FRAMEWORK FOR E-LEARNING CONTENT DEVELOPMENT ON *FACILITY PLANNING* SUBJECT

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ABSTRACT

E-learning is not a new issue in education. E-learning is one of the future education process, in which time and space can be overcome. A technical difficulty, educator's readiness, e-learning content that is representative, is some factors that can make e-learning project fail. E-learning design can be easily found in research papers, but not many e-learning content designs have been researched. In this research, authors develop e-learning content framework based on Agile. Agile methodology is to support success of e-learning project.

Keywords*: e-learning content, framework,Agile, Project, Educational innovation*

1. INTRODUCTION

Learning-teaching activity is basically an activity in which the learning material or information is shared between the lecturer and the students. This activity not only can be done in class, but can also be done using media like e-learning. Some of the benefit of learning according to A. W. Bates (Bates, 1995) and K. Wulf (Wulf, 1996), are:

- **Intensify the interaction between students and lecturers**

Not all students in conventional learning process is willing or have a chance to ask questions or share their opinions in discussion. The infrequent chances also tend to be dominated by students who responsive and brave. E-learning will help shy and not-confident students to have a chance to ask questions or share their ideas/ opinions without the feeling of being watched or pressured by their class-mates. (Loftus, 2001).

- **Enable the learning interaction anytime and anywhere (time and place flexibility).**

Consider the learning media that available electronically and is ready to be accessed via internet, then the students can have their interactions with their learning sources anytime and anywhere. (Dowling, 2002).

- **Easy updating of content as well as achievable capabilities**

Tasks or quizzes in a subject can be performed on-line so there will be no late submission and all items well documented. The internet will also support the interaction with more students. E-learning can also help students to become an active learner, add more variations in learning process, and also support efficiency.

Despite its advantage, there are risks of failure of e-learning projects, whatever the methods used. Hills and Overton (2010) stated that the failure in e-learning is caused by the lack of understanding of the contents. The project team tends to have focus on technical aspects. This cause the lack of emphasize on how the content is developed and designed. There are many researches on e-learning frameworks, but not on research of the content design framework.

Waterfall method is a method in information system design that is frequently used. The method still has the weakness i.e. the project deliverable that still not meet the end user demand. Agile method takes more time but it will support the project deliverable that meet the user needs. This paper will use the Agile approach as the research framework.

2. THEORETICAL BACKGROUND

E-learning (electronic learning) is a formal or informal learning that is perform using electronic media, such as internet, intranet, CD-ROM, Video Tape, DVD, TV, handphone, PDA, and others (Lende, 2004). Internet (web-based) is a widely used e-learning.

E-learning design is cannot be separated from the design of its content. A variety of media, such as comics or games can increase the understanding of material to 40%, while using the video will increase it to 50%. Those media can help to increase the understanding better than text (Indonesian DIKNAS).

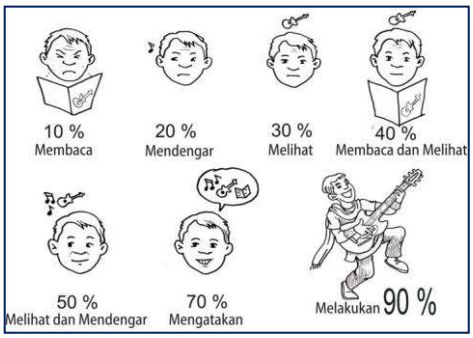


Figure 1. Illustrative Comparison of Learning (Indonesian DIKNAS).

The e-learning design is usually a project-based activity. The project life cycle can be explained in the following picture.

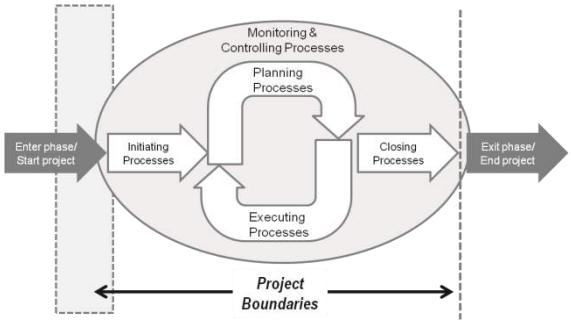


Figure 2. Project Life Cycle (PMBOK 5th Edition)

- **Initiating Process Group.** Those processes performed to define a new project or a new phase of an existing project by obtaining authorization to start the project or phase.
- **Planning Process Group.** Those processes required to establish the scope of the project, refine the objectives, and define the course of action required to attain the objectives that the project was undertaken to achieve.
- **Executing Process Group.** Those processes performed to complete the work defined in the project management plan to satisfy the project specifications.
- **Monitoring and Controlling Process Group.** Those processes required to track, review, and regulate the progress and performance of the project; identify any areas in which changes to the plan are required; and initiate the corresponding changes.
- **Closing Process Group.** Those processes performed to finalize all activities across all Process Groups to formally close the project or phase.

Agile software development is a group of software development methods based on Iterative and Incremental Method.

Figure 3. Agile Software Development

Agile is a development method that enable the team to design a software that has unclear and dynamic requirement. This method is relevant for e-learning development because of the content that continuously changing because of the knowledge.

Main principles of Agile are: (www.agilemanifesto.org)

- Faster in developing the software continuously
- Can easily adapt to requirement change
- Need a daily communication between customer and developer.
- Need of a direct communication between customer and developer
- Project developed between teams
- Team has flexibility to organize themselve
- Team has freedom to review their successful or failure level

- Simple design and implementation

3. RESEARCH METHOD

To develop the e-learning content, this paper use project life cycle and agile method to get the framework of e-learning content design. The framework then implemented in Facility Planning subject, one of the mandatory subject in Industrial Engineering at Telkom University. The framework of LMS design is not discussed here.

Basically, agile is a method in which the stakeholder involvement is high, thus the output can be well match with the stakeholder criteria. Agile or Adaptive life cycles is an iterative and incremental method, but the iteration in Agile is faster compared to other methods (PMI,2013).

4. RESULT AND DISCUSSION

These are the phases of the project

A.Initial Phase

In this step, the team decide the project scope statement. PMI (2013) stated that project scope statement is a scope of the project so that the activities of the project is relevant with the deliverable set before. The Project Scope Statement consist of the description of the subject, why the subject is chosen, the project constraint, the timeline, technical aspects, and the project risks.

These are the short description of the project scope statement:

1) Project deliverables : e-learning content for the Facility Planning subject, with 7 narrative slide and 2 multimedia contents.
2) Background of the project : the gap between score in class and in lab.

Table 1. Average score of Facility Planning

Mid Test Average Score	Final Test Average Score	Labwork Average Score
73,26	59,95	91

The root cause analysis for the problem are as follow:

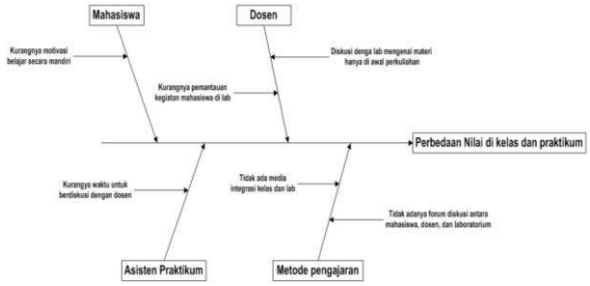


Figure 4. Root Cause Diagram

Based on the analysis, these are the results:

1. The lack of students motivation to do self learning
2. The lack of coordination between the lecturers of class and the lab assistants.
3. The media to integrate class activities and labwork is not available yet.

E-learning is also develop to help the integration of class and lab activities, in which also include the discussion media for lecturers, students, and lab assistants. The content that has multimedia is the fundamental topic for the subject.

1) Constraint
   a. The project budget is Rp.20.000.000
   b. The project should is done in 7 month, starting from April 2014; the implementation will be done in the next semeter.
   c. Software will support the LMS
   d. Hardware used are headset, pentablet, PC.
2) Project Risks
   One of the biggest challenges is the change in LMS in institution.
3) Acceptance Criteria
   Acceptance criteria consist of two part: the post project and the implementation.
   Post Project :
   1) Proyek match the time target as well as the budget provided
   2) Content can easily be used and understood by the end user. Usability test and post quiz will be conducted.

   Project Implementation:
   1) Student Passing Rate 80%.
   2) 50% of students actively involved in Facility Planning discussion forum.
   3) Minimum online quiz participation is 80%.

B. Planning Phase

The planning phase is done with Work Breakdown Structure and Activity List. WBS for the project consist of 4 working stage: Planning, Design , Deployment, and Closing and Evaluation. In this phase the Satuan Activity E-learning (SAE)/ e-learning Activity is also developed.

SAE

The SAE is a framework to blend the activity in class and e-learning activity. This is guided by the intended learning outcome. The SAE is done using tables as follow:

Table 2. Example of SAE

Kemampuan Akhir Yang Diharapkan	Waktu Aktivitas e-Learnig	Kajian / Pokok Bahasan	Bentuk Kegiatan	Konten e-Learning yang digunakan	Indikator Penilaian	Minggu SAP / GBPP yang di Dukung
1,2,3	minggu ke - 14	tugas besar	presentasi tugas besar mahasiswa	Overview Tugas Besar (Video)	mahasiswa mampu menerapkan materi yang ada di perkuliahan terhadap suatu kasus yang nyata	Presentasi tugas besar mahasiswa

SAE consist of the learning outcome, topics, e-learning activities, grading indicators, and the relevant subject topics.

Storyline

Story line is written based on digital animation. Storyline is a guidance to make storyboard. Some of the information in storyboard is topics, learning goals, communication type, and evaluation.

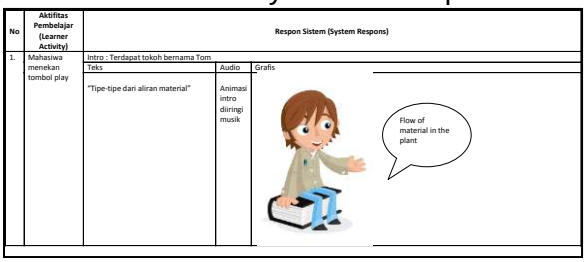
Tabel 3. Storyline Example

Sub Materi	Tujuan Pembelajaran	Kompetensi yang diharapkan	Alur Cerita	Jenis Komunikasi	Evaluasi
Material Handling	Mahasiswa memahami definisi material handling, ruang lingkup material handling, prinsip material handling, material handling equation dan contoh dari material handling	Menumbuhkan sofstskill dapat beripikir kritis sebagai decision maker	1. Mahasiswa akan disuguhkan narasi dengan tokoh yang bernama Tom. 2. Tom akan menjelaskan definisi material handling, ruang lingkup material handling, prinsip material handling, material handling equation dan contoh dari material handling berikut dengan ilustrasi sederhana agar mahasiswa mampu membayangkan apa yang dikatakan si Tom. 3. Di akhir cerita, Tom kembali akan mereview apa yang dikatakannya dan apa yang harus di highlight mengenai material handling	Animasi	Quiz berbentuk permainan seperti menjodohkan dan teka teki silang

Storyboard.

Storyboard is a blueprint for e-learning content. Some information of the storyboard is narration text, content sketch, and user interaction.

Tabel 4. StoryBoard Example



C.Execution Phase

In this phase, the plan is executed. The development is done in parallel works. All contents are evaluated and improved periodically.

D. Monitoring and Controlling Phase

Monitoring and Controlling phase is done simultaneously with the execution. If there is a change request, then the information is understood by the team. This information then becomes the guidance of improvement. In agile method, monitoring and evaluation is done several times (n-iteration) until the deliverable is match with the requirements. For the Facility Design project, the iteration is done 3 times.

Theses iterations are explained as follow :

Table 5. 1st Iteration

Multimedia 2		
No	Evaluation Result	Respond
1	The sound of narration is not clear enough	Re-record of the narration to make it better
2	The background music is too loud	The background music volume is reduced
2	No Quiz concept	Quiz is made in multiple choice
3	There is a confused narration, i.e. the “right place” with “right sequence” concept.	The confused narration is fixed.
4	The illustration for the “ergonomic Principle is not match with the concept.	The illustration is fixed.

Table 6. 2nd Iteration

Multimedia 1&2		
No	Evaluation Result	Respond
1	The consistency of ‘home’, ‘back’ and ‘forward’ button need to be repaired	All of the button is placed on the corner
2	The reference of pictures should be completed	Completing references

Table 7. 3rd Iteration

Multimedia 1&2		
No	Evaluation Result	Respond
1	The sound of narration is still not clear enough	Re-record of the narration to make it better
2	The mini quiz content cannot be deployed yet, baecause of the crash	Make the quiz format simple and compatible
3	Need to increase the interactivity, text and narration still not synchronal in time.	Synchronize the timing between the text and narration
4	The navigation button (next, stop, pause, repeat, etc) still not consistent and putted in all slides.	Put the navigation button (next, stop, pause, repeat, etc.)

To measure the implementation goal, a test is conducted. After testing the multiedia, students give their evaluation through a pre-test, post-test, and a satisfaction survey. The satisfaction survey consists of the evaluation of the benefit, content flexibility, ease of use, topics delivery, and visual appereance. The sample is Industrial Engineering students who never before take Facility Planning subject.

The pre-test result average score is 43,67 and the post-tes result (after accessing the multimedia) is 62. There is 70% of improvement from the previous result. It shows that the multimedia can give benefit for the learning process. Of course the content should be used together with other activity such as class meeting, independent learning, etc.

Table 7. Result of Evaluation Quiz

No	Pre Test	Post Test
1	40	50
2	30	50
3	80	50
4	30	60
5	50	60
6	50	70
7	60	80
8	70	80
9	40	70
10	80	100
11	30	80
12	40	70
13	20	50
14	20	50
15	40	60
16	40	50
17	30	70
18	50	70
19	70	70
20	20	60
21	40	70
22	60	60
23	40	70
24	60	90
25	30	40
26	30	40
27	30	50
28	50	50
29	30	50
30	50	40
	43.66667	**62**

Table 8. Survey Result

Kode	NamaVariabel	Nilai Rata-Rata
V1	Manfaat	3,4
V2	Kegunaan	3,7
V3	Fleksibilitas	2,9
V4	Interaktif	2,8
V5	KemudahanPenggunaan	3,2
V6	SistematikaPenyampaianMateri	3,0
V7	Tampilan Visual	2,8

Based on the satisfaction result, there are 3 variables that has the lowest score of satisfaction, i.e. interactivity, visual appearance, and flexibility.

i. Interactivity → the multimedia is not interactive enough. Its narration is too fast that some students have difficulty to follow the lesson. There is no quiz yet, and no navigation button such as the button to start the animation, etc.
ii. Visual appearance → the pictures used is too simple and lack of color combination. It is not create the interest of the users.

iii. Felxibility → lack of navigation to have the multimedia flow (next, stop, pause, repeat, dll) so that the user don't have to go back to home menu. For example, when user is done viewing one 'type of layout' (the topic that is discussed), then user is able to go to the next type of layout without the necessity of going back to the 'Home' menu.

D Closing Phase

At this stage, the e-learning content is ready to be published and all the evaluation has been responded. All information and lesson learned during the process is documented, and a framework for the e-learning content design is created as one of the organization asset.

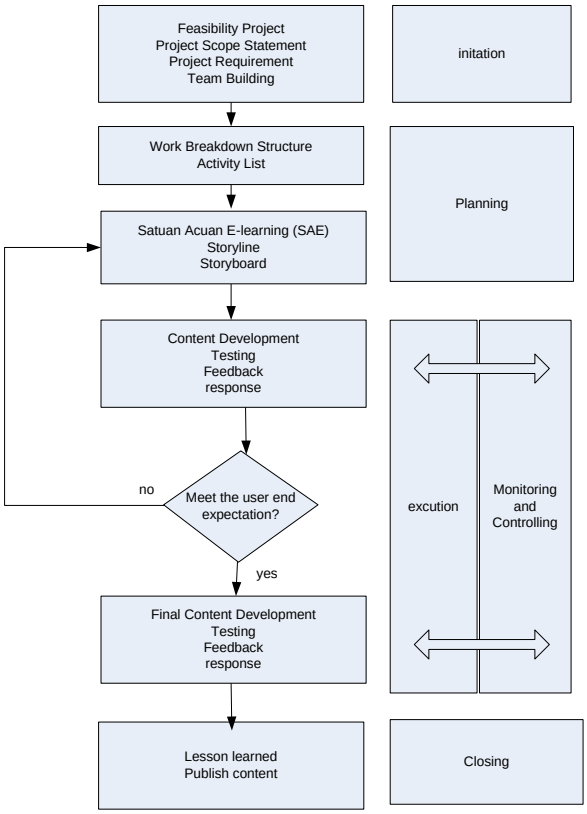


Figure 5. e-Learning Content Development Framework

5. CONCLUSION

One of the important aspects of successful e-learning project is the match between the content with the user requirement. By using combination of Agile method and Project Life Cycle, it is expected that the project team can delivered a good content to support the whole learning process.

6. REFERENCES

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