

Development of Virtual Learning Methods in the application of Practice Algorithms and Programming

Ahmad Yani Ranius¹, Zulfiati Syahrial², Moch. Sukardjo³

¹Universitas Negeri Jakarta & Universitas Bina Darma

²Universitas Negeri Jakarta

³Universitas Negeri Jakarta

Abstract

Practicum is a form of scientific proof of what has been learned. The theoretical study states that a laboratory is a particular place equipped with equipment to carry out experiments that have an understanding that is as a place equipped with equipment to carry out experiments in science or to conduct testing and analysis, I Nyoman Sugiana et al (2016). The learning model referred to is the computer practice for applying the algorithm to the Pascal programming language, to be developed based on a virtual laboratory. The technology used in virtual laboratories is one of the ICT-based learning processes that can be used as an alternative solution for practical learning. This study uses a learning method approach and verifies the use of technology to support it. However, challenges in interaction with technology, multimedia, have an impact on the ability to carry out learning activities. The findings indicate the need for research on alternative approaches and designing practically virtual methods. It can be proposed to incorporate practical lectures in a conventional manner and in a distributed user interface, using mobile devices to access a shared display, in order to improve the ability to follow a constructive learning process.

Keywords: Algorithms, Practicum, Programming, Technology, Virtual.

1. INTRODUCTION

Describes the research effort at Bina Darma University which aims to explore how the lecture process and reuse of virtual content can be used to overcome obstacles to conceptual understanding of Algorithms and Programming by practicing using the Pascal programming language. The research is based on a specific pedagogical framework that aims to identify "threshold concepts" - key concepts that are barriers to learning - and facilitate understanding through the creation and sharing of explanations, expressives, and students' thinking abilities. computer labs can provide alternatives to be done in a virtual way, with a tutorial pattern and given as additional explanations, and then through the involvement of viewers with an interactive display is an additional understanding of what is made in the form of "video performance."

Currently the learning process can take place without having to learn in the classroom because of the development of learning resources, especially through rapid information and communication technology, the learning process is no longer required to depend on the instructor as a source of learning. but can take place anytime and anywhere. Thus students will be able to learn according to their interests and learning styles. In fact, learning resources in various ways are mostly not fully utilized. Learning resources can be identified as messages, people, materials, tools, and techniques. Learning is a system, the success of learning is largely determined by the effectiveness of each component interacting.

The tendency to use learning resources in the form of textbooks and learning books is the view that other learning resources are used as an additional complement in learning. Making the assumption that the use of learning resources is not only an integral part of learning, it really helps the learning process. Media books are used as a source of learning for teachers and instructors as well as the main actors who play an educational role, especially in terms of delivery and present it, explain, analyze and account for the learning process. This is the idea that other learning resources are additional means of learning.

Learning resources must be an integral part of the learning process because their use can create a clearer learning experience and can facilitate interaction between students and teachers and fellow students. The use of learning resources will also enrich the learning experience for students. Using learning resources can change the culture of learning for students to actively discuss and will seek knowledge from a variety of available learning resources, while the teacher acts as a facilitator who is equally involved in the learning process to students. Generally the world of teaching that occurs in the learning process starts from "*Learning is an enduring change in behavior, or in the capacity to behave in a given fashion, which results from practice or other forms of experience*" (Dale H. Schunk, 2012) in Anurrahman (2010), Learning is a good student activity with guidance, learners with their own full business. In learning activities required interaction between learners and learning resources, in these activities obtained maximum results, the level of interaction must be high. Therefore, interactions need to be developed systematically. Appropriate learning resources also need to be developed and managed systematically, and properly functional. Maximum utilization of learning resources can improve learning achievement.

The learning process will increasingly use the learning resources used, the learning activities will be more complete, including the description of the subject being studied will be clearer and more meaningful. Learning resources can also be used to meet varied learning needs not only in the form of printed materials such as textbooks, but students can benefit from other learning resources such as radio, television, social media, email, interactive videos, and other information technologies to improve interaction and provide understanding to students. Each learning source will have a different role or learning activity, seen from how the learning resources are used. The way students not only interact with the instructor as the only source, he can also interact with all learning resources used to achieve the desired results.

Explore how to translate logic designed into programming using the Pascal program. By encouraging understanding of logic to be applied into the programming process, identifying logic into interactions during evaluation utilizes technology. Furthermore, it is further explored by design to ensure virtual learning collaboration, therefore in reflective learning. Through this learning process can build a more effective process for the discovery and construction of collaborative knowledge, review and consolidation. Present the first objective of this study and follow the methodology, then discuss the results of the research. It is hoped to be able to conclude to design the research again, by giving some consideration to the lessons learned from the implementation of the practicum algorithms and programming that uses the Pascal programming language.

2. MATERIALS AND METHODS

The goal is to: 1). develop practical learning process of Algorithm and Programming courses using Pascal language to facilitate practicum learning, 2). The development that will be carried out will produce a product in the form of an electronic textbook, an electronic practicum module, an electronic manual of Algorithms and Programming courses using the Pascal program and the display of making programs and exercises presented in a virtual way, 3). applying a virtual laboratory learning model for practicum learning, 4). for teachers and students taking Algorithms and Programming courses using the Pascal program.

The results of this study are expected to have theoretical benefits: a). Trying to provide an alternative model of effective learning services for the efficacy of the Algorithms and Programming courses using Pascal language, b). provide an additional learning model that facilitates practical learning, c). use information technology as a learning medium and increase motivation to learn independently, d). Development of learning models that can help practicum in Algorithm and Programming subjects and practical benefits: the results of this study can provide an overview of a practical learning model programming that can be done for other similar subjects.

Architecture will bring up alternatives, and think visually, and maintain involvement as students explore the predicted block blocks for understanding Algorithms and Programming. With the hope that the guided student will gain an understanding of logic by applying it using the Pascal programming language to alternative, creative, real-world, or other related experiences. Doing this through performance and video making requires students to step through the process of finding and constructing collaborative knowledge,

which leads to a deep and correct understanding of the Algorithm and other component parts. Furthermore, the resulting virtual-based learning functions as a form of learning utilizing information technology and logical expression of understanding, and an opportunity to reflect further the strengthening of the knowledge gained.

Longitudinal research with several students and lecturers has provided empirical virtual-based learning to show research has importance in the learning process. We follow a user-centered design methodology, providing options for building *scaffolding* pedagogical and technological for students and also lecturers on learning activities in a typical laboratory space and a more flexible learning environment. From research in *Computer-Supported Collaborative Learning* (CSCL), it starts with the existence of technological support for collaborative and collaborative learning activities in a joint laboratory. This is to take advantage of the recognized benefits shown in intuitive, active, enthusiastic, and real interactions with groups answering questions from research:

Is interaction around a large, shared, multi-touch table sufficient in itself as an enabler for augmented, collaborative, reflective construction of understanding ?

3. METHODOLOGY/MATERIALS

The novelty of the research conducted by the researcher is compared with the results of previous studies. Hendra Jaya's research (2018) states that the development of virtual laboratories is a simulation of a virtual reality created by a computer, then users can interact with results that reveal the contents of environmental reality called virtual reality (*Virtual Reality*). VR is a format of human and computer interaction where a real or imagined environment is simulated and users can connect and move the world (Jaya, 2018). This development model is created in the form of a virtual environment, users will feel that they really are present in a simulated world. His experience in the virtual world is done by what they will experience in the real environment.

Opinions of Tatli and Ayas (2010), the use of virtual labs is used for research in chemical laboratories when conducting experiments that have a high risk. They revealed, *Besides VLS also overcome the possible threats that can be seen in the real laboratory conditions or they create the opportunity of conducting the experiments free of charge which costs a lot if performed in a hands-on lab. With the VLS, students have the opportunity to conduct experiments over and over again until they fully understand and at a time and place for them appropriate* (Tatli & Ayas, 2010). From these studies it was revealed that VL can also overcome the possibility of danger seen from real laboratory conditions. Using VL, students have the opportunity to experiment again and again until they fully understand and at a time and place that is convenient for them.

Research by Olabbarriaga, Glatard, and De Boer (2010), *"virtual lab for,"* medical imaging for medical imaging that is adopted autonomously by users, especially for neuroimaging research (Olabbarriaga, Glatard, & De Boer, 2010). The novelty of this study illustrates that the laboratory is used as a visual medium that can describe something as a substitute for the object being used as an experiment. Such objects *di-visual-kan* to approach the actual object. This is done because it can provide a clear picture of the object under study, can reduce funding if done repeatedly or reduce the risk of the experiment itself. In this study will design a learning to facilitate the practice of making Pascal programs in the learning process of Algorithms and Programming courses. Furthermore, students will be given learning material in the form of electronic modules, books and electronic manuals for learning. In addition, students will be given visual learning how to create a Pascal program to apply the algorithm. At each session of the learning process, students will be given material understanding exercises by giving questions. This is intended as a medium of communication to see students' understanding abilities in participating in learning.

Judging from its purpose, this research can be said to be research and development (Research and Development). A research and development method is a method used to produce certain products, as well as test the effectiveness of these products (Sugiyono, 2015). Learning is a process that starts from the goal to solve problems and gaps. Striving for learning must also be able to make the subject of learning in this case students are able to construct or build new knowledge not just to obtain knowledge transfer from the

instructor. As revealed by Atwi Suparman (2014), that learning is a series of activities planned to produce behavioral changes as expected in a relatively fixed manner among students.

A conventional learning approach that relies solely on lectures will be addressed and support for learning tools will also be prepared. The learning process will be more effective if students actively participate in the learning process. Thus students will follow, experience, appreciate, and draw lessons from their experiences. In the end, learning outcomes will form part of their thinking and experience. Learning outcomes from learning experiences will be more embedded in the mind and conditions thus require students to think more creatively.

Some references have been studied previously, and by adopting several sections on the Modern Instructional Design model (Atwi Suparman, 2014), the design model developed for use follows the following steps :

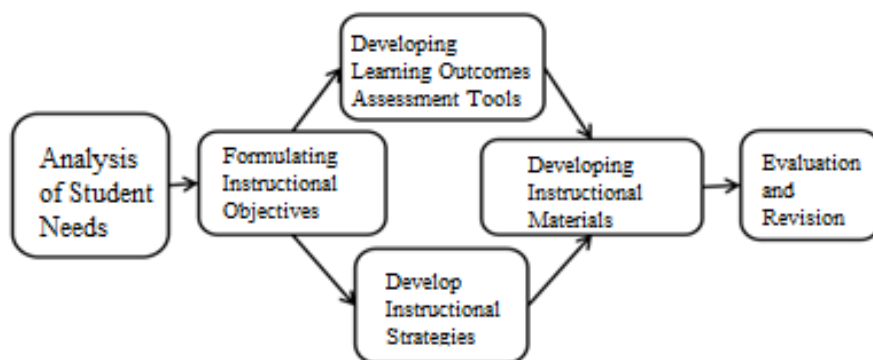


Figure 1 Desain Instruksional Modern (Atwi Suparman, 2014)

4. RESULTS and FINDINGS

4.1. Analysis of Student Needs

Information about students is collected. The designer must really understand the characteristics of students such as the learning environment, demographic background, knowledge of initial abilities and learning styles that influence so that the needs of students can be met.

4.2. Formulating Instructional Objectives

In formulating learning objectives need to pay attention to several things, namely: determining the knowledge and skills that students need to have after implementing the learning process, the conditions needed for students to be able to demonstrate the abilities and knowledge they have learned, indicators or criteria that can be used to determine the success of students in taking the learning process.

4.3. Developing Learning Outcomes Assessment Tools

The preparation of learning outcomes assessment tools is carried out in the second step after specific instructional objectives are formulated. This is based on the principle of goal-oriented, namely the assessment of an instructional system based on the results achieved. To find out whether the formulation of instructional objectives can be measured, it is necessary to develop an assessment of learning outcomes, namely by determining in advance the types of tests to be used, written, oral, or practical tests.

4.4. Develop Instructional Strategies

The selection of learning strategies is inseparable from the curriculum used, and the characteristics of students. The characteristics of the participants are mainly related to the participants' initial experiences, knowledge, interests, and learning styles. One characteristic of the model according to Chen, et.al (2016: 10) is that the model can help students gain new knowledge, skills, and self-understanding.

4.5. Developing Instructional Materials

To design learning it is necessary to think about what material / learning materials are needed to achieve the learning objectives and achieve the desired competencies, which is why we need to develop learning materials. In the implementation of developing learning materials, it can refer to two things, namely

the context in which education is organized and the form of learning activities to be carried out. Context considerations are made to determine the form of subject matter packaging.

4.6. Evaluation and Revision

After the instructional material has been completed, the next step is to evaluate and revise the instructional material, both formatively and summatively done to get the assessment and to find out whether the instructional material is effective or not. so that improvements can be made to perfect the program / unit developed.

Existing studies confirm the benefits of this initial proposal to support collaborative learning. However, collaboration comes with its own challenges, including conflicts due to group dynamics, ensuring fair contributions, effectively supporting distributed tasks and transitioning back to overall group activity - challenges that may be compounded by limitations in supporting technology. This must be managed carefully, to ensure it will not exceed the benefits of *Computer-Supported Collaborative Learning (CSCL)*. Other practical considerations, specifically related to dependence on *digital touchtables*, include still very high financial costs, low portability due to physical size and weight and, therefore, limited scalability of solutions for CSCL.

Thus it can be concluded that virtual-based practicum learning for Algorithms and Programming courses is the development of learning that is done by changing printed books into electronic books. Lecturers play a role pouring practicum materials in the preparation and provision of subject matter to be studied outside the practicum class and can maximally provide assistance for students while studying practicum in the laboratory. Furthermore, students also get lessons through a tutorial application on how to make the Pascal program and its exercises. It can be described as follows:

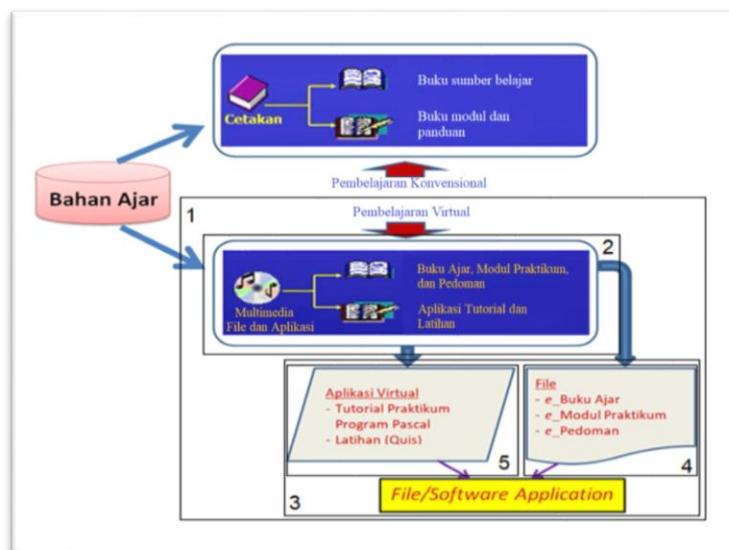


Figure 2 Virtual-based learning design

5. CONCLUSION

In order to succeed in meeting the goal of enabling deep conceptual understanding, practical solutions must be ensured that foster a reflective collaborative knowledge construction, without increasing the participant's cognitive burden. The research was conducted by making a practical learning model for Algorithm and Programming courses using Pascal programming language in the form of a virtual laboratory. This learning model is equipped with learning resources books, guidelines, and electronic modules as a learning tool. In addition, it is equipped with a tutorial application for understanding algorithms and programming by giving a view of the process of making the program and also given the training application. This series of processes uses the media as a major part of all learning activities that will be carried out. These concepts include the following: 1). learning model practicum Algorithm and

Programming courses using the Pascal programming language by implementing a virtual laboratory learning process, 2). the development of learning is designed to be made electronically so that the completeness of learning can be obtained by students and lecturers by downloading it, 3). The resulting learning resources are lecture material, practical guides, instructional manuals and are equipped with practical tutorial applications using the Pascal programming language and its exercises, 4). students get electronic learning materials and electronic practicum modules by downloading them and can print and learn earlier than the existing lecture schedule and for lecturers besides getting both the learning materials also get electronic practicum guidelines. Everything is made in the form of *files*, 5). Students can do practicum *online* without limits with practicum scheduling time and students can use the following program making tutorial application given an understanding of Pascal program training. This learning method changes the conventional way to multimedia by making learning materials electronically and visually so as to carry out practicum according to the determined practice class schedule it can be facilitated with a designed learning system.

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