Program and Lecturer to ask for input on the VLE design to be developed, then formulate general instructional objectives, determine the competencies that students must master, determine what requirements students will have take the Object Oriented Programming course and make specific instructional goals as indicators of learning achievement. The results of the formulation are: 1) The learning outcomes of the courses; 2) Conduct analysis instructional; 3) Analyze learner and contexts ; 4) Write performance objective.

Develop criterion reference test

Based on the learning performance objectives that have been formulated, a grid of questions for assessment is developed that can measure student achievement against the learning objectives that have been set, the grid of questions consists of essays, objective tests and performance. Items must be tested for validity and reliability. The validity test was carried out through content validity, namely the questions were assessed as valid according to instructional objectives by material experts based on learning outcomes. The reliability test was carried out through internal consistency reliability with one test on 25 student respondents using the KR-20 and KR-21 formulas. The results obtained The value of r table for N = 25 with a significant value of 0.05 is 0.3809. The calculated r value is 0.738, using the formula $K - R.20$. The results obtained from Kuder Richardson-20 r arithmetic $> r$ table, namely $0.73802 > 0.3809$, it can be stated that the instrument item means reliable.

Develop Instructional strategy

VLE development, using the canvas application, learning materials developed in the form of modules. The components of the learning module according to Smaldino (Smaldino et al., 2015) are:

Rationale, provide an overview of the content of the module and an explanation of why the learner should study it; 2) objective, state in performance terms what the learner

is expected to gain from completing the module; 3) entry test, determine whether the learner has mastered the prerequisite skills needed to begin the module; 4) multimedia materials, use a variety of technology and media to involve learner activity and to utilize a number of their sense; 5) learning activities, having a variety of strategies and media increases student interest and meets student needs; 6) practice with feedback, provide feedback as to the correctness of his or her responses; 7) self-test, give students a chance to review and check their own progress; 8) post-test, assess whether students have mastered the objectives of the module.

Selection of appropriate learning strategies is a matter of educator effectiveness. This includes how to manage five things, namely: managing time, choosing what to deliver, knowing where and how to apply power as effectively as possible, setting the right priorities, and then interweaving all of these with each other to obtain effective decisions. The results of the VLE instructional strategy design are as shown in Figure 2 and Figure 3 below.

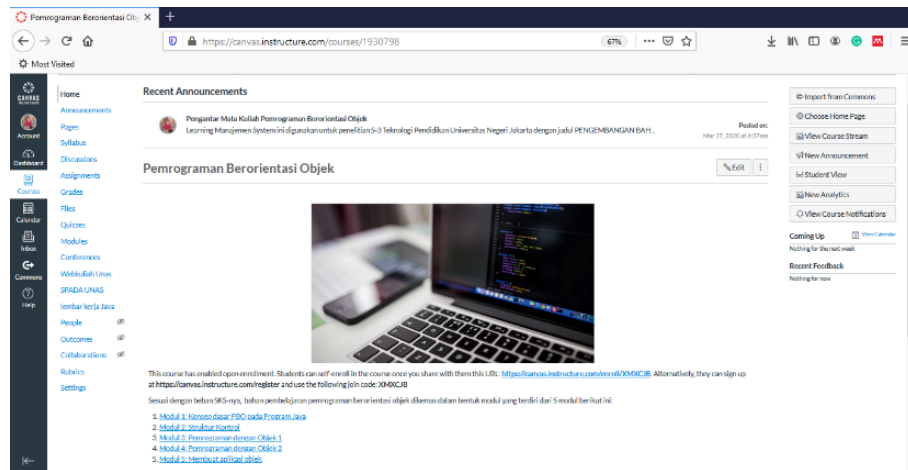


Figure 2. VLE main menu

Figure 2 is the main menu display on VLE, students and lecturers can choose the menu that will be used in the learning process.

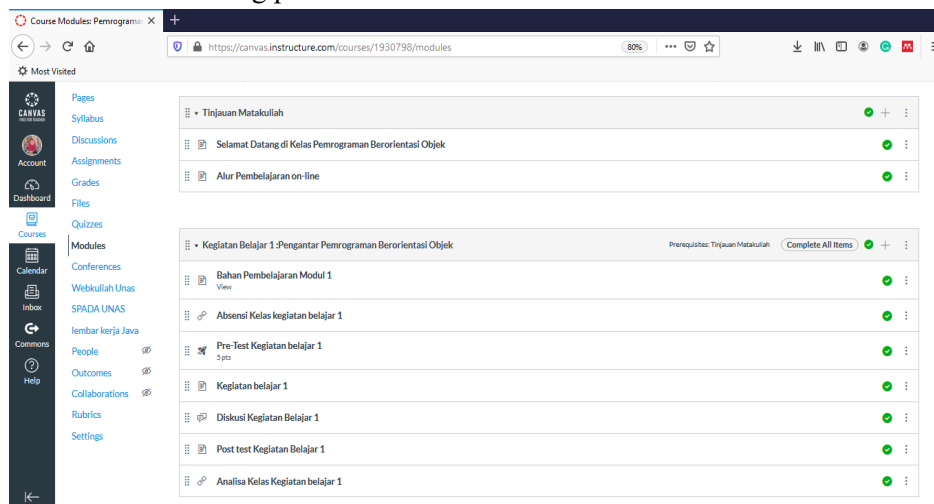


Figure 3. The arrangement of learning activities

Figure 3 shows the contents of the module menu. the module menu contains learning activities in each learning session.

Develop Instructional Material

In this step, learning materials for students are developed which contain a description of the material accompanied by an explanation video of each material and a guidebook for accessing VLE where learning materials are stored in ebooks..

Conduct Formative Evaluation

Create research instruments to conduct formative evaluation of learning materials that have been developed. The research instruments that have been made are then validated by experts.

The validated instruments consist of instruments for material experts, language experts, instructional design experts, design and media experts, instruments for one-to-one evaluation with students, instruments for small group evaluation and instruments for field trials. For instruments with experts, small groups and field trials, a questionnaire with a Likert scale of 1-5 is used, for one-to-one evaluation with students, the Guttman scale is used, namely yes-no, with the results of instrument validation by experts, namely the instrument as a whole is declared suitable for use.

One-to-one evaluation with experts

VLE and learning materials are evaluated by selected experts, Experts are given access to VLE along with assessment instruments. After all the data has been collected, the data is then processed using simple statistics, namely using the average of the total values. The average value is used as the basis for providing the level of assessment of learning materials that have been developed using evaluation standards(Widoyoko, 2019).

The overall recapitulation of the validation results that have been carried out by experts on VLE and learning materials is in the very good category as shown in table 1 below:

Table 1. Recapitulation of Expert Evaluation Results

No	Expert	Average
1	Material	4.58
2	Indonesian	4.833
3	Instructional Design	4.651
4	Design and Media	4.36
Average		4.606
Conclusion		Very good

One-to-one evaluation with students

The recapitulation of the results of the one-to-one evaluation with 3 students is as shown in table 2 below.

Table 2. Recapitulation of One-to-One evaluation results

No	Aspect	Respondent
1	Materi	100%
2	Bahasa	100%
3	Desain Instruksional	100%
4	Desain dan Media	100%
Average		100%
Conclusion		Very good

Kesimpulan Bahan Pembelajaran PBO :

3 tanggapan

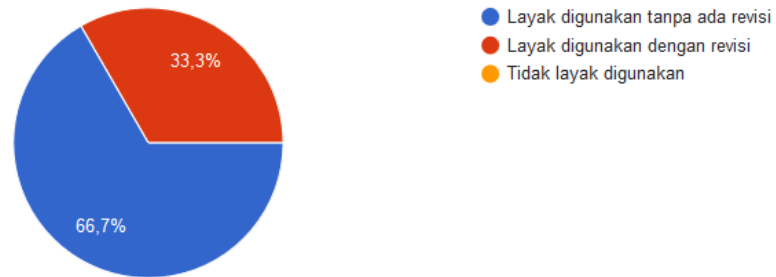


Figure 4. The conclusion of the one-to-one evaluation with 3 students

In Figure 4 the results of a one-to-one evaluation with 3 students learning materials developed 66.7% of respondents answered that learning materials were feasible to be developed without any revisions and 33.3% of learning materials were suitable for use, with suggestions for revisions to the program code, so that the program code contained in the module not typed, still on the screen capture the goal is so that students cannot copy-paste from the module into a java worksheet. The purpose of the suggestion is that students often practice typing program code and practice making program code, so far, if given learning materials by lecturers, some students do not type program code, but directly copy-paste, so that learning objectives are not met. Suggestions from students have been carried out, the program code in the module has been changed to a screen capture.

Small Group Evaluation with students

Recapitulation of the results of the small group evaluation with 9 students with 3 levels of ability, namely 3 students with high abilities, 3 students with average abilities and 3 students with poor abilities, table 3 below.

Table 3. Recapitulation of small group evaluation results

Student	Score
Respondent 1	4.189
Respondent 2	4.595
Respondent 3	4.51
Respondent 4	4.892
Respondent 5	4.59
Respondent 6	4.84
Respondent 7	4.24
Respondent 8	4.86
Respondent 9	4.405
Average	4,571
Conclusion	Sangat Baik

Figure 5 is a summary image of the results of the small group evaluation, it can be seen that 9 respondents gave very good scores on the learning materials developed.

Kesimpulan
10 tanggapan

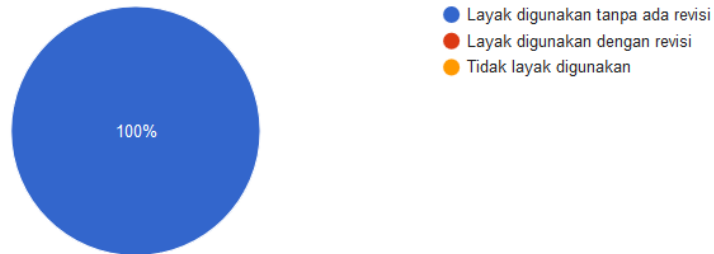


Figure 5 The conclusion of the small group evaluation with 9 students

The conclusion in Figure 3 is that students answered 100% of the learning materials are suitable for use without revision, with VLE comments and learning materials are very good in the presentation structure, systematic and very efficient, the material presented is very clear and understandable, attracts interest in learning, deserves to be used as material. learning, attractive appearance and neatly arranged so that it is easy to read and not boring, sample program code makes it easier for students to learn and practice, there are learning videos that can be replayed by students.

Field trial with students

In the field trial, the participants were 20 students who had never taken a PBO course. Participants are sought by offering to all 3rd semester students who have passed programming algorithm courses from the Electrical Engineering Study Program, Information Systems Study Program and Informatics Engineering Study Program who are interested in studying PBO.

before the trial was conducted, lecturers and students were given a guide book to access learning materials in VLE. One month after the lecturers and students access the learning materials, then students are given a questionnaire on learning materials in the VLE. The results of the questionnaire students wanted virtual face-to-face learning, due to difficulties in coding practice, so face-to-face learning was carried out virtual, using a video conference application that was integrated with canvas, namely bluebigbutton. Lessons will be held from 11 to 16 June 2020, from 13.00 to 15.30. One virtual face-to-face for one learning module.

Before learning begins, students are required to work on pre-test questions to find out whether they have read and studied the learning materials that have been given previously, after completing the pre-test questions, students are asked to take part in learning activities.

At the end of the lesson, students are asked to provide an assessment of the learning materials developed as a reference for perfecting the learning materials before they become the final product, table 4 below.

Table 4 results Field Trial.

No	Aspect	Question	Results
1	Instructional Design	I have become more understanding about PBO because the learning objectives are clearly explained	4.6

No	Aspect	Question	Results
2		It is easier for me to understand PBO because the presentation technique in the module is very structured	4.6
3		I find it easier to understand learning materials because I use VLE, which is structured, easy to understand and includes program code accompanied by multimedia in the form of videos	4.65
4		The illustrations on the video make it easier to understand the content	4.4
5	Content	I can understand the learning material because the examples provided are easy to understand	4.65
6		I like PBO learning materials because the content presented in the learning tools is clear and interesting	4.7
7	Motivasi	I like this learning material because the practice questions motivate me to study the next material	4.45
8		The deepening of the material in the form of pre-test and post-test given in VLE really helped me in understanding the PBO concept	4.65
9		With the use of VLE, it becomes easier for me to discuss with friends and lecturers in discussing the concept and scope of PBO learning	4.65
10		Program code that can be typed directly in the worksheet menu, really helps me to practice writing programs	4.4
11		Formative evaluation motivates me to learn things that have not been mastered/new	4.45
12		With the use of PBO learning materials, I became happy to learn PBO because the methods provided helped to practice code	4.65
13		PBO learning materials help me individually / in groups to actively practice programming code	4.55
14		PBO learning materials help me to find out my weaknesses and strengths in doing exercises/assignments	4.7
15		With this learning material, I can study anywhere and anytime	4.6
16	Language	The language used is easy to understand	4.55
17		Interesting illustration	4.5
18		Easy-to-read font	4.5
19	Design and Media	The presentation of the layout of the content makes the material easier to read	4.55
20		Font selection makes the material easier to read	4.55
21		The color in the content makes the material easier to read	4.55
22	Feasibility	I really agree if this PBO learning material can be applied	4.7

The results of field trials that have been carried out with 20 students on learning materials obtained an overall average score of 4.59 as shown in table 5, which means that

the developed VLE is very good in terms of instructional design aspects, material aspects, motivational aspects, language aspects, aspects of design and feasibility aspects.

Table 5 Recapitulation of the results of field trials

No	Aspect	Result
1	Instructional Design	4.617
2	Material	4.583
3	Motivation	4.567
4	Language	4.55
5	Design and Media	4.53
6	Feasibility	4.7
Average		4.59
Criteria		Very Good

Measuring Product Quality

To analyze the effectiveness of online learning, by processing the data from the pre-test and post-test results. The recapitulation of the results of the pre-test and the results of the post-test, the student learning outcomes showed an increase as shown in table 6 below:

Table 6 Comparison of pre-test and post-test results

No	Respondent	Pre-Test	Completeness	Post-Test	Completeness
1	Respondent-1	79	not finished	95	finished
2	Respondent-2	68	not finished	96	finished
3	Respondent-3	83	finished	93	finished
4	Respondent-4	27	not finished	86	finished
5	Respondent-5	77	not finished	79	not finished
6	Respondent-6	87	finished	90	finished
7	Respondent-7	84	finished	62	not finished
8	Respondent-8	67	not finished	91	finished
9	Respondent-9	59	not finished	79	not finished
10	Respondent-10	65	not finished	91	finished
11	Respondent-11	53	not finished	85	finished
12	Respondent-12	69	not finished	93	finished
13	Respondent-13	68	not finished	94	finished
14	Respondent-14	92	finished	99	finished
15	Respondent-15	84	finished	97	finished

No	Respondent	Pre-Test	Completeness	Post-Test	Completeness
16	Respondent-16	78	not finished	99	finished
17	Respondent-17	58	not finished	93	finished
18	Respondent-18	11	not finished	89	finished
19	Respondent-19	76	not finished	56	not finished
20	Respondent-20	62	not finished	88	finished
Total		67,35		87,75	
finished		25%		80%	

Based on table 6, the pre-test and post-test recapitulation is obtained as follows

Table 7 Recapitulation of pre-test and post-test

No	Test	Average
1	<i>Pre-test</i>	67.35
2	<i>Post-test</i>	87.75

Based on the results of the pre-test and post-test results, it can be seen that the average pre-test score is 67.35 and the average post-test score is 87.75, there is an increase in learning outcomes of 20.40%, so it can be concluded that online learning with VLE is proven effective and can improve learning outcomes.

Discussion

The learning materials developed are in the form of modules (Rahdiyanta, 2009), because the module has the following characteristics: a) self-instruction, enabling one to learn independently; b) independent, all required materials are in the module; c) stand alone, the module does not depend on other learning materials; d) adaptive, having adaptability to the development of science and technology; e) user friendly, any information presented can help facilitate the user. VLE developed using the Canvas application, which contains pre-test questions, material explanations, practice questions, post-test questions, program code files that can be used by students to practice, video files explaining the material, worksheets for writing exercises. code online, if students are not using a computer that has Java applications installed.

The results of field trials, students are happy, motivated to do practice questions and always follow the learning process on time. The results of the pre-test and post-test that have been carried out have increased by 20.40%. The importance of choosing the right learning strategy includes how to manage five things, namely: managing time, choosing what to deliver, knowing where and how to apply effective learning, setting the right priorities, and then interweaving all of these with each other to arrive at an effective decision.

During the trial, it was revealed 4 important things, namely the interaction between students and students and students and lecturers in discussion forums, thus motivating students to learn, they do not feel alone when studying online. When vicon students can discuss directly with lecturers about things they don't understand and lecturers can directly practice on their computer screens or lecturers can see student work through student computer screens. The VLE design facilitates the learning process because it is well designed. Online learning requires consistency of pre-test work and vicon time makes students have time management. Time management is very important when learning online, because students must be consistent with the vicon time and understand the material before studying.

According to Spector (J Michael Spector et al., 2019) learning materials must be able to meet student needs, easy to use, attractive designs, easy to find descriptions of materials, materials can be accessed at any time. According to Khaerudin (Khaerudin, 2011) Learning designers must provide opportunities for students to actively construct their own knowledge and competencies by searching, reviewing, formulating their own knowledge that must be mastered, so that ultimately master the competencies that must be possessed..

CONCLUSION

The development of VLE and learning materials for Object Oriented Programming courses has been completed. Based on the results and discussion of the research, the following conclusions can be drawn:

Online learning used in the learning process during the pandemic, based on the results of the literature is not designed and arranged systematically. Lecturers only move face-to-face learning to online via video conferencing applications, or use text through the WhatsApp application, for some campuses that already have learning management, Lecturers use learning materials by providing ebook links and powerpoint slides that are stored on campus learning management, not yet available learning materials that can help students to learn independently both in class and at home.

The results of the one-to-one evaluation with experts resulted in an overall average score of 4.6 with the conclusion that the learning materials were very good. The results of the one-to-one evaluation with 3 students stated that 66.7% of the learning materials were suitable for use. The results of the evaluation of the learning small group get a score of 4.7, meaning that the learning materials are feasible to use. The results of the field trial or field trial resulted in an overall average score of 4.59 with the conclusion that the learning materials were very good.

The results of the effectiveness test on learning materials were carried out by comparing the results of the pre-test with the post-test the results were the average pre-test score was 67.35 and the post-test average score was 87.75, there was an increase in learning outcomes of 20.40% an increase in learning outcomes.

CONFLICT OF INTEREST

The authors declare there is no conflict of interest regarding the publication of this paper.

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