

# Project Proposal

CS 6460 - Educational Technology

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## Introduction

The problem I am interested in is 'Group formation in an MOOC' environment. MOOCs have been embraced in a big way by elite universities and institutions, and are beginning to have a major impact on higher education. As MOOC stands side by side with traditional education system, it's often compared with the latter. In a traditional classroom education, group formation is facilitated by several factors (such as physical presence, face to face interaction with others) which are unavailable in MOOC environment. How then can we facilitate group formation for MOOC environment in an effective way?

## Theoretical foundation

MOOC is well known for its flexibility. The flexibility of being able to take the class anytime from anywhere is indeed overwhelming as well as disrupting. Yet, MOOC has not been able to make its mark when it comes to retention. Daphne Koller, co-founder of Coursera, specifies that the retention in Coursera courses is around 9%<sup>[1]</sup>. There can be several reasons for students not finishing a MOOC course they started. Top reasons for such low retention are<sup>[2]</sup>: 'Takes too much time', 'assumes too much knowledge' etc. According to a study<sup>[2]</sup>, 'poor communication channel' stands 6<sup>th</sup> top reason for low retention. *"The most important thing that helps students succeed in an online course is interpersonal interaction and support,"* says Shanna Smith Jaggars, the assistant director of Columbia University's Community College Research Center<sup>[3]</sup>.

Let me dissect this problem of 'Poor Communication Channel' a bit more. We are in a stage of MOOC, where we can't point fingers to online platforms for communication. Our communication platform is pretty mature and it provides us with advanced tools and environment we need to communicate online. Yet, interpersonal communication is attributed as one of the top reasons for poor retention. Let's view the problem from another angle. Several studies suggest that many students who spend more time contributing to course discussion forums end up performing better<sup>[3]</sup>. A study of the online-only version of edX's course Circuits and Electronics offered in the spring and summer of 2012 found that 52% of the students who earned a certificate for the course were active in discussion forums<sup>[3]</sup>.

Drilling down to the problem, we reach to a question: "Why some students are active on forums but most aren't?" Or rather than dissecting this we can reframe the question to our benefit. We know from studies that if we can increase the participation, we would increase the inter-personal communication and eventually increase the retention rate. This leads to question: **"What can be done to increase the participation of students in an MOOC environment?"**

To search the answer to this question, let us look into traditional educational program. One easy and full proof solution which is traditionally used in school is formation of groups – Project Groups / Study Groups. There are several advantages<sup>[4]</sup><sup>[5]</sup> of such groups, but it can be easily agreed upon that such groups increase the peer communication among students.

A group formation in a class can be required for several different reasons. It can be needed for open-ended projects, closed project or simply study group. However, group formation in MOOC is pretty challenging. Let us explore very briefly a major challenge which we face in group formation in an MOOC environment:

- **Missing interaction with others:** If you ask any MOOC champion or critic about most lacking features in MOOC, you'll likely get some variant on "interaction with others." Clearly this is a big gap between traditional and large scale online classroom. There are also a few sub problems which is worth exploring:
  - o Missing relationship building with other students
  - o Missing relationship building with teachers

The 'missing relationship building' is a major hindrance in formation of an effective group. In general group formation is facilitated by psychological bonds, which is facilitated by interpersonal attraction, which in turn arises from interpersonal relationship.<sup>[6]</sup>

In theory, this problem of missing interaction is handled online by discussion board and social media components of a course. And if you peek into the discussion board of any MOOC class you'll find lots and lots of discussion threads, most of them very high quality. But if you were to count up the number of exchanges (formal and informal) that take place in just a one-hour, face-to-face study situation, you'll see that even the most active discussion boards can't possibly keep up with that level of content generation. And given that a majority of human-to-human communication is supposedly non-verbal, the use of smileys cannot mask the fact that online interaction is simply a different creature than face-to-face.<sup>[10]</sup>

So in the world where 'interaction' used to be the fodder for group formation to facilitate; if the 'interaction' is missing, how can the group formation proceed? One possible solution is to facilitate interaction specific to group formation. In analogy this is similar to providing just the necessary nutrients (instead of food) for a human being to survive.

## Project Buddy-up

### Overview

Project Buddy-Up is based upon the idea of need of a portal which can facilitate group formation (study group/ project group). Unlike traditional classroom, students in MOOC don't have advantage of being face to face with other students. This means that the small talk between MOOC students is compromised to a great extent and automatic group formation is a challenge in such environment. I intend to provide that added support which can facilitate group formation in online learning environment. Luckily, there has been a lot of research in the field of group formation and dynamics. My idea is to build upon the research already done in the field and create a platform which can facilitate group formation. The three types of group formation I am considering are:

1. **Study Group:** A study group is a small group of people who regularly meet to discuss shared fields of study<sup>[8]</sup>. For an MOOC course, this would a group of students who meet to discuss their understanding of the course.
2. **Project Group (Closed):** A group of students are assigned with a project (usually by mentors / instructors). In such cases usually the project is same for all the other project groups in the class.
3. **Project Group (Open Ended):** Students form their group based on their interest and then come up with a problem statement which they try to solve as a part of their project.

Tuckman's stages of group development<sup>[7]</sup> suggests that there are 4 stages of group development (Forming – Storming – Norming – Performing) which are necessary and inevitable stages in order for the group to grow, to face up to challenges, to tackle problems, to find solutions, to plan work, and to deliver results. My project is built essentially on 'Forming' stage of this theory. The high level purpose of this project is defined as below:

#### ❖ Facilitate the study group formation:

- Capture answers to set of questions from students: The set of questions can contain some general common questions (such as interests, time zone etc.) and some course specific questions (such as skill set, experience), based on the configuration / question selected by instructors.
- Present the students with suggestions for possible study group partners based on student's response (and other student responses)
- Allow students to join a study group or create a study group based on configuration settings.
- Allow instructors to evaluate formed groups and modify the groups if necessary. Allow instructors to finally approve the formed groups.
- Allow instructors to create the course page and configure desired group properties

- ❖ **Facilitate the project group formation** (for classes in which projects ideally have common goal to achieve, eg CS6300 – Software development Process)
  - The features could be almost similar to previous sub-heading
- ❖ **Facilitate the project group formation** (for classes which has pretty open ended projects, such as CS6460 – Education Technology)
  - Allow students to submit project ideas
  - Allow students to view project ideas, express interest in ideas and comment
  - Allow students to form project groups almost similar to features mentioned in ‘study group formation’ sub-heading.

## Deep Dive

The three types of project groups though are inter-related, differ from each other. There are several parameters to consider when trying comparing the three types of groups. The below table compares and the three types of groups:

Parameters	Study Group	Project Group (Closed)	Project Group (Open Ended)
<b>Goal</b>	Work together to understand the concepts of subject better	Solve a general problem assigned by the mentor / instructors	Solve a problem collectively defined by the team
<b>Team Size (In General)</b>	Generally undefined in a course. Students can form as big or small team they would like to	Typical team size is 4-6 students. Though this can vary based on the course	Typical team size is 4-6 students. Though this can vary based on the course
<b>Roles</b>	Roles are generally undefined in a study group. Every individual's contribution is optional, and everyone's role is to just contribute to goal of team	Closed project group may have forced role. Or the role of each individual may be decided collectively by group. It may also happen that the role is never officially decided; rather there is a mutual understanding among group and role is understood intrinsically.	The role of each individual may be decided collectively by group. It may also happen that the role is never officially decided; rather there is a mutual understanding among group and role is understood intrinsically.
<b>Course related Skill Set Variation</b>	In a study group, where all the students are trying to understand the concepts better, skill set might play a less prominent role. Though in some cases, to understand some topic, which group is trying to understand, skillset might take the team forward.	Skill set might be important in a closed project group. From an instructors point of view, a group should be formed with varying skill set so that each group members benefit from each other. Though on the other hand it might also hurt the team as a few group members might end up contributing less to project.	Varying skill sets is tricky for open ended project group. Usually in such a group, students get connected via common interests rather than skill sets. It's a tough combination to match students' skillset as well as interests.
<b>Common Interests</b>	In a study group, where the goal is just to understand the courseware, common interests might not be an important factor	In a project group where the problem statement is pre-defined common interests might play less important.	This is the major parameter via which such a group is formed. People with common interest join hands to form a team, define the problem statement and solve the problem.
<b>Location</b>	Matters a lot since study groups works better when	Matters a bit since project group needs to frequently	Matters a bit since project group needs to frequently

	the team in same time zone, and works best if team can meet up to discuss	meetup either in-person or virtual, though different timezone can also help in continuation of work if planned properly	meetup either in-person or virtual, though different timezone can also help in continuation of work if planned properly
<b>Parameters</b>	<b>Study Group</b>	<b>Project Group (Closed)</b>	<b>Project Group (Open Ended)</b>
<b>Motivation of students in a course</b>	Students have different levels of motivation within a course: some prioritize the work for a project in order to excel, some are content to receive the minimum passing grade, some are taking the course because of genuine interest, and some are taking the course to satisfy a requirement. A study group with different motivations might not work so well.	For closed project group, motivation plays an important role too. It might create an imbalance of work load within the group when the motivations of students are different.	For open ended project group, motivation plays an important role too. It might create an imbalance of work load within the group in case there are differences in motivation of group members.
<b>Diversity of Perspective</b>	For a study group, diversity of perspective is an important factor. It's believed that, people with diverse perspectives form a very innovative group. In study group, different perspectives of students might make it interesting for groups to study.	For a closed ended project group, diversity of perspective is not so important. Though this factor can be attributed to innovative ways of solving a problem. When the project is pre-defined this group cannot come up with innovative problems.	This can be a very important parameter for an open ended project. With diverse perspective lot more ideas can be brainstormed and discussed.
<b>Students' familiarity with each other</b>	'Familiarity between students' might help them build a repo with each other. Study group can then be more interactive and helpful. On the other hand if there are say a couple of friends in a group, it may lead to formation of a sub group, which might hurt the study group.	Familiarity between students has similar problem for closed project group too. On one hand it can increase the group dynamics, if all the members in group are familiar to each other. On the other hand it may lead to problem when group is partially familiar to each other.	The parameter has similar impact for open ended project group.
<b>Personality</b>	Group dynamics share close bonds with personality. A good mix of personality share great moments as a team, whereas an imbalanced personality group might lead to disasters.	Personality more or less is responsible for group performance. For example, an extraverted student may become the group leader for running group meetings. However, an introverted student who is detail-oriented may also be an effective group leader for ensuring that other	Almost similar to Close Project groups personality has direct impact on team's performance for open-ended project group too.

		group members are on schedule.	
<b>Parameters</b>	<b>Study Group</b>	<b>Project Group (Closed)</b>	<b>Project Group (Open Ended)</b>
<b>Grading</b>	Study groups are usually ungraded.	Graded based on collective group performance	Graded based on collective group performance
<b>Dependency on other Students</b>	Study groups are usually an optional group. There is very minimal dependency on other students.	Dependency on other students is a lot.	Dependency on other students is a lot.
<b>Interaction with other Groups</b>	Study groups may interact with another study groups to share knowledge.	Restricted, since all the groups have similar goals	Allowed since project groups generally differ in the end goals

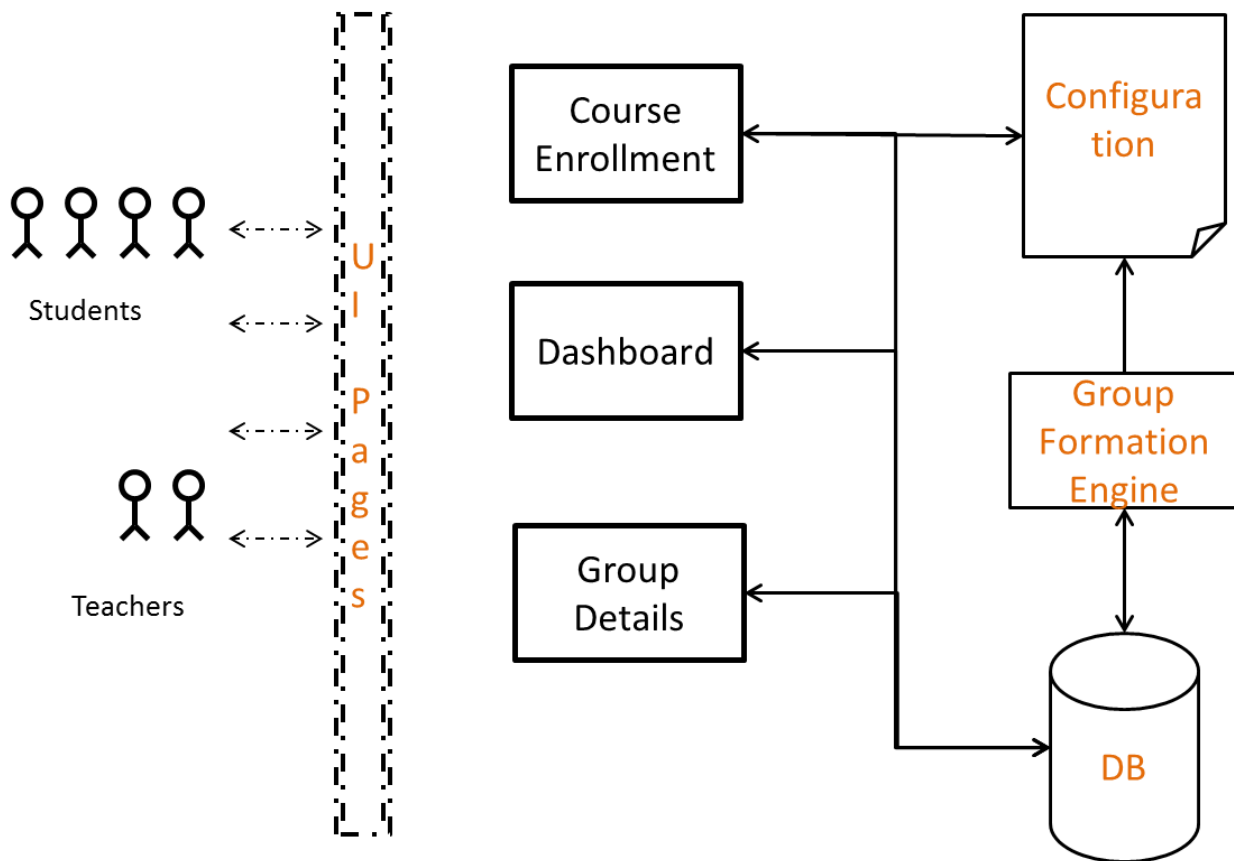
## Detailed functional Feature List (Design Description)

Below table details the functional features the project will have. I have divided the functionality of the project in small functional units. Below I will detail each functional unit from student's and teacher's perspective:

Components	Details (Student's Perspective)	Details (Teacher's Perspective)
<b>Authentication Module</b>	Basic login facility for students and instructors. This would be customizable at a later point of time if education institution would like to use single sign-on or any other authentication module.	
<b>Course enrollment</b>	This component enables students to <b>enroll in a course</b> . Students are presented with a <b>set of questions</b> which students have to answer. These answers serves as an input to ' <b>Group formation engine</b> ' which uses this information to match students based on the preference set by teachers.	This component enables teachers to create a course. Besides providing the basic information about the course, the teacher will also provide input to the ' <b>Group formation engine</b> ' about the type of group he wishes in the class. He will have choice to select from <b>standard templates</b> which define basic criteria for group formation and then edit each criterion if he wishes to. Finally a teacher will be able to select the standard questions which would be a part of <b>course enrollment questionnaire</b> . For simplicity these questions would be multiple-choice questions.
<b>Group Formation Engine</b>	This engine is responsible for enabling the group formation. Based on the <b>configuration</b> set by the teacher the engine would <b>suggest students</b> with the group in which he or she is the best fit.	The engine will accept the <b>configuration</b> from the teacher and do its best to form the group as per the configuration. The engine will also keep the record of success / failure in group formation and a <b>report of group configuration</b> would be accessible to teacher for later group amendment if he wishes to.
<b>Dashboard</b>	Customized dashboard for students which would enable students to do the following:  - Select a course from enrolled course list	Customized dashboard for teachers which would enable teachers to do the following:  - Add a course

	<ul style="list-style-type: none"> <li>- View summarized list enrolled in the course</li> <li>- View suggested groups</li> <li>- Links to view details of a group</li> <li>- Link to enroll in a course</li> <li>- Link to create a group</li> <li>- Logout, edit profile links</li> </ul>	<ul style="list-style-type: none"> <li>- View list of course teacher is associated with</li> <li>- View summarized group list for each course</li> <li>- Links to view detail of each course</li> <li>- Logout, edit profile links</li> </ul>
<b>Group Detail</b>	Contains and <b>manages details</b> of a specific group – Its purpose, group members, contact details of each member of group, mentor details. This component also enables a student to <b>join a group / Express Interest in a group</b> based on the group properties. The component also <b>facilitates communication</b> specific to the group such as a communication thread.	Teachers can <b>view details</b> of group similar to the students view. Teacher would be able to add mentor to the group, <b>add a student to group or remove a student from a group</b> . He will also be able to <b>send message</b> to the group. The teacher will also be able to <b>approve the group</b> , if he has chosen to do so earlier in configuration.

Below is a very high level architecture of the system:



## Minimum Viable Project (MVP)

Since the scope of the project is big and it might be difficult to fit in the project in the timeframe of this course, below are the minimum viable product features which I intend to implement as a part of this project:

- ❖ **Authentication Module:**
  - **User Registration:** Basic user registration facility. Let user create an account with basic details: name, email, password and security question.
  - **Reset Password:** Allow user to reset password using security question.
  - **Login:** Allow user to login to the portal using registered user name and password.
- ❖ **Course registration:** Allow teacher to register a course in the portal. Allow teacher to provide a configuration for group required for the course. For now one course can have just one type of group (either study group, project group (closed or open)).
- ❖ **Course Enrollment:** Allow students to enroll in a course. Allow students to answer some basic question which would serve as base for group suggestions.
- ❖ **Group Enrollment:** Allow students to view all groups. Allow them to create a group or enroll in a group.
- ❖ **Group Approval:** Allow teachers to view all groups in a course. Allow them to shuffle the group if required and approve the groups.
- ❖ **Group Communication:** Allow for communication via post / comments on group page.

## Task List

The below task list is based on the functional units classified in above section:

- ❖ Analyze and expand the requirement to detail
- ❖ Create a High Level Design
- ❖ Create a class architecture
- ❖ Create a user interface prototype, which would later connect with controller to be a part of project
- ❖ Create the database design
- ❖ Create the database and all the table
- ❖ Conduct research for 'Group formation engine' and define the algorithm
- ❖ Write the 'Group formation engine' component
- ❖ Create the login component and link it with user interface
- ❖ Write the business logic and link Group formation engine with backend
- ❖ Write the logic for student dashboard and link it with UI
- ❖ Write the logic for teacher dashboard and link it with UI
- ❖ Write the logic for course enrollment and link it with UI
- ❖ Write the logic for group detail and link it with UI
- ❖ Final integration of all the components
- ❖ Add the seed data
- ❖ Test the integrated system
- ❖ Prepare the final presentation
- ❖ Host the project on the web hosting platform and update the platform on a weekly basis once hosted



## Technical Description

I have decided to use following technologies for this project:

**Coding Language:** C#  
**Markup Language:** Razor + html5  
**IDE:** Visual Studio Express 2013  
**Database:** SQL Express  
**Hosting Platform:** Microsoft Azure

## Week By Week Calendar

In my final section, I would like to propose the week by week schedule, which will also serve as high level plan for this project. The following plan is based on the full fledge featured portal which I have planned. As a fallback, this will still serve as a plan to complete 'Minimal Viable Project'.

Sunday, September 27	Monday, September 28	Tuesday, September 29	Wednesday, September 30	Thursday, October 1	Friday, October 2	Saturday, October 3
<ul style="list-style-type: none"><li>Amend final proposal draft</li><li>Expand the requirement</li><li>Prepare High level design</li></ul>						Proposal Final Draft Due
Sunday, October 4	Monday, October 5	Tuesday, October 6	Wednesday, October 7	Thursday, October 8	Friday, October 9	Saturday, October 10
<ul style="list-style-type: none"><li>Finalize out a hosting platform</li><li>Design the UI prototype</li><li>Create the Database design</li></ul>						Weekly Status Check
Sunday, October 11	Monday, October 12	Tuesday, October 13	Wednesday, October 14	Thursday, October 15	Friday, October 16	Saturday, October 17
<ul style="list-style-type: none"><li>Create the database and all the table</li><li>Conduct research for 'Group formation engine' and define the algorithm</li><li>Write the 'Group formation engine' component (Part 1)</li></ul>						Weekly Status Check
Sunday, October 18	Monday, October 19	Tuesday, October 20	Wednesday, October 21	Thursday, October 22	Friday, October 23	Saturday, October 24
<ul style="list-style-type: none"><li>Write the 'Group formation engine' component (Part 2)</li><li>Create the login component and link it with user interface</li><li>Progress Report</li></ul>						Progress Report due, Weekly Status Check
Sunday, October 25	Monday, October 26	Tuesday, October 27	Wednesday, October 28	Thursday, October 29	Friday, October 30	Saturday, October 31
<ul style="list-style-type: none"><li>Write the business logic and link Group formation engine with backend</li><li>Write the logic for student dashboard and link it with UI (Part 1)</li></ul>						Weekly Status Check
Sunday, November 1	Monday, November 2	Tuesday, November 3	Wednesday, November 4	Thursday, November 5	Friday, November 6	Saturday, November 7



<ul style="list-style-type: none"> <li>Write the logic for student dashboard and link it with UI (Part 2)</li> <li>Write the logic for teacher dashboard and link it with UI (Part 1)</li> </ul>						Weekly Status Check
Sunday, November 8	Monday, November 9	Tuesday, November 10	Wednesday, November 11	Thursday, November 12	Friday, November 13	Saturday, November 14
<ul style="list-style-type: none"> <li>Write the logic for teacher dashboard and link it with UI (Part 2)</li> <li>Write the logic for course enrollment and link it with UI (Part 1)</li> <li>Prepare Trailer</li> </ul>						Trailer Due, Weekly Status Check
Sunday, November 15	Monday, November 16	Tuesday, November 17	Wednesday, November 18	Thursday, November 19	Friday, November 20	Saturday, November 21
<ul style="list-style-type: none"> <li>Write the logic for course enrollment and link it with UI (Part 2)</li> <li>Write the logic for group detail and link it with UI</li> </ul>						Weekly Status Check
Sunday, November 22	Monday, November 23	Tuesday, November 24	Wednesday, November 25	Thursday, November 26	Friday, November 27	Saturday, November 28
<ul style="list-style-type: none"> <li>Final integration of all the components</li> <li>Add the seed data</li> <li>Host the web application</li> </ul>						Weekly Status Check
Sunday, November 29	Monday, November 30	Tuesday, December 1	Wednesday, December 2	Thursday, December 3	Friday, December 4	Saturday, December 5
<ul style="list-style-type: none"> <li>Test the integrated system</li> <li>Prepare the final presentation</li> </ul>						Project, Paper and Presentation Due

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## References:

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