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Virtual Learning : Practicum of Algorithms and Programming Using Pascal Program

Ahmad Yani Ranius[1,2 a)], Zulfiati Syahrial[1, b)], Moch. Sokardjo[1, c)], Syakirah[1, d)]

[1]*Universitas Negeri Jakarta, Indonesia*
[2]*Universitas Bina Darma, Indonesia*

[a)]*Corresponding author: ayaniranius_tp17s3@mahasiswa.unj.ac.id & ay_ranius@binadrma.ac.id*
[b)]*zulfiati@unj.ac.id*
[c)]*msoekardjo@unj.ac.id*
[d)]*syakirahalwy@gmail.com*

Abstract. Virtual learning is intended to overcome the problem of the separation of space and time between students and instructors through computer media. Students can obtain learning materials that have been designed in available learning packages. Practicum is a form of scientific evidence of what has been learned. Algorithm and Programming subjects study an algorithm by applying it in the form of Pascal programming. Technology users are used for hybrid learning, through constructive learning through creative, collaborative and reflective virtual compositions. This research applied a learning method approach and verified the usefulness of the initial prototype that was built to support it. The researchers proposed to combine conventional practical lectures and distributed user interfaces to increase the skills of students to follow constructive learning processes. Then, the need to manage challenges that are carried out to collaborate with a distributed approach is also discussed

Keyword : Algorithms, Virtual Learning, Pascal, Practicum

INTRODUCTION

The information era enables students get a lot of information that is widespread through various printed and electronic media. This requires improvement on the quality of teaching which must be carried out continuously and requires a long process. This statement is in accordance with Mitchell's opinion that, however, these improvements in efficiency, responsiveness, and quality are not immediately realized [1]. Blended Learning (BL) creates a rich educational environment that enables various forms of communication by combining face-to-face learning with technology-enhanced learning so that teaching and learning takes place both in class and online [2].

At present, the learning process can take place without having to study in the classroom because of the development of learning resources especially through very fast information and communication technology. The learning process no longer has to depend on the teacher as a source of learning, but it can take place anytime and anywhere. Thus, students can study based on their interests and learning styles. However, in reality, most of the source of learning in various ways have not been fully utilized.

The use of learning resources is able to change the learning culture for students. They can actively discuss and get information from available various learning resources, while the teacher acts as facilitators who is involved in the learning process with students. Basically, the teaching that occurs in the learning process starts from the fact that "Learning is an enduring change in a behavior, or in the capacity to behave in a given fashion, which results from practice or other forms of experience" [3].

Referring to Anurrahman, learning is an activity of studying both with guidance, learners (students) and with their own full efforts. Learning activities require high level of interactions between students and learning resources, so that maximum results can be obtained. Therefore, interactions need to be developed systematically [4].

Several studies related to virtual learning showed that in an effort to do the best learning it is very important to be given a strategy of utilizing information and communication technology (ICT) as over the past few years, digital media has taken precedence over the analog ones.

Higher education institutions have adopted learning management platforms referred to as Virtual Learning Environments (VLEs). The strong implementation of VLE in higher education institutions justifies concerns with such an environment to assess its influence on student performance.

Through research and its application, virtual laboratory teaching (VL) is along with the development of new century of teaching and becomes an important symbol of the power of education. VL will have more application features and flexible response capacity, which can make virtual laboratory excellence clearer in experimental teaching. Knowledge of how strategies are developed, analyzed, selected and used to apply to the learning process will affect learning outcomes. Learning as practiced virtually is a learning using the media that is displayed and systematically created to facilitate learning in a virtual way which contains a series of learning activities. This research will also develop a learning process that will change the way teachers and students learn by enriching the knowledge and creativity of learning *virtual* in practicum Algorithms and Programming courses to facilitate practicum learning.

The development carried out to produce a product in the form of learning material is presented in the form of electronic and visual text media that can be accessed *online* using computers and *mobile phones* as well as how effective the virtual learning model is. Thus, how to develop a learning process that will change the way teachers and students learn by enriching the knowledge and creativity becomes the focus of this research.

LITERATURE REVIEW

Virtual computing is a digital replication version of something real. Replications made using software are basically quite similar to describe as digital renditions.

Carina Girvan [5], conceptualises virtual computing as that which is opposed to actual, but not opposed to real, meaning that the virtual is real, or at least our perception. Virtual computing is a modifier for the world and therefore it is important to be clear about what is meant by a virtual world. The world of virtuality is also interpreted in many forms, including aspects of reality that are ideal and real, or as if they were real.

Rob Sheilds, argues that virtuality is space; it is palces, relationship, and implies values. To understand the term and the power of its associations, one should equipped with a tool for cutting through hype to the last core of technological and economic change [6]. Mark W. Bell refers to the opinion of Castronova, a cyber researcher, defining "cyberspace" as "an artificial place on a computer designed to accommodate a large number of people" [7].

Based on some definitions above, it can be concluded that virtuality is a representation of several phenomena that exist in the real world, describing the whole picture that is interrelated and helps to deliver real information and data virtually.

The development of technology has pushed changes in the format of documents that were originally printed into digital or electronic forms. The concept of digital learning has also encouraged the development of students' abilities in communication, computing, collaboration and critical thinking patterns [8]. Educational support has been carried out *online* through the web site which makes the learning process easier to obtain. As stated by Moch. Sukardjo, there are many things to consider when building a new website for education. Basically, the site must be interesting enough so students want to use it. It should also contain all the material students need to help them achieve the goals for the learning target. One of the most important aspects of building a website is testing its usefulness. Internet users (students) are accustomed to knowing how to use websites quickly [9].

METHODOLOGY

Data is collected through by ADDIE model [10]: (1) analysis; (2) design; (3) development; (4) implementation and; (5) evaluation. The followings are how the researchers use the instruments.

1. Analysis is a systematic exploration of the way things are and the way things should be. The difference is teh performance gap. The analysis used to answer questions about: (1) current conditions of learning Algorithm and Programming practical lab courses in the laboratory, (2) concepts related to the learning process carried out in the laboratory, (3) the results of previous researches on virtual laboratories.

2. Design, if the analysis identifies a performance gap, the design phase will outline the performance objectives. Design for about the learning process of Algorithm and Programming courses in the laboratory that are being carried out. Furthermore, design were also conducted during preliminary research to gather

information on the conditions of learning in Algorithm and Programming courses that were carried out virtually.

3. Development, using the information gathered in the analysis and design phase, the performance solution as created. Development to gather information about conditions in the laboratory where the learning process is carried out. Development at Bina Darma University Computer Laboratory, were also conducted to obtain data on how the learning being developed was used or tested.

4. Implementation, this stage includes delivery of the performance solution. The implementation is used to obtain data on perceptions, attitudes, motivations, abilities of students before the dam after using learning materials including the readiness of students to carry out the learning developed.

5. Evaluate, Measurement of how well the performance solution achhived the objectives. The evaluate is given to determine the effectiveness of learning materials by giving preliminary tests given before learning and the final test is given after learning.

The data collection process will determine the learning model of the Algorithms and Programming practicum. The desired virtual learning model is equipped with learning resources for books, guidelines, and electronic modules as a learning tool. In addition, it is equipped with a turtorial application for understanding algorithms and programming by providing guidance in the process of making the following program given the application of the exercises. By applying this method can give an idea that practicum learning for Algorithm and Programming courses needs to be developed by changing learning resources through virtual learning.

RESULTS

In this study, the validity of the test is obtained through content validity which is carried out through expert judgment, while the reliability of test is obtained through test-retest reliability method. Experts involved in validity testing are experts who have expertise in the field of research and measurement methods and educational technology. The implementation of the model was to see the level of effectiveness of learning facilitated by the virtual learning developed. The researcher used the technique of collecting pre-test and post-test (final test) in essay form. Pre-test and post-test were conducted before and after students study through a virtual learning. The instrument for the pre-test and post-test sheet was developed based on the learning indicator grid formulated in the needs analysis.

Before the instrument used for the pre-test and post-test sheets, it must be validated first by the expert. Based on the instruments that will be used in obtaining model implementation data, it has two characteristics, namely instruments that produce quantitative data and qualitative data. Instrument that produces quantitative data, namely pre-test and post-test, and qualitative data from interviews, observation, and documentation.

1. The Validity of the instruments
   The validity of the formative evaluation is obtained through expert assessment. The instrument grid and instrument items were given to two experts to be assessed. The results of the assessment are then used to improve the instrument.

2. The reliability of the instruments
   After testing the validity of the instrument, the reliability test was then carried out, with the instrument together with the developed learning material tested by the speakers, namely experts and students. The try-out was conducted by conducting interviews with experts and students, then the results of the interviews were confirmed back to the speakers. This interview confirmation can show that the instrument used is reliable.

Reliability of the test instrument is obtained by test-retest reliability. The procedure for testing the test-retest reliability is to carry out a test in a group next time to do the test again in the same group with the same or equivalent test. Then, the researchers correlate the two sets of score scores obtained from the two tests [11].

DISCUSSION

Virtual learning uses a learning development model from Dick and Carey in Walter Dick, L. C. dan J. O. C. [12], which consists of ten steps, namely: (a) Identifying learning objectives; (b) Carrying out instructional analysis; (c) Analyzing the characteristics of learners and the learning context; (d) Formulating specific learning goals; (e) Developing assessment instruments; (f) Developing learning strategies; (g) Developing and choosing learning materials; (h) Revising learning materials Designing and implementing formative evaluations; (i) Revising learning

materials; and (j) Designing and carrying out summative evaluations. These steps can be seen in the following figure:
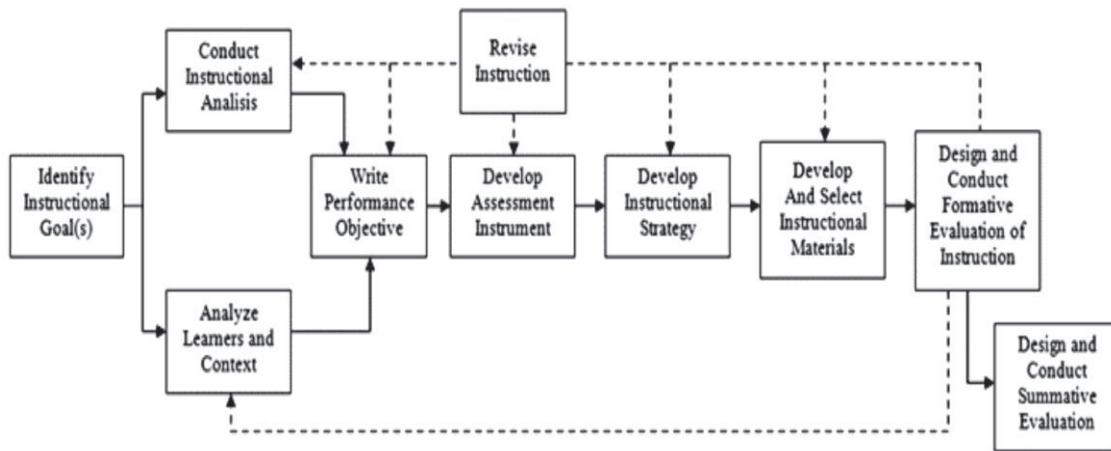

FIGURE 1. Steps of The Systematic Design Of Instruction Model [13]

Steps of the Systematic Design of Instruction Model:
a. Identify learning objectives.
    The first step in this model is to determine what new information and skills students want to master when they have completed the instruction, which is stated as the goal. Instructional goals can come from a list of goals, from performance analysis, from needs assessment, from practical experience withlearning difficulties student, from the analysis of people doing work, or from several other requirements for new teaching.
b. Conduct instructional analysis.
    This second step is a procedure for determining skills and knowledge that are relevant and needed by learners to achieve competencies and learning objectives, such as knowledge, skills and attitudes that students need to have. After identifying instructional objectives, then determine step by step what is done when going to do that goal and see the sub skills needed for mastery of the total goal.
c. Analyzing the characteristics of learners and the context of learning.
    Analysis of student characteristics includes analysis to determine students' initial abilities, preferences or learning styles and attitudes toward learning activities. Analyzing the characteristics of students correctly and accurately will be very helpful in the selection and use of learning strategies. Meanwhile, the analysis of the learning context includes analysis of the situation and conditions of students, which includes situations related to the tasks faced by students in applying knowledge and skills and conditions related to the skills learned by students.
d. Formulate specific learning goals.
    After doing the instructional analysis, the next step is to develop competencies or specific learning goals (instructional objectives) that need to be mastered by students. The formulation of this specific learning goal needs to be considered the knowledge and skills that must be possessed by students after the learning process is complete, the conditions needed so that students can demonstrate the ability of the knowledge they have learned, indicators and criteria that can be used to determine the success of students learning process.
e. Develop an Assessment Instrument.
    Based on the specific objectives or competencies that have been formulated before, the next step is to develop learning outcome assessment tools / instruments. This learning assessment instrument must be able to measure student performance both in terms of knowledge / cognitive, skills / psychomotor and attitudes. The types of instruments that can be developed include objective tests, performance tests, and tests to measure attitudes, portfolio and other tests. The main emphasis is placed on linking the types of skills described in the objectives with the assessment requirements.
f. Developing Learning Strategies.
    Based on previous information, a learning strategy can be developed that will be used so that the learning program can be achieved. Learning strategies include pre-learning activities to increase motivation, presentation of learning materials using examples and demonstrations, and follow-up of the learning process. Factors that

need to be considered in the development of learning strategies are: Theory and results of the latest learning research, Characteristics of learning media, material or substance that needs to be studied, and characteristics of students. Choosing the right learning strategy will be able to support a variety of learning activities.

g. Develop and choose learning materials.

Development of teaching materials can mean everything that is used to carry and convey information and messages from learning resources to learners. Examples of teaching materials that can be used are textbooks, guidebooks, modules, audio video programs. In this step, learning strategies are used to produce instructions, and usually include guidance for students, teaching materials, and assessment. The decision to develop original material depends on the type of learning outcomes, the availability of relevant materials available, and available development resources. Criteria for choosing from existing ingredients are also provided.

h. Design and develop formative evaluations.

Formative evaluation is done to collect data related to the strengths and weaknesses of the learning program. After completing the draft instruction, a series of evaluations are conducted to collect data used to identify problems with instructions or opportunities to make instruction better, which is called formative because the goal is to help create and improve teaching processes and products. The results of formative evaluation can be used as input to improve the draft learning material.

i. Revise learning material.

The revision of the learning program is the final step in the process of designing and developing learning programs. Data obtained from formative evaluation procedures are summarized and interpreted to determine the difficulties faced and weaknesses and then revisions are made. Data from formative evaluations are summarized and interpreted to identify difficulties experienced by learners in achieving goals and to link these difficulties with specific deficiencies in instruction. The dashed lines in the figure show that the data from formative evaluation are not only used to revise the instruction itself, but are used to re-examine the validity of the learning analysis and assumptions about the entry skills and characteristics of the learners.

j. Design and carry out summative evaluations.

This summative evaluation is the peak of evaluation to measure the efficiency and effectiveness of learning, but this last step is often seen as part of the learning design because this evaluation is carried out after all components are complete and formative evaluation is carried out and sufficient revisions have been made according to the standards used by the learning and evaluation designer summative does not involve program designers but involves independent assessors.

Although summative evaluation is the peak evaluation of teaching effectiveness, it is generally not part of the design process. This is an evaluation of the absolute or relative value of the instruction, and occurs only after the instruction has been formally evaluated and is sufficiently revised to meet the designer's standards. Because summative evaluation is usually not carried out by the instruction designer but by independent evaluators, this component is not considered as an integral part of the instructional design process.

The procedure used for summative evaluation received more attention today than in previous years due to increased interest in the transfer of knowledge and skills from teaching settings. This type of evaluation answers questions related to whether the instructions given solve the problem designed to be solved. Terms such as student verification, material effectiveness, and assurance of the effectiveness of materials reappear now because transportation of materials is far more economical and easier. The nine basic steps represent the procedure used when using a system approach to design instructions. This series of procedures is referred to as a system approach because it consists of interacting components which simultaneously produce instructions to meet the needs stated in a goal. Data is collected about the effectiveness of the system so that the final product can be increased to reach the desired quality level.

Summative evaluation is done to look for strengths and weaknesses in teaching and document these findings for policy makers needed to apply other learning. Summative evaluation only includes two stages, namely expert assessment and field trials.

CONCLUSIONS

In this study, investigated the role of independent learning, technological readiness, and student motivation in a virtual way. The results of the study indicate that the virtual learning environment supports and is better than the environment without virtual learning support in providing learning facilitation. Results from structural modeling imply that independent learning plays an important role in influencing cognitive presence. Teachers or instructors

must recognize the value of independent learning patterns in the context of more flexible learning. The impact of social presence on the other two attendance shows the importance of involving students emotionally and socially in the learning process both in online and offline learning scenarios. Technology readiness has a stronger positive influence on teaching attendance in virtual learning. Previous study habits or direction of learning technology or platforms have the potential to improve students' perceptions of the existence of teaching.

LIMITATIONS OF THE STUDY

The sample size was not too large because the number of registrations was limited to virtual classes and only offered to groups of students selected from the same background for better trial control. Given the above constraints, and with systematically controlled arrangements, the sample size of each of the 30 students, is considered acceptable to provide insights for special studies. We hope to expand the study to more selected virtual classes because of the research resource limits, types of evidence, for example, students, usage data systems are not included here.

CONTRIBUTIONS

The findings in our study revealed the impact of independent learning, technological readiness, and learning motivation on the effectiveness of learning in mixed learning environments and non-mixed learning environments. This study extends the literature in blended learning and influencing factors that have not been adequately explored. By comparing interdependencies in different learning settings, our research provides empirical evidence and insight for educators to adopt appropriate teaching strategies in online and offline teaching, to improve perceived social, teaching and cognitive presence that lead to more learning outcomes well.

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