Optimizing Team Selection for Educational Group Projects

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This paper was completed and submitted in partial fulfillment of the Master Teacher Program, a two year faculty professional development program conducted by the Center for Teaching Excellence, United States Military Academy, West Point, New York, 2010.

Group projects allow students to collaborate and synthesize what is learned in class to hopefully create a project that is better than if each individual in the group created their own. In addition, it aids in developing "…skills such as problem solving, communication, collaboration, interpersonal skills, social skills, and time management…"[1] These skills learned from group project work will be extremely useful once the student enters the workforce and will be either a participant or leader on a project team.

Importance of choosing a team

Team member selection can potentially either make or break a project. As Bruce Tuckman studied and observed training groups, he found that these groups went through four stages of development: Forming (testing and dependence), Storming (intragroup conflict), Norming (development of group cohesion), and Performing (functional role-relatedness/constructive action).[2] The team members will either contribute or detract from moving through these stages, which is why team selection is an easy to change variable that can have significant impact on the team's success.

Student Selection

An easy and simple way for an instructor to define teams is to let the students select themselves. Allowing this can "…increase the likelihood that teams will be formed based on previous affiliations or seat proximity, neither of which is likely to assure optimal productivity or total group cohesion."[3]. In addition, it is common for groups to form naturally based on how each member resembles each other, which has nothing to do with how each team member believes each other will perform the task that the group is created to handle.[4] These criteria that students will often use may not create the best team, however it can reduce the time it takes for the team to get to know themselves if they already had a previous affiliation. Imel and Tisdell suggest that there is a lack of evidence supporting student selection versus profession selection of teams.[5] Perhaps the problem is that it is difficult to run an experiment where the students use different criteria than the professor. If these criteria overlap with specific individuals, it can create randomness where students happen to select the same team members as the professor would, thus making empirical data supporting one method or the other difficult to attain. However, we can predict that in the first stage of Tuckman's development, forming (testing and dependence), could be accelerated if team members already know each other. This may or may not have any bearing on the rest of the process or the final performance of the team.

Professor Selection

When a professor selects members for a team, the goal will generally be to make the most productive teams for learning. If the project can enhance the student team members learning and experience in class, then the goal of the professor is to select teams that allow this enhanced experience. The method of selection can range from random to specific teams based on surveying the students. In some cases, the professor may have more access to student data, allowing him or her to use grade point average, class schedule, or even student housing location to help facilitate creation of productive teams.

Determining Criteria for Professor Selection

One study suggests that general mental ability, conscientiousness, agreeableness, extraversion, and emotional stability generally resulted in higher supervisor ratings for team performance, thus letting us to believe that these criteria would be worth examining to determine how to build an effective project team.[6] The obvious problem is that the instructor has to work with a pool of students within the classroom, and typically cannot exclude a student. Therefore, if a professor creates these ideal groups, he or she will most likely have students who do not rank well in these categories, and they will be in their own group. The result of composing a team of students who are low in all areas could potentially be devastating. A study conducted by Tziner and Eden where tank crews were composed of soldiers of either high or low capability showed that the team composed of top soldiers performed better than expected, while the team of low performers performed worse than expected.[7] Therefore, based on this study, creating a team in a classroom of the least productive members of the class could result in students performing worse than if they did an individual project. If this becomes the case, the professor may question whether to do a group project, or make it an individual project.

Gender diversity is another factor that can be easily used to define teams within a classroom (at least in schools that are not all male or female). Various sources support that gender diversity can affect team performance. The specific part that affects the team is the interaction among the team members. Same member teams "…may be more effective than mixed-gender teams."[8] This is not a concrete fact, since there may be a dependence on the type of project the team is working on. For example, another study discusses some varied results based on the content of the project. In this study, "individual males' (vs. females') advantage at mathematical tasks appears to be highly pronounced when the problem is couched in a masculine form, such as the number of cigarettes smoked, but is much less pronounced when presented in a feminine context, such as the number of pounds of weight lost.[9] This suggests that it may be worth assigning projects that have more female or male related content in the project to their respective groups. This aspect is specific to the project content, but not the type of project. It is also important to understand what tasks males will generally be better at and what tasks females will generally be better at. If a project required task-oriented behavior, males will generally perform better, whereas females will perform better on projects that require high quality solutions to discussion problems, due to their greater level of positive social behavior.[10] Therefore it is up to the professor to determine what best outcome will be for the course, and manage the male to female composition in a group, and modify the project to lend itself better to the groups that he or she forms.

Since gender impacts team interaction, it becomes a piece to another overarching factor: cohesiveness. Many researchers have "…argued that cohesiveness is a requisite for effective team performance"[11] Cohesion in social groups can be defined as "…the resultant of all the forces acting on the members to remain in the group."[12] Applying this definition to the project groups in a class present an interesting issue: the project members typically cannot leave the group. Although this constraint is put upon the members, we could expect that if a member would leave the group in a social setting, they will probably not have as much desire to contribute to the goal as a member who would normally stay in the group. "Members of a student team who stick together and remain united in pursuing a grade A on their project, for example, are more likely to achieve that goal. Alternatively, members of a non-cohesive student team are less likely to work together and more likely to turn in an uncoordinated effort that results in a lower grade."[13] It appears that the key is to assign students so that they make up a cohesive team, however, the difficult part is how to determine which student combinations will result in a cohesive team.

In an ideal situation, the instructor can focus specifically on forming best possible cohesive teams, however this does not take into considering the amount of time the team will have to spend together. A different approach to assignment is assigning teams so that they have more chances to meet outside of class. Structured universities like the service academies allow for this, since the schedules are easily available online to faculty. At the United States Military Academy (USMA), the web based application used by faculty to assign grades also allows them to see the student schedules. A recent addition to this system is to view all the students' schedules on one page for the entire class. In one of the two required Information Technology courses, this is commonly used to pair up teams so that they have as many free hours as possible together. This pairing not only helps the students find more free time together, but also helps them find time to meet as a group with the instructor outside of class. The ideal end result is that even if a team is not the most cohesive team, they can at least spend more time together working out their issues.

In addition to time, the cadets at USMA are assigned into a company and regiment, which determine the barracks they live in. Using this information, the faculty can also assign teams by company and regiment, thus allowing the teams more conveniently find meeting places and times in the evenings. For example, if a group is all assigned to the same company or battalion, they will generally be in the same barracks or adjacent barracks, whereas if they are in different regiments, it may be a ten to fifteen minute walk from one room to the other. Although this does not seem like a lot of wasted time, due to the cadets very regimented schedules, they will opt not to meet as often due to the extra time it will take.

There are various factors that impact the way student teams will work at an educational institution. There are many tradeoffs that must be considered, and factors that can impact how well a team will operate on a given project. It is important for the instructor to evaluate the project, the background of the students, and the desired goal in order to prioritize the factors for team assignment. Once the priorities are set, then team assignment should start with the first priorities and work through the various options until the teams are assigned. For example, if a professor wanted mixed gender teams as a top priority, then assign that first. Next, if mental ability grouping is needed, use prior GPAs

to group teams, keeping in mind that teams should still maintain the gender diversity. Then finally if schedules are known, move students around so that they have similar time periods free so they can utilize their out of class time better. Once this is complete, take surveys throughout the course that have peer evaluations. These can be used to determine if criteria priorities for team assignments should be updated the following semester.

In conclusion, team assignments are important; however there is no ideal assignment that works for any course. The professor must evaluate the goal of the project, ensure the project is written well to meet that goal, and then determine how best to assign teams. Understanding various methods of evaluating students and using resources to gather information on the students are essential in making the best choice on the method of assigning teams for group projects.

Annotated Bibliography

Developmental Sequence in Small Groups. Tuckman, Bruce. Psychological Bulletin, Volume 63, Number 6, Pages 384-99.

This article is probably one of the most influential articles on how team's develop. Tuckman was in a think tank in the US Navy where he studied small groups from all perspectives and under all conditions. He began with 50 articles his boss gave him that were studies of therapy groups. He conducted research, and developed the common stages of group development that many educators and professionals who study group performance commonly use: Forming, Storming, Norming, and Performing. He later updated it to add a fifth stage, adjourning, which captures what happens after the group is disbanded. Many research of teams and group work cite Tuckman's article, and it has become a fundamental work in understanding how teams work from start to finish.

The Importance and Invasiveness of Student Team Selection Criteria. Mary L. Connerley and Fred A. Mael. Journal of Management Education 2001; 25; 471

This article is a fairly recent article that is most relevant to the topic. One of the key points Connerly and Mael make is that formations of teams in classrooms is different than any other scenario, since the team members may not know each other at the start, and have to have a finished product within a semester timeline. This is a short amount of time to go through the team formation process as described by Tuckman. Their research on choosing teams shows that there is not enough evidence to support professor selected teams over student selected teams, however they did allude that students choose teams based on their social network of friends rather than how much the members will contribute to the project. They then perform two studies to determine criteria for team selection, and which ones are most invasive to students. Their first study shows that criteria related to communication skills, achievement orientation, and dependability were considered by the students to be more useful than other domains (negative personal characteristics, potential distractions, and time conflicts in the focal person's life). The second study dealt with invasiveness, and found the five most invasive items: propensity for violent mood swings, problem with a learning disability, frequency of alcohol or drug use

and sense of responsibility, desired grade in the class, and ability to get along with others. The ability to get along with others was an interesting characteristic, since it seems the most useful, yet is the fifth most invasive. This is a key to this study to be used if a professor decides to try and gather that kind of data before assigning teams.

Sex Differences in Group Task Performance. Wendy Wood, Darlene Polek, and Cheryl Aiken. Journal of Personality and Social Psychology. 1985, Vol 48, No. 1, 63-71

This article was essential in understanding how sex differences can affect group performance. The main ideas gathered from this article is that it does make a difference to have an all male, all female, or mixed gender team. The difference is two-fold. First, the content of the project can make a same gender team perform better due to their interest in the subject. For example, a math problem involving race cars may be better received by an all male group, while a math problem involving dress design will be better received by the all female group. The second part is that a project that requires a high quality decision based on good group discussion will be performed better by an all female group, whereas the all male group will perform better on a very task oriented project.

Enriching Our Understanding of Student Team Effectiveness. Dawn R. Deeter-Schmelz, Karen Norman Kennedy and Rosemary P. Ramsey. Journal of Marketing Education 2002; 24; 114.

This article discusses many aspects of a team that relate to the team's effectiveness. The authors discuss gender, cohesiveness, and team size, and then relate that to the team process and effectiveness of the team. They develop an input-process-output model, and show that cohesiveness and team process were useful input variables in determining output variables of task performance and goal achievement. They did not find gender diversity or team size to be predictor inputs to their model.

Effects of crew composition on crew performance. Aharon Tziner and Dov Eden. Journal of Applied Psychology 1985, Vol. 70, No. 1, 85-93.

This article explains why groups are important. The experiments the authors use are very simple and effective. They used three-man military crews as the base subjects, and based on commander's rankings, tested the teams' performance when top soldiers were put on the same team, as well as low ranked soldiers. The results are somewhat expected, however this validates the importance of groups. The top soldiers performed better than expected, while the bottom soldiers performed worse than expected. This explains the synergy found when a good team is formed. They also found that at least two members being highly motivated contributed greatly as well as the general ability of all members.

Progress in small group research. John M. Levine and Richard L. Moreland. Annual Review of Psychology. 1990 41:585-634.

This is an interesting article that reviews many papers that deal directly with the subject of small groups. The authors evaluate many works in the areas of ecology, composition, structure, internal conflicts, and performance. The specific aspect utilized by this review is the composition of small groups. This paper

deals with a general small group, not specifically with a team in a classroom, however it provides some insight on group dynamics that can be applied to many situations.

Informal Social Communication. Leon Festinger. Psychological Review. Vol 57(5), Sep 1950, 271-282.

This article discusses a key part of teamwork: cohesiveness. The review of literature on groups led to the factor of cohesiveness being essential in creating a well performing group. Festinger discusses how social groups interact and cohesiveness is created. It is focused on social groups where members may join or leave the group, which is different from the classroom. However, it is worth understanding, since members of a project group in a class typically do not have a choice to leave the group, and if they wanted to, this may mean the group will not function properly.

Successful teamwork: A case study. Pina Tarricone and Joe Luca. Quality Conversations. Proceedings of the 25th Annual Conference. 7-10 July 2002, Perth Western Australia.

This paper is very useful when determining key attributes for a successful team. The authors created a table of key attributes along with examples that are cited by other research papers. Although this does not relate directly to team member selection, it becomes useful once the team is created to determine if the team needs to work on any of their 6 areas to ensure their success.

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