

Some Experiences in Web-based Management of Group Projects

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Abstract

This paper discusses our experiences in using common Web-based tools to support and to manage group projects, a common form of collaborative learning which has been demonstrated to enhance the development of critical thinking. We attempt to develop a methodology to address common pitfalls such as problems in logistics, uneven distribution of work, and unfair grading. Major features include reference case studies, staged execution and submission of work, public and private discussion forums, presentations, demonstrations, and individual grading. We will also compare our experiences with research results from other researchers and educators.

1. Introduction

Collaborative learning and cooperative learning have been demonstrated to enhance the development of critical thinking. But some common pitfalls are often encountered in their applications. Sometimes students find it difficult to find time to work together; other times the distribution of work may be perceived to be unfair; and some students may find the grading unfair. From what we understand, cooperative learning and collaborative learning are related but apparently different from one another in important aspects. The methods discussed in this paper has similarities with both collaborative and cooperative learning, and we do not intend to stress the difference between them.

Group projects are commonly used in teaching. With the advent of the World-Wide Web and Web-based tools, it is believed the following are feasible with group project-based learning:

- *Engaging research and adding intellectual value to existing information resources.* By purposefully using information resources to construct answers to their own question and achieve their own learning goals, students move beyond “knowledge reproduction” to “knowledge building”.
- *Sharing information and communication to*

coordinate activities and to collaborate in building communal knowledge. Cooperation is the process of working together toward some shared purpose, generally the construction of some shared artifact. Collaboration is the process of creating new knowledge and involves communication through a shared artifact for the sake of creating new understanding that the participants could not have achieved individually.

- *Engaging in sustained progressive inquiry.* Students must build on their own work and that of their peers to progressively advance their individual and group knowledge as they work on these problems and goals.

This paper discusses the experiences of the use of group projects in the teaching of the subject of object-oriented technology, in which a Web-based tool, WebCT, is used. Admittedly, WebCT has many well-known short-comings. But it is popular, and does support many useful functions such as calendars, public and private forums, assignments and submissions, etc. Our method stresses giving the groups structured guidelines and case studies for reference, periodic checkpoints, Web-based tools for information sharing and discussions within groups and with the whole class, and group as well as individual grading. Some preliminary results were previously reported in. Since then, the methodology has been refined and applied to another batch of students. The details are discussed in the following sections.

2. Group Projects in Teaching Object-oriented Technology (OOT)

Group projects are commonly used as teaching method at the Department of Computing at the Hong Kong Polytechnic University. In the subject object-oriented technology, two kinds of projects were assigned. The programming project involved the design and implementation of a software system using a prescribed development methodology. The reading project involved literature review and discussions on an assigned topic. Generally a team consists of four students, grouped by

mutual consent. In this study, the class consisted of 64 undergraduate students in their final years of studies. Main features of the method for conducting these group projects as practiced in the past two years are discussed in the following sections.

2.1. Staged execution

Cooper [0] and many others stress the importance of ensuring that students clearly understand the assignment. In the subject on object-oriented technology, the projects were executed in a number of well-defined stages, each with clearly specified deliverables, to ensure that the students are well-informed on how the projects should be carried out. For example, the typical programming project involves the design and implementation of development of an information system to support an e-commerce application. A popular software development methodology, Unified Software Development Process [Jacobson et al 0] was discussed in a series of lectures in parallel to the execution of the project. In addition, there were tutorial sessions in which the lecturer met with the groups (about 5 groups at a time) once a week to give them guidance and feedback. Each group would then meet as necessary to carry out their own work. Execution of the project then consisted of these stages:

1. Requirements specification. One week was assigned to this stage. At the end, each group submitted the description of the business model of the e-commerce application as the context of the project, and specification of the requirements of the project in the form of Use Cases according to the Unified Process.
2. System Analysis and Design. Two weeks were assigned to this stage. At the end, each group submitted the analysis and design of the system in the form of class diagrams, collaboration diagrams, and other diagrams as appropriate.
3. Implementation and Testing. Four weeks were assigned to this stage. At the end, each group demonstrated the system developed, and submitted a final report containing revised versions of the deliverables of the previous stages, as well as additional sections related to the implementation and testing results.

Each of the intermediate submissions were commented on and returned to the students within a week, to provide the students with sufficient feedback and to ensure that they are on the right track. No grades are given in the intermediate stages, so that the students can work under minimum pressure. Only the final submission is graded. Evidences as tabled in Figure 1 indicate that students are positive about this practice.

2.2. Reference Cases Studies

Other than giving students appropriate guidelines, sample case studies were also provided to the students, as illustrations of the expected outcome. For the development project, project reports written by a previous class (see

for a sample) were posted on the subject web site for the students' reference. This year nine development case studies, and seven reading case studies were posted. The sample projects were briefly discussed in class and we gave the extra bonus points to encourage student to comment on the sample projects in the subject's bulletin board. Specifically the students were asked to:

1. Comment on the case studies from the point of view of object-oriented technology
2. Suggest a grade for the case studies with justifications

Only a small number of students, about 10% posted their comments on the public discussion forum. However, evidences indicate that practically everyone of the students spent quite a bit of time reading or downloading the case studies. And students generally find the case studies useful.

Similarly, for the reading project, papers on suggested topics were distributed to the students for reference and briefly discussed in class. Students were also encouraged to post links to relevant web sites and other reference material to be shared among their own team members.

2.3. Shared Workspaces

The Internet provides a very convenient infrastructure for the members of a project team to share information and working documents. At the Hong Kong Polytechnic University, we have adopted WebCT [0] for teaching and learning support. In particular, general as well as dedicated bulletin boards were set up. They include the following.

1. A main board was set up for general announcements and discussions. Guidelines for the project, general references, reminders of deadlines, common pitfalls, etc. were posted on the main board for information of all students in the class. Students are also invited to comment on the posted cases studies. For example, one of the students commented:
"The best project is the 'Job On Demand'. It provides interactive, comprehensive job matching ... it a quite a new function for job seeking web site ... for the report has detailed UML diagrams, description and test plans. The project should be graded A."
2. A private board was set up for each project team for private discussions and sharing of references and working documents. The lecturer can also participate

in any private board, e.g., to suggest reference

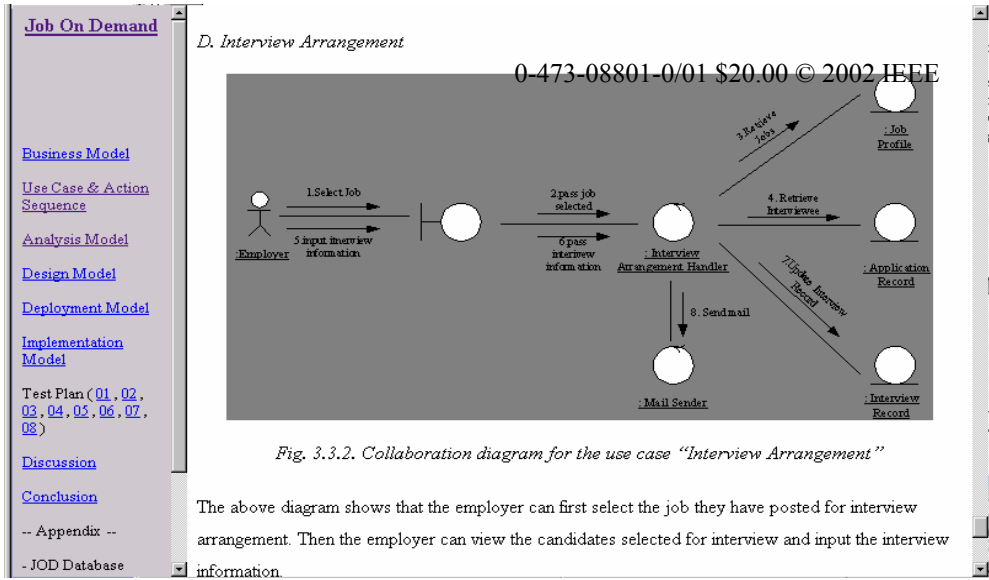


Figure 2. A case study provided to the students for reference.

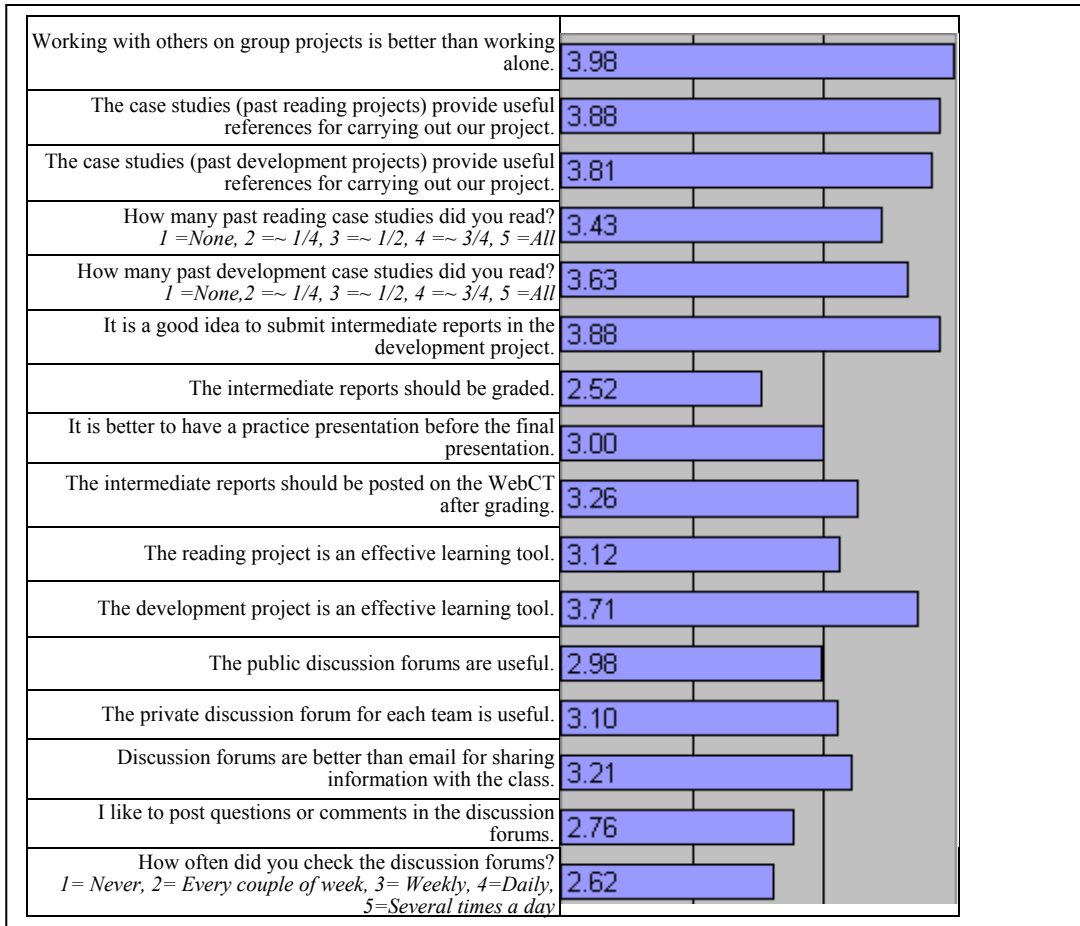


Figure 1. Students feedback on the web-based management of group projects (5=totally agree, 4=agree, 3=neutral, 2=disagree, 1=totally disagree).

material, comment on the works in progress, etc. About 28% of the teams use the private forums extensively.

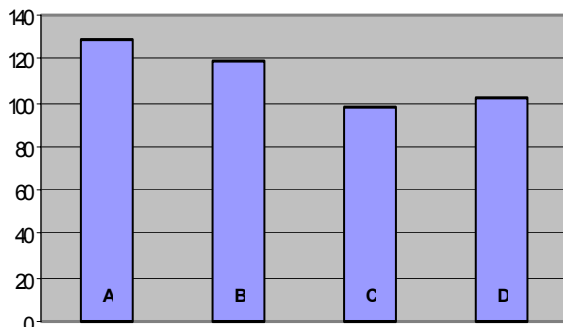


Figure 3. Average number of times the student accessed WebCT plotted against their average grades

2.4. Presentation, Report and Grading

At the end of each project, each team was required to submit a report, make a presentation of the project, and demonstrate the program. Presentations and the accompanying questions and answers between lecturer and team members are very effective means to determine the quality of the projects, and the extent to which each member contributed to the project.

In the OOT subject, each team project is assigned a grade based on the overall quality of the project. Individual members of the team may then be assigned an individual grade slightly different from the team's grade. Two kinds of information are considered by the lecturer, to arrive at a possible individual grade. Generally an individual grade different from the team grade is assigned only rarely (<10%).

1. Mutual agreement of team members. Each team is given an opportunity to indicate which member(s) of the team contributed more (or less) to the project, hence deserving a slightly higher (or lower) grade than the team grade. Generally most teams (>90%) opt for the same grade for all members.
2. Observation of each member's participation throughout the life cycle of the project and performance at the presentation and demonstration. Questions were addressed to individual members to determine their roles and extent of contribution to the project.

3. Experiences and Observations

The OOT class concerned in this project consisted of 64 students, divided into 18 teams. The students' responses to a survey were summarized in Figure 1. Also, we obtain the student access information on WebCT.

There were some interesting results, highlighted as follows.

1. Generally group projects were found to be effective learning tools. They felt they learned more from the development projects that involved programming, than the reading project in which they research on a chosen topic.
2. Intermediate reports were found useful in helping the students maintain reasonable progress in the project. However, students did not want the intermediate reports to be graded.
3. There is a very positive result on the case studies. On average, students read more than half of the past reports. The past development project reports were found to be useful for the students as case studies.
4. Many educators and industry leaders, in fact, considers that computing students in general are lacking in presentation skills and urge more training on presentation skills in universities. Students in general agree, but are nevertheless nervous about making presentations.
5. The main discussion forum (bulletin board) was found to be generally useful, and students prefer using discussion forum other than email to sharing information with the class. But students had a negative feeling about using the discussion forum. The lecturer used discussion forums to provide comments and feedback to encourage students and teams to use. It is believed that the unenthusiastic response to the discussion forum may be related to some of the problems with WebCT as noted below.
6. Even though WebCT is a popular web-based tool for teaching support, students generally did not find it user-friendly. In particular, it was suggested that there were a number of ways in which it can be improved, particularly in relation to support for group projects.
 - Uploading files to WebCT can be made simpler, particularly where multiple documents are involved;
 - Files attached to messages posted on bulletin boards have to be downloaded to a local machine before they can be opened;
 - WebCT cannot be used together with many popular tools, such as FrontPage, etc.
7. Students with higher grades (A and B) have significantly higher average hits than those with grades C and D. This positive correlation between academic results and the degree of use of the Web is in line with research results such as those from Danchak & Grosser 0, although no cause and effect relations can be deduced.

5. Conclusion

In this paper we discussed some of our experiences and observations in using web-based tools to manage student group projects. In general both lecturers and students felt that web-based tools provide valuable support for the management of group projects. This year we provided more reference case studies, and we encouraged students to use the WebCT, especially the discussion forums. Students only make limited use of discussion forums (bulletin boards) to discuss their project, and generally find the chosen support system, WebCT, to be inefficient in the sharing and exchange of documents. However, it is evident that students make heavy use of the cases studies, as seen both from the access data on WebCT and the results of the questionnaire. In the near future, we expect that the user-friendliness of these tools to be greatly improved. In addition, we are also working on developing other supporting tools for collaborative learning. These include a wireless online tutoring tool, and an integrated collaborative graphical editor for concept maps, which is reported in another paper.

6. Acknowledgement

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