Developing SDL Culture Using CAI and Feedback Learning

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Abstract: This article demonstrates the Self-directed Learning (SDL) culture development using e-learning based on learning module called Extended Computer Aided Instruction (Extended-CAI) and feedback learning model called Gamma Feedback Learning Model (GFLM). In the Indonesian context, there are two main problems in Self-directed learning culture development, the technological challenges, and the cultural issues. The e-learning implementation in Indonesia mostly uses a Learning Management System (LMS) to manage learning activity outside the classroom. The uses of LMS cannot develop SDL culture because of passive learning culture still dominant, the internet technology not fully support, and the content is not unusual. Students had long and been comfortable attending classes in the classroom. Students from primary school until the second year in higher education have been familiar with face to face model. In Indonesia, the majority of students say the internet is very slow, especially when accessing video. Students think not easy to get an internet connection when outside the campus, mainly if they are living in rural areas. The other side, the materials considered less impressive because most of it is only power point and e-book. Easy to understand that students not willing to use the e-learning facilities, this condition causes SDL culture development failed. In this research, the Extended-CAI modules designed to solve a technological problem. Students can use Extended-CAI online or offline. The module contents are videos, concepts, e-books, and tasks. Besides that, the Extended-CAI module can record student activities and work then forward it to LMS. Lecturers can monitor, conduct the evaluation, and provide appropriate learning treatment when student need it. This way is to solve a cultural problem which teacher can applied feedback learning model.

Key words: CAI, e-leaning, feedback learning model, LMS, self-directed learning.

1. Introduction

Universities in Indonesia are trying to change from teacher-centered learning to student-centered learning. One strategy for student-centered learning development used e-learning. Many universities develop internet-based e-learning facilities, most of them using the Learning Management System (LMS), particularly Moodle. In Indonesia, there are 1459 Moodle registered sites, 53 of them owned by universities [1]. However, this effort has constraints because there are technological and educational problem. Although the internet facilities have been developed successfully in campuses, for students it is still limited, especially when they learn outside the university area. The quality of internet connection or coverage, in general, is good but not yet equitable; we easily to get internet facility in urban but not in the rural area [2]. Also, e-learning content has not been able to attract students because the content is the same as books, video tutorials are lacking, and often lecturers provide power point lecture materials. These lecture materials are

less attractive to students because they are not abundant in multimedia and are not interactive [3]. Even today's students are very comfortable with and accustomed to using social media; they are familiar with very merely interface and meaningful short text.

The LMS development is a way of shifting the teaching method, from a “traditional” view of educational delivery to a “networked” view of educational delivery or from classroom to e-learning [4]. The primary purpose of e-learning development using LMS is to support the change of the learning model from Teacher Centered Learning (TCL) to Student Centered Learning (SCL). One of the barriers to change from TCL to SCL is the difficulty of building an SDL culture. Students accustomed to face-to-face models from elementary school to university, so to change these habits require appropriate and gradual ways, we assumed this as a cultural or educational problem. In such a situation, the innovation of the learning model should involve the lecturer. Students still need the supervision and guidance from the lecturers in very individual ways. Thus, we need appropriate technology with support by a specific method. One of the ways to realize SCL base on e-learning is to use appropriate e-learning technologies and proper learning models. The use of e-learning to foster self-directed learning readiness should be appropriately designed [5].

The SDL culture in an institution can develop if every student has a sense of responsibility and strives to fulfill and achieve success. O'Shea defines SDL as a process whereby a person has initiative, select and use learning resources, select and use appropriate learning strategies, and evaluate their learning outcomes [6]. One of the ways to develop SDL culture is using reflective learning. A student can assess their practice as a part of the learning process [7]. In this research, the learning culture realized by using a feedback model of learning [8]. Gamma Feedback Learning Model (GFLM) is a learning model using e-learning based on feedback principle. GFLM is one type of blended learning. In GFLM, lecturer plan the learning activities outside the classroom which using e-learning environment. During the student learn using e-learning resources (in this research we use CAIs) are always accompanied by lecturers. In this method, the lecturer will watch or monitor the student activities personally (one by one), observe activity data, evaluate, and assist if any student has learning problems. Lecturers are still trying to establish communication with students. This mentoring affects learning independence improving which means helping to forming the SDL culture. In the GFLM concept, a lecturer can treat a group of students if most students have the same learning difficulty.

This study aims to develop the Extended-CAI model that is easy to use, interesting, can be used it anytime-anywhere, and appropriate to realize the SCL model by implementing the principle of feedback learning model. The meaning of “anywhere” and “anytime” are vary if connected with internet quality, particularly in Indonesia. Correspond to the limitation of internet connection; we have particular CAI design. The module developed in this research is named Extended-CAI because it has a function and task facility, communication, can be used offline/online, and able to work with minimal internet support. In addition to this interactive learning tools, Extended-CAI able to communicate with LMS server for monitoring and assessment purposes to provide appropriate guidance for students. Extended-CAI has advanced facilities such as leaner performance report, chatting room, and fully multimedia interactive tutorial module.

The results of this study significantly contribute to realizing the SDL culture using the principles of e-learning based learning feedback although with the support of low-quality internet facilities. SDL culture development is not enough only to provide e-learning facilities but requires the right technology and learning model. The principle of learning with feedback can improve the quality of lecturer-student interaction. Continuous interaction is necessary to accelerate the process of ensuring the culture of SDL. If the SDL culture realized, it means that the students' chances of achieving higher learning goals. If more students are quick to achieve mastery learning, then the quality of an institution's education automatically

increased significantly and vice verca.

2. Design the Model

In this research, we use the Gamma Feedback Learning Model (GFLM) to develop a Self-Directed Learning culture (SDL culture) in a university. The concept of GFLM for SDL culture development shown in Fig. 1.

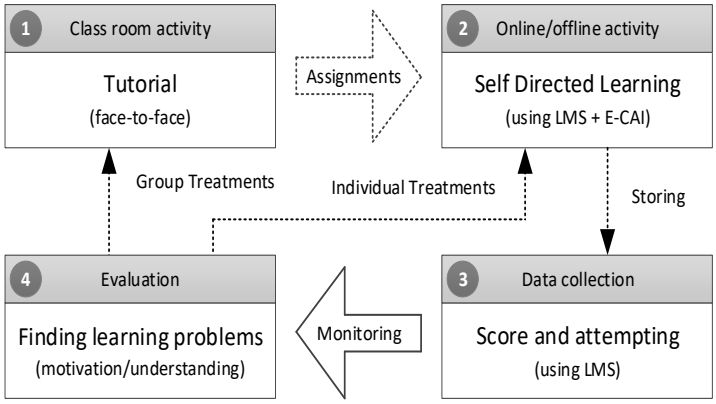

Fig. 1. GFLM concept using extended-CAI.

The GFLM concept does not alter or reduce face-to-face activities in the classroom but only adds to student learning activities whenever outside the school [9]. This principle should use so that GFLM suitable for a blended learning model. Fig. 1 also shows that the GFLM concept supported by an Extended-CAI. In GFLM, lecturers can carry out face-to-face lecture activities as well as provide guidance at any time if needed. After the students attend the lectures, every student must learn independently using the Extended-CAI module wherever and whenever. The student activities are under lecture supervision and guidance. A lecturer will motivate if a student or group of student looks less enthusiastic. The lecturer also teaches individually if a student or group of student has problems to understand the Extended-CAI material. We must use these two manners because motivation and understanding are essential factors in achieving of learning goal [10].

For the GFLM concept can adequately implement, we designed the implementation model like Fig. 2. Moodle still used here for e-learning facilities optimizing reason. It is mean that we do not need to build a new e-learning infrastructure. We created a specific Extended-CAI module for the student so that it can work properly without internet or with low internet quality. The module anytime can connect to the Moodle server for reporting if needed. We also produce the Extended-CAI module so that very interesting for the student.

Fallow to Sathian's suggestion, we must consider the learner-centric interface design, innovative content, shows examples, provide helpful feedback, beautiful appearance, and quickly understand the material, and directly navigation [11]. The type of feedback inline to GFLM requirements as well. Similarly, the Extende-CAI module should use user interface and interaction design rules because research shows this has a significant effect on how well the student will learn [12], [13]. The content structure is part of the module design because it is an instructional for experiences creating which make the learning process efficient, effective and exciting. The excellent content structure will reduce cognitive load [14]. Animation also can use here, because animation is a dynamic medium where objects are manipulated to appear as moving images. In Extended-CAI animation used to describe a complicated process so that it looks simple. The first goal of animation in the presentation is to improve students' cognitive functionality that ultimately results in a lesser understanding of subject matter with the minimal cognitive load. We can say that by using the

Extended-CAI concept we freer to make exciting content and easy to understand contents without worry about internet quality.

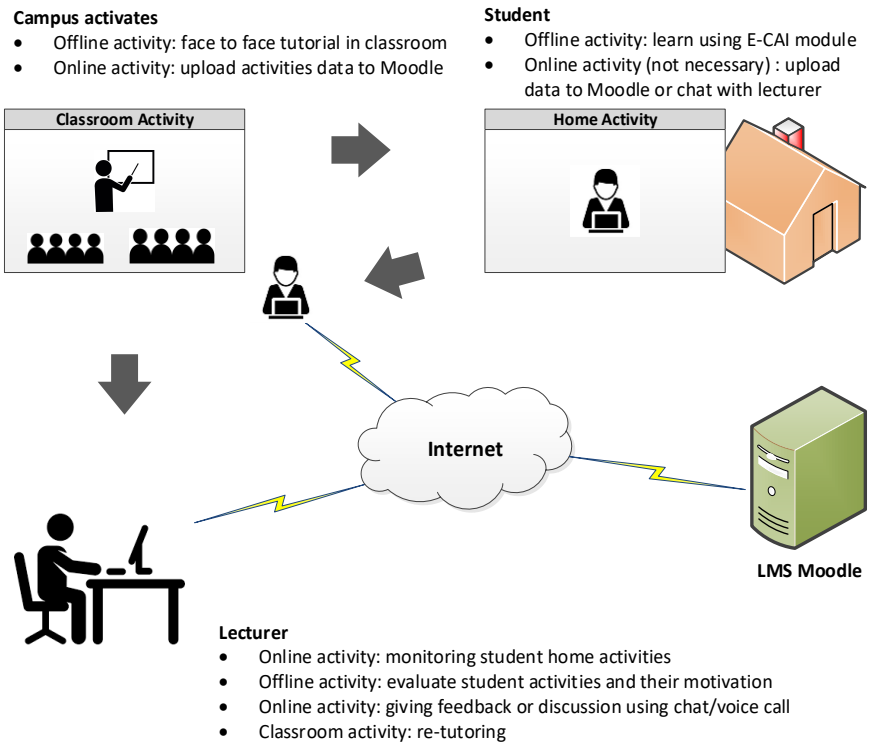

Fig. 2. Implementation GFLM using extended-CAI.

In this research we designed the CAI module as Extended-CAI with the following specifications:

1) Very interactive for students involved in learning activities
2) Use multimedia and social media like, so students will enjoy using this [15].
3) Easy to disseminate and easy to use so that students give more attention to the contents.
4) Students can use CAI modules whenever and wherever without internet. This approach is used to overcome the weaknesses of internet facilities for students.
5) Lecturer easy use the module for monitoring, supervising the student activity, and regularly conduct evaluations.
6) Simple chat room for communication

It is easy for lecturers to decide on appropriate actions for students who need help, either individually or in groups.

An experiment conducted in two different locations with the same subject. The selected subject is Research Methodology with the consideration of this course obligatory for master program students. The first location is Department Master of Hospitals Management at the Muhammadiyah University of Yogyakarta Indonesia. We selected the student batch of 2017/2018 as a sample of the control group. The second location is the Midwifery Master Program of the Aisyiyah University of Yogyakarta Indonesia. We choose students of batch 2017/2018 as the sample of the experimental group. Incidentally, both places were currently running this course simultaneously.

Students in the control group must use extended-CAI module, but the GFLM concept did not apply here; students were only required to learn and work through the application. Students in the experimental group must use the same Extended-CAI module, but the GFLM concept applied here. We experimented for one semester. The module contains nine video tutorials, 15 tutorials in PDF format, five books in PDF form, and

four tasks in the form of stuffing. All student from both groups must answer the questions. All student writes the research title, research questions, determine the research variables and create a hypothesis.

This experiment answers three critical questions:

1) Does Extended-CAI appeal to students?
2) Does applying the feedback principle have a positive effect on students
3) Do the Extended-CAI modules and GFLM improve the self-directed readiness?

We analyzed the data using PLS (Partial Least Square) because this is a standard method for estimating path models that use latent constructs with many indicators. PLS does not require normally distributed data. PLS can work with a limited amount of data. PLS also does not need parameter significance tests because of the PLS evaluation model based on predictive measurements that have non-parametric properties. PLS is used to develop a theory with the purpose of prediction. PLS is intended for causal-predictive analysis in situations of high complexity but low theory support.

3. Result

By analysing the activities data, we get information from both groups. Student information and student activities data collected in lecturer module. We can compare between groups using this information. Table 1 shows the comparisons of research results between the control group (74 students) and experimental group (50 students).

Tabel 1. Comparison of Student Activity between Two Groups

Variable	Control group	%	Experiment group	%
Module error reporting	6	8,1	5	10
Number of participants who completed the task	14	18,9	48	96
Number of participants who do the task without listening to the module at all	18	24,3	3	6
Number of participants who did not do the job at all	16	21,6	2	4
Number of participants who did not read the learning material	64	86,5	7	14
Number of participants who did not learn from the video tutorial	45	60,8	20	40

Fig. 3. Simply interface student module.

There are two CAI modules, teacher module, and the student module. Those modules are similar. Each Extended-CAI module consists of several slides. Fig. 3 shows interface of a student module slide. On the left side, there are four buttons: home, video, pdf document, and assignment. On this, an example slide shows a list of video tutorial as classroom teaching replacement. In the pdf slide, there is 17 chapters' short documents and two books. The last one is an assignment slide. In this slide, the student must write the proposed research, i.e., title, research questions, variable, and hypothesis. Video tutorial regarding the assignment also there.

Fig. 4 shows the Extended-CAI teacher's module; this module is similar to the student module; there are two monitoring buttons added in the teacher module. If we click the student button, the activities slide will appear. There are two tables, the student list, and individual student activities report. The lecturer can get student phone number; this simple way gives lecture possibly call and speaks through mobile phone anytime. By clicking the list of activities, the teacher can select a student has learning difficulties.

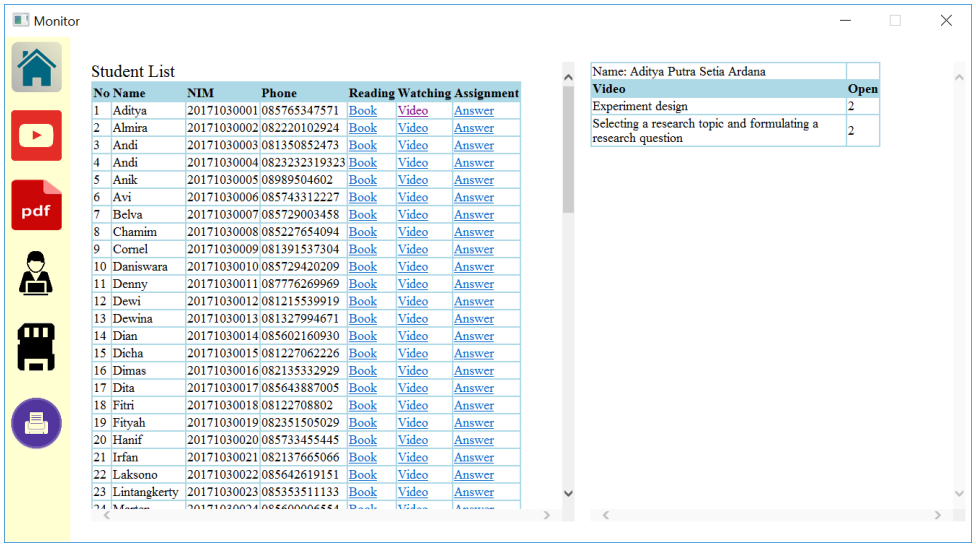

Fig. 4. Monitoring interface in lecturer module.

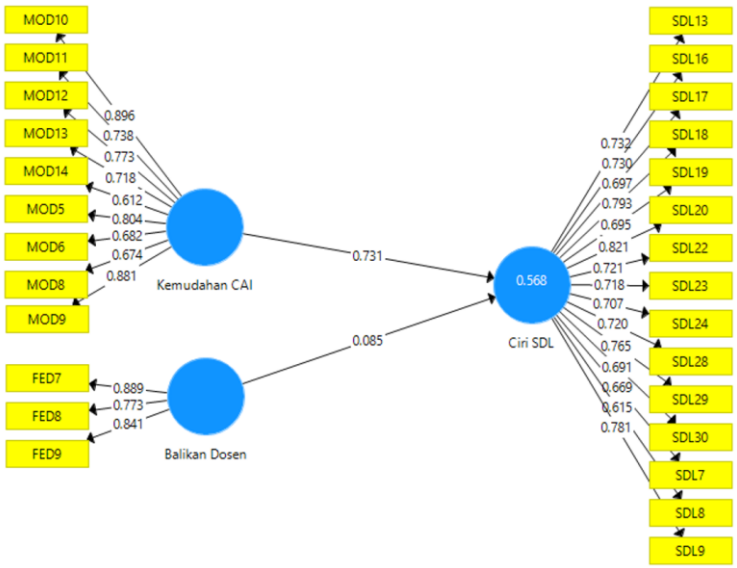

Fig. 5. Questionnaire calculation in Smart PLS 3.2.7.

Correspond to the research questions; there are two independent variables: the effectiveness of feedback

and Extended-CAI module; one dependent variable: characteristic features of SDL. We are using ten questions for feedback (FED 1-10), 20 for CAI module appearance (MOD 0-20), and 30 for SDL characteristic features (SDL 1-30). This question for experiment group only. The calculation result using Smart PLS 3.2.7 shows in Fig. 5.

We can presume that all the loading factor above 0.5, this shows the model has substantial Goodness of Fit. A value of R2 of 0.731 indicates that endogenous latent variables influenced by exogenous latent variables [16]. From the blindfolding test results obtained the value of Q^2 (cross-validated communality) for the level of constructs and indicators of positive value; this shows that the model can provide useful predictions. From the result of the above three test models, we conclude that sufficient to continue with hypothesis testing using bootstrapping techniques [17]. We drop nineteen questions from sixty due to the loading factor less than 0.5.

4. Discussion

The percentage of students who worked on the tasks in the experimental group show higher than the students in the control group. Participants who tended to answer question without reading and listening to the video were more likely to be found in the control group than in the experimental group. The students' passion for learning by module appears to be higher in the experimental group than in the control group. Easily observed, students in the experimental group seem to be more active than students in the control group.

By the research design, the purpose of this study was to find out whether the results of Extended-CAI development and the use of GFLM were able to encourage the SDL culture. Table 1 shows that students in the experimental group are more motivated than the student in the control group. Although the Extended-CAI module used is the same between the two groups, but the effect is different. The result is different because in the experimental group the lecturer actively supervise, examine, and give feedback to the students who need it. Lecturers in the experimental group interact with a student only if someone needs help. The lecturer in the experiment group run the GFLM concept, this mean the lecturer using feedback to motivate students; how much the GFLM concept influence to the learning, can observe from the analysis of the results using Smart PLS as shown in Fig. 5.

Bootstrap test result with a number of the case 74 and number of sample 1000 obtained by T-statistic calculation on all paths above T-table value 1.645 (one tile, at 5% significance level) which means all hypothesis accepted. We concluded that the ease of learning variables using Extended-CAI significantly influence the self-directed student readiness. Lecturer comments as feedback in GFLM affect to the independence of learning, although small. However, if we compared student learning performance of the experiment group with the control group, very much different (see Table 1).

Critical points discovered during the study:

1) In this research to avoid the Placebo effect, the student in the experiment and control group did not know if their learning activity is part of the study. We use a *double-blind* design [18]. This condition maintained successfully until the survey ends
2) The GFLM scenario works well in the experiment group. Monitoring and treatment activities implemented successfully because the Extended-CAI module feature and communication tools are very convenient.
3) After seeing positive results, program managers plan to implement Extended-CAI and GFLM in all courses. If this plan can release, this means very supportive for further research, i.e., to measure effect size of the learning model.

Difficulties encountered during the study:

1) The availability of e-learning materials is limited. This condition caused the research team should search for and select a learning source (text, video tutorial, assignment) that match the course design and the Extended-CAI requirement. Those also shows how complicates to conducted the experiment.
2) In the research plan, the model would implement in Medical Study Program, particularly for endocrine block subject, but this plant canceled due to this subject will replace with the new topic. If the replacement occurs in endocrine blocks, then there is a risk of unenforceable research. The research should conduct in different more convenient place. Thus, we must reconstruct the course materials for the new Extended-CAI module.
3) This study was designed using field experiments so that the implementation should adjust to the academic calendar of the research location. In real batch the number of participants is limited, this causes the research samples are also limited.
4) From the focus discussion group, we get feedback from colleges: the CAI module must have upload file tools and voice call. Those seem exciting part for next CAI module development.

5. Conclusion

From the experimental, we conclude that the implementation of Extended-CAI using GFLM concept as follows:

1) Students in the experiment group are very motivated in using the Extended-CAI module because they can learn in anytime and anywhere and feel under lecturer supervision. Teacher has main role in giving positive feedback. The student uses e-learning technology can learn although without internet facility. Although the feedback response still low, but this has significant meaning in learning, particularly for increasing student motivation [19].
2) Lecturers were happy if students show enthusiasm when using the Extended-CAI module, because of this the lectures can supervise and treat the student learning activities. The lecture can monitor the students learning outcomes also.
3) The e-learning architecture in this research potentially for SDL culture building in the face-to-face learning environment because this model suitable for classroom teaching complementary. This model also able to increase the lecturer's role in the learning activities when the students learn outside the classroom.

For broader development and implementation, the Extended-CAI learning module should add voice communication feature or text communication as well “chatting”. In e-learning the interaction between students and lecturers is very critical [20]. Extended-CAI also should add an element that can send files directly.

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