

# Implications of a Multidisciplinary Students' Computer Game Design Project

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**Abstract**—In the current globalized economy, human resources needs of both the industry and society are much focused on an individual's multidisciplinary competency. This is to say that, employers look for people that can perform and work positively with people of various background disciplines. To test whether students are ready for such, this case study summarizes the findings of a year-long multidisciplinary computer game design project between the Multi-media Game Science (MGS) and the Applied Foreign Languages (AFL) departments' students of a science and technology university in Taiwan. A total of 10 (3 - AFL and 7 - MGS) local students and 3 Dutch MGS students participated in the study. Qualitative focus group interviews, students' reflection, and researcher's observations logs were gathered in the yearlong study. Data analysis includes the generation of meaning from reoccurring themes from the interviews and logs. Results indicate that AFL students improved on various English language communication and other employability skills needed in the industry. In addition, results also show that for a multidisciplinary computer game design project to become successful the school administration should provide clear guidelines and conduct periodic dialogues with student participants to clear up issues and avoid misunderstanding. Lastly, other implications and recommendations are provided for future practitioners and researchers in the same field of inquiry.

**Index Terms**—multidisciplinary team, cooperative learning, intercultural competence, employability skills, domain specific knowledge

## I. INTRODUCTION

Recently, both the industry and society itself have placed much importance in an individual's multidisciplinary competency. In the fast paced world, changes in our social and economic spheres occur in a blink of an eye. Such changes have also ushered the need for future talents to perform in a multidisciplinary domain [1]. Being able to work in a multidisciplinary domain also means that a person should be able to cope with situations that are equally diverse. Similarly, a person working within the multidisciplinary domain should also be able to cooperate with several disciplines but remain

unchanged [2, 3]. In other words, team member works within the boundaries of their professional fields, while the progress of the project is discussed at team meetings. Hence, effective communication is considered an important factor in the success of such integrated teamwork. Ultimately, in the multidisciplinary approach each discipline within the team works towards accomplishing (or achieving) a common goal.

Currently, most if not all of the products and services offered in the industry requires the knowledge of multidisciplinary domains. In Taiwan, both the industry and society itself have recently started to place much importance in an individual's multidisciplinary competency. Simply put, an individual should be able to work and perform positively in an atmosphere wherein people from all sort of background and discipline are group together. The modern society of today is so diverse no matter ethnically or culturally, while the industry's workforce requirements of multidisciplinary competence increases, higher education institutions should play out its role by supplying the much needed workforce. Hence, in order to satisfy the needs of the both the industry and the society, it is quite important to train the workforce early in their college years.

In light of these issues, this case study shall summarize the findings of a year-long multidisciplinary game design project between the Multi-media Game Science (MGS) and the Applied Foreign Languages (AFL) departments' students of a science and technology university in Taiwan. A total of 10 (3 - AFL and 7 - MGS) local students and 3 Dutch MGS students participated in the study. Within this multidisciplinary team, a goal is set to design and create a mobile phone game focused on environmental awareness. Qualitative focus participants group interviews, participants' reflection, and researcher's observations logs were gathered in the yearlong study. Data analysis includes the generation of meaning from reoccurring themes from the interviews and logs. Initial research questions are as follows:

1. What are the requirements of a successful multidisciplinary teamwork project?
2. What are the benefits of a multidisciplinary teamwork project?

### A. Significance of the Study

The current study seeks to provide various insights and implications with emphasis on the following significance:

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1. Provide an exemplar (model) for future multidisciplinary teamwork projects.
2. Provide students the necessary knowledge and preparation needed before undertaking future multidisciplinary teamwork projects.
3. Provide students the multidisciplinary training much needed in their future jobs.
4. Provide school administrators with both the pros (good) and cons (bad) of such multidisciplinary teamwork projects.

#### B. Limitations of the Study

As since this is only a case study, results gathered from the data are applicable to groups that are newly formed. However, since such concepts of multidisciplinary teamwork are quite new, results might be of contribution to other educators as a sort of eye opener of what might happen in a similar type of learning environment.

## II. REVIEW OF RELATED LITERATURE

### A. Multidisciplinary Teamwork

To fully understand what multidisciplinary teamwork means, one must first understand the core concepts of teamwork. Teamwork is actually defined as the process of working collaboratively with a group of people in order to achieve a goal [4]. A team is primarily composed of a small number of people with complementary skills who are committed to a common purpose, performance goals, and approach for which they hold themselves mutually accountable. More importantly, teamwork is often a crucial part of an organization, within a company as it is often necessary for colleagues to work well together, trying their best in any circumstance. In sum, teamwork means that people should try to cooperate while using their individual skills and competencies, at the same time, providing constructive feedbacks, despite of any personal conflicts between individuals.

Before, multidisciplinary teamwork is often found in the medical industries [5]. However, recent studies have claimed that using the concept of multidisciplinary teamwork in the field of engineering has proven to be much productive [6, 7]. Similarly, such concepts of multidisciplinary team working in various areas of education have shown promising signs in helping to develop students' versatility and innovation [8, 9].

Except multidisciplinary teamwork, interdisciplinary grouping is also a concept industries are adapting. However, a lot of misconception between the meanings of the two has risen. Both multidisciplinary and cross-disciplinary teamwork involves knowledge from diverse disciplines; each member adds their specialized skill, creating a mosaic-like solution for a problem. However, distinction between the disciplines remains intact [10]. In contrast, interdisciplinary, while also involving members from different disciplines, is defined as creating new knowledge in the service of solving a common goal. In sum, multidisciplinary involves the cooperation among

members, while interdisciplinary is the collaboration of each member achieving a common purpose.

### B. Cooperative and Collaborative Learning

*Cooperation* is mainly defined as the association of persons for a common benefit [11], or simply put is the process of working together to accomplish shared goals. Within cooperative activities individuals seek outcomes that are beneficial to themselves and beneficial to all other group members. Cooperative learning is a relationship in a group of students that requires positive interdependence (a sense of sink or swim together), individual accountability (each of us has to contribute and learn), interpersonal skills (communication, trust, leadership, decision making, and conflict resolution), face-to-face interaction, and processing (reflecting on how well the team is functioning and how to function even better) [12]. Hence, cooperative learning is the instructional use of small groups so that students work together to maximize their own and each other's learning [13].

On the other hand, *collaborative* learning is defined as any instructional method in which students work together in small groups toward a common goal [14]. As the notion of working with others often increases involvement in learning, similarly, sharing one's own ideas and responding to others' reactions sharpens thinking and deepens understanding [15]. College students nowadays are primarily involved in their studies and classroom activities; however, involvement in co-curricular activities is also quite common [16]. In a study involving the quality of student involvement in a group of college educational psychology students, findings suggest that overall quality of experience was greater during cooperative learning. Benefits occurred specifically for thinking on task, student engagement, perceptions of task importance, and optimal levels of challenge and skill [17].

### C. Learning Engagement or Experiential Learning

Learning (sometime also referred as student or school engagement) engagement is closely related to Dewey's [18] concept of *learning by doing*. Such concept involved the combination of knowledge taught and authentic tasks to reinforce the learning process; a process also known as *experiential learning* [19]. Furthermore, Kolb [19] also mentioned that "*learning is the process whereby knowledge is created through the transformation of experience*" (p. 38). This theory is also applied into the professional field as in the concept of work-integrated learning theories, such as the integration of employment-oriented work experiences into the education curriculum; is considered appropriate for developing skills in higher education, particularly in business schools [20]. By enriching student experiences, cultivation of students' engagement beliefs, values, feelings, motivation, behavioral habits, and skills shall follow next. In essence, the concept of student engagement is built on the belief that student learning is affected by their engagement in purposeful activities, which are an essential part of the students' development.

A basic understanding of student engagement is that students' activity, involvement, and efforts in their learning tasks is related to their academic achievement. Krause and Coates [21] mentioned that student engagement is the quality of effort students devote to educationally purposeful activities that directly contribute to desirable educational outcomes. In other words student engagement is the degree and quality, to which learners are engaged with their educational activities, which are positively linked to a host of desired outcomes, including high grades, student satisfaction, and perseverance [22]. In sum, the more students spend quality time and study a subject, the more they will know about it. Similarly, the more students interact academically with faculties, the deeper they tend to understand what they are actually learning [23].

### III. METHODOLOGY

This research is designed as a case study, wherein the primary objective is to investigate a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used [24]. This study also employed the descriptive research paradigm; a qualitative research that is concerned with how something that exists is related to some preceding event that has influenced or affected a present condition or event.

Descriptive research, according to Best [25] is concerned with conditions or relationships that exist, practices that prevail, beliefs, points of views, or attributes that are held, processes that are ongoing, effects that are being felt; or developing trends. Kvale [26] defined qualitative research interviews as an attempt to understand the world from the subjects' point of view, to unfold the meaning of peoples' experiences, and to uncover their lived world prior to scientific explanations.

For the data analyses procedures, data gathered are the qualitative focus group interviews, reflection, and observations logs by the participants [27]. These data were analyzed using the Miles and Huberman [28] method for generating meaning. The resulting themes were listed and together formed the implications of the multidisciplinary teamwork project.

#### A. Participants

This year-long multidisciplinary teamwork project is made up of students from the Multi-media Game Science (MGS) and the Applied Foreign Languages (AFL) departments of a science and technology university in Taiwan. A total of 10 (3 - AFL and 7 - MGS) local students and 3 Dutch MGS students participated in the study. In addition, all 3 AFL students are female, while the rest of the members from the MGS are male students.

#### B. Research Process

The study started during the spring semester of school year 2010-2011. All of the students from the AFL and MGS departments are volunteers; whereas the three Dutch students are exchange students from Holland. The

multidisciplinary teamwork project is organized to accomplish a common goal, which is to design and develop a mobile phone based game. The game should also be based on the theme "Green Ecology".

The group meets every week to discuss and design the game. The AFL students also meet with their adviser twice a month, to discuss the progress of the multidisciplinary teamwork project. Furthermore, focus group discussions were accomplished twice a semester with the entire multidisciplinary teamwork members, to determine their overall insights and experiences while undertaking the project. Lastly, the AFL students were asked to write a reflection log regarding the entire year long multidisciplinary teamwork project.

### IV. RESULTS AND DISCUSSIONS

#### A. Requirements of a Multidisciplinary Teamwork Project

In order to determine the requirements of a successful multidisciplinary teamwork project, during the focus group discussions, students were asked regarding the issues and problems that they encountered and possible solutions to those problems. Table 1 is a list of repeating themes resulting from those discussions.

TABLE I.  
NEGATIVE OUTCOMES OF THE PROJECT

Dimension	Issues
Language	<ul style="list-style-type: none"> <li>● Different English speaking style (Dutch)</li> <li>● Lacks knowledge on less common technical vocabulary terms</li> </ul>
Personal	<ul style="list-style-type: none"> <li>● Anxiety due to uncertainty of role in the project</li> <li>● Domain stereotyping – assumes that other group's members don't understand the domain</li> <li>● Frequent misunderstanding due to various reasons</li> <li>● Lack of domain specific knowledge</li> <li>● Lack of effective intergroup communications</li> <li>● Notion of foreigners should comply and adapt to our cultures (vice-versa)</li> </ul>
School	<ul style="list-style-type: none"> <li>● Concrete specific school policy should be provided prior to the start of the project</li> <li>● Group members' grievances regarding lack of support from department/college</li> <li>● Lack of project orientation</li> </ul>
Preparations	<ul style="list-style-type: none"> <li>● New innovative project, problems encountered are all new and unexpected</li> <li>● Objectives of multi-disciplinary group unclear</li> <li>● Time constraint – different group of students have different class schedules</li> </ul>

Results show that the multidisciplinary teamwork project members have encounters some negative experiences: These are separated into four groups, namely: Language, Personal, School, and Preparations. For the **Language** factor, AFL students mentioned that they had a hard time in understanding the Dutch English. However, after a few weeks, the AFL students started to become familiarized with the different English speaking style. Furthermore, domain specific terms or vocabularies are also an issue wherein students have difficulty in communicating with the MGS students.

*At the beginning, I don't know what they (Dutch exchange students) are talking about. I really have to listen very carefully.*

*Furthermore, I'm not familiar with the terminologies that they used. – AFL#2*

*Between the conversations with the other group members, it's hard to understand immediately what they are talking about. The vocabularies that they used are hard to understand. – AFL#3*

As for the **Personal** factors; these are issues related to the students' experiences. Issues such as: anxiety, cultural differences, domain specific knowledge, and effective communication skills. Besides the above mentioned issues, an interesting finding is the notion of domain stereotyping. Wherein, students from MGS assumed that AFL students are not capable of contributing to the technical side of the project. This notion is a sort of domain stereotyping the AFL students.

*I think AFL students can only help us in the translation side of the project, besides the game is too technical for them. – MGS#2*

In addition, AFL students mentioned that they lack effective intergroup communications. AFL students actually spend most of their time they are busy interpreting what the Dutch exchange students want to relate to the group. Although, such tasks have strengthen both their listening and speaking skills, however, they are mostly concerned with translating other person's words and are not able to express their own opinion. More importantly, the lack of knowledge towards the Dutch exchange students' culture is also seen as an important setback. Foreigners with western culture would tend to express their own opinion, while Asians are more private and kept our opinion to ourselves.

*It is okay to translate and help the exchange students. During the translation, at first, I found a lot of misconception and I misunderstood what they (Dutch students) meant. Cultural difference is really a big issue. – AFL #1*

*I think it is not enough to know how to speak English; we also need to know and understand their culture. So we can really know what the exchange students want to express. – MGS#4*

With regards to the issues of **School** and **Preparation**; these two factors are quite related. The findings stem from the issue that this type of multidisciplinary teamwork project is new and is of an experimental status. Therefore, there is much room for future improvement. One key issue that most of the students' mentioned is the notion of not having an explicit plan of what are the roles and responsibilities of the two groups of students. Furthermore, the students also claimed that there is a lack of proper orientation in the beginning of the project and together with the assessment (or accountability) methods being used for computing their grades.

*The project is interesting; however, as we progressed onwards, I still don't know what my specific role in the group is. – AFL#2*

*The school should give us the guidelines in advance. We should not be guessing all the time what is expected out of this project. – MGS#3*

## B. Benefits of a Multidisciplinary Teamwork Project

In order to visualize the benefits or positive outcomes of the multidisciplinary teamwork project, results of table 2 was developed from the emerging themes of the qualitative data. Results were separated into three sections, namely: Language, Personal, and Teamwork. For the **Language** component of the benefits, AFL students claimed during the final focus group session that they have improved on their English-Mandarin Chinese (and vice-versa) translation skills. Furthermore, they have gained additional knowledge with regards to the technical terms used in the project.

*I learned a lot from the other members, besides my overall improvement in English. I also learned a lot of new words and vocabularies. I realized that all things are hard at the beginning, but after awhile I started to appreciate the little things that I can learn from the group. – AFL#2*

With regards to the **Personal** components, students mentioned that although the language used and communication skills is quite important for the success of a teamwork project, however, the students felt that these along are not enough. In order to become successful in working with other people, we should also be able to adapt ourselves into the other person's culture. In essence, having good cross-cultural skills are quite essential. During the year long project, students have the opportunity to communicate and work together with individuals of different culture. Such opportunity has opened up a chance for them to improve on their competencies.

*In this project, I learn to become more receptive on others culture. I believe that English communication is a way to bridge the gap; however, this is not enough. I think we also need to appreciate their culture, in order to be able to understand them better. – AFL#2*

*During the project, I also become more responsible. Being a leader is hard. I should also communicate with the other members. I need to understand them. I think to become successful; we should learn their (exchange students') culture. – MGS#1*

TABLE II.  
POSITIVE OUTCOMES OF THE PROJECT

Dimension	Issues
Language	<ul style="list-style-type: none"> <li>● Effectively accomplished on-the-spot translation</li> <li>● Improved listening and speaking skills</li> <li>● Learn various basic cross-discipline technical vocabulary terms</li> </ul>
Personal	<ul style="list-style-type: none"> <li>● Gain intercultural experiences, thus help increases cultural adaptability</li> <li>● Improved leadership skills</li> <li>● Improved self-confidence</li> <li>● Learns to speak out opinions</li> </ul>
Teamwork	<ul style="list-style-type: none"> <li>● Knows the important of job commitment, dedication, and responsibility</li> <li>● Thinks and decides for the benefit of the group</li> <li>● Time management – should adjust own time schedule to accommodate other group members</li> </ul>

Lastly, with regards to the **Teamwork** component of the multidisciplinary teamwork project, almost all of the members agree that having to find time to meet together is quite difficult. However, they mentioned that they

overcome this just by knowing their priority, through simple communication, and small sacrifices from each and every members of the group.

*I really had a hard time adjusting my time at first, but later on after I realized that there is no 'I' in the work team, I began to set aside time for the group meetings. – MGS#5*

## V. CONCLUSIONS

The primary objective of this study is to understand the various insights and implications provided by the multidisciplinary teamwork project. With both the industry and the society in much need of multidisciplinary talents, it is quite important to train the workforce early in their college years. Results have shown that there are both positive and negative implications of such a multidisciplinary teamwork project. However, most of the negative implications can be avoided by just simple planning and preparation before the start of the project. Students mentioned several negative issues, which are separated into four categories, namely: Language, Personal, School, and Preparations. In addition, the students also categorized the benefits into three areas, such as: Language, Personal, and Teamwork. More importantly, as students gained more experience with the project, they gradually overcome the negative issues that arise at the beginning of the study. Lastly, it is suggested that further attempt of a multidisciplinary teamwork project should be carefully thought out, in order to preempt negative issues.

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