

Case Studies of Team Project Based Instruction

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Abstract

The purposes of this study were to examine how project-based learning is practiced in different classrooms and how students react to the team-project based learning. This study focused on three different classes which were taught by different instructors. In order to examine how project-based learning is practiced, interviews were conducted with the instructors, asking them how they apply the instructional method to their classes. In addition, surveys were conducted with the students who participated in the team-projects based classes, exploring how students manage the team activities. Guideless for the ways of practicing successful project-based classrooms are suggested based on the study results.

Keywords: *Team-based Learning, Instructional Design, Project-based Learning*

1. Introduction

The role of higher education is to prepare people with required knowledge and skills in society. Through a variety of educational programs and curriculum reforms, universities constantly make endeavor to facilitate the need of society. However, business organizations often complain that students who graduate from the university do not have enough skills to collaborate with other people in work places. The most significant elements that affect to the economic growth are knowledge, information, problem-solving skills, creativity, and abilities to work with others (Sokol, *et al.*, 2015). Currently, technology can replace 99% of human skills, however, 1% of the human abilities such as creativity and problem solving skills play a key role in the society. Problems are often most effectively solved in a team and ability to work as a team is critical to be successful in problem solving situations. The team project provides students with opportunities to learn from mistakes and develop collective and individual working skills (Whatley, 2012). Students develop cognitive, affective and psycho-motor skills as a result, while they link the ideas together and synthesize the problems through a range of activities (Voronchenoa, 2015).

In many years, higher education institutions had various attempts to develop effective ways of teaching and learning. Team-project based learning is one of the methods that is designed to encourage better learning outcomes through social interaction with other people (Ha, 2014; Lee, 2013). Lee and Lim (2012) advocate that team project-based learning is an alternative teaching method for both improving the quality of teaching and enhancing learning outcomes, promoting cooperative ability, critical reasoning, creative thinking, responsibility, and communication. However, project-based learning is based on the learners' active participation. If the learners are not sufficiently communicating with others, it will be damaging to fellow learners. When team members do not see each other's perspective, discussions will live on without points and closes in the teams and it will lead to superficial learning. Therefore, strategic instructional approaches are necessary to be successful in students' learning because that team-based learning do not bring any effective learning outcomes by simply collaborating each other. Thus, it is

necessary for instructors to prepare their own teaching strategies for managing the course successfully.

1.1. Need of the Study

Currently, instructors in higher education tend to prefer team-oriented activities or team project-based tasks to individual activities because the society requires graduates with team skills. Yet, studies [1, 2] often complain that, project-based activities do not properly occur during the class time due to the complex classroom situations. Classroom situations are different based on subject areas, teaching styles, and attitudes of students such as attitudes toward team work and levels of participation in the class. Therefore, it is important to consider these elements that may have an effect when adopting the instructional method. Through the years, projects-based learning has been introduced into the classroom, but studies focusing on different classroom cases are rare. Therefore, it is necessary to examine how project-based learning is practiced in different disciplines with different classroom situations.

1.2. Purposes of the Study

The purposes of this study are to examine how project-based learning is practiced in different classrooms and how students react to the team-project based learning. This study focuses on three different classes taught by different instructors. In order to examine how project-based learning is practiced, interviews were conducted with the instructors, asking them how they apply the instructional method to their classes. In addition, surveys were conducted with the students who participated in the team-projects based classes to find out how students manage the teams and the team activities. Based on the study results, guideless for the ways of practicing successful project-based classrooms are suggested. The guidelines and the real classroom cases will help instructors have better ideas about designing their own classes.

1.3. Research Questions

In order to achieve the study goals, there are three research questions proposed as follows; (1) How do instructors operate team project-based learning? (2) How do students manage the teams and participated in the team activities?(3) How do students perceive the team project-based learning?

2. Team Project Based Instruction

Higher education institutions have responsibilities to prepare for students to function as a member of society with the necessary skills and knowledge (Kwon, 2013; Yoon, 2013). There are many factors affecting students' learning outcomes, including curriculum, educational programs, facilities, instructors, and instructional strategies. Among these factors, elements that are directly related to students' learning may be instructional strategies that are used in the classroom. Based on the instructional objectives and subject areas, different instructional approaches are required. Today, most required skills by the job market include creativity, problems solving skills and abilities to work as a team.

In particular, organizations expect university graduates to have knowledge and experience of team working (Chant, *et al.*, 2015; Yoo, 2014). Team project based learning is a kind of instructional methods that learning occurs while students interact with each other to complete the projects. The students develop individual and team skills by working together, analyzing the context and situations through the process of finding the answers. During the team work, students construct the knowledge and skills through social interaction (Benson, *et al.*, 2015; Kang, 2014). However, it is very difficult to measure how much students learned and what they learned, unless they are given an

opportunity to reflect on their performance in team working through reflection and evaluation process. Since team project-based learning has been introduced to the field of education, it has been increasingly used to promote students' learning outcomes in many subject areas. In order to achieve the desired outcomes, it requires students' active participation and solid teamwork. Sometimes, high-achieving students tend to dominate the team activities for their own grades, rather than mutually collaborating with each other (Lee & Son, 2014; Yoon, 2013). Therefore, flexible instructional design strategies are required based on the class situation.

Even though active learning pedagogies are proven effective, it is still challenging for educators to adopt (Lee, 2013). There are many factors to consider for the successful implementation of the pedagogy in the real classroom. According to Spoelstra et al. (2015), team projects are highly successful when team members are creative and knowledgeable about the topics. Team members should be homogenous in the level of knowledge and experiences. Lee & Lim (2012) emphasize that in order to be project-based learning successful, instructional goals, planning, research design, the process of performance should be well designed and the central theme of the project should be associated with the real life situation. In addition, the one of the important factors that affect students' learning outcomes is the evaluation method. Therefore, planning, selection of topics and evaluation methods are the key factors to decide the success of the instruction in the project based learning (Lee & Lim, 2012).

3. Methodology

3.1. Research Methods

Interview and survey methods were employed in this survey. In order to find how instructors operate team project-based class, interviews were conducted with 3 professors who taught the team project-based classes. In order to find how students perceive the instructional method and find the advantages and disadvantages, surveys were conducted with 83 students who took the classes.

3.2 Participants

Three professors and 83 students participated in this study. The professors belong to the engineering department and social science department and they taught the team project based class for a semester. The students who took the classes participated in the survey after the class. The participants consist of 45 freshman, 18 juniors, and 30 seniors with three different majors. Table 1 Presents information about the participants.

Table 1. Survey Participants

Field of study	Freshman	Junior	Senior
Engineering	45	0	2
Social Sciences	0	18	9
Art	0	0	9
Total	45	18	20

3.3 Instruments

Interviews were conducted in an unstructured way. The interviewees freely described how they designed the instruction and operate the classes. The survey questionnaire with 29 questions was developed by the researcher and three professionals in the field of higher education assured the reliability of the tool. The questionnaire was composed of three subsections; team management, perceptions of team work, and preferences of team work. The survey items used point Likert scale (5 strongly agree 4 agree, 3 not sure, 2

disagree, 1 strongly disagree). The Chronbach alpha of the questionnaire was 0.89, 0.88, and 0.87 each.

Table 2. Survey Participants

Items	Number of Questions	Reliability
Management of team works	10 questions	0.89
Participation of team activities	10 questions	0.88
Perceptions of team works	9 questions	0.87

3.4 Data Analysis

Interview results were analyzed by four categories such as class objectives, class design, instructional strategies, and class outcomes. Survey results were analyzed using SPSS 21. In order to answer the research questions, statistics such as means and standard deviations were calculated for each section. To examine if the responses are different by the grade level or classes, ANOVA was conducted, but there was not any statistical differences based on the variables.

4. Findings

4.1. How do Instructors Operate Team-project based Learning and what are the Difficulties to Operate the Class?

According to the interview with the instructors, the ways of operating the class such as class objectives, class process, instructional strategies, and students' outcomes were analyzed and summarized by categories such as class objectives, instructional design, instructional strategies, and students' outcomes. [Table 3] describes a summary of operating classes by each instructor.

Table 3. Team-project Based Instruction

Classes	Class A	Class B	Class C
Subject	Innovation	Real Estate seminar	Creative Design for Engineers
Class Objectives	Improving creative problem solving skills	Understand the real estate market and write a business proposal	Developing and designing creative ideas
Class process	[Lecture – Class activities – Presentation – Feedback] Project topics and resources are given by the instructor each time. Students finish the projects in class and make a presentation as a class activity	[Idea presentation – team work – Team meetings with instructor - Final presentation] The teams decide one major project related to the real world problems Class meets 4 times only.	[Introduce the team project – Lecture- Class activities - Progress presentation – Feedback-Final presentation] The instructor provides the same project topic to the teams and lectures about the concepts.
Instructional strategies	Emphasize the personal roles by peer evaluation and team evaluation	Focus the proposal to apply to the real life situation	Combine lecture and class activities equally
Students' outcomes	7-8 in class projects PPT Presentation	One(1) final project: Business Proposal	One(1) final project
Evaluation	Team & Individual	Team performance	Team performance

performance Mid-term, final exam Class participation	Final project	Finalproject Class participation
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4.1.1. Class A

Class A is a creative design for engineering students. The objectives of the class are to promote students' creativity and problem solving skills. Since it is a basic liberal art class, more than 50 students take the class. The class is designed to learn creative problem solving skills by participating the small class projects. The instructor prepares for the lecture, class activities, and the evaluation method each time and explains to the students. At the beginning of the class, small lecture is given and students participate in the team project during the class to learn and better understand the concepts.

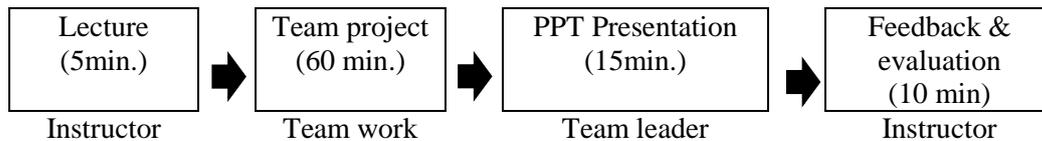


Figure1. Instructional Process for Each Week

The projects and the resources are provided by the instructor each time and students work as a team to complete the projects. At the end of the class, the teams make a presentation about their outcomes. Through the semester, the students complete 7-8 projects and learn how to express and organize their ideas and make the ideas as product while working the projects. Since the same projects are given to the class and the credits are given to the best 2-3 teams only, the teams compete with each other for the best outcomes. The students are evaluated by the team projects, mid-term, and final exam. Therefore, both team and individual performance are graded in this class. For the successful management, the instructor's preparation and the team competition play a key role in this class. When the instructor does not explain the concept well or do not prepare for the class projects in detail, the students do not understand what are the relationships and the class projects. In this class, since small activities are given everybody, students tend to concentrate on the project relatively well.

4.1.2. Class B

Class B is a seminar class for the seniors who are majoring in Cadastral science. The class objectives are to understand the real estate marketplaces and improve the business skills to handle the real estate in real life situation. At the beginning of the semester, the students meet in class and the instructor explains what will be the projects and how the class is managed. In the first class, the students are divided into teams and discuss the topics for their projects. In the second class, the teams present the topics and the schedules about how they carry on their projects through the semester.

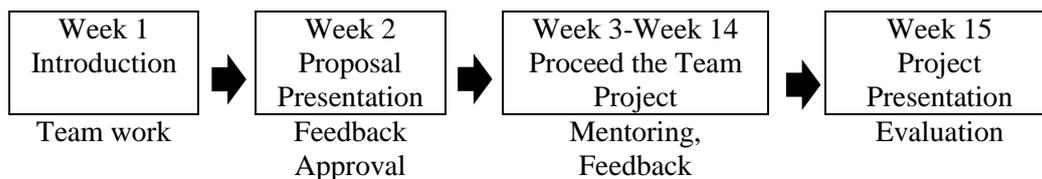


Figure 2. Instructional Process for the Semester

The topics should be authentic, being related to the real life situations. For example, one team proposed to open a takeout coffee shop on the campus. They contacted the

university administration if it is possible to rent the small area and open a coffee store on campus. They also looked for the investors to rent the facilities and purchase the necessary items to open the store. The other team proposed to make profits from the rental business. They went to the real estate business site and find a real building for the project. They will propose to run the rental business by researching the areas and buildings that are advertised in the marketplaces. When the instructor approves the projects, the teams proceed with their projects through the semester and make a final presentation at the end of the semester.

During the semester, there is not any formal class meeting. The instructor plays a role as a mentor. The teams have to meet the instructor at least two times to report their progress and ask for the advice. The students can use any resources for research and contact people in the marketplaces to gather information. At the end of the semester, the teams have to submit the final report and make a presentation. The teams are evaluated by their presentation and the report. However, there are teams that do not complete the projects as they proposed at the beginning. Since there is not any formal classes during the semester, students tend to lose their focus on the class and fail to complete the project. For the success of the team work, the role of a team leader is important. When the leader keeps the schedule and manages the project actively as planned, the team successfully completes the project. When the leader is not responsible for managing the team schedule and team members, the team fails to finish the work. Therefore, when the class does not meet on a regular basis, team leader's role is important for the success of the team work.

4.1.3. Class C

Class C is a creative design for engineering students. The objectives of the class are to promote students' creativity and concept design skills for the future engineers. The instruction consists of lecture, class activities, and one final project. Lectures and class activities are to teach the concept design process and the final project is to evaluate students' skills and abilities to work as a team.

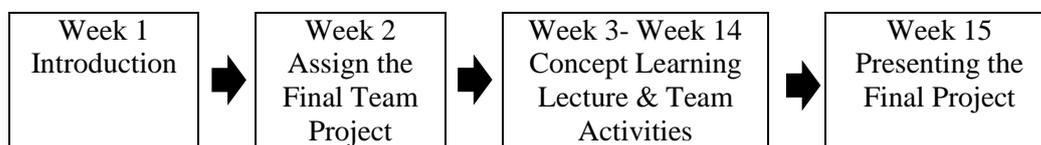


Figure 3. Instructional Process for the Semester

The instructor said that reading and writing skills are the most required skills for the engineering students. However, students lack those abilities. The instructor prepares for the activities to improve reading and writing skills. In addition, during the class activities, students learn how to do brainstorming, concept mapping, organizing team ideas, making a report, decision making, negotiating, and solving team conflicts. Throughout the semester, students learn how to develop the ideas, write business proposals and make a presentation as a team while working on the final project apart from the class. Regarding the class management, the biggest problem of the class was the students' attitudes. Some students are not interested in class activities and do not pay attention to the class even though it is not a lecture class. When the students lack interests, there will be a team conflict. In general, students with high academic achievement tried a variety of ways to successfully complete the team project by conducting a research and enthusiastically participated in the class activities as well. Relationships among the team members and the team work influence the quality of the team students' outcomes.

Regarding the students achievement, students seem to improve their presentation skills a lot at the end of semester. However, their creativity or reading and writing skills are not improved much as he expected. The instructor said that team project based instruction

makes the classroom atmosphere more active and more engaged than the lecture, and provide more learning opportunities for the students who are enthusiastically involved in the project. However, the abilities such as creativity, critical thinking, and reading and writing are not improved in a short period of time. Thus, a series of team project based classes should be implemented in the curriculum focusing on the skills necessary for the engineering students. For the success of the team project, it is important for each member to be responsible for their own roles. The instructor has to set up a strict rule for the students who are not responsible for their roles in the teams.

4.2. How do Students Manage the Teams?

Based on the survey analysis of the team management section, it appeared that team members have the same team goals (m=3.92) but they do not set up the concrete team rules for managing the team (m=3.28). They respect each other's opinion (m=3.84), examining the suggested solutions carefully (m=3.8), and have necessary skills and knowledge for the team work (m=3.7). Team members' ideas are relatively sufficiently discussed all the time (m=3.65) but discussions are not future-oriented all the time (m=3.57). In addition, the team evaluation plays an important role to make the members fulfill their responsibilities as a team member (m=3.73). Table 4 presents the responses of the team management in detail.

Table 4. Team Management (n= 83, 5 Strongly Agree <-- > 1 Strongly Disagree)

Items	M	S.D
1. Our team members set the same team goals.	3.92	1.0
2. Team members set up the concrete rules to effectively manage the team.	3.28	1.11
3. Team members respect each other while working together.	3.84	0.98
4. Solutions suggested by the team members are handled respectfully and carefully.	3.8	0.84
5. Team members' ideas are sufficiently discussed all the time.	3.65	1.02
6. Team discussions are future-oriented.	3.57	1.05
7. Team members try their best to complete the assignments.	3.67	0.89
8. Team members quickly responded to the assignments given.	3.64	0.94
9. Team members have the necessary skills and knowledge of the team work.	3.7	1.12
10. Team evaluation by the instructor plays an important role to keep the members to fulfill our responsibilities.	3.73	1.20
Total	3.68	1.02

When analyzing how the respondents participate in the teamwork, it appeared that they actively participate in the team activities (m=3.82) while effectively communicating with the members (m=3.83) and do not insist their own ideas (m=4.33). They try their best to resolve the conflicts during the team work (m=3.77) and listen to their colleges opinion sincerely (m=3.83). In addition, the respondents perceived that team activities help solve difficult problems better than they do it by themselves because they can share a variety of ideas (m=4.02). However, they show relatively low scores for voluntarily helping other team members (m=3.37).

Table 5. Participation in the Team Activities

Items	M	S.D
1. I actively participate in the team work.	3.82	0.97
2. I effectively communicate with my team members.	3.83	0.96
3. I dedicate all my abilities and skills for the success of team work.	3.81	0.9

4. I listen to the team members' opinion sincerely.	3.83	1.2
5. I try my best to resolve the team conflicts among the members. .	3.77	1.04
6. I do not insist my idea to other members.	4.33	0.4
7. I volunteer to help other team members when it is necessary.	3.37	0.89
8. I hardly have conflict with others during the teamwork.	3.95	1.04
9. I can negotiate the solutions with my team members.	3.67	0.96
10. We can share a variety of ideas through the team work.	4.02	1.05
Total	3.84	0.9

When analyzing the students' perceptions of the team work, it appeared that they enjoy working as a team and perceive the team work as an effective way of solving problems. In detail, the respondents perceive that team activities are helpful to develop creative thinking skills (m=3.92) and to make good relationships with colleges (m=3.84). It also helps solving difficult problems (m=3.71) and producing better outcomes than individual works (m=3.61). They also enjoy having discussions and sharing ideas with the team members (m=4.02), however, they did not perceive that team work save time to complete the assignment (m=3.27).

Table 6. Students' Perceptions of Team Work

Items	M	S.D
1. Team activities are helpful to develop creative thinking skills.	3.92	0.9
2. I like team works more than individual works.	3.16	1.33
3. Sometimes, I feel hard to finish the individual tasks alone.	3.27	1.23
4. I enjoy having discussions and sharing ideas with the team members.	4.02	0.92
5. Team works help in saving working time.	3.35	1.25
6. Team works help us produce better outcomes than the individual works.	3.61	1.05
7. Team works help in solving difficult problems.	3.71	1.03
8. Team works help in getting good relationships with colleges.	3.84	1.00
9. Team works help in developing creative ideas.	3.63	1.09
Total	3.61	1.09

When analyzing the responses of the students that they wrote in the text box at the end of the survey questionnaire, there were advantages and disadvantages discussed about the teamwork. Students point out that through the team work, they can learn from each other and help in completing the assignment in short time. They also can experience active learning environments while being involved in the projects together, working for the best outcomes. However, they point out that there are some bad cases such as (1) people who do not participate in the team work at all but receive the same score with other members or (2) people who are not responsible for their roles ruin the entire team work.

5. Conclusion

In this study, three types of team-project based instruction were introduced. First was the lecture-added instruction that team projects are given every week after small lecture for learning the concepts. In this class, both team and individual performance are graded in this class and scores are given to the best teams only, the teams tend to actively participate in the projects. However, the instructor's preparation plays an important role for the successful learning. Second was open project instruction in which the teams select their own projects, work on their own throughout the semester, and make a presentation at the end of the semester. In this case, instructors become a mentor and provide feedback and advice only. Since students do not meet during the semester, some teams fail to follow the work schedule and complete the project on time. Third was a combination of

concept learning activities and one big team project. The instructors assign the final same team projects to the class and the class works on their projects on their own throughout the semester. During the semester, students participate in the small class activities to learn the concepts and necessary skills for proceeding with the projects.

According to the survey with the students, regardless of the instructional type, the students had positive attitudes towards the team project based classes. They prefer team work to individual work. During the team work, they could learn from each other and combine better ideas and quality work. However, team discussions are not always future oriented and working as a team is not an effective way of saving time to complete the project. When students do not contribute to the team and get the same scores with other team members, they felt unfair. In addition, when the team members have different ideas, it is very difficult to solve the team struggles.

The study showed that depending on the class objectives, different approaches are needed for the effective instruction. Based on the study results, there are suggestions made as follows. First, when the class objectives are to introduce the basic team work and problem solving skills, the classes with small lecture and simple projects or activities are appropriate. The instructor decides the concept to teach and prepare for the activities focusing on the concepts. The students may learn the concepts and skills while participating in the projects through the semester naturally. For the success of the class, the instructional design and preparation for the class are important. Before the class starts, the instructor has to make a plan how to organize, manage, and evaluate the teams and the team rules. The guidelines for the team work such as time to spend on the activities, the role of individuals in the teams, and the evaluation method should be very clear and concrete. In this case, team evaluation and individual evaluation should be combined to give more responsibilities for the individuals.

Second, when the class objectives are to increase the basic skills to go to the next level, small in- class activities combined with individual and team works, and one final team project will be effective. In this case, it is important for the instructor to make the students be involved in the class activities actively since students easily lose their interest when evaluation is not directly related to the activities. During the in-class activities, students learn how to communicate, brainstorm the ideas, collect data, make decisions, and manage the team problems while reading the research articles and write reports. At the end of the semester, students complete the final project by integrating the skills learned during the semester.'

Third, the class objectives are to improve problem solving skills for the advanced students, one big semester projects and two or three class meetings will be good. The instructor provides the guidelines to select the topics and work as a mentor during the semester. The students make a plan to proceed with the projects and the teams are totally responsible for the final outcomes. In this case, it is important to select the topics from the life situation, such as developing websites for the non-profit organizations or designing educational programs for regional organizations. When the projects are authentic, the students keep working with people in real organizations during the semester and they will be more responsible to finish the projects.

Today, the society values the group synergy rather than one person's excellent ability. When working as a team, sometimes, there are conflicts and struggles among the team members. However, through the teamwork, more and better ideas can be collected and the collective ideas bring about innovations in our society. Therefore, it is necessary for the universities to provide the students with the opportunities to practice working as a team and solve undefined and unexpected problems. In that sense, team project based instruction is suggested as one of the best solutions for students to experience both team work and authentic problem solving situations.

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