



STUDY ON APPLICATION OF PROBLEM-BASED LEARNING TO INCREASE STUDENT'S LEARNING OUTCOME AT DATABASE LESSON IN VOCATIONAL HIGH SCHOOL

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Abstract

Purpose of Study: In the process of learning in vocational high school, the common problem happens today is low student learning outcomes. Predictably it is caused by several things, one of them is the learning model that is not in accordance with the characteristics of the subjects. One of the learning models in accordance with the database subject and can improve student learning outcomes is a problem-based learning model.

The purpose of this research is to know about: (1) how far the utilization of learning model based on problem in database subject; (2) how the procedure of implementing the problem based learning model in the database lesson; and (3) how the influence of problem-based learning on student learning outcomes in database subjects.

Methodology: Based on the problem as described above, problems can be formulated as follows: (1) how far the use of learning models problem based learning in database subjects?; (2) how is the procedure of implementing the problem-based learning model in database subjects?; And (3) What is the effect of problem-based learning on student learning outcomes in database subjects?

Results: Based on the literature review, the following conclusions are obtained: (1) problem-based learning model can be utilized for database subjects because most of the subject material is practical; (2) the procedure of implementing the problem based learning model on the database subject is started from orient student on the database operation problem, organizing the students to learn to operate the database software, guiding individual and group investigation to completing database operation, developing and presenting the results then evaluate the problem solving process on the operation of database software; (3) problem-based learning model can improve learning outcomes in database subjects.

Implications/Applications: Problem Based Learning model, if applied to database subjects, can improve learning outcomes in database subjects.

Keywords: *Problem-Based Learning, Database, Learning Outcomes*

INTRODUCTION

It is Government Regulation No. 29 in year 1990 on Secondary Education Article 1 Paragraph 3 states that "vocational secondary education is education at secondary education level which prioritizes the development of students' ability to carry out certain types of work", in addition to Article 3 Paragraph 2 stipulates that "vocational secondary education Prioritizing the preparation of students to enter employment and develop an attitude alternative "[Safdari et al., 2013].

Based on these objectives, the vocational school is expected to prepare students to be a productive human being, able to work independently in accordance with the competence of his expertise, in order to achieve optimal learning objectives, then the problems in the learning process should be anticipated before. Many learning problems faced by students in the learning process. Learning problems can include internal and external issues. Internal problems such as student motivation, intellectual ability, and others. While external problems such as facilities and infrastructure, learning environment, and so forth. This is what causes low student learning outcomes.

Based on the exposure of some alternative, the problems that occur in the learning process of productive subjects in Vocational High School, in general, are: (1) in the learning process, the teacher has not known and use learning model that can improve student learning outcomes, (2) teachers use the learning path (3) students in the classroom have a level of speed in capturing different materials, in students who are good at being active in their learning and can answer questions from teachers but in students who are less resourceful. They are generally ashamed to ask questions or answer teacher questions. This condition resulted in the low learning outcomes of productive subjects in class XII Vocational High School.

Based on the problem, then one way to increase student's absorption is by choosing the learning model that is suitable with the learning condition. Among some existing learning models, learning models that can help improve students' ability in theory and practical learning is a model of Problem Based Learning learning. The learning model is suitable for subjects that are practicum. In learning in Vocational High School, productive subjects are vocational learning which is a special ability given to students according to their chosen skill program, one of the productive subjects in Computer Engineering and Networking is the Database. In this study, discussed database concepts including tables and fields, database functions, database design and database software operation in learning in Vocational High School using XAMPP software, WampServer or SQL command line.

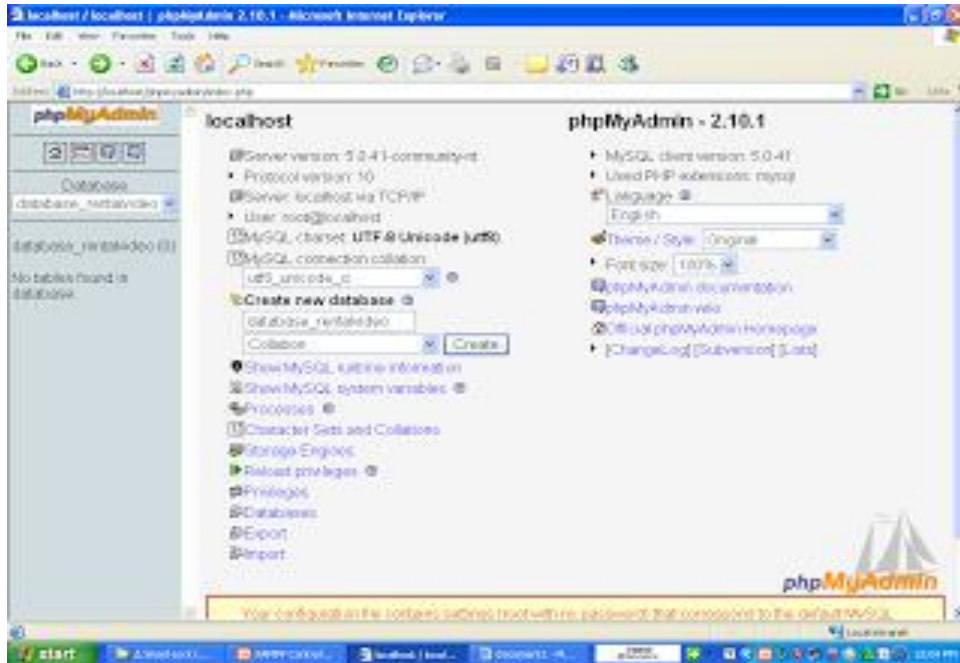


Figure 2. View database of DBMS XAMPP

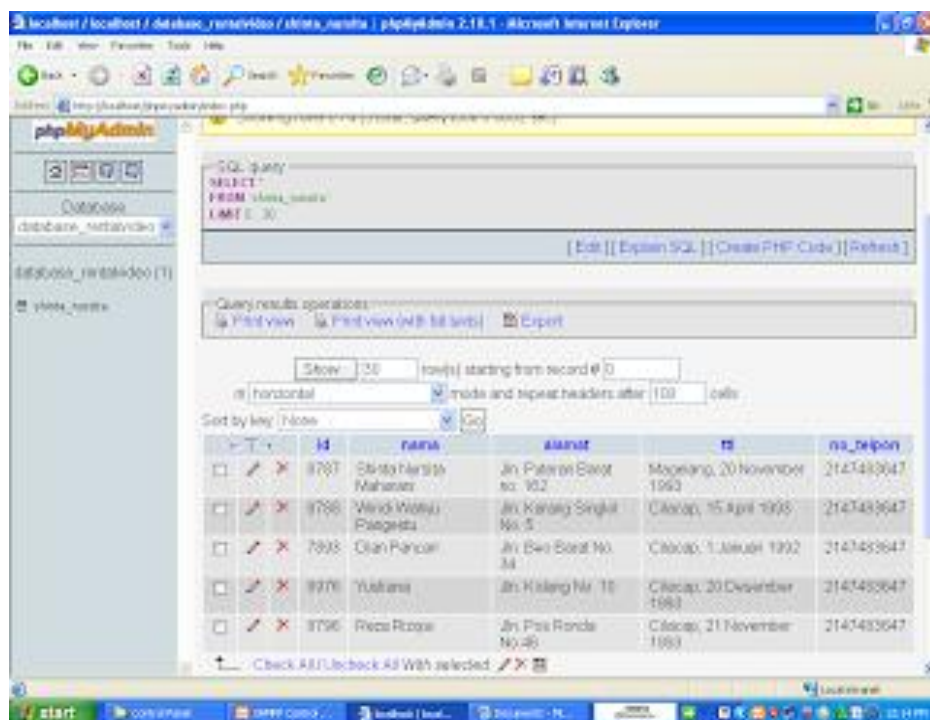


Figure 3. View of the table in database DBMS XAMPP

The database is a place to gather data that are interconnected and integrated about the company's operations are stored and managed in a systematic way with the aim that can be stored, modified, searched and re-used easily and quickly. A database is a collection or data set that generally describes the activities of one or more related organizations. In order for

company data can be compiled, stored in an integrated and well managed it needs to design a good database [Barakhsanova, Savvinov, Prokopyev, Vlasova, & Gosudarev, (2016).].

In this database learning uses SQL as a Database Management System (DBMS). This DBMS is good for database theory learning. The main components of the database are: database design, SQL, and database project implementation [IONESCU, Andreea, Andreea ISTOC. 2013]. While Problem Based Learning is essentially a set of teaching models that use problems as a focus for developing problem-solving skills, materials and self-regulation [Eggen, Paul & Don Kauchak. "Strategi Dan Model Pembelajaran." Terjemahan oleh Satrio Wahono. Jakarta: Indeks. 2012.].

In learning Problem Based Learning, there is two assessment. For individual-based assessments, students are required to present/work individually. For group-based assessment, all group members appear in the presentation sessions and present their sections in a group-based format. During the presentation session, students support each other during a question and answer session [Alias, Maizam, Alias Masek, Hasanul Hadi Md Salleh 2014]. In practice, it contrasts with previous Database learning. The Problem Based Learning environment provides students with the opportunity to develop their ability to adapt and change learning methods to adapt to new situations. Furthermore, students participating in the Problem Based Learning environment have a greater opportunity to learn the process in learning related to communication, representation, modeling, and reasoning [Abdullah, Nur Izzati, Rohani Ahmad Tarmizi, Rosini Abu. 2010].

Experimental Details

This study basically aims to examine how far the use of PBL learning model in database subjects, how the procedure of implementation of Problem Based Learning model in database subjects and how the influence of Problem Based Learning model of learning outcomes in database subjects through a study from several lithos. The literature taken as a reference in this study consists of several international journals and national journals. The other reference is a book and government regulation on vocational education. from several kinds of literature, we take some similarities in the application of problem-based learning in various practice lessons such as databases and some other practical subjects.

The design of the studied study generally used a kind of quasy experiment involving experimental groups. The quasy experimental method itself is a research method used to search for the effect of certain treatments on others under controlled conditions [Safrina, Saminan. 2015; Jenaabadi, & Shad, 2013].

In this design, there is one group of students/classes selected at random. Stages of research conducted in some literature, in general, are initially given pretest groups before getting treatment, with the aim of knowing the initial ability of the group. Students who in the previous material have been taught with conventional learning models. Then the group gets treatment by using the problem-based learning model.

The variables controlled in the study were as follows: (1) the condition of the students, (2) the learning time, (3) the teacher, (4) the subject matter, and (5) the learning environment. After getting the material with the model, then the students follow the test results of learning.

Based on the study of various journals about the effect of learning outcomes on productive subjects or subjects are a practicum, then the learning model but associated with the implementation of the database subjects that are essentially practical.

RESULTS AND DISCUSSION

From the study of several kinds of literature that discusses the application of Problem Based Learning model on student learning outcomes on the type of subjects that are practical such as database subjects, etc. in getting results like the following.

Utilization of Problem Based Learning Model in Database Subject

In the problem-based learning model, there are three basic elements that should arise in the implementation of the problem-based learning model that initiates the initiating trigger, examines the issues identified previously, and leverages knowledge in further understanding of the problem situation [Hoque, Abu Sayed Md. Latiful, dkk. 2012]. It must also exist later in the application of Problem Based Learning learning model in Database subjects.

Database Design

As we discussed earlier, this database material focuses on database design. Database design is the process of creating a design for a database that will support the operations and corporate goals.

In the design of the database has several objectives, namely:

- a. To meet the need for information from users and applications used;
- b. Provide a structure of information that is natural and easy to understand by the user. So that will be more neatly arranged in a database-making;
- c. Supports the processing needs and performance of multiple object databases and some display objects (response time, processing time, and storage space) [Barakhsanova, Savvinov, Prokopyev, Vlasova, & Gosudarev, 2016].

In designing a database, used methodologies that can assist in each stage of database design. A design methodology is a structured approach using procedures, techniques, tools, and document assistance to assist and facilitate the design process. Use of this method can help in planning, managing, controlling and evaluating the development project database [Barakhsanova, Savvinov, Prokopyev, Vlasova, & Gosudarev, (2016)].

According to Connolly, the process in the design methodology is divided into three stages:

- a. Conceptual Database Design

It is the process of building a model based on the information used by companies or organizations, without physical planning considerations.

- b. Logical Database Design

It is the process of making a model of information used on the company based on a specific data model, but not dependent on the Database Management System (DBMS) and other special physical considerations.

- c. Physical Database Design

It is a process to generate an overview of the implementation of the database on the storage, explaining the basis of the relation, the organization of the files and the indexes used for data efficiency and linking multiple integrity constraints and security measures [Barakhsanova, Savvinov, Prokopyev, Vlasova, & Gosudarev, (2016)].

Entity Relationship Diagram

- a. Definition Entity Relationship Diagram Diagram

Entity Relationship Diagram or ERD is a diagram describing entity along with its data elements and its relation with other entity. Entity Relationship Diagram is a graphical notation in conceptual data modeling that describes the relationship between storage. With the Entity Relationship Diagram, we can determine what data is needed, stored in what file, and how to relate to other data in the database that we build,

- b. Entity Relationship Diagram Components and Notations

Standard notation commonly used in Entity Relationship Diagram, there are:

- 1) Entity

The entity is an object that can be identified that exist in a system to be made its database. An Object must be indistinguishable from other objects. Objects can be people, parts, objects or concepts, can be abstract (no form) and can be physical (there is a form). Entities are depicted in rectangular form.

- 2) Attribute

Attribute to declare the data elements or characteristics possessed by the entity. Described with an elliptical shape.

- 3) Relationship

Relationship to declare the relationship between one entity with another entity. Relationship symbol is depicted in a diamond or rhombic form.

- 4) Cardinality

Cardinality to declare the maximum number of entities on a set of entities that relate to entities on another set of entities [Trianto, 2012; Sugiyono, 2016].

The type of relationship that occurs between one entity and another entity in the database consists of :

1) One to one

Each entity in the entity set A corresponds to at most one entity in the set of entity B, and vice versa every entity in entity set B is related to at most one entity in the entity set A

2) One to many

Each entity in the entity set A can relate to many entities in entity set B, and not vice versa that each entity in entity set B can only relate to at most one entity in the entity set A.

3) Many to one

Each entity in the entity set A can only relate to at most one entity in entity set B, and not vice versa that each entity in entity set B can relate to many entities in the set of entity A.

4) Many to many

Each entity in the entity set A can relate to many entities in entity set B, and vice versa every entity in entity set B can relate to many entities in set entity A.

c. Stages of making ERD

1) Preliminary design stage

This stage is used to obtain a minimal database design that can accommodate the data storage needs of the system to be built. This stage usually ignores any deviations or redundancy of data.

2) Optimization stage (final design)

This stage is used to correct errors or deviations that occur in the initial diagram, with attention to aspects of efficiency, performance, and feasibility. Correction forms that can be done include: decomposition of the entity set, merging entity set, change of degree of relation, the addition of new relation, addition or subtraction of attribute of entity or relation.

Step making Entity Relationship Diagram that is:

1. Identify and define the set of Entities
2. Determine the key attribute (primary key) of each entity
3. Define the relation with the guest key (foreign key)
4. Determine cardinality
5. Complete the non-key attribute on the set of entities and relations (if any)

This figure is the example of a simple Entity Relationship Diagram :

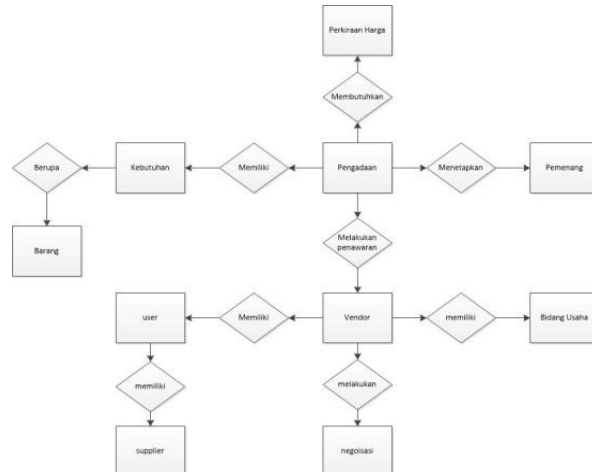


Figure 4. Example of an Entity Relationship Diagram

In a previous study, Fauziah et al in " Pembelajaran Saintifik Elektronika Dasar Berorientasi Pembelajaran Berbasis Masalah " concluded that: "The scientific approach through Problem Based Learning model is easier than conventional model because the direct theory is proved by practice and learners more competent with material that is always proven with practice. But in the preparatory learning process before the start of learning should be more mature and complete,

the teacher must be ready with the ever-evolving material insights "[Fauziah, Resti, Ade Gafar Abdullah, Dadang Lukman Hakim, 2013].

In another study, Qurniatush et al in " Penerapan Model Problem Based Learning (PBL) Untuk Meningkatkan Aktivitas dan Hasil Belajar pada Mata Pelajaran Teknik Listrik Siswa Kelas X Jurusan Teknik Elektronika Industri di SMK Negeri 3 Boyolangu Kabupaten Tulungagung." also concluded that: "Student learning outcomes The realm of knowledge shows an increased learning mastery. Increased student learning outcomes in the knowledge domain cannot be separated from the increased student activity during the learning activities "[Brunner, José Joaquín, and Francisco Ganga-Contreras, 2018].

This is in line with Suprijono's statement that Problem Based Learning's encourage learners to connect their existing experiences with new experiences so that learners discover new principles. Students are motivated to complete their work until they find answers to their problems. So they are more actively involved In learning [Sugiyono, 2016].

Berlianto, in his research related Penerapan Model Problem Based Learning Untuk Meningkatkan Hasil Belajar Mata Pelajaran Teknik Elektronika Dasar SMK Negeri 2 Surabaya, suggest about the implementation of Problem Based Learning model for subjects in Electrical and Informatics Engineering: (1) Problem Based Learning model can be made lternative in teaching and learning process teaching and learning process is more interesting. Students can be more active and think creatively in solving problems or seeking answers, so it can be used as a new innovative learning in order to improve learning outcomes, (2) by looking at the overall responses of students to the model of Problem Based Learning obtained very good results, so can be used to increase student interest in learning, and expected teachers have a high understanding of the subject with Problem Based Learning model [Berlianto, Wildan 2016].

In addition to the implementation of Problem Based Learning model of learning, there are still some problems and limitations. Problems that arise in learning as above can be attributed to Trianto's opinion about the lack of a Problem Based Learning model such as (1) complex learning preparation (tools, concepts, problems), (2) difficulty in finding relevant problems, (3)) Often miss-conception, and (4) time consumption, where this model takes considerable time [Suprijono, Agus, 2009].

The procedure for implementing Problem Based Learning model in database subjects.

The steps study of Problem Based Learning in accordance with the learning steps Problem Based learning has been established. Safrina in her research "The Effects of Model Problem Based Learning" mentions Problem Based Learning steps are student orientation on the problem, organizing students to learn, guiding individual and group investigations in solving problems, developing and presenting the work, analyzing and evaluating problem-solving process Which is solved in group breakdown as well as by individual analysis [Qurniatush, Diah, Sujono, 2015].

So, if it applied in the learning Database, the Problem Based Learning steps are student orientation on the problem of database operations in everyday life, organize students to learn to operate database software in groups, guide the investigation of individual cases or groups in completing the operation of the database , Develop and present the work, analyze and evaluate the problem-solving process on the operation of database software.

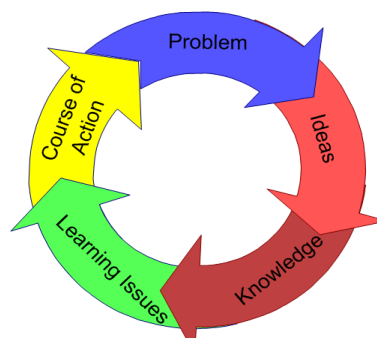


Figure 6. Problem Based Learning Process

Influence Application of Problem Based Learning model to productive learning outcomes database

As revealed by Qurniatush et al in his research entitled " Penerapan Model Problem Based Learning (PBL) Untuk Meningkatkan Aktivitas dan Hasil Belajar pada Mata Pelajaran Teknik Listrik Siswa Kelas X Jurusan Teknik Elektronika Industri di SMK Negeri 3 Boyolangu Kabupaten Tulungagung." also concluded that: The learning outcomes of students in the realm of knowledge show an increased learning mastery. Improved learning outcomes of students of

the knowledge domain cannot be separated from the increased student activity during the learning activities " [Matandare, 2018].

The Problem Based Learning model is recommended for practical subjects as Bilgin suggests that Problem Based learnings are very useful for learning in the laboratorium/practice because they include activities such as understanding, collaboration, and event analysis, developing hypothesis gathering information and analyzing it and creating experiments [Bilgin, Ibrahim, Erdal Senocak, Mustafa Sozbilir, 2009]. Problem Based Learning model is suitable for teaching practical knowledge, in accordance with field and daily life issues, and advanced skills.

This is in line with the idea of Trianto in his book entitled "Learning Ibah model excess Problem Based Learning is: (1) students are not too dependent on the teacher because students, in general, have been given a picture of issues that must be split either independently or in groups, Give the interest to think independently because it gives opportunity to the students to express their own answer before discuss with their friends, (3) train students to think and discuss with their friends to get agreement in solving a problem in a learning, (4) give opportunity for student to think Longer in solving a problem, (5) learning focuses on the problem to get a mature concept related to learning.

Based on the reviews of some of the above researchers, After the overall learning outcomes were calculated with a predetermined percentage, and the questionnaire results were analyzed. Problem Based Learning model is better than the conventional learning model. This means that Problem Based Learning model is more effective in improving student learning outcomes as a whole in learning is practical and good if applied in the subjects Productive Database.

CONCLUSIONS

Based on the study of literature that has been done, it can be concluded that: (1) Problem Based Learning model appropriate to apply to subjects Database that most of the material in the form of practical knowledge; (2) The procedure of implementing Problem Based Learning model on database subject is student orientation on database operation problem, organizing students to learn to operate database software, guiding individual and group investigation in completing database operation, developing and presenting the work, analyzing and evaluate troubleshooting process on database software operation; (3) Problem Based Learning model if applied to database subjects can improve learning outcomes in database subjects

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