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PROJECT-BASED LEARNING ACROSS THE MIS CURRICULUM: AN ASSESSMENT ON TEAM BUILDING

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ABSTRACT

Project-based learning provides a cross-collaborative learning environment that enhances student learning through mutual interaction. It provides improved understanding of subject matters, helps develop communication and fosters teamwork, and provides opportunities to hone leadership skills. In our MIS program, we require students to work on group projects as part of several courses such as Systems Analysis and Design, IT Project Management, Web Development, e-Commerce, Data Warehousing, and Management Information Systems. This paper briefly describes how group projects are implemented in these courses, and particularly we report the effectiveness of group projects in students' learning through an assessment performed in these courses. The purpose of this across-the-curriculum assessment is partly driven by the recent AACSB requirement of the assurance of learning standards in each of the curricular programs of business schools.

Keywords: Group project, project-based learning, team building, communication, assessment.

INTRODUCTION

Project or Inquiry-Based Learning is an instructional method that uses complex, real-life projects to motivate learning and provide learning experiences; the projects are authentic, yet adhere to a curricular framework (PBL1, 2006). It allows teachers to create tasks whose complexity and open-endedness mimic problems in the real world (PBL2, 2006). Projects that have depth, duration, and complexity challenge students and motivate them towards construction of knowledge. Project-based learning provides a cross-collaborative learning environment which enhances student learning through interactions with each other (Nance, 1998). It provides improved understanding of subject matters, helps develop communication, planning and teamwork, and provides opportunities to take responsibility. Teams outperform individuals acting alone or in a larger group, especially when performance requires multiple skills, judgment, and experiences (Wells, 2002).

Teaching through cases, projects, and role-playing has been a common practice in many MIS courses, especially in the Systems Analysis and Design (SAD) course. For example, Sullivan (1993) emphasized the project management aspect of software development projects through role-playing between instructor and students. Adams (1993) stressed on project management documentation such that students acted as reviewers of documents and prototypes created by each group. Kirs (1994) describes teaching SAD through role-playing between instructor and students, such that they acted as personnel of a software development company. Nance (1998) used group projects to improve students' soft skills such as teamwork, group
development, and project management. In teaching project management, Rob (2003) and Lowe (2000) focused on students’ role-playing as project managers as well as on-time delivery of project documentation. Lenox and Woratschek (2004) used a case project in order to teach a database management systems course.

In our MIS program, we have been using group projects as part of several courses such as Systems Analysis and Design (SAD), IT Project Management (PM), Web Development, e-Commerce, Data Warehousing (DW), and Management Information Systems (MIS). This paper briefly describes how group projects are implemented in these courses, and more importantly, we report the effectiveness of group projects in students’ learning through an assessment performed in these courses. The purpose of this across-the-curriculum assessment is partly driven by the recent AACSB requirement of the assurance of learning standards in business school programs. Our MIS program defined four learning goals for our students, one of them being “team building.” We thus developed an instrument to measure the team building effort across the curriculum. The results are reported here.

KEY ASPECTS OF A PROJECT-BASED LEARNING COURSE

Project-based learning may evolve in two perspectives: teacher-facilitated and teacher-guided (PBL3, 2007). A teacher-facilitated project transforms “teacher-telling” (or teacher instruction) to “student-doing” (or student action). It places the emphasis of action on the students’ part. A teacher-guided project places emphasis on teaching according to the curriculum and engages students in projects to acquire knowledge and skills that are paramount for the greater understanding of the course. Irrespective of the approaches taken, as proposed by many researchers (Granger and Lippert; 1999; Killingsworth, et. al., 1999; Wells, 2002) and as experienced and implemented by the author, successful learning through a group project requires strategic organization of a course and group project in the following key areas:

- **Planning for the course:** Success in a project-based teaching requires extensive, well-thought out planning for the course. It requires establishing a classroom climate that facilitates learning (Killingsworth, et. al., 1999). The climate can be set by defining course objectives and course activities, developing a schedule of these activities, as well as outlining expectations from students, and identifying a grade distribution. The project activities should address all areas of knowledge and skills that will be taught in the classroom.

- **Setting Goals and Expectations:** Like traditional teaching, the teacher still sets goals and objectives of the course and expectations from students. However, thoughtful planning by the educator ensures that students can attain those objectives in a timely manner through knowledge gained from the overall course activities.

- **Types of group project:** Depending on the learning objectives of a course, the life of a group project may extend only as long as a single class period or it may extend as long as a semester. Teaching unrelated concepts of a course may be suitable in the former case, while teaching related concepts such as that in the SDLC is more suitable for a semester-long project. A semester-long project may be a fictitious or published case problem, or it can be a real-life problem. A realistic project that represents today’s business environment and implements necessary activities of cross-functional areas of a business domain is suitable for a group project. Problems more applicable to the real world seem to stimulate students’ interest and motivation (Killingsworth, et. al., 1999). Some of the criteria to be considered in selecting a project include the following: the project must be large enough to require a high degree of interaction between individuals working on different components, the project must be feasible during the duration of the course, and a preferred project is report-driven than data-driven (Perkins, 1980).

- **Selection of the project:** Project selection can occur in a number of ways, by the instructor or by the students, and all students may work on the same business problem or on different problems. Multiple business problems tend to foster more knowledge and class participation than a single problem.

- **Selection of project group or team:** A project team may be organized in various ways as well (Wells, 2002). Depending on the type of the project selected, an entire class may act as a project team (Fernandez and Williamson, 2003) or a class can be divided into multiple groups (Dodani, 1992). Wells (2002) suggests a group of 2 - 5 students. For smaller groups, there are many different ways a team may be organized. The instructor may assign the team members or the members may organize themselves in a group (Granger and Lippert, 1999). The groups can be homogeneous or heterogeneous depending on knowledge, gender, ethnicity, cultural background, and socioeconomic background. Ideally, a successful project team should reflect a real-world business team and should be manageable. A successful team should also possess some of the following characteristics: a small size, a
complementary skill set within the group, a commitment to goals and objectives, and accountability of each team member's efforts (Wells, 2002).

- **Monitoring and Control of Tasks:** While instructors make overall plans for learning objectives and associated tasks, students assume a great deal more responsibility in carrying out the activities. Monitoring and management of related tasks by the instructor is necessary to achieve overall objectives of a course. Monitoring can be to check one's progress towards set goals. Adjusting refers to changes to planned tasks based on monitoring the steps taken in order to reach set goals. For example, a presentation on a key concept of a subject matter in the group project may be repeated depending on the outcome of the presentation. Project groups learn from each other, which helps foster better understanding of key concepts.

- **Assessment:** Assessment helps teachers develop more complex relationships with their students. It provides opportunities for formal and informal conversations about the work as well as feedback on students’ projects. Assessment helps students answer the questions "Do I get it?" and "How am I doing?" Assessment can help clarify objectives. Teachers and students can both use such activities to take note of concepts and connections to carry forward to the next stage or activity. Assessment engages students directly in the evaluation of their own work, while helping teachers plan the next step. By documenting and reviewing student progress, eliciting answers to specific questions, and confirming conceptual understanding, teachers gain insights into what the students are learning and what needs to be addressed before moving forward to the next objective. Assessment helps students plan their projects well. Class presentations, design reviews, and discussion with both teachers and group members all give students valuable feedback to help them plan their subsequent activities. Assessments should come in multiple formats such as in written work, observations, presentations, informal discussions (or question and answer sessions), project designs, and in the final product.

**COURSE ORGANIZATION**

We design our course curriculum based on the key concepts of the project-based learning. It is organized such that students gain knowledge and concepts through lectures, group projects, group presentations, documentation, research papers, classroom writing, and discussion. Over the years, lectures have been deemphasized, and have been placed all lecture notes in a course web site (http://mis.uhcl.edu/rob). The web site also serves as a central repository for all course-related resources such as the current syllabus, the presentation schedule, research paper assignments, as well as past presentations, research papers, and completed project documentation.

The types of group projects as well as their weights counted typically between 10 and 40 percent of the overall grade depending on the course. For example, in the SAD course the group project weighs 40%; in the DW course it is 20%, and in the MIS course, it is 10%. In all courses, the instructor defines the project requirements and the students are free to choose a project. One of the most effective ways to monitor and control group project activities is through listening to students’ presentations as the project activities progress. Typically by the second or third week of a semester, project groups are formed and presentation schedules are developed and posted on the web site. Each student group then selects a project and finalizes through discussion with the instructor. In most courses, students work on a semester-long project and usually make three presentations.

*Implementing the Group Project*

In implementing the group project, we focused more on the teacher-guided concepts than those of the teacher-facilitated. The purpose of the group project is to offer first-hand knowledge of the key concepts of a course as well as the tools, techniques, and technologies necessary to develop the concepts. Our group project activities fit the model of team development proposed by Wells (2002), which suggests four stages of team development, namely *forming, building, management, and assessment.*

Students are given the opportunity to select their own projects; and it is found to work successfully in our classrooms, possibly due to the availability of a blend of employed and mature students along with the full-time students. Our purpose is that the students select a system of sufficient complexity and detail that both challenge and enhance their knowledge and skills.
Depending on the size of the class, a group typically consists of 2 - 3 students. As the majority of the group project activity is outside the classroom, it is found that for a larger group, a group member fails to participate effectively due to poor communication or schedule conflicts. To ensure that the students learn the key concepts of a course, we use a framework for the group project consisting of key ingredients for the course: models and techniques, tools and technologies, and communication. This is illustrated in Figure 1. Rob (2006) provides a detailed description of how the group project is implemented in the Systems Analysis and Design course.

**Figure 1: Key Components of a Group Project**

### Models and Techniques

Students are expected to gain substantial knowledge on the models and techniques covered in a course. In a SAD course, this might include for example the feasibility study, project plan, data-flow diagrams, entity-relationship diagram, program design, and user interface design. In a DW course, some of the key areas are dimensional modeling, dimension hierarchy, star and snow-flake schema, cube design, and OLAP processing.

### Tools and Technologies

In the workplace, an IT person is expected to use many different tools to develop models, making project plans, developing web sites, developing documentations, and communicating with stakeholders. As such, students are required to use tools such as Microsoft Visio, Visible Analyst, Microsoft Project, and other Microsoft Office tools such as Word, PowerPoint and Access to develop system models, project schedule, presentations, data dictionary, program models, database models, user interfaces, web site architecture, and system prototypes.

### Communication

Communication is one of the most important skills an IT person must have in the workplace. Interviewing customers to gather systems requirements, developing system-related documents such as systems proposals, design specifications, and training manuals, as well as making presentations to customers are common practices. All courses require group presentations and some courses such the SAD, DW and PM require substantial documentation development. Most presentations are focused on the key models or techniques covered in a course or are required to develop a project. Repetitions of some presentations are required when students do not seem to grasp the knowledge expected from the course. Groups learn from each other’s presentations and are required to modify their presentations until they acquire the fundamental knowledge or concept.

### ASSESSMENT ON TEAM BUILDING

In addition to assessing the group project in individual courses through presentations, documentations, discussion, and feedback, we have done an assessment on team building in four courses that use a group project. Tables 1 and 2 show the survey questionnaire and the sample results from four courses in which group projects were implemented. The number of students in most courses is between 15 -20, except the MIS course that typically contains about 40 students. In addition to team building, the questionnaire also contained some questions on soft skills such as oral and written communications. Out of eleven questions, eight questions were devoted to team building. A general observation of the results suggests that most
students had a positive attitude towards team building. Results are similar for other courses as well. A complete analysis of the data will be presented in the conference.

Table 1: Assessment on Team Building in the Systems Analysis and Design Course

<table>
<thead>
<tr>
<th>Number</th>
<th>Question</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Fairly</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The group project significantly helped me to understand the course materials</td>
<td>21%</td>
<td>43%</td>
<td>29%</td>
<td>7%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>2</td>
<td>The group project helped me to improve my oral communication</td>
<td>7%</td>
<td>43%</td>
<td>36%</td>
<td>14%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>3</td>
<td>The group project helped me to improve my written communication</td>
<td>7%</td>
<td>29%</td>
<td>43%</td>
<td>21%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>4</td>
<td>The group project helped me to understand teamwork</td>
<td>14%</td>
<td>29%</td>
<td>29%</td>
<td>21%</td>
<td>7%</td>
<td>100%</td>
</tr>
<tr>
<td>5</td>
<td>I had fair participation in forming my team at the beginning of the semester</td>
<td>29%</td>
<td>57%</td>
<td>0%</td>
<td>14%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>6</td>
<td>In general, members in my team participated fairly equally in all group activities</td>
<td>21%</td>
<td>57%</td>
<td>7%</td>
<td>7%</td>
<td>7%</td>
<td>100%</td>
</tr>
<tr>
<td>7</td>
<td>My team members took responsibilities of their task or work</td>
<td>29%</td>
<td>43%</td>
<td>14%</td>
<td>7%</td>
<td>7%</td>
<td>100%</td>
</tr>
<tr>
<td>8</td>
<td>My team members showed interest in initiating a task or work</td>
<td>29%</td>
<td>29%</td>
<td>29%</td>
<td>7%</td>
<td>7%</td>
<td>100%</td>
</tr>
<tr>
<td>9</td>
<td>My team members completed their portion of the task or work on time</td>
<td>36%</td>
<td>43%</td>
<td>7%</td>
<td>7%</td>
<td>7%</td>
<td>100%</td>
</tr>
<tr>
<td>10</td>
<td>My team members responded to my e-mails or telephone calls on time</td>
<td>43%</td>
<td>29%</td>
<td>21%</td>
<td>7%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>11</td>
<td>My team members were helpful in resolving differences/conflicts between us</td>
<td>29%</td>
<td>36%</td>
<td>36%</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
</tbody>
</table>

CONCLUSION AND DISCUSSION

We have discussed how group projects are used across an MIS curriculum especially we have focused on the usefulness of group projects on team building. A simple analysis of the assessment data in four courses shows that most students had a positive experience in team building. A complete statistical analysis of the data will be presented in the conference.

REFERENCES


**Table 2: Assessment on Team Building in the Advanced Internet Development Course**

<table>
<thead>
<tr>
<th>Number</th>
<th>Question</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Fairly</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The group project significantly helped me to understand the course materials</td>
<td>50%</td>
<td>25%</td>
<td>13%</td>
<td>0%</td>
<td>13%</td>
<td>100%</td>
</tr>
<tr>
<td>2</td>
<td>The group project helped me to improve my oral communication</td>
<td>38%</td>
<td>38%</td>
<td>13%</td>
<td>0%</td>
<td>13%</td>
<td>100%</td>
</tr>
<tr>
<td>3</td>
<td>The group project helped me to improve my written communication</td>
<td>13%</td>
<td>38%</td>
<td>38%</td>
<td>0%</td>
<td>13%</td>
<td>100%</td>
</tr>
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<td>25%</td>
<td>13%</td>
<td>100%</td>
</tr>
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<td>63%</td>
<td>0%</td>
<td>0%</td>
<td>13%</td>
<td>100%</td>
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<td>25%</td>
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