DEVELOPMENT OF LEARNING MODELS IN WEB PROGRAMMING COURSES WITH COMPUTER-BASED LEARNING TUTORIALS

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ABSTRACT

Web programming courses are practical courses that can only run with the help of computer devices. The content or learning content in web programming courses is in program code directly created with a computer. The models developed include conceptual models, procedural models, and physical models. The research method used is Research and Development (R&D) using the Dick & Carey instructional system design model combined with the Hannafin & Peck model. The learning model was tested for feasibility and effectiveness before being implemented. The learning model developed has four components: syntax, reaction principle, social system, and support system. The feasibility of the model is seen from the percentage of the results of the one-to-one evaluation, which is 91.47%, the small group evaluation is 94.88% and the field trial evaluation is 92%. The effectiveness test results can be seen from the increase in the post-test score with the pre-test reaching 68.7% and the percentage of the success rate of student studies who have carried out learning with the tutorial learning model reaching 83%. The result of this research is a web programming learning model computer-based learning tutorial that is effective for improving student learning outcomes in web programming courses.

Keywords: Instructional design**,** learning model, CBL, web programming, tutorial learning.

INTRODUCTION

The web programming course at the Mataram University of Technology is a practicum course that students must take for several study programs, namely Informatics Engineering, Software Engineering, and Information Systems. Prerequisite courses that must be taken before taking web programming courses are web design, algorithms and programming, and database systems. The expected competence of this course is that students can build web-based computer applications. Competence to develop or create software is a

cognitive competence level 6 (C6) or the highest competence in Bloom's taxonomy. The final competence of this course is also the learning achievement of the web programming course.

In the 2018/2019 and 2019/2020 academic years, students' final grades in web programming courses with grades A and B were 57%, and grades C, D, and E were 43%. This can be interpreted that the achievement of study success has not been optimal. The minimum standard of study success is 75% of students get an A or B grade from the total students who take web programming courses.

If you look at the results of preliminary research, based on a questionnaire filled out by 39 students, 33% of them are less able to understand and memorize programming syntax, and 25.6% of them answered that there was no mentor. Hence, they had to learn to be self-taught, and 20.5% had problems understanding logic and algorithm. This means that the main problem faced by students is the ability to memorize and understand web programming syntax, so this results in a lack of student ability to create web applications. In addition, the role of lecturers as mentors is considered insufficient if they only teach during lecture hours. They need a guide who has the function of a mentor who guides them in every practice.

In overcoming the problem of learning difficulties, based on the answers in the student survey, 48.7% chose the option to find the answer themselves on the internet through a search engine, and 43.6% chose the opportunity to ask people they considered more experts as lecturers or top-level students. This means that most of the students are trying to learn independently. But because they are looking for solutions to problems encountered in programming code, they have difficulties. They still need a learning system that can provide solutions to their challenges.

From the results of this survey, it is also known what media students like the most to learn web programming. From the students' answers collected, 74.4% chose to use video tutorial media to learn web programming. Only 15.4% used the lecture module given by the lecturer. This indicates that they find it easier to understand video tutorials than lecture modules. However, another problem faced is that so many video tutorials are available on the internet and not necessarily by the material discussed. They need a video tutorial model that fits their needs according to the learning objectives and is structured and easy to understand.

Web programming courses are practical courses that can only run with the help of computer devices. The content or learning content in web programming courses is in program code (syntax) directly created with a computer. In this course, the computer finds teaching materials or open learning media and tasks in carrying out learning content. To improve understanding in this course, visualization using tutorials or simulations can help students understand. Research has proven that computer-based learning (CBL) through visualization of computer programs can improve students' understanding of complex processes in learning programming, increase their involvement in education, and improve their achievement (Belsam, 2017, p. 377).

A computer-based tutorial learning model is needed with the complete text, images, or videos to overcome the obstacles described above. Video tutorials are expected to provide a learning experience for students as they learn face to face, directly guided by the lecturer. Based on the study results, online videos allow teachers to build their online social presence because they can more easily talk with emotions and communicate with students. Students will also create a sense of closeness with their teachers (Borup et al., 2015, p. 249)

Several previous studies that are relevant to computer-based learning and have relevance to this research include research with the title: 1) A Computer-Based Game that Promotes Mathematics Learning More than a Conventional Approach conducted in 2017 by Bruce M. McLaren, et al (McLaren et al., 2017, p. 36); 2) Learning Application of Multimedia-Based-Computer Network Using Computer Assisted Instruction Method conducted in 2018 Janner Simarmata et al (Simarmata et al., 2018, p. 344); 3) Visualizing Computer Programming in a Computer-based Simulated Environment conducted in 2017 by Dr. Belsam Attallah (Belsam, 2017, p. 369); 4) Using a visualization-based and progressive learning environment as a cognitive tool for learning computer programming conducted in 2019 by Jun Peng et. Al (Peng et al., 2019, p. 52); 5) Designing and Developing Video Lessons for Online Learning: A Seven-Principle Model conducted in 2019 by Chaohua Oud et al (Ou et al., 2019, p. 82); 6) A Web-based Approach for Teaching and Learning Programming Concepts at Middle School Level conducted in 2019 by Sania Bhatti et al (Bhatti S et al., 2019, p. 46); 7) The Effect Of Animation In Multimedia Computer-Based Learning And Learning Style To The Learning Results conducted in 2017 by Rusli and M. Rinartha (Rusli & Rinartha, 2017, p. 177).

From the results of relevant research that has been done previously, it can be seen that the topic of research on computer-based learning is still feasible and even more interesting to research. The development of learning models carried out with structured plans, and integrated with the use of information technology so that they can be accessed online from anywhere and anytime, are the latest research themes since the COVID-19 pandemic until the post-pandemic. Including in this case, the learning model in practical courses such as web programming, from the development to implementation aspects, needs to be researched.

Based on the results of the analysis of relevant research, the novelty of the study (state of the art) of the research to be carried out is compared with the existing one, namely the learning model developed, namely the web programming learning model based on computer-based learning tutorials. The models developed include conceptual models, procedural models, and physical models. The research method used is Research and Development (R&D) using the Dick & Carey instructional system design model combined with the Hannafin & Peck model. The learning model will be tested for feasibility and effectiveness before being implemented. The learning model developed has 4 (four) components: syntax, reaction principle, social system, and support system. The learning model will be applied to practicum courses, namely web programming practicum, through the Online Tutorial Learning Information System (OTLIS). In OTLIS, tutorial learning will be equipped with modules, video tutorials, and interactive exercises.

MODEL DEVELOPMENT CONCEPT

Learning is a lasting change in behavior or the capacity to behave in a certain way, resulting from practice or other experience forms (Schunk, 2012, p. 3). Another definition is that learning develops new knowledge, skills, or attitudes when interacting with information and the environment (Smaldino et al., 2014, p. 31). From the two definitions, it can be concluded that learning consists of changing behavior, learning to survive for a long time, and learning gained from interaction or experience. Learning is defined as a change in one's abilities, attitudes, beliefs, knowledge, and skills (Spector, 2012, p. 27). Learning is a series of events that affect students or learners so that changes in a behavior called learning outcomes are facilitated. According to Gagne in Suparman, learning is a set of events that affect students to facilitate learning (Suparman, 2014, p. 9). Learning activities are influenced by the theory of learning psychology, which is the basis for learning development. Five schools are considered significant and dominant in influencing learning practices: humanism, behaviorism, cognitivism, constructivism, and cybernetic (Suparman, 2014, p. 14).

The model reflects reality or a temporary substitute for something more specific and accurate. Models are beneficial in explaining things that may be difficult to explain. A model can describe similarities among several items; a model can illustrate a process, and a model may represent something (Brown, 2015, p. 8). The model represents the reality presented with a level of structure and regularity, and the model is usually an idealized and simplified view of reality (Richey R, Klein J, 2011, p. 8). A model represents the reality that describes the structure and order and displays the following four forms: verbal or conceptual description, steps of activities or procedures, physical or visual replicas, equations, or formulas (Suparman, 2014, p. 107).

Harre in Richey identifies two types of models: micromorphs and paramorphs. Micromorphs are physical, visual replicas, such as computer simulations or scale models of large objects. On the other hand, Paramorphs are symbolic models, usually using verbal descriptions. As Harre notes, the simplest example of a paramorph is a verbal analogy. More general paramorphs can be categorized as conceptual, procedural, and mathematical models (Richey R, Klein J, 2011, p. 8).

The learning model consists of 4 (four) components: syntax, social systems, reaction principles, and support systems. Each model has a different syntax or model structure. Syntax, namely the steps, phases, or sequence of learning activities. The social system, namely the various roles of teachers and students in each stage of learning activities. In different learning models, it will be possible for teachers and students to be diverse or varied. The principle of reaction, namely the teacher's reactions to the activities of students. The support system, namely all the facilities, materials, and tools needed to implement a learning model (Joyce et al., 2009, pp. 89–93). The Applied Research Laboratory at Penn State University developed the definition of Instructional Design or instructional design in 4 related sections (Brown, 2015, p. 6), namely instructional design as a process, instructional design as a discipline, instructional design as a science, and instructional design as a reality.

According to Smith and Ragan in Richey, Instructional Design is a systematic and reflective process of translating learning principles and instructions into plans for instructional materials, activities, information resources, and evaluations. According to Reigeluth in Richey, Instructional design is the process of deciding what instructional method is best to bring about the desired changes in student knowledge and skills for particular course content and a particular student population. Meanwhile, according to Gustafson, instructional design is a systematic process used to develop education and training programs consistently and reliably (Richey R, Klein J, 2011, p. 2). Some examples of instructional design models are the Dick and Carey model, the Morrison, Ross, Kemp (MRK) model, the ARCS model (Attention, Relevance, Confidence, Satisfaction), the ADDIE model, the ASSURE model, the Alan Jolliffe model, and the Hannafin and Peck model.

The Concept of the Developed Model

According to Wena in Lestari, computer-based learning is learning that uses computers as a tool. Computers are media servants or supporters in the learning process or commonly known as computer-assisted learning or Computer-Assisted Instruction (CAI) (Lestari, 2015, p. 703). Several CAI models are offered as learning media, namely tutorial models, drill and practice, simulations, and instructional games.

Computer-based learning (CBL) has several other terms that are sometimes debatable, such as computer-assisted instruction (CAI), Computer-Based Instruction (CBI), Computer Based Education (CBE), and computer-assisted learning (CAL). CAI refers to using computers to assist the learning process in delivering programmed material. In CAI, the role of the teacher is not eliminated, and the computer only acts as a teacher companion in providing material. CBI is programmed learning that uses a computer as the primary tool to communicate the material to students; the computer becomes a learning center where students play an active role in learning material with the leading media computer. Students learn independently without the help of a teacher. CBE is comprehensive. All computer applications in education can support educational activities such as processing data, recording attendance, storing personal data archives, etc. Applications on CBE are not used to support learning activities. CAL is learning that involves using computers to present learning materials, tutorials, and feedback on student learning progress (Diana, 2014, p. 108).

A computer-based learning tutorial model is a learning program used in the learning process by using software in the form of a computer program containing subject matter and practice questions. The purpose of computer-based tutorials is to provide "satisfaction" or complete understanding (mastery learning) to students regarding the material/subject matter they are learning. Through computer-based tutorials/learning, computers as tutors are oriented towards building student behavior through computers. In a simple tutorial learning patterns are: (1) the computer presents the material, (2) student responses, (3) student responses are evaluated by the computer with an orientation towards students in taking the next achievement, and (4) continue or repeat the previous stage (Syafmen & Theis, 2021, p. 161).

According to Rusman in Lestari, the tutorial provides direction, assistance, guidance, and motivation to students to learn effectively and efficiently (Lestari, 2015, p. 703). For practical learning, tutorials can be provided in the form of videos. By learning through video tutorials that are well designed, expertly validated, and feasible, the results obtained are that students' conceptual understanding, skills, and creativity in developing computer programs increase significantly (Huda et al., 2018, p. 703)

CBL learning tutorials can be given online or offline. Online tutorials have three crucial points: autonomous but connected, flexible, and continuous learning (O'Hare, 2011, p. 10). In online learning, the presence of technology is significant. Furthermore, institutions that organize online learning need to ensure the availability of technology and how to use this technology to be effective for teaching and learning activities. In this way, the teacher takes on the role of a facilitator for students (Okur, 2011, p. 3920). Online learning, which is applied in e-learning, has also experienced rapid development. Currently, e-learning is moving towards student collaboration and the global distribution of learning content (Aparicio & Costa, 2013, p. 21)

In computer programming learning, good practice is required to facilitate conceptual understanding and encourage creativity in designing computer programs. Students' problems or difficulties in learning computer programming are generally related to programming concepts, contexts or cases, programming

structures, and personal challenges students (Dijkstra et al., 1991, p. 143). Video tutorials can facilitate students' understanding of concepts, materials, and procedures for making programs in detail (Huda et al., 2018, p. 703).

In the curriculum recommended by the ACM (Association for Computing Machinery), an international computer science association that provides a standard curriculum for all computer fields, web programming is a compulsory subject in most courses in informatics and computers. In the informatics engineering curriculum, web programming is referred to as a software application development course on a platform, so it is included in platform-based development studies (ACM, 2013, p. 142). In the Information Systems or Information Management curriculum, web programming is in application development and programming studies, and web programming is a compulsory subject (ACM, 2020, p. 55). In the Software Engineering curriculum, web programming is included in distributed client-server programming (ACM, 2014, p. 74).

Learning web programming can also be done online with an appropriate learning model. Learning CBL through online video tutorials is a great way to master web programming. In addition, the use of online code editors can help improve students' skills (Elgamal et al., 2013, p. 46). Online learning provides various benefits to students, including (1) enabling schools or colleges to increase the quantity of learning despite the limited number of classes, (2) providing access to learning for students who cannot attend lessons due to an obstacle, and (3) increasing group performance of learners to engage better in a digital environment (Betts et al., 2009, p. 3). E-learning in computer programming learning is not enough with learning content but needs to be equipped with exercises, tests, questions and answers, and other helpful modules (Mustakerov & Borissova, 2017, p. 89).

MODEL DESIGN

A conceptual model is a general verbal description of a particular view of reality (Richey R, Klein J, 2011, pp. 8–9). In general, tutorial learning is assistance or academic guidance by tutors to students (tutees) to help smooth the independent learning process of citizens studying individually or in groups related to teaching materials. Each learning model, including the tutorial, has a syntax, social system, reaction principle, and support system. In online tutorial learning, teachers or lecturers prepare teaching materials, admins as system administrators, and students who take online tutorials. The concept of learning CBL online tutorials can be described as follows:

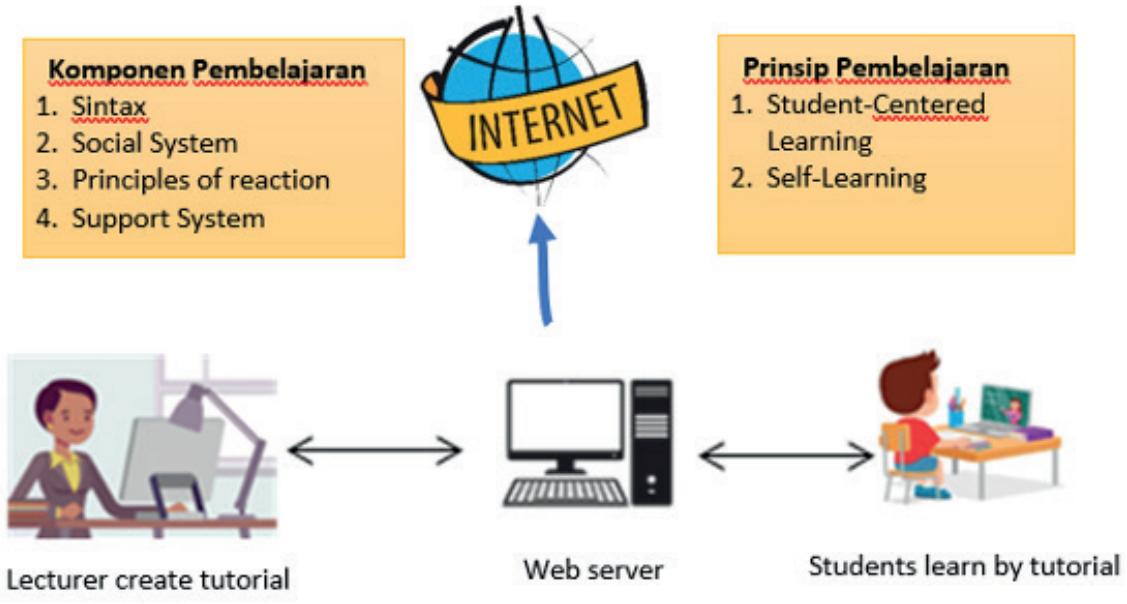

Figure 1. Conceptual model of learning CBL tutorial

The procedural model consists of a CBL tutorial learning model and a research design procedural model. The procedural model of CBL tutorial learning can be described as steps or tutorial learning syntax, which includes 6 (six) steps as shown in the following figure:

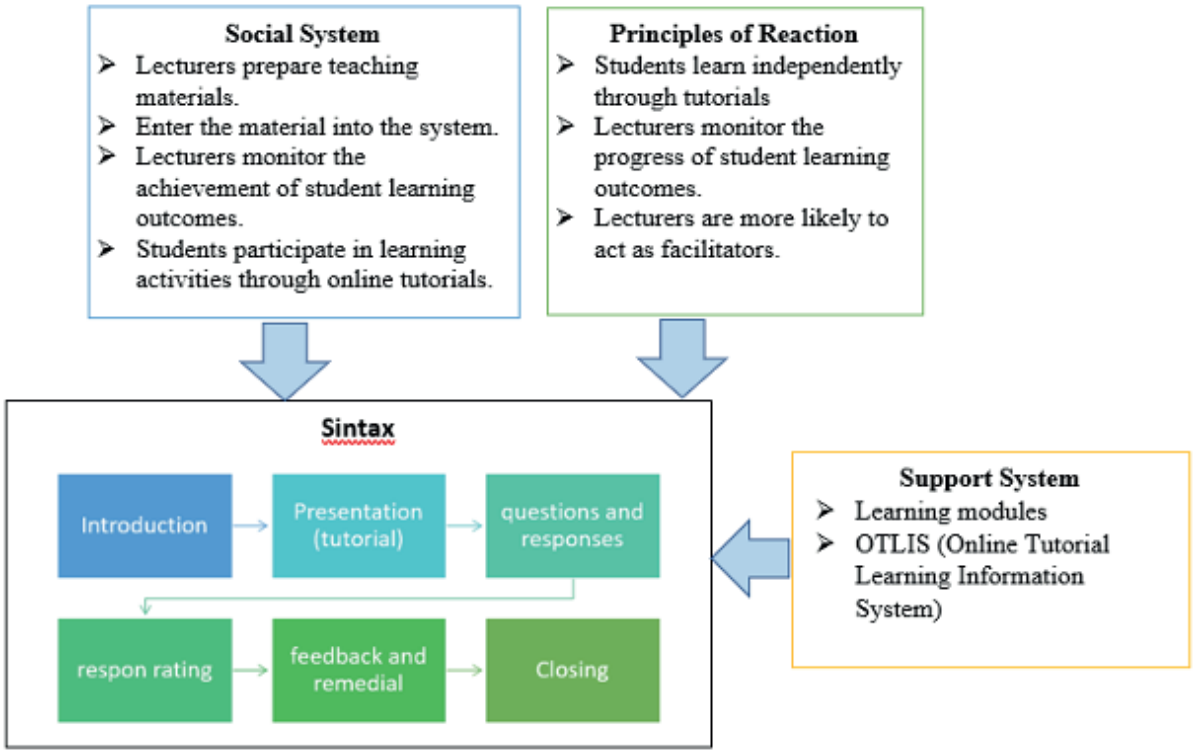

Figure 2. Procedural model of CBL tutorial learning

The tutorial learning steps consist of introduction, presentation of information, questions and responses, response assessment, feedback, and remedial and closing. 1. Introduction. At this introductory stage, the lecturer, through video tutorials, will convey learning outcomes, both subject learning outcomes (CPMK) and sub CPMK from the subject to be carried out. At this stage also, the lecturer gives instructions to students on how to follow the learning that will be carried out through online tutorials; 2) Presentation of information, at this stage, the lecturer, through online tutorials, delivers teaching materials in the form of video tutorials that students can follow. In learning web programming, the video tutorial will be displayed with presentation layouts, screen recordings for application demos, and lecturer videos explaining; 3) Questions and responses, is the stage where students practice and test their abilities, both through practice in the code panel and multiple-choice tests. The results of the exercises carried out can be known directly after each activity is completed; 4) Response assessment is the stage of assessing the effects of each exercise. If the calculation results of the computer machine show that the assessment results do not meet the standards, then students are asked to repeat the learning process; 5) Feedback and remedial, is a process of repeating learning if the results of the response assessment do not meet the traditional values set by the lecturer/ teacher; 6) Closing, is the final stage of the learning process in tutorial learning which includes conclusions and competencies of student achievement on learning outcomes.

The CBL tutorial learning model includes four main things, namely 1) Syntax, namely the steps or sequence of learning activities as shown in the procedural model picture above; 2) The social system, namely the various roles of lecturers and students in each phase of learning activities. The role of the lecturer in learning CBL tutorials is to prepare tutorial teaching materials and enter these materials into the online system. Lecturers also monitor the achievement of student learning outcomes online. The role of students is to participate in web programming learning activities through online tutorials; 3) The principle of reaction, namely the reactions of lecturers to student activities. In this tutorial, CBL learning, students learn independently

through tutorials provided by the lecturer and the system. Lecturers monitor the progress of student learning outcomes. Lecturers are more likely to act as facilitators; 4) The support system, namely all the facilities, materials, and tools needed to carry out the tutorial learning model. The materials and tools required are learning modules and the tutorial learning system in OTLIS (Online Tutorial Learning Information System). The system will provide learning tutorial videos code pads for exercises and practice questions.

RESEARCH APPROACH AND METHOD

The research method used is the research and development or R&D method. According to Borg and Gall, the most widely used R&D step in education is the systems approach model developed by Walter Dick and Lou Carey, as shown in the following figure (Borg & Gall, 1984, p. 570):

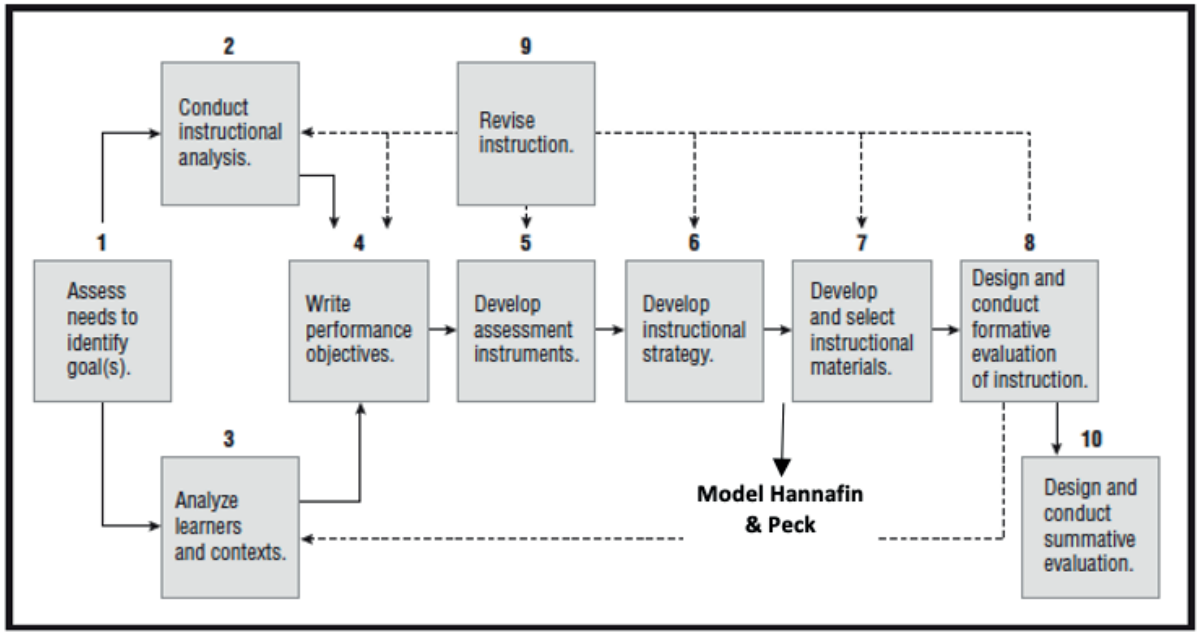

Figure 3. Research approach and method

The explanation of each stage is as follows assess needs to identify goal, conduct instructional analysis, analyze learners and contexts, write performance objectives, develop assessment instruments, develop instructional strategy, develop and select instructional materials, design and conduct formative evaluation of instruction, revise instruction and design and conduct summative evaluation.

MODEL DEVELOPMENT STEPS

Preliminary research was through a survey distributed to 50 students. The survey is filled out online via Google Form. The number of respondents who filled out the survey was 39 people. The plan for developing a web programming learning model based on computer-based learning tutorials is carried out through several stages according to the planned schedule. The settings in model development are adjusted to the settings in Dick & Carey's learning development design, namely as follows: identifying learning objectives, conducting learning analysis, analyzing students, setting specific learning objectives, developing benchmark test criteria, developing learning strategies, developing and selecting learning materials, developing and conducting formative evaluations, revising learning, and developing and executing the summative assessment.

The developing and selecting instructional materials stage, carried out according to the steps in the Hannafin & Peck learning design model, which consists of the stages of needs analysis, design, development, and

implementation. The learning materials and media developed to consist of learning modules for face-to-face learning and an Online Tutorial Learning Information System (OTLIS) as independent learning media.

Revision of the Dick & Carey learning design model can be done at every step of development. This means that the model revision does not need to wait until all the model development process has been completed. If errors or deficiencies are found during the model development process, then the model can be revised at that time. Meanwhile, expert validation and model evaluation was carried out through formative and summative assessments. Formative evaluation is carried out in the model development stage, while summative evaluation is carried out after completion. The formative assessment in research on developing a web programming learning model based on computer-based learning tutorials includes several stages, namely 1) One-to-one evaluation by experts. Evaluation with instructional design, materials, media, and language experts; 2) One-to-one evaluation by learners. This evaluation is carried out by selecting three students with high, medium, and low abilities and then evaluating one by one by each of these students; 3) Small group evaluation. Small groups consist of 8-20 students who represent the developed learning model; 4) Field trial. Field trials were conducted on 30 students who represented the users of the learning model and a teacher who could use the teacher's guide and the student's guide. The summative evaluation was carried out to test the effectiveness of the learning model. Summative evaluation is carried out using a new learning model in the learning process.

RESEARCH RESULT

The physical model generated from this research is a web programming learning model called the Online Tutorial Learning System (OTLIS) and and an additional e-module. The learning content in OTLIS consists of learning tutorial videos that are structured according to the topic of web programming courses. Video tutorials for web programming courses produced as many as 14 videos for 14 meetings in 1 semester, apart from the midterm and final exams. The content of this tutorial is divided into 3 parts, namely the opening, presentation of the material and closing or conclusion. The video tutorial looks like the following image:

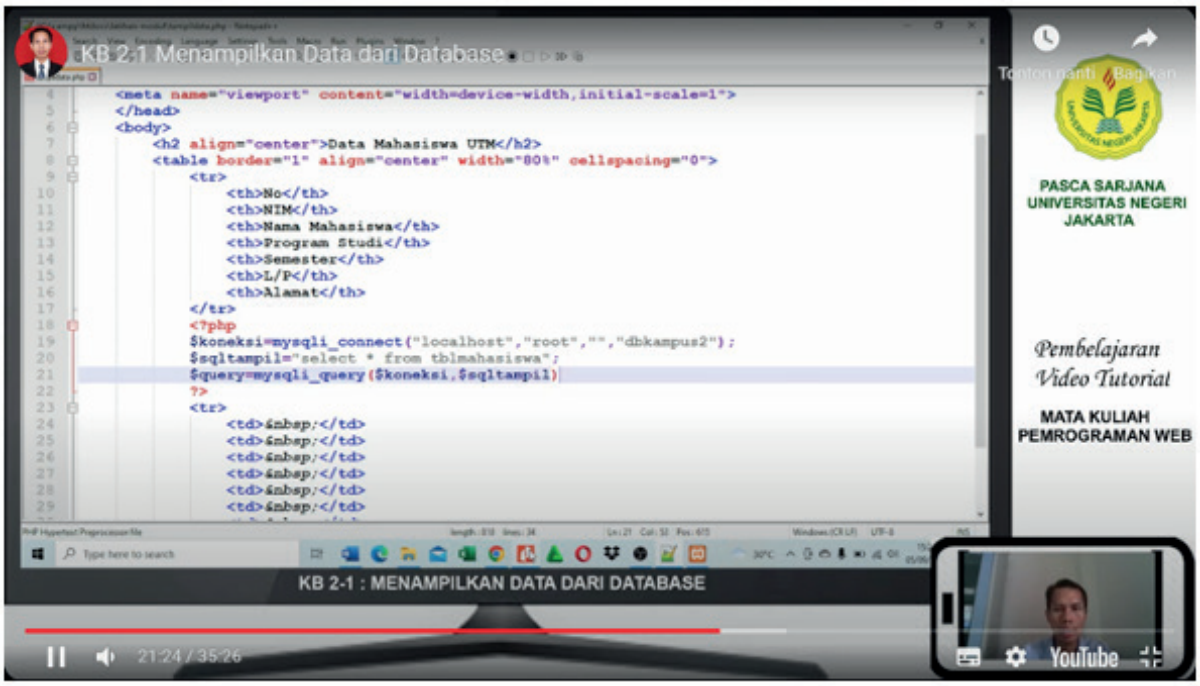

Figure 4. Video Tutorial Display

The topic of discussion in each video tutorial is adjusted to the lesson plan and learning outcomes of the course. The topics for each video tutorial are as shown in the table below:

Table 1. Discussion Topic Video Tutorials on Online Tutorial Learning Systems

Video Tutorial	Topic Discussion	Duration
Video Tutorial 1	Introduction to PHP and web server installation	00:25:00
Video Tutorial 2	Variables, constants, and operators	00:20:30
Video Tutorial 3	Logical structure: If Then Else	00:29:00
Video Tutorial 4	Loop structure	00:28:00
Video Tutorial 5	Implementing PHP functions	00:26:20
Video Tutorial 6	Date and time function	00:22:00
Video Tutorial 7	Form processing	00:28:00
Video Tutorial 8	PHP and MySQL Connection	00:27:00
Video Tutorial 9	Input data to MySQL table	00:29:00
Video Tutorial 10	Displaying data from a MySQL table	00:28:00
Video Tutorial 11	Updating data from a MySQL table	00:29:00
Video Tutorial 12	Deleting data from MySQL table	00:26:00
Video Tutorial 13	Register and login user	00:27:00
Video Tutorial 14	Responsive Templates	00:28:30

Evaluation of the feasibility of the tutorial learning model is carried out through one-to-one, small group, and field trial evaluations after instrument validation and expert testing have been carried out. The formative evaluation instrument is in accordance with the Dick & Carey instrument guidelines which consist of the dimensions of clarity of instruction, impact on learner, and feasibility of instruction (Dick et al., 2015, p. 289). In addition to these 4 dimensions, 2 dimensions are added, namely instructional goals and the technical dimensions of the model (Suparman, 2014, p. 145).

One-to-one evaluation involves three students representing students with high, medium, and low abilities. With a questionnaire with 43 questions in the form of answer choices "Yes" and "No," the score of the answer "Yes" is 118 or 91.47%, which means that the learning model is suitable for use in the learning process. The small group evaluation involved ten randomly selected students and a lecturer. After testing and filling out a questionnaire with 43 questions, a total score of 408 or 94.88% was obtained. The field trial evaluation involved 30 students and a lecturer. After testing the use of learning models and filling out questionnaires of 43 questions, the results of the "Yes" answer scores are 1,187 or 92%. With the percentage of answers above 90% and the model revision stage has been carried out, it can be concluded that the learning model developed is feasible to be implemented.

Table 2. Formative Evaluation

Dimensions	Indicators	Number of questions	One to One		Small Group		Field Trial	
			Max score	Score	Max score	Score	Max score	Score
Clarity of instruction	Messages	7	21	19	70	67	210	192
	Links	6	18	17	60	59	180	171
	Procedures	5	15	14	50	47	150	144
Impact on learner	Attitudes	5	15	15	50	48	550	145
	Achievement	3	9	9	30	29	90	78
Feasibility of instruction	Learner	4	12	10	40	36	120	107
	Resources	3	9	9	30	27	90	82
Instructional goals	Instructional goals	2	6	6	20	20	60	55
Technical	Learning model	8	24	19	80	75	240	213
Total			43	118	43	408	43	1187

The assessment of the model's effectiveness is done by looking at the increase in the posttest value compared to the pretest value. At the time of the pretest, the average value of the students was 46.7, while at the time of the posttest, the students' scores increased by an average of 78.8. The increase in scores between pretest and posttest was 32.1 or 68.7%. In addition, an evaluation of the level of completeness of students was also carried out with the result that 85% of students completed based on indicators of scores greater than 75.

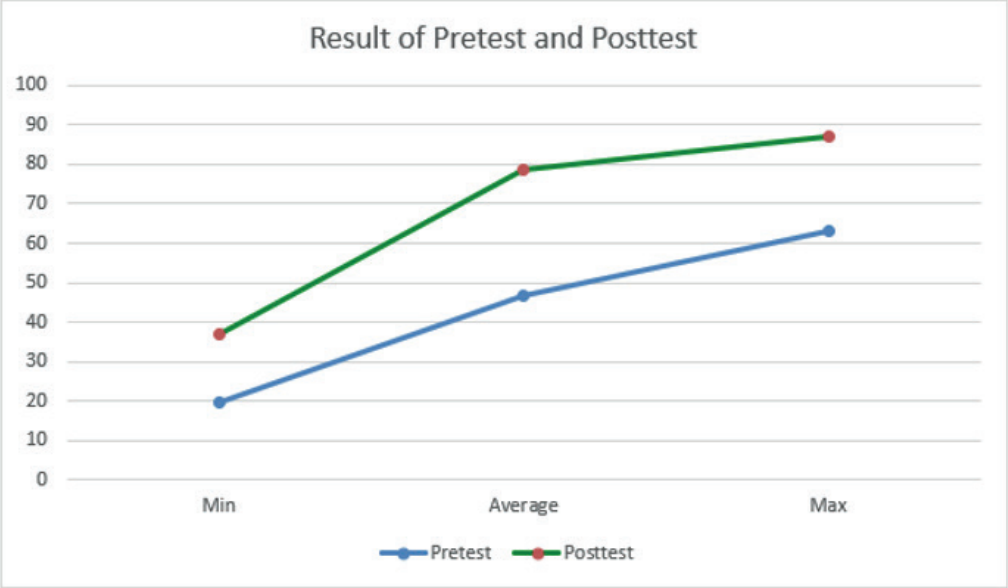

Figure 5. Result of Pretest and Posttest

The results of this study confirm the results of previous research, namely learning tutorials through videos can increase the effectiveness of learning, and at the same time answer suggestions for continuing research on the impact of online video tutorials (Putro & Govindaraju, 2021, p. 209). This research also proves the statement in previous research that the application of CAI as part of CBL makes students interested in studying computer practice material, besides that the material can be presented with various models such as tutorials, simulations, exercises and games (Simarmata et al., 2018, p. 344). This research is also in response to suggestions from other studies on how the use of video lessons by students affects their learning performance (Ou et al., 2019, p. 100). In this study, it was proven that the tutorial learning model with well-designed videos can improve learning outcomes for web programming courses.

CONCLUSION

Research on the development of a computer-based learning tutorial-based web programming learning model produces a feasible and effective tutorial learning model to be applied to web programming courses. This can be seen from the results of the feasibility test and the effectiveness of the model. The feasibility of the model is seen from the percentage of the results of the one-to-one evaluation, which is 91.47%, the small group evaluation is 94.88% and the field trial evaluation is 92%. The effectiveness test results can be seen from the increase in the post-test score with the pre-test reaching 68.7% and the percentage of the success rate of student studies who have carried out learning with the tutorial learning model reaching 83%. The conclusion is that web programming learning model computer-based learning tutorial is effective for improving student learning outcomes in web programming courses. This development research was only carried out in one course, namely web programming and was piloted at one university, namely Mataram University of Technology. For future research, it is hoped that it can proceed to the implementation stage on all learning topics in a wider scope, for example several universities.

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