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Model Effectiveness Cooperative Project Based Learningg In Geographic Information System (Gis)

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Abstract:
The research aims to develop a cooperative project based learning model for the Geographic Information System (PjBL-GIS) course with a valid, practical and effective method used to improve student learning outcomes and creativity. The research uses research and development (R&D) methods and ADDIE development procedures. Research based on need analysis found the phenomenon that the STAD cooperative learning model has not been effective in developing self-potential and student learning outcomes to the fullest. In learning Geographic Information System (GIS), students produce scientific products, namely the design of real-world digital map object modeling and application programs as a result of learning and skills to support the development of the software sector creative industry in the era of the digital industrial revolution. The result of the research is that the effectiveness of the PjBL-GIS model is stated to be effective in improving student learning outcomes. The average value of the increase in student learning outcomes in the control class was 61.83 and the experimental class was 85.67. The results of research and model development show that all criteria can be implemented properly so that it can be concluded that the PjBL-GIS model is an effective model. 83 and the experimental class is 85.67. The results of research and model development show that all criteria can be implemented properly so that it can be concluded that the PjBL-GIS model is an effective model. 83 and the experimental class is 85.67. The results of research and model development show that all criteria can be implemented properly so that it can be concluded that the PjBL-GIS model is an effective model.

Keywords: PjBL-GIS learning model, validity, practicality, effectiveness, learning outcomes.

INTRODUCTION

The development of learning models creates creativity as human capital that can contribute to increasing productivity and quality of education, driving innovation growth, economic growth, entrepreneurship, and can reduce intellectual unemployment rates in society.

The implementation of the learning model for the Geographic information system (GIS) course needs to apply the following principles: (1) focus on mastering object modeling competencies; (2) having relevance to work procedures in the industrial world; (3) learning patterns oriented to the world of work competence (Gay & Airasian, 2000). Based on data from a field survey conducted at the Information Systems Study Program at Lancang Kuning University (UNILAK), that the GIS learning process still does not meet these principles.

The Geographic information system (GIS) course in the UNILAK Information System Study Program is a course that has a learning objective to shape the character (creativity), skills, and computational expertise of students in designing digital map object modeling and developing application software through computer programming based on world problems. real. Based on data in the UNILAK Academic Information System, there is a tendency to decrease students' learning scores for Geographic information system (GIS).

Based on observational data and analyzing the results of interviews with students related to the

implementation of learning GIS courses in class, students judged that the lecturer gave too much theory (23%), while the practical activities in the laboratory were lacking (25%). Lecturers give tasks that are not in accordance with the development of technology and the software industry (43%), and learning GIS is not fun or monotonous (9%). Based on the results of discussions and discussions with several lecturers who support object-based modeling and programming courses, specifically resulted in recommendations that it is very necessary to change the process and improve the quality of GIS learning.

Based on observations of the implementation of the GIS learning process in the classroom, there is a reality that GIS learning is more intensively carried out using the lecture method and short practicum accompanied by the assignment of practice questions, while the characteristics of GIS courses include informatics engineering courses that can produce real work products in the form of designs. modeling objects and application programs as a GIS learning final project. Based on the survey results, it shows that 85% of student respondents need intensive and structured guidance in doing GIS assignments given by the lecturer.
The obstacle experienced by lecturers in GIS courses is that there is no learning model that brings students closer to literacy, object modeling procedures, and programming in the real work environment. Students still tend to learn on the instructions of the lecturer and not take the initiative on their own awareness to find learning resources available on the internet. Students lack motivation and are not optimal in completing their learning tasks.

Geographic information system (GIS) is one of the expertise courses that have a big role in the development of information technology (IT). Geographic information system (GIS) is one of the sciences in the field of computer software engineering that can support the development of mapping information systems independently digital and analysis of the earth's geographic surface, so that the learning model Geographic information system (GIS) is very important to be developed in order to provide provision of skills skills to higher education students.

Geographic information system (GIS) is a system that organizes hardware (hardware), software (software), and data, and can utilize storage, processing, and data analysis systems simultaneously, so that information related to spatial aspects can be obtained. GIS is a computer-based spatial and non-spatial data management with three basic characteristics, namely: (1) having actual phenomena (non-location data variables) related to the topic of problems in the location concerned; (2) is an event at a location; and (3) has a time dimension (Purwadhi, 1994).
In connection with improving the quality of GIS learning and to provide knowledge, expertise and skills to students in the field of software development so that students can play an active role in developing the country and society, especially in developing the potential of the creative industry in the software sector in Indonesia, research on the development of learning models in cooperative and project learning-based GIS courses (PjBL-GIS) it is very important to do a special in-depth study. Project-based learning (PjBL) is different from other learning models, namely in scientific concepts, the active role of students in the learning process flexibly, solving problems,
These innovative learning models have characteristics and are based on human social characteristics which are patterned to form team-work, cooperative and collaborative, discussion groups with open-ended answer discussions, are interactive and constructive in building knowledge. Knowledge, working together on real projects and tasks in the field (workshops) and industry. Students try to learn how to learn (learn how to learn), and work hard to acquire knowledge and skills (Eberly, 2012).
The application of project-oriented learning models can motivate students, make learning activities fun, and increase learning achievement. Project-oriented learning usually uses case studies of real-world problems as the core of learning. Meaningful use of knowledge and student skills can be constructed by carrying out project tasks and real work (Cord, 2010).
The project-based innovative learning model (PjBL) is a learning model that can actually

trigger and motivate students in solving problems and is able to construct self-potential. Project-based learning is based on constructivism theory and is problem solving oriented (Doppelt, 2003). Students build the construction of knowledge and skills to gain learning experiences and actively hone their own skills. Project-based is innovative learning, which emphasizes contextual learning through the implementation of several stages of complex activities in an effort to solve problems in lectures related to real-world problems. Students learn with fun, participate fully in meaningful learning activities, and solve tasks and problems in groups. Lecturers give students the freedom to work independently with their teams, explore knowledge and construct knowledge, seek learning experiences so as to produce unique, valuable and realistic products and creations (Okudan & Sarah E, 2004).

In the implementation of the project-based model, students begin to plan projects, implement projects, solve problems and produce products and carry out evaluations. Students use the product, present the product and evaluate their work (Moursund, Bielefeldt, Ricketts, & Underwood, 1995). According to Hadgraft (2009), project-oriented learning is a form of cooperative learning which is contextually implemented through the presentation of problems to be solved by students through a project to produce new products.

According to Sofyan (2006), PjBL students communicate actively and collaborate with other students and lecturers. Students study in groups of 3-5 people, actively collaborating to complete project assignments from the lecturer. Students work in teams, practice skills and competencies, plan, organize, negotiate, and find solutions to problems.

Smith, MacGregor, Matthews, & Gabelnick (2004)defines that collaborative learning is an innovative learning strategy by combining the intellectual potential of lecturers and students in the learning process. Collaborative learning is a learning model in groups to complete tasks in learning given by the lecturer. Collaborative learning is not just working together between students in a group but the communication process also involves lecturers in the classroom. Collaborative learning method emphasizes the importance of active communication and collaboration in groups.

In the collaborative model or cooperative learning, there is a division of tasks, authority, and responsibilities among group members to carry out group activities. Slavin (1991:73) says "cooperative learning methods share the idea that students work together to learn and are responsible for one another's learning as well as their own". Slavin suggested that the student team achievement division (STAD) model is a cooperative method that motivates students to work together and cooperate in understanding the learning material provided by the lecturer (Rusman, 2012: 215). Cohen (1994:3) says “cooperative learning will be defined as students working together in a group small enough that everyone can participate on a collective task that has been clearly assigned. Moreover, students are expected to carry out their tasks without direct and immediate supervision of the teachers”.

The STAD model is implemented by learning groups or teams to find solutions in solving problems in learning so that students learn to socialize and interact socially in study groups to solve problems (Slavin, 2010:12; Borich, 2007:388). STAD learning model most ideally implemented by the lecturer as an introduction or beginning in implementing cooperative learning in the classroom. Cooperative learning is the basis for lecturers to implement collaborative learning.

Soloway, E. & Spohrer, J. Eckerdal, A. (2009) conducted a study to determine the level of understanding of students in computer programming, including variable initialization, correcting incorrect programs, and program interactions, as well as the syntax of existing programs. However, the first difficulty experienced by students was the planning of the program itself. This research also reveals that it is very important to know the difference between programming knowledge and programming strategy, thus an understanding of problem solving strategies and careful planning are needed in Geographic Information System (GIS).

GIS courses	*Project-based Learning*(PjBL)
Create complex scripts and coding	Solve complex problems, Meaningful and constructive learning
Requires strong logic	
Creating software models for various fields	Interdisciplinary
Produce model designs and computer application programs that are done in groups (teams) as project assignments	Real product. Train collaboration, cooperation, communication, critical thinking in solving common problems (social aspect)
	Authentic tasks
	Emphasis on time management (emphassis on time management)
Designing computer application models and programs requires creativity	The role of lecturers as providers of learning resources

Relevance of GIS and Project Based Learning Courses

Source: Mustari (2017)

Human Resource is the main and important capital developed in the development of a new science-oriented economy. Competent human resources have the potential to win in competing in the global market and knowledge is positioned as a competitive resource (Boutin, Chinien, Moratis, & Baalen, 2009). Competent, smart and well-skilled human resources are the main elements to achieve life success and social welfare. The skills and knowledge possessed by students must be continuously constructed and updated so that they are able to develop object-based models and new application software products so as to make a positive contribution to IT technology support software services effectively and efficiently. well.

In connection with the development of the creative economy of the software sub-sector above, it is very important to conduct research and development of the PjBL-GIS model to equip students with expertise and skills in the field of object-oriented modeling as a basis for software development so that students can compete globally in the new economic revolution era. industry 4.0.

METHOD

Based on the background and research objectives that have been described, the dissertation research uses research and development (R&D) methods. Research and development in the field of education and learning is research with the main objective of producing new products or developing models and learning products that have been applied for a long time, then validating the learning products developed (Richey & Klein, 2005); (Seels & Richey, 1994).

Research on the development of the PjBL-GIS model uses the ADDIE model of learning design with several considerations, namely that ADDIE is more general in nature so that it is easier to understand by model developers and learning programs. Lecturers, teachers, and training instructors as educators find it easier to use the ADDIE model in developing learning models, education and training systems.

According to Branch (2009) The ADDIE instructional design model developed by Reiser and Molenda in 1990 aims to design a process-oriented learning system. At the stage of the analysis process, the model developer analyzes the needs for the development of a new model based on the results of the evaluation of the available old model. Developers must understand the advantages and disadvantages of the old model. SWOT analysis can be used to identify older models. The development of a new learning model should start by analyzing the problems and needs of the learning model.

Researchers identify all the potential and existing problems. Researchers try to describe the research problem clearly, dopreliminary study including reviewing theory, literature and learning methods, study applicable laws and regulations relating to theory, studying relevant research results, empirical studies on collaborative learning models, project-based learning models, and conducting needs analysis. The product planning and modeling framework is developed based on data and information and hope to solve the problem.

Researchers made observations on the implementation of GIS learning as material for designing models. At this stage, the researcher also formulates development needs, determines learning objectives, determines the procedures for learning components, and the resulting research products and creates a blueprint for the PjBL-GIS model and research instruments. Several aspects that need to be done in product design in this research are: a) determining the steps or phases to be carried out by lecturers and students; b) determine the materials that must be mastered by students in improving the quality of the learning process.

This stage is the stage of making product development, namely the PjBL-GIS model book, RPKPS learning tools and syllabus, manuals (lecturers and students), and project-based GIS teaching materials. After product development, the process of validating the conceptual model was continued by expert panelists or education experts through FGD discussions. The results of the validity of the panelists are used as material for suggestions, input and considerations in revising the product developed and evaluating the model.

Small-scale product testing activities are carried out in small groups. Data were collected through the process of interviews, observations and questionnaires of respondents to determine the performance or practicality of the product on a small-scale trial. This is a combined stage of product revision and product testing. Tests on an expanded scale are carried out at the implementation stage of product development.

Stage evaluation The product development of the PjBL-GIS model is the product trial stage and the final revision. The final revision aims to improve the product based on observations of product implementation in the classroom and recommendations from educational experts. The product that has been refined is the final product of the research on the development of the PjBL-GIS model which has been tested for validity, practicality and effectiveness. The PjBL-GIS learning model can then be implemented and disseminated in university learning on a wide scale.

RESULTS

The discussion of the results of development research is a more specific description of the results of the research that has been described in the previous article to complement and as a review of research results at the implementation stage, and also describes the perceptions of students or lecturers as practitioners who have used the PjBL-GIS learning model in the GIS learning process. .

To produce the PjBL-GIS model and GIS learning tool products, researchers have carried out several stages of the learning model design development procedure which refers to the ADDIE development model (analysis, design, development, implementation, evaluation) developed by Reiser and Mollenda in 1990. .

In the analysis phase, the activities and processes carried out are analyzing the characteristics of the GIS course curriculum and student characteristics, literature study, reviewing relevant research results on cooperative learning and PjBL, preliminary studies and surveys on the implementation of GIS learning, as well as carrying out a needs analysis. Students and lecturers of GIS courses on the development of learning models.

The findings at the stage of analyzing student needs for the development of the PjBL-GIS model show that the average in the aspect of lecture preparation is 81.47%, meaning that students really need preparation in carrying out lectures. The average lecture information aspect is 84.13%, meaning that students really need clear and well-structured GIS lecture information.

At the design stage, the activities carried out are: a) formulating specific, measurable, applicable, and realistic GIS learning objectives; b) develop test and evaluation instruments, determine appropriate learning strategies and media, learning resources based on relevant real world and support systems and learning environments based on analysis of potential strengths, weaknesses, opportunities and challenges (SWOT).

In the development stage, researchers have succeeded in developing a hypothetical PjBL-GIS model. The PjBL-GIS model has 7 (seven) components/model elements, namely: 1) Learning outcomes that are adapted to the characteristics of GIS courses; 2) Syntactic learning which consists of eight stages; 3) Social system; 4) The principle of management reaction; 5) Support system for GIS learning process based on LAN/WLAN technology, Google Maps API; 6) Instructional impact; and 7) The impact of learning accompaniment.

The PjBL-GIS model and learning tool products have been well validated by experts in discussion forums (FGD). Expert recommendations serve as consideration in evaluating and refining the PjBL-GIS model design so that the resulting product and model meet the criteria and can be tested to measure the effectiveness of the model in the classroom.

In the implementation phase, researchers conducted product trials on a small and wide scale

in the GIS learning class. The effectiveness of the PjBL-GIS model was measured based on the results of the initial (pre-test) and post-test (post-test) students in the control class and the experimental class. The findings of the average pre-test result of the control class students were 52.65 and the experimental class was 52.30. This shows that students in the control class and the experimental class at the beginning of the lecture have almost the same abilities or do not differ significantly.

To test the effectiveness of the PjBL-GIS model, the two classes were given different treatments. Students in the experimental class were given learning using the PjBL-GIS model, while students in the control class used the available cooperative STAD model. Giving pre-test and post-test aims to determine whether student learning outcomes in the two classes have the same or different quality results. The data from the pre-test and post-test were tested for normality and homogeneity of the data. If the data is correct, it is normal and homogeneous, then it can be continued with the t-test. The t-test was conducted to determine the difference between the results of the pre-test and post-test of the two classes.

Based on the data from the t-test results, it can be concluded that there is a significant difference in the average value of learning outcomes in the two classes. Student learning outcomes in the experimental class had an average score of 81.93, which was better than that of students in the control class with an average score of 62.76. These findings prove that the use of PjBL-GIS in GIS learning by implementing a cooperative project based learning strategy is more effective than the STAD cooperative learning strategy.

Evaluation is carried out thoroughly and revised the product so as to produce a more perfect product. The evaluation and revision stages produce the final product of the PjBL-GIS model and are ready to be implemented in GIS learning at several universities.

CONCLUSIONS

Based on the results of research on the development of cooperative project-based learning models in GIS courses, the conclusion given is that development research has succeeded in developing new learning models and producing products of cooperative project-based learning models in GIS courses (PjBL-GIS). A significant difference was found between the learning outcomes of the experimental class using the PjBL-GIS model and the control class based on the results of the t-test. Thus the PjBL-GIS learning model developed meets the criteria for effectiveness and based on the results of confirmatory factor analysis (CFA), the PjBL-GIS model is a fit learning model.

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