Collaborative Learning Model of Software Engineering Using Github for Informatics Student

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Abstract—**Collaborative Learning Model Of Software Engineering Using Github is a learning method based on the Student-Centered Learning (SCL) that combines the collaborative method with the help of instructional media such as Github which implemented at courses of software engineering. core courses of informatics engineering study program is defined a software engineering. The outcome of this course is that students are able to apply the principles of software development. A medium is required to assist students in collaborative learning process so that the learning objectives can be achieved. GitHub is a web-based software that can be used as a medium for collaborating in the development of application software projects. Github is a source code management (SCM). Collaborative Learning Model of software engineering using Github for informatics student not only facilitate the learning process but also facilitate students to collaborate so that the learning objectives can be achieved.**

Keywords — Collaborative Learning; Software Engineering; Github; Informtics Student

I. INTRODUCTION

Student-Centered Learning method which is currently widely applied in Indonesia is a learning method based on student activity. It shifts the focus of activity from the teacher to the learners . In this method, students are required to self-direct and active role in the learning process. One example of the application of this method is the Collaborative Learning. Collaborative Learning is a method of group learning and working together to solve problems.

Software Engineering is a compulsory subject in all curriculum of Informatics Engineering. The final goal of this course is students can apply the principles and methods in software development. In the implementation of the learning achievement, students are required to complete a software project as a group that should be presented at the end of the semester for assessment. Assessment is based on the contribution of each student.

To determine each student's involvement in the development of software projects is very difficult because there is no written evidence that shows the contribution of each student. Unless lecturers to do an oral test to each student.

Github is a medium that can be used in the application of collaborative learning. Github supports several open source programming language like PHP, Android, and others. Github is a tool that can be directly used on the client side without the need to perform the installation. Users can use its features after registration. The world's leading companies such as Google and Facebook also use Github as a tool in the development of their software.

Github has features that can be used in collaborative learning, especially in the course of software engineering. One of its features is the source code management. Source code management allows the user to interact or collaborate in the review of code (create, add, edit, commits, make change pull request, etc.) in accordance with the permissions that have been given.

Research Question :
How to create a collaborative learning model that can facilitate the learning process in engineering software for informatics students to enable them to collaborate and learning objectives can be achieved?

Goals :
Build a Collaborative Learning Model to facilitate the learning process in software engineering to enable the students of informatics engineering to collaborate so that learning objectives can be achieved well.

II. METHODOLOGY

The research method used in building collaborative learning models of software engineering using Github is the exploratory research methods consisting of a literature study, design, implementation and evaluation. Evaluation was conducted by questionnaire to 72 students of informatics engineering in software engineering courses and 3 lecturers in one semester.

III. Study Of Literature

A. Collaborative Learning

In small groups, students can share knowledge and develop interpersonal skills. in the group of students learning to deal with conflict. in collaboration with the aim complete a task that has been set in advance, in students' understanding of flocking to the material they are working on. To create a comfortable environment to collaborate in order to Achieve the learning process, there are three things to note are [1]:

1. students must feel secure, but Also challenging.
2. the number of members of the group should not be too much so that every student can be unnoticed.
3. the task of what to do to be more clear in the beginning of the discussion so that each member of the group Cleary knows the duties of each student [1].

methods of collaborative learning support teachers to share knowledge Accelerate to students [1].

B. Software Engineering

The IEEE [IEE93a] has defined a more comprehensive understanding of Software Engineering [2]:

1. The application of a systematic, disciplined, quantitative approach to the development, operation, and maintenance of software; namely, the application of software engineering,
2. The study approaches such as "systematic, disciplined, and measured" approach adopted by a team of software might incriminate others. We need discipline, but we also need adaptation and agility [2].

C. Github

GitHub is a web-based repository hosting services. all controls distributed processing and source code management (SCM). GitHub provides a web-based graphical interface and desktop as well as integration with mobile devices. besides Github has access control and some functions to collaborate as a search error, file merging code, division of tasks, and wiki for each project [3].

GitHub provides a free account and personal repository, which previously generally to host the project open-source software. In February 2016, GitHub reported having more than 12 million active users and more than 31 million repository, then Github is the world's largest host of the source code [4].

IV. Result

A. Architecture of Collaborative Learning Model of Software Engineering using Github

Architecture of Collaborative Learning model of software engineering using Github is divided into three main parts :

1. level of lecturers,
2. level of student as leader, and
3. level of student group member.

At each level has a different function. Level lecturer has access rights as a admin. Admin privileges is the highest level in a collaborative learning models using Github. Level leader of the group of students in a collaborative learning models have a member as an admin level. As for the level of students as a member of the group has access rights as a member write.

Below is an overview of the architecture of collaborative learning models of software engineering using Github.

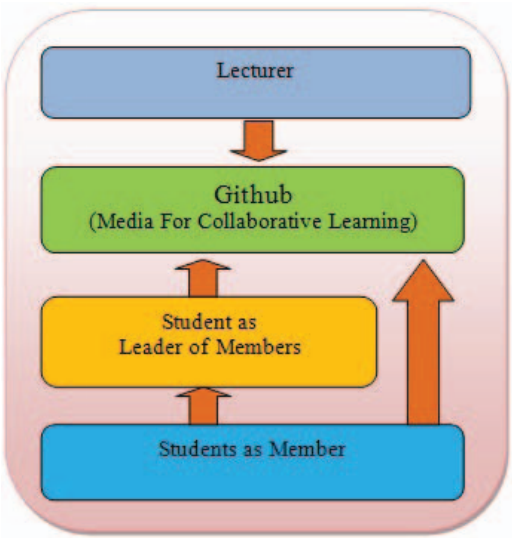

Fig. 1 Architecture of Collaborative Learning Using Github

From the picture above, the student as a member of the team can interact with the head of his team to collaborate via Github. While the lecturer can monitor the activity of each student through graphs. Graphs is a feature in github that can display graphics of contribution level of all student.

B. Interaction in Collaborative Learning Model of Software Engineering Using Github

The following is a diagram made based on the architecture of Collaborative Learning Model of Software Engineering Using Github described above :

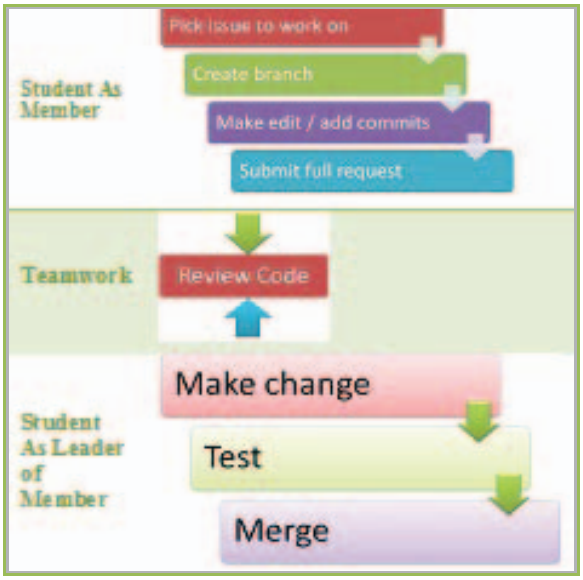

Fig. 2 Student Interaction in the Collaborative Learning of Software Engineering Using Github

From the picture above we can see that each student can interact and collaborate in project design software applications. Between the member and the lead of members collaborate in conducting a Review Code. Review Code can be discussed using the existing communication facilities on Github called Issue. The Issue is one of the features that can be used for communication between members to make improvements of the code.

Below is a picture of interaction of the lecturers. Lecturers can determine the contribution of each student with functions of Graphs.

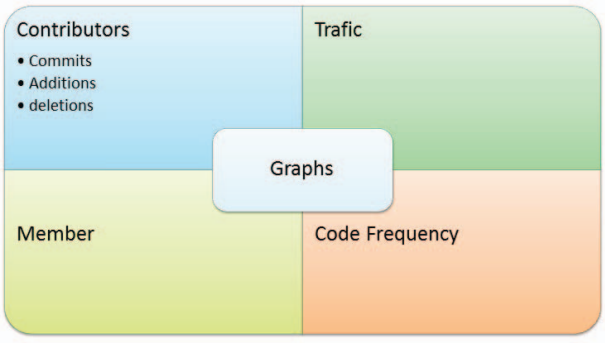

Fig. 3 Lecturer Interaction in the Collaborative Learning of Software Engineering Using Github

The expected outcome of this engineering software learning is that students are able to build or develop a software project by applying the principles of development that has been studied in groups. To assess the extent of the contribution of each student involved in the development of software projects can be seen in Graphs features found on Github. So that lecturers can conduct an objective assessment based on the contribution of each student.

From the three pictures above, a flow can be created which is used in general in the implementation of collaborative learning model using Github as one of the media. Here's the general workflow interactions that occur :

Fig. 4 Workflow in the Collaborative Learning of Software Engineering Using Github

From the picture above, workflows used by students to collaborate using Github consists of 7 stages: Pick issue, clone repository, make edit / add commits, resolve conflict, make change and the last one is a push to central.

Push to central carried out by the student as team leader. Previously members conduct "proposed to pull request" and then the leader of the team will perform tests to review the code. Whether the results are better or worse. If the results are better then it will be merged. And all that happened in the changes in the code can be notified via email. Team leaders can use the compare facility available on Github to do a comparison of the code created by the member (branch) with the master branch. Best code will be selected so that the the work of the software application project can be quickly resolved.

C. Implementation of Collaborative Learning Model of Software Engineering Using Github

Implementation of collaborative learning models using Github is done in software engineering courses at two universities namely Widyatama University and Polytechnic Pos Indonesia on informatics engineering study program.

At this stage in a semester, the students involved in the learning process engineering software to collaborate in completing the great task of software development using Github as a mandatory tool. So all the students involved must have a member account at Github. Previously, students are trained to have an account on Github.

D. Evaluation

The evaluation is done to determine whether the learning model using Github simplify or complicate the students and lecturers. Evaluation is done by using a questionnaire to students and lecturers. Tests carried out to a sample of students and lecturers in informatics engineering are as follows

1. 16 undergraduate students of Informatics Engineering, Widyatama University
2. 22 students of D4 of Informatics Engineering, Politeknik Pos Indonesia
3. 34 students of D3 of Informatics Engineering, Politeknik Pos Indonesia
4. 1 Lecturer of Software Engineering at Widyatama University,
5. 2 Lecturers of Software Engineering at Politeknik Pos Indonesia

So the total number of respondents is 75, 72 students and 3 lecturers. The first step, the respondent students are trained how to use Github so it can use it and can undertake the task has been given by lecturers. Furthermore, when using Github students should no longer ask how to use it. While the lecturer told how to use with admin privileges.

As a matter tested are:

Students must complete part of the program until the application can be run in accordance with practicum material on the topic of web service with PHP programming language.

The next step is student must do the problems in accordance with the instructions using Github.

The students and lecturers as respondents will be asked to complete a questionnaire. The questionnaire contains 10 questions that contain their assessment of Github.

The questionnaire used is closed, meaning that the researchers limited the alternative answers that chosen by the respondent in accordance with the contents of the questionnaire items.

After the questionnaire, the results of the questionnaire were analyzed with the presentation of data in table of ordinal data.

1) Evaluation Results of Student Respondents

Here are the results of evaluation in the form of student response data about Github.

TABLE 1.
TABULATION OF STUDENT QUESTIONNAIRE DATA

Questions	Persentage (%)	
	Yes	***No***
1. Is collaborative learning in software engineering using Github effective??	86,00	14
2. Is collaborative learning in software engineering using Github efficient??	90,30	9,7
3. Does Github has good utility in the process of collaborative learning of software engineering?	97,22	2,78
4. Is collaborative learning of software engineering with Github easy to learn?	87,50	12,5
5. Is functions in Github easy to remember?	84,72	15,28
6. Is studying software engineering with Github pleasant?	91,67	8,33
7. Does studying software engineering with Github help in contributing?	94,44	5.56
8. Is studying software engineering with Github surprising?	6,94	93,06
9. Is studying software engineering with Github boring?	5,56	94,44
10. Is studying software engineering with Github frustrating?	4,17	95,83

From the analysis of the questionnaire to the student obtained a majority agree that studying software engineering using Github is very helpful, easy and fun.

2) Evaluation Results of Lecturer Respondets

Here are the results of evaluation in the form of lecturers response data about Github.

TABLE 2.
TABULATION OF LECTURES QUESTIONNAIRE DATA

Questions	Persentase (%)	
	Yes	***No***
1. Is teaching software engineering with collaborative learning method using Github effective?	100	0
2. Is teaching software engineering with collaborative learning method using Github efficient?	100	0
3. Does Github has good utility in the teaching process with collaborative learning methods of software engineering?	100	0
4. Is teaching software engineering with collaborative learning methods using Github easy to learn?	100	0
5. Is functions in Github easy to remember??	100	0
6. Is teaching software engineering with Github pleasant?	100	0
7. Does teaching software engineering with Github help in contributing??	100	0
8. Is teaching software engineering with Github surprising?	0	100
9. Is teaching software engineering with Github boring?	0	100
10. Is teaching software engineering with Github frustrating?	0	100

From the analysis of the questionnaire to the three lecturers concluded that they agree that teaching software engineering using Github is very helpful, easy and fun in the assessment.

V. Conclusion

Collaborative Learning Model of software engineering using Github for informatics students can facilitate the learning process. Students can collaborate with other students and learning objectives can be achieved.

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