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E-Learning Model to Support Industrial Based Adaptive Learning for Student Vocational High School

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Abstract- Vocational High Schools have an important role in improving the quality of human resources to meet industrial needs. However, the current education system in Vocational Schools especially in Purwakarta, Subang, Karawang, Bekasi (PURWASUKASI) still has disadvantages compared to other countries. The government through the ministry of industry has started vocational education for Vocational Schools in Indonesia. Vocational education conducted to support the creation of qualified human resources that can meet the industrial needs related to labor. The implementation of information technology in the field of education is one of the ways to improve the quality of education, including education in vocational schools. E-learning implementation aims to improve the quality of education. E-learning is often used in the application of adaptive learning in the field of education. In this study, an e-learning system model has been created that has been developed to support industrial based adaptive learning for Vocational High Schools in PURWASUKASI. The system that has been developed has been tested from the functional side of the system and shows that the developed e-learning system is ready to use.

***Keywords*- e-learning, adaptive learning, Vocational High Schools, PURWASUKASI**

I. INTRODUCTION

Vocational High School Education (SMK) has an important role in improving the quality of human resources to meet industrial needs. However, the current education system in Vocational Schools still cannot compete compared to other countries. The government through the ministry of industry has started vocational education for Vocational Schools in Indonesia. Vocational education is conducted so that the education system can meet the industrial needs related to qualified human resources[1]. Improving the quality of education in Vocational Schools needs to be done to help prepare reliable candidates for industry needs. Badan Pusat Statistik (BPS) in collaboration with the Asosiasi Penyelenggara Jasa Internet Indonesia (APJII) in its survey noted that the growth in the use of internet technology in Indonesia by the end of 2013 had reached 71.19 million people, dominated by the younger generation[2]. The results of a survey conducted by BPS and APJII show that technology is currently dominantly used in Indonesia, especially students in the high school level.

The implementation of information technology in the field of education is one of the ways to improve the quality of education, including education in vocational schools. This is driven by the Peraturan Presiden Nomor 17, 2010[3], regarding the implementation of national education information systems based on information and communication technology (ICT), and also recommendations for implementing ICT-based learning by the government in using the 2013 curriculum (K-13) for education in Indonesia. In addition, vocational education, in particular, is expected to always and constantly with the technology to improve the quality of education, especially for the education field in the learning process.

E-learning is the technology that compatible to implement in education field. The use of e-learning aims to improve the quality of education. E-learning in its implementation is often used in the application of adaptive learning in the field of education today. Adaptive learning is an educational method that uses information technology to regulate interactions with students and provide resources with learning activities that meet the needs of students. The use of e-learning will impacted for producing qualified human resources. But in reality, the use of e-learning in Vocational Schools, especially in Purwakarta, Subang, Karawang (PURWASUKASI) is not yet maximal implemented. Based on the survey results, there are several obstacles faced in the use of e-learning, namely:

1. A lot of Vocational High School still do not have e-learning;
2. E-learning has not been fully utilized by the teacher;
3. The teacher is still have a lot of task, so the time to conducting e-learning is very lacking.

This study will develop an e-learning model to solve these problems. The proposed e-learning model is expected to support industrial-based adaptive learning for vocational students.

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II. METHOD

A. VOCATIONAL HIGH SCHOOL (SMK)

Vocational Schools have important role in supporting the fulfillment of reliable human resources for industrial needs. However, the current education system in Vocational Schools still cannot compete compared to other countries. The government through the ministry of industry has now started vocational education for Vocational Schools in Indonesia. Vocational education is conducted so that the education system can meet the industrial needs related to qualified human resources[1].

B. INFORMATION TECHNOLOGY

Information Technology (IT) is a general term for any technology that helps humans to make, change, store, communicate and/or disseminate information. The development of information technology is increasingly rapid in the globalization era and its influence for education field[4].

The role of information technology in the field of education are:

1. As an educational infrastructure
2. As a tool and learning facilities
3. As support for education management

C. E-LEARNING

E-learning is one of the implementations of information technology in the field of education. E-learning is also known as electronic learning[5]. Masrom mentions e-learning is all forms of education facilitated by the internet and technology. It includes the use of the World Wide Web (www) to support instruction to deliver the contents of the lesson[6]. The ILR of Bristol University also defines e-learning as the use of electronic technology to send, support, and improve teaching, learning, and assessments[7].

D. ADAPTIVE LEARNING

Adaptive learning is an educational method that uses information technology to regulate interactions with students and provide resources with learning activities that meet the needs of students. Adaptive learning is driven by the awareness that the learning process cannot be achieved on a large scale using traditional approaches. Adaptive learning systems seek to transform learners from passive information receptors into collaborators in the educational process[8].

E. MOODLE

Moodle (Modular Object-Oriented Dynamic Learning Environment) is an open source e-learning platform. Moodle can be downloaded for free, used and modified by everyone with the General Public License (GNU)[9]. Moodle supports student center learning and distance learning. Through the concept of learning, students can easily access material and attend learning anywhere without any distance and time constraints. Besides that, the teacher can provide material not limited by distance, space, and time. Teachers can upload material in the form of words, presentations, audio, videos, links from other webs, etc.

F. DEVELOPMENT METHOD

In this study, Development Life Cycle (SDLC) used as a development approach. SDLC is a workflow used in the design, development, and system testing process to produce quality products[10]. In this study, The SDLC model that used is a throwaway prototyping model. The system development process uses a throwaway prototyping model consisting of planning, analysis (analysis, design, implementation), design and implementation.

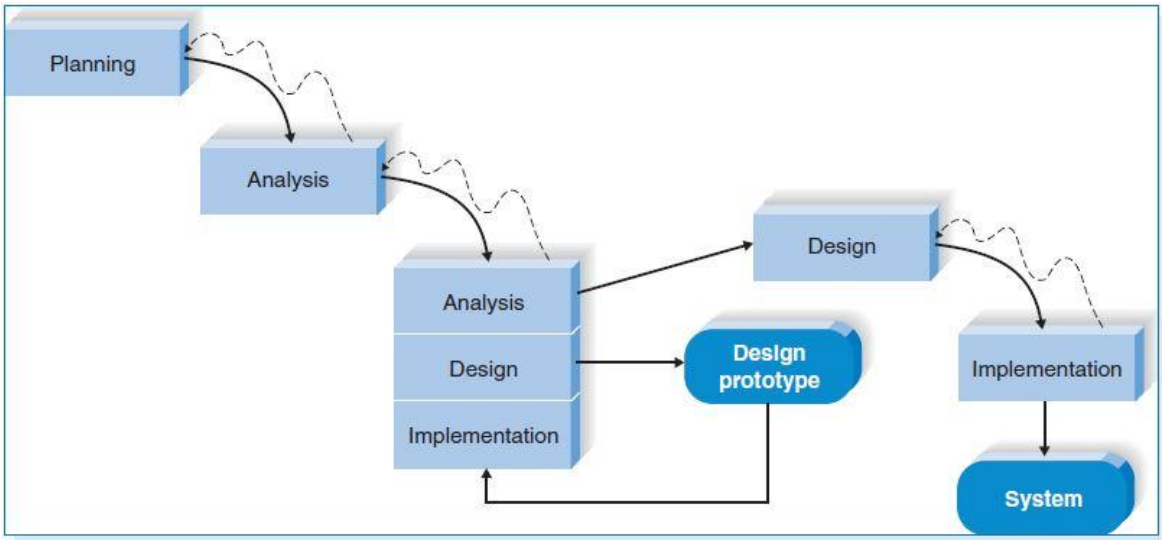

Figure 1. Throwaway Prototyping Method

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III. RESULT AND DISCUSSION

A. REQUIREMENTS ANALYSIS

This study aims to develop an e-learning model that supports industrial-based adaptive learning for vocational students. There are several actors involved in the use of e-learning as one of the supporting tools of the teaching and learning process including Administrators, Teachers, Students and also industries as external entities that must be considered by the Teacher in preparing teaching materials for the teaching and learning process.

From each actor involved, functional requirements are defined. Functional requirements in developing a system are the functions that must be fulfilled by the developed system. The following is a list of recorded functional requirements:

Table 1. Functional Requirement

ID	Requirement
FR01	A system should facilitate administrator to add users to the system
FR02	A system should facilitate administrator to define users status
FR03	A system should facilitate administrator to manage users role
FR04	A system should facilitate administrator to create course categories
FR05	A system should facilitate administrator to create courses that related to categories that created before.
FR06	A system should facilitate teacher to manage their courses, including: - Complete the description on the course - Add students to the courses - Add material to the courses - Manage tasks - Manage quizzes - Manage discussion forums in each course - Manage student grades for each course
FR07	A system should facilitate student to view materials of their courses
FR08	A system should facilitate student to join forum discussion of their courses
FR09	A system should facilitate student to do the task of their courses
FR10	A system should facilitate student to do a quiz of their courses
FR11	A system should facilitate student to grade of their courses

B. PROPOSED E-LEARNING MODEL

Based on functional requirement above, this study proposed e-learning model as follow:

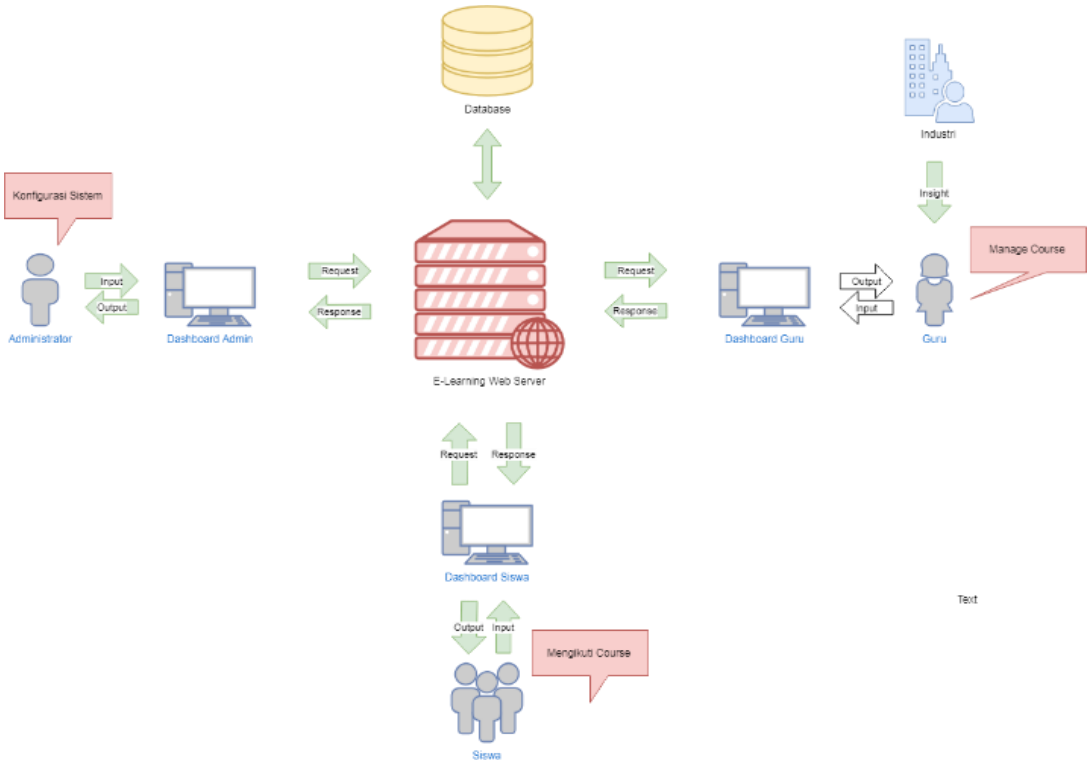

Figure 2. Proposed E-Learning Model

Figure 2 explains how each element (Actor and System) in the use of the e-learning system interacts and doing each roles. The following is a detailed explanation of each role in system utilization:

Table 2. Roles in Proposed E-Learning Model

No	Element		Description
1	User	Administrator	The administrator has task for configuring system from user management to the courses.
		Teacher	The teacher is the main facilitator in the teaching and learning process which is in charge of the management of their courses, the assignment up to the assessment. In carrying out its role, the teacher must actively assess the needs of the industries so that they can get insight to create materials in the teaching and learning process using the e-learning system.
		Student	Students as the main actors who will follow each course that given to them.
2	Dashboard		Each user will have access into dashboard page according to the user category. Each user will have a different dashboard according to the access rights of each user category.
3	E-learning Web Server		Web server for running e-learning application
4	Database		Database management system.
5	Industries		Industries in this model is an external entity that cannot be separated. In practice, industrial needs will be an insight for teachers in carrying out the teaching and learning process especially using the developed e-learning system.

C. SYSTEM DESIGN

Based on results of the requirements analysis and the proposed model in this study, next phases are design and implementation of the system that suit to the requirements and models proposed.

This stage contains system design and implementation which refers to the functional requirements and proposed e-learning model. System design at this stage is use case diagram that explains the actors interactions with system functionality. Here is the design of use case diagrams for e-learning applications that are built:

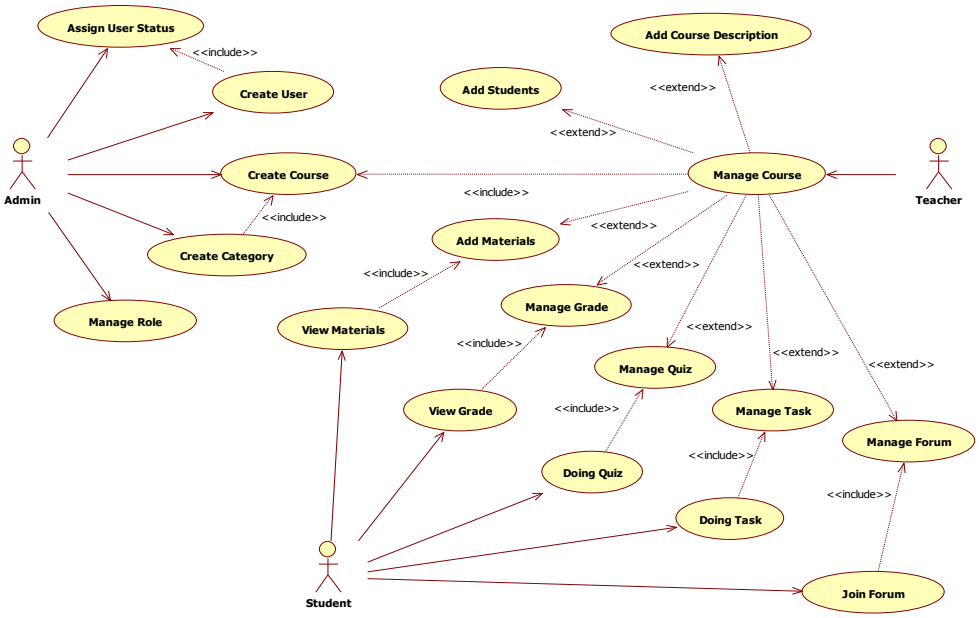

Figure 3. Use Case Diagram

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The following are the actors involved in the use case diagram above:

Table 3. Actor Description

No	Aktor	Deskripsi
1	Admin	Actors with this role have the authority to manage e-learning systems in general and ensure that all the needs of other actors related to this system can be fulfilled
2	Teacher	Actors with this role are tasked to carry out the learning process using an e-learning system. In this system, the actor with this role is in charge of managing their courses
3	Student	The actor with this role has task to follow each course in the e-learning system where the actor joins.

Here is a list of use cases with a brief description of the use case in the use case diagram above.

Table 4. Use Case Description

No	Use Case	Description
1	Manage Role	The system displays a list of roles in the e-learning system so that authorized users can manage each role in this system.
2	Create User	The system provides a form for adding users
3	Assign User Status	The system provides facilities for giving status to users
4	Create Category	The system provides an additional category form
5	Manage Course	The system displays a list of courses in the e-learning system so that authorized users can manage each course on this system.
6	Add Course Description	The system provides a form for adding descriptions to each course.
7	Add Materials	The system provides a form of adding material to each course
8	Add Student	The system provides a form of adding users to each course
9	Manage Quiz	The system displays a list of quizzes on each course so that authorized users can manage each quiz on this system.
10	Manage Task	The system displays a list of tasks on each course so that authorized users can manage each task on this system.
11	Manage Forum	The system facilitates discussion forums on each course
12	Manage Grade	The system displays a list of values on each course so that authorized users can manage each value on this system.
13	Join Forum	The system facilitates users to join forums discussion
14	View Materials	The system displays a list of materials from the course followed by the user.
15	Doing Task	The system provides a form to do the task
16	Doing Quiz	The system provides a form to work on quizzes
17	View Grade	The system displays the grade on the course followed by the user

D. SYSTEM IMPLEMENTATION

Below is the implementation of the system that has been carried out at the design stage:

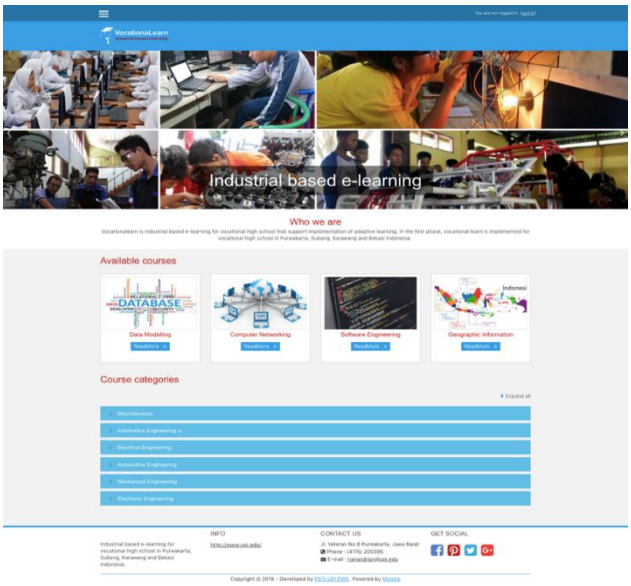

Figure 4. Main E-Learning Page

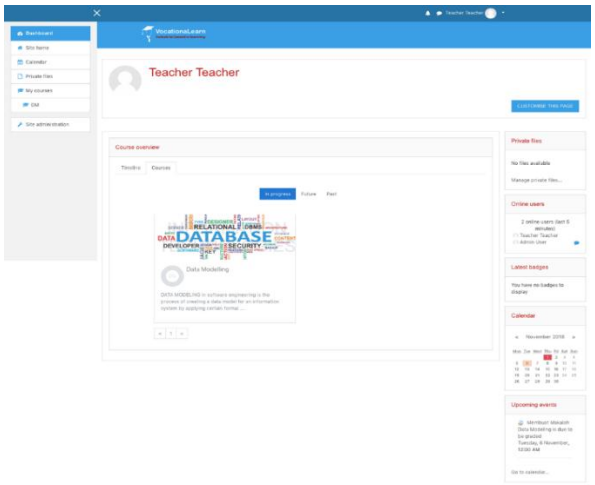

Figure 5. Dashboard Page

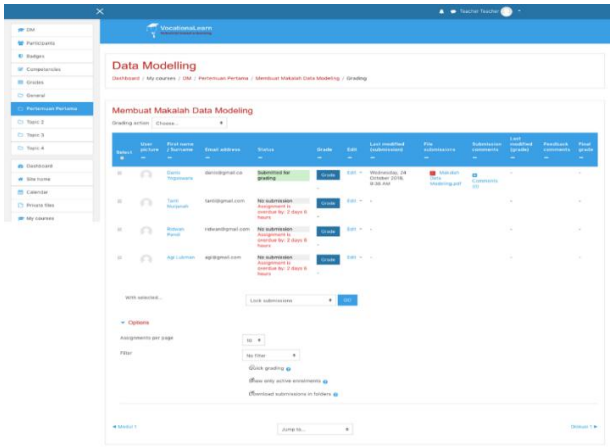

Figure 6. Grade List Page

The developed e-learning system has the following features:

- Administrator Features

Table 5. Administrator Features

No	Feature	Description
1	Manage Role	Feature used by Administrators to define roles from each user
2	Create User	Feature used by Administrators to add new users (Administrators, Teachers, Students)
3	Assign User Status	Feature used by Administrators to provide status to other users
4	Create Category	Features used by Administrators to manage learning categories
5	Manage Course	Feature used by Administrators to manage courses in general

- Teacher Features

Table 6. Teacher Features

No	Feature	Description
1	Add Course Description	Features used by the teacher to complete the description of each course taught
2	Add Materials	Features used by the teacher to complete the material in each course
3	Add Student	Feature used by the teacher to add students to the course they are teaching
4	Manage Quiz	Features used by the teacher to manage quizzes that given to students
5	Manage Task	Features that are used by the teacher to manage tasks that given to students
6	Manage Forum	The feature used by the Teacher to manage forums discussion
7	Manage Grade	Features used by the teacher to manage the values obtained by students

- Student Features

Table 7. Student Features

No	Feature	Description
1	Join Forum	Features used by students to join the forum discussion
2	View Materials	Features that are used by students to view material from the course they are taking
3	Doing Task	Features used by students to do assignments given by the teacher
4	Doing Quiz	Features used by students to do quizzes given by the teacher
5	View Grade	Features used by students to see the obtained grade

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E. SYSTEM TESTING

System testing is conducted to ensure system functionality according to user needs, so that the system can fulfill one of aspect quality of the system, namely functionality. A quality system will increase its utilization by users[11]. System testing that conducted in this study is black box testing.

All features for Administrators, Teachers and Students from the system developed have successfully passed the functional testing stage. Based on the testing results that has been conducted, it can be concluded that the system developed is ready to be used.

IV. CONCLUSION

Vocational High Schools (SMK) have an important role in improving the quality of human resources to meet industrial needs. However, the current education system in Vocational Schools still cannot compete compared to other countries, especially in Purwakarta, Subang, Karawang, Bekasi (PURWASUKASI).

This study was conducted to improve the quality of education in Vocational Schools with a case study in PURWASUKASI to help prepare qualified human resources in accordance with industry needs. In this study, an e-learning system has been developed and tested from the functional aspects of the system. Based on the results of functional tests that have been conducted, it can be concluded that the system developed is ready for use.

There are several suggestions related to further research, including:

1. Based on the research that has been done, it is recommended that the e-learning system model that has been created be validated by implementing in vocational high school in accordance with case studies to support adaptive learning.
2. Conducted evaluation of the model and e-learning system that has been developed is in accordance with the needs so we can get insigh about the model and features for further development.
3. Conducted further development of the model and e-learning system that has been developed, based on insigh from the results of the assessment that conducted in point two.

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