

## USING PROJECT BASED LEARNING FOR CURRICULUM DEVELOPMENT AT THE CLASSROOM LEVEL: A CASE STUDY

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### ABSTRACT

*Curriculum planning occurs at several levels – classroom, school, national and international. Teachers have always had an important role in implementing classroom level curricula. Teachers have traditionally determined the amount of learning (Bellon et al. 1992), as well as the learning activities used in achieving learning outcomes. They are also responsible for creating a classroom learning environment and engage students in learning communities to accomplish learning outcomes. Project Based Learning, as a classroom activity, provides the teacher with a way to help students learn through experience*

*This paper is a case study of an international project between US students and Basque students (Spain) in which the two countries work together analyzing the effects of Project Based Learning and social media on project outcome. The conclusions and recommendations focus on classroom level curriculum development.*

**Keywords:** Project Based Learning, social media, learning communities, knowledge management

### INTRODUCTION

#### Knowledge Management

Knowledge management becomes more and more important in global settings. The influence of aspects like geographical dispersion, communication across time zones as well as cultural influence factors has become a focus issue in research for the past decade. A variety of topics has come up in the field to understand global knowledge management, focusing on foundational issues, KM implementation and adoption processes as well as specific issues in these processes.

Using knowledge management has proven to have a positive impact on classroom level curriculum development (Wild et al., 2002; Smith and Farquhar, 2000; Lynn et al., 2000). There is general agreement that the primary objectives of knowledge management are to identify and leverage the collective knowledge in an organization (such as a college level class of students) to achieve the overriding goal of helping organizations compete and survive (Choo, 1996). Knowledge management involves a mix of cultural, organizational, process, management, and technology initiatives. These initiatives can become part of the classroom-level curriculum developed by the teacher. In both the classroom and work settings, knowledge sharing (1) is a dynamic, interactive, supportive learning environment that stimulates creativity and is facilitated when there are incentives for promoting knowledge as part of the evaluation process (Pascarella, 1997) as happens in the classroom with student evaluations; and (2) requires curriculum activities designed to openly share data, information,

and knowledge that foster the competitive advantages of creativity, flexibility, and innovation.

### **Learning Communities**

In recent years, academics and professionals from the field of knowledge management have developed ways to improve effectiveness and performance in the corporate world by creating learning communities. Researcher, author, and consultant Etienne Wenger—perhaps the foremost authority on learning communities (also referred to as knowledge communities or communities of practice) defines these groups as people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on a regular basis (Blouin et al., 2009).

In Learning Communities, knowledge occurs as the result of interactions among people. It does not simply happen. Knowledge can be socially constructed through classroom activities to influence and enhance the learning environment and teachers can use knowledge management in the learning process. To convert the student experiential interactions into knowledge and then to authentic learning, the teacher coordinates student classroom activities making sure knowledge is shared among all its members.

Creating and maintaining the dynamic energy which drives the interactions in a learning community and, consequently the learning that occurs, has proven the most difficult task in sustaining a learning community. Classroom learning communities based on projects are energized by the time line of the project, the agreement on a project goal, the expectation of student learning outcomes and the interactions inherent in collaborative learning. The project transforms traditional pedagogy to experiential pedagogy, and changes faculty-student

This study is a case study of the formation of a temporary international learning community using a college classroom project between US students and Basque students (Spain) in which the two countries work together analyzing Project Based Learning .

### **PROJECT BASED LEARNING: A CASE STUDY – THE DOW-JONES PROJECT**

Projects are complex tasks, based on challenging questions or problems, which involve students in design, problem-solving, decision making, or investigative activities. Projects give students the opportunity to work relatively autonomously over extended periods of time; and culminate in realistic products or presentations (Jones et al., 1997; Thomas et al., 1999). Project deliverables consist of knowledge process artifacts that are integrated through a social communication process (Lytras, Pouloudi, 2003).

### **Background**

The Dow-Jones Project was a classroom activity in a college management course. The activity was designed to be an international, comparative study of the influence of advertising and training costs compared to the overall profitability of the firm. The project was to collect comparable data to the original study (García-Zambrano et al., 2013) in Spain and to work with the researcher to identify comparable data in the United States. The principles of project based learning (Marx et al., 1997; Boaler, 1998; Krajcik et al., 1998; Arthur et al., 2001; Frank and Brazilai, 2004) were used to structure and organize the project and social media was used as the medium for communication. Results are reported in a narrative format following the qualitative research guidelines of the case Study method (Malterud, 2001; Yin, 2009; Creswell, 2012) and supported by quantitative data when available.

## How it was Organized

The Dow-Jones Project goal was to collect advertising and training costs as well as book value and market value for the 30 publically traded companies on the Dow-Jones Market Index for years 2010, 2011 and 2012. This data would serve as a comparison to similar data collected by the original researcher for the Stock Market of Spain's IBEX index. The project was included in the class syllabus and a considerable amount of class time was spent discussing the project and the learning outcomes in terms of skills and competencies. Classroom curriculum development was intended to develop a sense of community and students were included in classroom planning. End planning was used by identifying the overall project goal, and means planning was used to determine next steps and activities that would move the project closer to successful completion.

The Dow-Jones Project goal was to collect 450 data stock market elements for all 30 companies on the Dow-Jones Industrial Index for the New York Stock Market. 43 students participated over a 12 week college quarter. An Excel electronic spreadsheet was used to organize the task. With rows and columns defining cells, group assignments were to collect a portion of the spreadsheet. The project was intended to develop student skills and competencies in data collection and analysis; group skills in managing a project team; and manipulation of large databases. Academic content included role and function of the stock market in determining market value, the use of a stock market index, identification of available data bases for use in preparing analytic reports, and use of project management principles. Since the course was in health management, an emphasis was placed on the healthcare companies on the Dow-Jones. The project outcome of completed comparable data was to be used as a starting point for development of a comparison of advertising and training costs and their influence on profitability in Spain and in the United States. The Dow-Jones Project was intended to meet the five criteria for a project qualify for PBL identified by Thomas (2000) – centrality (Excel Spreadsheet), driving question (accuracy), constructive investigations (advertising and training costs), autonomy (group membership), and realism (international study/learning communities).

A journal of class activities was kept by the instructor weekly. The journal entries consisted of activities to move the project forward and observations of classroom reactions to emerging events.

## What happened?

### *Start-up*

This project involved 43 non-reimbursed Student Research Assistants in the summer of 2013. Student research assistants were trained in research methodology. These research assistants/students were divided into 8 groups, 3 groups in a day class and 5 groups in an evening class. The project required attention to detail, locating sources and identifying key facts and following guidelines for maintaining data integrity and confidentiality.

In training the assistant/students in data collection, all the terms used in the task had to be defined and the meaning of those terms understood. The researcher in Spain provided this direction. This provided a knowledge base to build the collection of advertising, training, market value and book value of a stock in 2010, 2011, and 2012 and providing comparability to the original study.

### *Pre and Post Survey*

To determine the value to students of project based learning as an educational tool, a 10 question self-assessment survey was given to students. A 10 statement electronically scored

Likert Type survey asked students to self-assess knowledge of the European Union, stock markets, indexes, scientific methodology and applied research a scale of 1 (Strongly Agree) – 5 (Strongly Disagree):

The survey was given at the beginning of the project and then again at the end of the project. The results of the Post Survey have not been formatted as of the writing of this paper. However the initial survey results suggested that students brought prior knowledge to the class and some students had the basics in stock markets. They were not familiar with indexes, applied research or how healthcare works in other countries. These learning gaps were identified and specifically addressed during the course.

### ***Action- Steps taken***

The first tasks included defining the data elements to be collected so that they would be comparable to the original study and locating the data sources that would be used.

The instructor began looking for course resources that could be used to achieve the project goal. The beginnings of a learning community started with the addition of Research Librarians from the college library and from the New York City Library of Business and Industry. The Librarians identified the approved data resources to be used in the collecting the data identified by the researcher. Restricting data collection to approved data sources insured the data was standardized and was comparable between companies and classroom groups and countries. All data elements were contained in one of two sources either *Advertising Redbook* or in *Y Charts*. Both were available free of charge but were restricted for use in the libraries.

An electronic spreadsheet (Excel) was developed for project use. It was created in the classroom and posted electronically for ongoing availability. It was also posted in the electronic discussion boards for each group of assistant/students working on the project. Data collection used a 450 cell electronic spreadsheet. Instructions on updating data entries and reporting milestones toward completion were given.

### ***Resources***

A temporary classroom virtual learning community of 51 members developed and was used to support the project members and knowledge management activities. The learning community was composed of – 43 students/research assistants, 2 research librarians, 1 instructor and 4 advisors, plus the original researcher in Spain. The instructor served as the moderator of the learning community and facilitated collaborations, transferred knowledge between individuals and groups, and maintained artifacts produced by the learning community. Various forms of social media were used (Treem and Leonardi, 2012) in the learning community for this project:

- I. *E-mail* was used between members to communicate issues, problems and findings. These e-mails were either individually sent and received or authored by and sent to groups working on the project.
- II. *A virtual workspace* was created within the classroom software for exclusive use of each of the groups working on the project. Members used this space to communicate with all members simultaneously, to post results and see clarification, and to update the group as to the status of project. This use of a discussion board provided a continuity and guide to team activities.
- III. *A weekly electronic journal* was kept and distributed to key management members of the group. The journal was shared with all members at the conclusion of the project and used as part of the experiential learning reflection activity.

- IV. *Discussion Boards* addressing issues and problems were used to resolve disputes and set new directions. The discussion boards were open to all students/research assistants in a class.
- V. *Announcements with automatic alerts* were used to convey key information.
- VI. Use of *video and voice communication* (e.g. *Skype*) was scheduled. *Microblogging* was used to push important content messages to members.

### ***Instructor's journal***

The instructor in the project recorded significant classroom events in an electronic journal weekly. The project and journal evolved over a 10 week period. Regular class sessions were held twice a week for the day time class and once a week for the evening class. The journal has been annotated to provide necessary context for the reader. The activities recorded in the journal are interpreted in terms of Tuckerman's Stages of Group Development (Forming, Storming, Norming and Performing).

#### ***Forming***

Week 1: Teams were formed by self-selection on the first day of class. In the instructor's observation of selecting teammates, students choose team mates based on prior associations, proximity and spontaneous choice. There were 9 groups of 5-6 students each. Classroom lectures during the first week were on stock markets, scientific methodology and applied research in the marketplace.

Week 2: Students/assistants met in their groups during class time. Students were required to develop communication rules for their group using the guidelines in *A Handbook of Successful Strategies for Teams* by Frances A. Kennedy published by the Office of Teaching Effectiveness and Innovation at Clemson University (2008). Classroom lectures were on the Dow-Jones and IBEX indexes, and their use in the stock exchange of Spain and the US.

Week 3: The researcher in Spain provided precise definitions of advertising cost, training cost, market value and book value. The instructor worked with the college librarian to identify data sources for these terms. One data base for advertising costs was proprietary but available free to New York Public Library (NYPL) members and available at the Library for Business and Industry (NYPL-BI). A research librarian at the NYPL-BI agreed to become a member of the project. The college librarian was assigned to the class and involved from the beginning. Data on training costs could not be located.

Week 4: Training sessions were conducted at the NYPL-BI by the research librarian. Student assistants learned to locate the data bases and to access the required data.

#### ***Storming***

Week 5: The class attendance for both groups was less than during the previous weeks. The virtual workspace was used by 6 of the 8 groups. Class time was spent in the project activities. The class seemed to be divided between those who understood the requirements of the project and those that began questioning the instructor about exactly "what do you want me to do". The questioning groups remained confused even after extensive review of the project and the project goals, as well as the sources of data to be used. Some groups just didn't get it. In retrospect this proved to be the beginning of the process of groups of students withdrawing from the project. There was a lack of agreement on tasks to be done and leadership of the group was given to the most vocal and aggressive member.

Week 6: Class time was spent on communicating about successful results from some groups. These groups were making progress. Other groups had nothing to report. We celebrated the accomplishments.

#### *Storming and Norming*

Week 7: Class attendance continued to be poor. Students became more vocal about the project. Students who were making progress wanted to spend class time problem solving and learning about the project. Members of the dysfunctional groups challenged the relevance of the task and wanted to withdraw from participation in the project. Project based learning requires the dynamics of groups to accomplish the project outcome. Classroom discussion was about conflicts, barriers to completing the task and struggles with issues such as trust and commitment to the successful completion of the task. The course requirements were re-negotiated and students were given the option of either individually contributing to the outcome or choosing another course requirement. Of the 8 groups originally formed, only 3 remained functional in week 7.

Week 8: The classes had to be cancelled. The instructor was sick.

#### *Performing*

Week 9: One group in the day class posted their portion of the project spreadsheet with complete data entry for 10 companies, or 150 of the 450 data cells on the spreadsheet (33%). None of the groups in the night class posted to the spreadsheet.

Week 10: This was the last week of the project. Of the 450 cells required on the spreadsheet, the final product had 224 completed cells in the night class (49%) and 189 cells for the day class (42%). Of the 27 students in the evening class, 11 students (39%) participated in the final outcome and of the 16 students in the day class, 9 students (56%) participated in the final outcome of the project.

Week 11: Class discussion used this journal as a learning tool. The journal was read in class with student comment encouraged. The students agreed that they had learned about stocks, markets, indexes, and group processes. The experience of both functional and dysfunctional groups accentuated the learning context of the project. Students expressed that the project caused such a stir in the classroom that the project's demands created a memorable class.

## **DISCUSSION**

In this paper, Project-Based Learning was used as the basis for a spiral curriculum developed at the classroom level. The spiral curriculum recognizes that learning occurs in steps, each part building on simpler content learned earlier. Since students have an accumulation of prior knowledge from pre requisite courses, in this experiential course, students were able to develop understandings of management concepts that were beyond their capacity when simpler elements of the topic were introduced earlier.

### **The Group experience**

The "Forming" stage of group development is crucial to group success. Members are brought together for the first time, define the rules they will abide by, and identify the role each member will play. When individuals find out that they will be expected to work in groups, they react based on their past experience. Based on a positive group experience, students often request to work with their friends or former teammates. While students with negative group experiences, initially object and then reluctantly join with other students who feel the same way. Most current research supports instructor-formed teams where students are selected based on complimentary skills and competencies (Fiechtner and Davis, 1992; Obaya,

1999) rather than permitting students to self-select. However, the research is inconclusive on which approach is best (Bacon, et al., 1999).

In this project, students were allowed to self-select the group they would join. In retrospect, the stronger students in the class, that is, students who got good grades and had positive group experiences, tended to seek out like minded students. The Group that produced 33% of the required 450 data cells was made up of students who knew the other members in their group consistently obtained A's in their courses. The weaker, those students who either received a low grade or had a negative group experience, shifted for themselves and often by default or resignation, they wound up in groups containing like-minded individuals. Groups containing students, who reluctantly joined with other reluctant students, seemed to flounder aimlessly or reinforce one another's misconceptions about the assignment. Weak groups continually used instructional time for clarification of assignments and complained about the relevance of the project. While groups composed of strong students used instructional time for mentoring and coordination, parceling out and completing different parts of the assignment individually while communicating about their part of the assignment with team mates. Team members in a classroom project have widely divergent goals—some wanting an A no matter what it takes, while others wanting to do just enough to get a C. The table 1 reflects the grade distribution for the day and night classes.

**Table 1. Grade distribution for the day and night classes**

<i>Grade</i>	<i>Day</i>	<i>Evening</i>
A	7 (44%)	17 (63%)
B	2 (12%)	1 (4%)
C	0	2 (7%)
D	3 (19%)	2 (7%)
F	4 (25%)	5 (19%)
Total	16 100%)	27 (100%)

**Temporary Classroom Learning Community**

The Dow-Jones Project Learning Community was unplanned and not recognized until reflecting on the completed project. Projects require the interaction of various stakeholders with different cognitive levels and experiences and skills in order to promote the preparation of the deliverables within in pressured deadlines. The resources needed to produce the spreadsheet of 450 data cells were dispersed and specialized in locations and people. The original researcher in Spain had prior research experience, knowledge, and the authority to define the scientific determination of project outcome. The librarians of 2 different libraries had knowledge of and access to the data bases containing the information necessary to populate the spreadsheet. The instructor had access to the human resources (student assistants) needed to collect and format the data as well as the communication tools in the courseware to exchange information, maintain project artifacts, and coordinate activities in the classroom. The classroom is not the privileged locus of learning. It is not a self-contained, closed world in which students acquire knowledge to be applied outside, but a part of a broader learning system.

## Knowledge Management in the Classroom

Knowledge management is developed to increase innovativeness and responsiveness (Hackbarth, 1998). According to Davenport and Prusak (1997), knowledge management projects have at least one of three aims: a) to make knowledge visible and show the role of knowledge in the organization, b) to develop a knowledge-intensive culture by encouraging behaviors and proactively seeking and offering knowledge, c) to build a knowledge infrastructure, a web of connections among people given space, tools, time and encourage to collaborate.

Understanding the role of knowledge management in the classroom requires recognition that KM is targeted at knowledge maximization. As such, KM requires the establishment and update of the knowledge infrastructure which is the vehicle of support of any initiative in technological terms.

In the Dow-Jones Project, the learning community and social media formed the knowledge infrastructure. KM also requires creation, renewal, building and organization of knowledge assets. KM generally integrates people, processes, behavior, attitudes, business objects and available resources in a manner where the desired outcome is organizational effectiveness (Lytras and Pouloudi, 2003).

Learning community allows to the project to be completed successfully; it's necessary to maintain a good relation among students and teachers. The most effective teacher-student relationships are characterized by specific teacher behaviors: exhibiting appropriate levels of dominance; exhibiting appropriate levels of cooperation; and being aware of high-needs students. In the Dow-Jones Project, teacher was always aware of what was happening in class, asking and answering questions to students, encouraging people to participate and learn, motivating people to don't desist, etc. It's important to bar in mind student research participants who studied in groups, even only once a week, were more engaged in the project, were better prepared for class, and learned significantly more than students who worked on their own.

Social media lend to the community to be in a constant communication, not only during the classroom, but also after it. Because the class was off line but also the work was done after it, social media played an essential role in connecting students and creating an online community. Students had the opportunity to share their work on a variety of platforms: facebook, skype, e mail, virtual workspace). So, Social media enables many engaging classroom activities, including "communities of practice" where learners can interact and share ideas.

Our project suggests that the learning community created with the using of social media has allowed to show that knowledge management in the classroom is possible, and on only in an effective way, but also in an efficient way.

## RECOMMENDATIONS

In conclusion:

1. This Project based learning is dynamic. You have to be ready to move along with the task. This is what makes it such a great classroom teaching/ learning technique.
2. Project based learning creates a team of participants. Team membership is the experience. Project based learning is experiential pedagogy.



3. When the project is meaningful, students commit to the outcome and become teammates. Providing a group infrastructure that supports the group can help students achieve their group's goals. You can't leave it up to chance.
4. Learning communities are the natural outgrowth of a project. Various student team members and group resources commit to learning about the project and use social media to generate artifacts. These artifacts and the process to obtain them is KM.

Although the project could be considered a successful learning experience, it's necessary to take into account some recommendations in some different aspects for the following time.

1. The instructor should assign team members based on an evaluation of student skills and competencies. Students should not be permitted to self-select their groups.
2. Project-based learning is an intensive collaborative learning experience and the number of project members and groups should be limited. Optimal size would be 15 students, with a group size of 5.
3. Students should be familiar with group dynamics and team building skills prior to the start of Project-based Learning.
4. The instructor should take an active part in the early stages of group development to help structure project activities. It should not be assumed that students have project management skills.
5. The instructor should be more tenacious respect to the original ideas. Students have to complete the task proposed from the initial moment. Maybe, the project needed to be more specific and more organized.
6. Project-based learning is an experiential activity. The instructor should take an active mentoring role and insure students remain active and committed throughout the process.

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