AC 2007-1699: USE OF ASSESSMENT SURVEY TO ASSIGN PROJECT TEAMS AND ROLES

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Use of Assessment Survey to Assign Project Teams and Roles

Abstract:

Effective assignment of teams and distribution of tasks within a group is an arduous task. Successful teams display harmony, successfully completed projects, and effective skill utilization of all members. Weak teams demonstrate ineffective dynamics, poorly completed projects, and underutilized team members. We propose a method to assign team members and to delegate members with equally weighted tasks using assessment surveys.

Our method is applied in a first-year project-based engineering design course with approximately 180 students each semester since Spring 2003. The course is divided into 4 sections each consisting of at most 45 students per section. Each student is assigned to a team consisting of at most five students working on an engineering design project with a community partner. The use of community partners requires students to develop professional skills such as verbal and nonverbal communication as well as technical engineering design principles.

We propose the use of pre-course assessments to determine students' skill sets in technical, professional, and managerial roles. We also account for diverse students' background and interest levels in certain fields. The evaluation of these surveys results in the assignment of teams with each student possessing unique traits and characteristics to aid the team in the completion of the assigned project. We discuss the method of evaluating such result to properly assign teams in this paper.

We assign team members to five different roles based on survey results: (1) primary facilitator, (2) secondary facilitator, (3) process observer, (4) timekeeper, and (5) conflict manager. The primary and secondary facilitators are students that possess the most experience in professional and managerial roles. These individuals are required to oversee team progress and maintain clear communication with the community partner and course instructors about project status. The process observer role is for an individual with strong nonverbal professional communication skills. The student is responsible for composing all written project status reports and final project report for the community partner and course instructors. The timekeeper and conflict manager roles are useful in ensuring that the team remain focused throughout the course of the project. They are also delegated to students with stronger technical skills. These students focus on meeting the technical requirements required by the project. The hierarchal structure in role assignment facilitates maintaining harmony amongst team members.

At the end of every semester, students are required to submit a personal reflection discussing his or her team working experience in addition to rating their fellow peers. Students on teams with good team dynamics indicate a level of satisfaction with respect to their completed projects and group, while the converse is true for students on teams with poor team dynamics. Community partners and course instructors also evaluate the teams' effectiveness as a group. Our results indicate a direct correlation between team harmony and quality of project from a pedagogic view. Methods to facilitate evaluation of pre-course assessment surveys are underway.

Introduction:

A team is defined as a group of people who aggregate to fulfill a common goal. Functional teams are a key factor in the completion of successful projects. Effective distribution of work amongst team members allows for individuals not to feel overwhelmed with assigned tasks. In addition, assuring that each member is assigned to tasks that best match their strengths ensures that there is no weak component present in the completion of the project. Team failures usually arise when there is an unbalanced workload on its members or when certain members are given tasks that do not address their strengths or interests. [1, 2]This basic concept of functioning teams is critical in our engineering design course.

Course Structure:

The required engineering design course is offered every academic term to all first-year engineering students. The main goal of the course is to give students the opportunity to learn about engineering and explore an overview for their proposed field of study. The method we have chosen is a hands-on approach to give students real experience in the field of engineering. To successfully accomplish this goal, we have established a Community Service-Learning Program (CSLP) in which all students enrolled in the engineering design course are required to complete an assigned service-learning project with a community partner. This project encompasses not only the fundamental engineering design principles taught to students during lecture but additionally allows for students to develop interpersonal communication skills while communicating with their project partner along with peers to successfully complete their term project. [3, 4] Each of our students is assigned to project teams composed of five members.

Team/Group Structure:

Our course model is set to ensure that students develop tools for understanding engineering design while additionally focusing on interpersonal communication development. This is especially important today since any real-world job requires for individuals to take part in teams/groups. The course requires all students to complete a community service-learning project with a community partner as their term project while utilizing engineering design tools and methods learned in class. Furthermore, students are neither given the flexibility of choosing their own project nor picking their own team members. This rule is applied to ensure that students do not pick teams of their own friends to work with for the project, as this would inhibit them from attaining the true teamwork experience.

True teamwork experience entails learning to compromise with others and adapting to a new group setting. This experience is invaluable to our students as very few have taken part in a real project before in this setting. Added in with community partner interactions, our students have the chance to see what a real-world job would feel like.

Once our instructors select the teams, they are given some primary guidelines about organization. We outline five different team member roles that each team will then need to assign to their individual members. Since our teams are groups of five, this ensures that each person on the team will be assigned a responsibility task.

The five roles are primary facilitator, secondary facilitator, conflict manager, timekeeper, and process observer. The role of the primary facilitator is to act as the lead liaison between the student team, instructors and community partners. Leadership skills and experience aid in the successful handling of this role. Aside from simply serving as the liaison, the primary facilitator is responsible for overseeing project management and completion.

However, anytime one single person is given too much control, there is always a chance for dictatorship to occur. To avoid this conflict, we ask students to assign the role of the secondary facilitator. This ensures that the primary facilitator will not overtake the group. In addition, if the primary facilitator cannot attend a meeting or fulfill his/her responsibility for any given the reason, the secondary facilitator can always fill this position.

The roles of conflict manager, timekeeper, and process observer are more behind the scenes for students who not necessarily feel comfortable in interacting with too many people. Every team is destined to have conflict regarding the project at some point during the duration of the project. The conflict manager is assumed to be the judge of the team and aid to solve any such conflict that may arise. The timekeeper is responsible for making sure that team meetings stay on track to assure that time is most efficiently spent in completing the project. This role is extremely important since our students are taking a full-college course load and do not need the additional burden of losing aimless time during group meetings. The roles of conflict manager and timekeeper are usually assigned to those who will be responsible for the major technical parts of the project. This assures that they have enough time to devote to both responsibilities.

Finally, the role of the process observer is assigned to those interested in writing. The course requires for weekly progress reports of the teams project and group development. In addition, each team is required to submit a final project report. This document contains a complete assessment of the project from its initial stages to final product such that the project can be replicated if the need exists or can be further expanded by a future group/team. The process observer is responsible for both the progress reports and the final project report. The process observer's task during each meeting is to take effective meeting notes accounting for both project completion and progress but also team dynamics. This aids in the completion of the reports required.

Use of Assessment Survey:

The assessment survey used in the course is administered online, thus making it easier for students to complete and for the staff to evaluate. Each student is asked to fill out this simple survey during their first meeting in class. The survey is designed to take no longer than ten minutes to avoid students losing interest in honestly completing it. It is broken into three major sections. Students complete the survey through simple drop-down menus, checkboxes, and fill in the blanks. We intentionally try and minimize the amount of free-response type questions on the survey. Many students do not provide enough information in such questions. Thus, the specific rating and multiple-choice questions provide better results. The questions posed by the survey are shown in Table 1.

Table 1: Assessment survey conducted in engineering design course.

Section 1: About You

- Your Preferred Name
- Section
- Gender
- How do you describe your ethnicity/cultural background?
- Is English your native language?
    - If not, what is/are?
- Are you an international student or an immigrant to the US?
    - If so, in what country/countries have you spent most your life, and when did you come to the US?

Section 2: Academic Interests and Career Goals

- What's your current first choice of a major?
- How confident are you in your first choice? (percentage)
- What's your second choice of a major?
- What's your first choice for a minor, if any, at this time?
- How clear are you on your plans for what you want to do as a career?
- How comfortable or happy are you with how clearly you have identified your career goals?
- How comfortable or happy are you with your progress towards achieving your career goals?
- How likely do you think it is that you will attend graduate school?

Section 3: Skills and Interests - Indicate knowledge and interest level.

- MS Excel
- PowerPoint
- HTML
- Web Composition Software (e.g. Dreamweaver, FrontPage, etc...) - In what programs?
- Drawing/Graphics Software - In which programs?
- Programming Languages/Scripting - In what languages?
- Macromedia Flash
- Database Applications or Programming - In which programs?
- Design Software (e.g. Maya, Studio Tools, 3DMax, etc...) - In which programs?
- Other CAD Software (e.g. Autocad, etc...) - In which programs?
- Project Oriented Research (e.g. researching existing products, conducting informal surveys, etc...)
- Project Oriented Writing (e.g. summarizing team progress, taking meeting notes, etc...)
- Working with others as a team
- Leading or coordinating projects or teams
- Using personal video cameras
- Using video editing software (e.g. Final Cut Pro, Premiere, iMovie, etc...)
- Observing and describing team-related behavior and attitude

The first section is a basic information section in which we ask students for demographic information such as their name, gender, nationality, and country of residence. This information is used for strictly objective purposes as explained later in this paper. The second section asks a series of questions regarding to the students academic interest, namely first choice for major and minor in the engineering school. The survey also asks for students to provide short answers for their career goals. The third section addresses the professional and technical skills set in which a student may have prior knowledge or interest. The main goal in this section is to learn about student strengths and weaknesses.

Use of Survey Results to Assign Project Teams/Groups:

The information obtained from the second part of the survey pertaining to academic interests and career goals are used to assign students to specific project teams/groups. Our projects are grouped into five specific project genres. This enables us to ensure that students are assigned to types of projects that will appeal to their interest and serve as an introduction to design problems in that field. The current genres include: (1) assistive devices, (2) civil/architectural designs, (3) educational tools, (4) information technology, and (5) urban development. Table 2 shows the common majors that are associated to each of the project genres. Two majors that are un-addressed specifically – industrial engineering/operations research and applied physics/mathematics – are key to any of the five genres discussed. Industrial engineering/operations research students are useful for project management and for successful overseeing of team progress throughout the project. These students usually partake in the more non-technical parts of the process and in ensuring effective communication between the student team, client, and instructors. Applied physics/mathematics students are beneficial to each team, as they possess the technical computational skills required by the course for each project assigned.

Table 2: Majors associated to project genres.

Genre	Major
Assistive devices	Biomedical/Chemical Engineering, Electrical Engineering, Mechanical Engineering.
Civil/architectural designs	Civil Engineering, Mechanical Engineering
Educational tools	Computer Science, Computer Engineering
Information technology	Computer Science, Computer Engineering
Urban development	Civil Engineering, Earth and Environmental Engineering, Mechanical Engineering

Thus, when a student indicates at least a 70% confidence rate for their first choice of major we automatically assign the student to a project genre that matches their interests, as shown in Table 2. However, we cannot guarantee that students will always be assigned to the exact matching project genres due to the popularity of certain majors over others. In addition, students who are either undecided or uncertain about their choice of major are usually assigned appropriately depending on their other interests and listed career goals.

The demographic information obtained from section 1 of the survey ensures that a single gender does not get outnumbered in a team since this can cause social anxiety, team dysfunction, and

unusual balance of power. In addition, many of the students in our course are international students whose communication skills may not be as strong as other students. For this reason, the country of residence and nationality questions are imperative in ascertaining that a group of potentially students with weaknesses in communication skills are not placed on the same team.

The skills acquisition in section 3 is imperative in ascertaining that each team has the basic skill set and interest level necessary to complete a particular project. Disinterested students often times lack in contributions made to their respective teams. Thus, we have noticed that interest rate is a great factor in the successful completion of our projects. Finally, we want to balance the amount of technical and managerial expertise in every team, so that no team has an unfair advantage or disadvantage.

Use of Survey Results to Assign Team/Group Role:

Our five roles as discussed earlier are primary facilitator, secondary facilitator, conflict manager, timekeeper, and process observer. The primary and secondary facilitator roles are assigned to those students who indicated an interest in industrial engineering/operations research and those who noted prior experience leading or coordinating projects/teams in the skills acquisition portion of the survey. The role of conflict manager is designed for those who have prior experience of working with others as well as aptitude and interest for technical components that a project may require. The role of timekeeper is intentionally given to one of the students who will be involved with the technical aspects of the project. Thus, the individual selected for this specific role is determined by knowledge and aptitude for more computer based application. We tend to try keep the timekeeper and conflict manager roles open for the members of the team/group who will probably undertake the most responsibilities for the Finally, the process observer is selected based on experience and interest in project oriented writing and observation of teams/groups.

Discussion:

While we do not specifically assign students to particular team roles, our selection process ensues that there exists a viable candidate for each position both from the managerial and technical aspects. An interesting study would be to correlate our intended role assignment to the team/group's actual role assignment. We hypothesize that this would results in a high correlation given the success of our projects and students teams/groups.

The use and evolution of survey success can be effectively and easily seen by project completion and success rates. Since it's introduction in Spring 2003, the number of projects successfully attempted by students has been increasing. While it is improbable that 100% success rate will ever be attainable, we have successfully reached 80-90% success rates with completed projects by students. This increasing success rate indicates that students on teams are performing well together. Table 3 shows the steady growth of projects completed by our students. While class size does not vary per academic year, we have played with team/group sizes since the onset as well as the introduction of the assessment survey. Thus, our method of placement of students on teams using our relatively short survey is in turn effective.

Table 3: Growth of projects completed by students in the course.				
	Academic Term	**Academic Year**		
	Spring 2003	**2003 - 2004**	**2004 - 2005**	**2005 – 2006**
Number of projects	11	48	65	67
Use of assessment survey	No	Yes	Yes	Yes

Student personal reflections are collected at the end of every academic term in hopes of learning about team dynamics and student experiences. Prior to the introduction of the assessment survey in Fall 2003, several of our teams were dysfunctional. Student reflections indicated discontent with the entire project and team experience. Team/group dynamics were often blamed. Common comments include, "If given the chance to start over, the team would definitely begin working on the foundations of team stability before jumping into any actual work on the project." Therefore, it is no surprise that students completed only 11 projects in Spring 2003 as showing in Table 3.

However, most current reflections indicate content with their team colleagues. A student from Fall 2003 writes in his reflection, "I had never been a member of such an apt, intelligent, fun group before, and this experience truly changed my perspective on collaborative work. I personally cannot wait for the next group I am a part of." Similar reactions exist from most students on successful functional teams. Another common reaction by students follows the thought, "We distribute all the work, take care of our own responsibilities and help each other constantly." Student content with their fellow teammates indicates that our selection and placement method was successful. For the occasional dysfunctional team, we reevaluate student survey responses and reflections to determine the cause of incompatibility. In many cases, this is caused by students who do not take the assessment survey seriously.

Future work to improve the assessment survey is constantly underway. We are always trying to devise methods to make the assessment as succinct as possible. This alleviates aggravation felt by students in completing the survey and amount of unnecessary data that the staff has to organize in assigning teams.

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