



## Effective Teamwork among Female Emirati students

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## **Abstract**

Teamwork is an essential component of the engineering design process. The Petroleum Institute (PI) in Abu Dhabi encourages the development of teamwork skills to embody the same principles of professionalism and Emirati values that all employees must demonstrate in the workplace. Instructors working with student teams at every institution, however, are aware of the difficulties that arise with respect to logistics, task assignments, and work quality. Perceptions of effective group dynamics and the contributions of individual team members to the group process can affect the quality of the team experience. In the present study, female students in two engineering design courses at the PI were randomly assigned to teams. As research indicates that females prefer to have some choice in the group creation process, after the first team presentation, one section of the course was given the choice to change their group members. The second section was not given this option. In this paper, the authors discuss the implications of allowing students to choose their own group members compared to random assignment and how group creation can affect perceptions of team effectiveness and overall satisfaction.

## **Introduction**

The present study explores group creation and perceptions of satisfaction and team effectiveness in two all-female sections of an undergraduate engineering design course at the Petroleum Institute (PI). Random assignment was used to create groups in both classes at the beginning of the semester. As the course emphasizes teamwork, at least 50% of the projects are given team grades. After the first team presentation, the experimental group was given the choice to change team members. The control group was not given this option. The study followed the student teams in both classes to explore the kinds of team building and conflict resolution strategies that were utilized by the teams. The two groups were compared at the end of the semester to determine if providing choice in the team selection process affected students' satisfaction with their team as well as their perceptions of team effectiveness.

## **Background**

The mission of the PI is to impart world-class education in engineering and applied sciences in order to support and advance the petroleum and energy industries. The Institute strives to develop students as whole persons and as the future leaders in their respective fields of expertise in the UAE and globally. It is expected that students will appreciate the critical role played by team skills in engineering practice and project management.

The PI was created in 2001 with the goal of establishing itself as an international institution in tertiary engineering education and research in areas of significance to the oil

and gas and the broader energy industries. Currently the PI offers Bachelor degrees in Chemical, Electrical, Mechanical and Petroleum Engineering, and Petroleum Geosciences. The students are admitted based on their TOEFL score and their GPA in high school. Most of the students go through a foundation program, known as the Advanced University Placement program, before they are enrolled as a freshmen student at the PI. The foundation program is designed to help students develop knowledge, study skills, technical, analytical, and communication skills which are necessary to meet the PI's entrance requirements and assist them in their future studies at the Petroleum Institute.

Once students reach the freshmen level there are core courses that have to be completed irrespective of their majors. The core courses as well as some elective courses required for the engineering programs are offered through the Arts and Science Program (A & S). The six departments within A & S include Mathematics, Physics, Chemistry, Humanities and Social Sciences, Communication, and General Studies (See Figure 1). Students must take these required courses in a sequence.

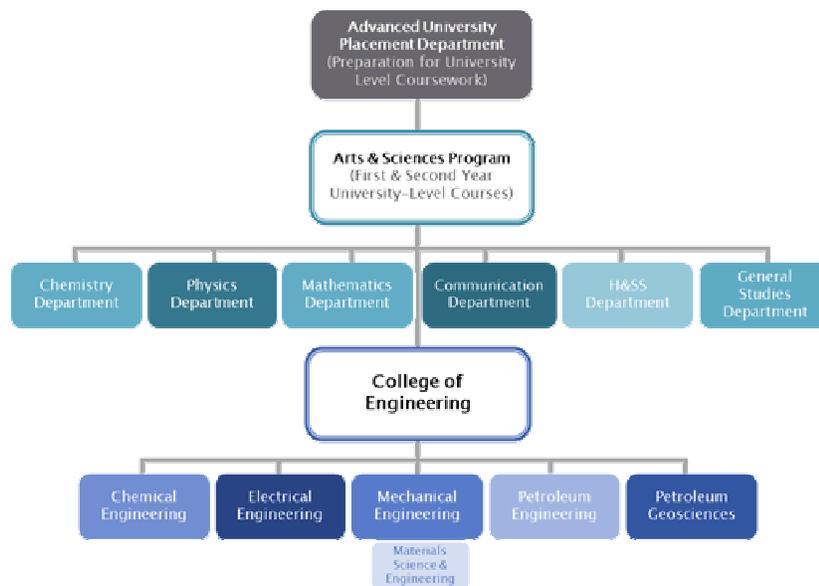


Figure 1. The Petroleum Institute Academic Department Structure

The General Studies department offers a sequence of two engineering design courses called STEPS, which stands for Strategies for Team-based Engineering Problem Solving. In STEPS courses students integrate what they are learning in science, mathematics and communications, couple it with teamwork and project management tools and build a working prototype of a useful machine. The requirement to start the STEPS courses is that they should complete the first course of Physics and two levels of Communication classes. After successful completion of the courses in Arts & Sciences, students enter one of the six engineering departments to do upper level courses and pursue a specialized engineering degree program.

## **Same-Gender Teams**

The PI is divided into two campuses—one for male students and one for female students. Gender segregation, however, does not apply to faculty members. Thus, male and female faculty members may be found on both campuses. The Women in Science and Engineering Program (WiSE) is a unique model of operations dedicated to the support of female undergraduate students pursuing their studies at the PI. Its aim is to provide an environment where female students are encouraged and supported to succeed academically, professionally and personally. The current study was conducted with two sections of the STEPS course on the female campus of the PI known as Arzanah.

Research suggests that same-gender teams (all-male or all-female) perceive themselves as more effective than heterogeneous teams (Baugh & Graen, 1997). In classroom situations, it appears that both genders value the importance of teamwork, but more female students want to be able to choose their own team members (Alexander & Stone, 1997). As task interdependence is a factor in effective teamwork (Ramamoorthy & Flood, 2004), it is possible that homogenous teams offer a greater degree of comfort for communication among team members to address the tasks needed. For female students, control over team memberships may be linked to a higher degree of comfort and familiarity with members' abilities and skills. In Arab communities in the Middle East, gender homogeneity and communication patterns among gender-segregated groups may enhance this phenomenon. The current study was conducted to provide more insight into the group processes that take place in all-female teams at the university level.

## **Communication and Teamwork in the UAE**

Even though Western media often portray Arabs as a homogenous group, in reality Arab communities are highly diverse in terms of ethnic, linguistic, tribal, and national identities. At the same time, Arab communities share some common features which can differentiate them from their Western counterparts, including an emphasis on collectivism, honor, and social stability that emphasizes extended family and tribal relations (Feghali, 1997; Al-Krenawi, & Graham, 2000). Feghali (1997) addresses some of the general communication patterns that appear in Arab communities, including code-switching from one language to another, flowery rhetoric, indirect speech in relation to topics that reflect social practices, and direct speech when commenting negatively or positively on personal appearances. She also notes the importance of physical space, which tends to be closer in all-male or all-female situations as contact and touching between genders is considered offensive in public spaces. Status, which may be attained through age or tribal affiliation, is another factor that influences communication patterns.

Despite--or perhaps more pointedly, because of the sudden surge of commercialism and globalism in the United Arab Emirates (UAE), for example, the local Emiratis remain highly embedded in tradition. The dependence on foreign labor has fostered a society of relatively closed enclaves of locals who often feel that their culture and traditions are being threatened by the global forces at play within their country (Al-Khazraji, 2009). Thus, communication patterns among Emiratis may reflect more traditional roles and expectations than communication patterns between Emiratis and expatriates.

Demographic characteristics and patterns of social interaction influence team effectiveness through quality of team processes and improved team performance (Rentsch & Hall, 1994). It is possible, then, that single-gender homogenous teams who share a cultural schema may have better communication among team members. Al-Romaithi (2011) found a positive correlation between communication and team effectiveness among employees in Abu Dhabi government departments; however the study did not elaborate on the ethnic or gender composition of the teams. Rogelberg & Rumery (1996) found that gender homogeneity increased team performance for females. In a study of homogeneity of subgroups, Gibson & Vermeulen (2003) noted that “the homogeneity of the team made it easy for them to experiment, communicate about the outcomes of the experiments, and quickly converge and implement alternate solutions’ (pg. 208). On the other hand, homogeneity of gender and culture may also encourage groupthink which would perhaps lessen the quality of the final product. Given the collectivist nature of Emirati traditional culture, the tendency towards groupthink may be more germane. Bennet and Wright (2010) found that female Emirati students in a single-gender, single-nationality university context reported more positive team experiences than Emirati female students in a mixed-gender university environment. However, they were also more likely to engage in behaviors such as changing their views to suit the group and hiding their true opinions.

## **Participants**

The present study was conducted with thirty-three female students in two sections of an engineering design course (STEPS 201) at the Petroleum Institute in Abu Dhabi. The classes consisted of freshmen and sophomores on the Arzanah campus. Student ages ranged from 18-21 (n=33). The majority of students were Emirati nationals (n=30) and all students were of Arab descent.

## **Rationale**

STEPS is PI’s Sophomore / Junior engineering program. There are two levels of STEPS courses; the first level of the STEPS course deals with more real world problems and the second level of the course is more of a theoretical approach with computer simulation and analysis. Both are core courses to be taken in succession. The overall aim of the STEPS program is to introduce and expose students to the engineering design process and integrate a range of skills and competencies that will simulate project management and real-world design activities in a professional engineering environment.

Teams of students are required to respond to hypothetical client specifications by designing, managing and presenting technically feasible solutions rooted in real world engineering problems. Teamwork, organization, planning, research skills, and problem solving are essential for success in the STEPS courses. All students are actively engaged in teamwork to solve open-ended design problems using methodical approaches and state-of-the-art design and communications tools. During the semester, students are also

required to present the results of their project work using oral and written communication as well as computer aided graphics. The progress of each team project and each student's contribution is closely monitored and evaluated by qualified engineering design experts and English communication specialists to provide continuous feedback and guidance.

As the course focuses on team processes, 50% of the assignments are assessed with team grades. Lectures are kept to a minimum and students are encouraged to utilize their time efficiently, both during and after class hours, for designing their team project. In general, team members are chosen randomly by instructors and team membership is not negotiable or transferrable during the semester. However, as research indicates that female students may prefer to choose their own teammates (Alexander & Stone, 1997), the current study sought to explore the influence of choice in group creation on female students' perceptions of team effectiveness and overall satisfaction with the team. Thus, after the first team presentation, one class section (n=20) was offered the choice to change team membership, while the control group (n=17) was not given this option. In the experimental group, initially all the students chose to change group members. However, the next day, when they were asked to verify this choice, the majority (62.5%) chose to return to their original team assignments. Thus, the composition of teams in both classes did not change throughout the semester. A survey was given at the end of the semester which asked students to reflect on their team processes. The survey included both quantitative and qualitative questions to gauge students' perceptions and attitudes towards group creation as well as their group functioning.

## Results and Discussion

Students' attitudes towards group creation were assessed by the following question: In your opinion, what is the best way to create groups in class? The results for the experimental and control groups are graphed below.

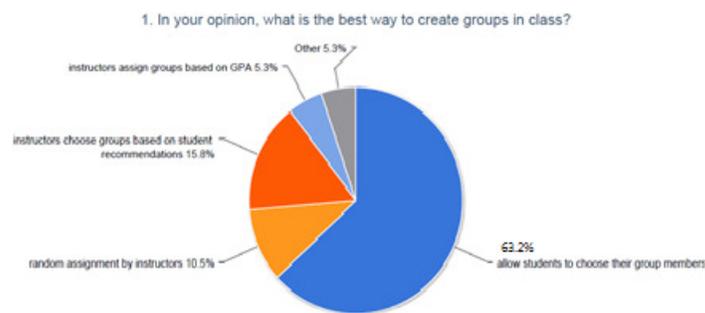


Fig 2: group creation – experimental group

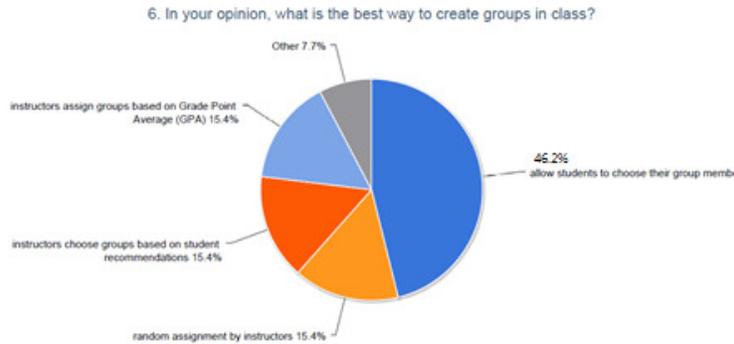


Fig 3: group creation – control group

Figure 2 shows that 63.2% of students in the experimental group reported that the best way to create groups is to allow students to choose their group members. In addition, 15.8% wanted some influence on the instructor in determining group membership. In contrast, only 46.2% in the control group felt that students should choose their own groups. Another 46.2% rated three other options (instructors creating groups based on GPA, student recommendations, and random assignment) as viable options for group creation. It is possible that being given the choice to select group members during the semester influenced the attitudes of students in the experimental group. As students in the control group were not given this option, it may not have been an aspect of group creation that was given extra emphasis for their particular circumstances.

When asked if they would have preferred different group members during the semester, 83.3% of the students in the control group said no. In contrast, 52.6% of the students in the experimental group indicated that they would have preferred different group members. Instructor observations of team meetings during the semester showed that teams in both courses were struggling with communication between team members, time management of tasks, and conflicting schedules. In both sections, teams that were focused on the project, rather than the individual personalities of team members, appeared to have less conflict.

As teams in both sections were dealing with similar conflicts, however, it is interesting to note that the control group which was not given a choice to change team members appeared to have formed more cohesive relationships. The following comments from students in the control group illustrate this point: “even though there is a bit (of) conflict we are still the best!” and “I am happy with my group and we became good friends”. In contrast, many of the comments from the experimental group opined the lack of choice in group creation and the desire to work with friends. The following are examples of this: “it is more easy to communicate with your own friends and meet with them ‘without finding difficulties in schedules’ and the quality of my work and my friends are a bit different and better”; “I felt like working with group members who I know”; and “I chose to work with my friends because we can all meet and we can still enjoy ourselves and not feel obligated to complete something just for the sake of it”.

In addition to attitudes towards team creation, perceptions of team effectiveness were addressed through the following item: How effective is your current group? The item used the 5-point Likert scale with effectiveness ratings ranging from 1 (highly ineffective) to 5 (highly effective). There was no statistically significant difference between the control group and the experimental group with regards to perceptions of team effectiveness. The mean effectiveness score for the experimental group was 4.1 and the mean effectiveness score for the control group was 4.06. Additionally, 52.6% of the experimental group pointed out that the team was moderately effective compared to 53.9% in the control group. A similar percentage was observed between perceptions of “highly effective” and “ineffective” teams in both classes. Figure 4 shows the group effectiveness ratings between the experimental and control groups.

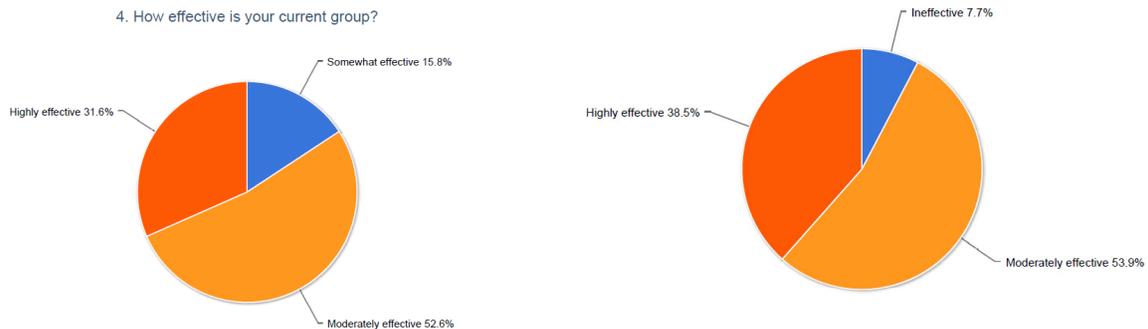


Fig 4: Group effectiveness – experimental group (left) & control group (right)

Thus, even though students in the experimental group wanted more influence over group creation in the course, they did not feel that their existing group was less effective than the students in the control group. This is an important finding in that it shows that students can feel effective in their teams despite their lack of choice in the team creation process. Thus, even though female students may want more influence on group formation (Alexander & Stone, 1997)—a phenomenon that was supported by the perceptions of the experimental cohort in the present study—this preference may not necessarily affect their overall level of effectiveness as a team. Additionally, even if students are not given the choice, they may develop the relationships over time as they become more immersed in the tasks at hand.

Satisfaction with the team was another aspect of the current study; this was evaluated using the following question: How satisfied are you with your current STEPS group? Similar to the effectiveness ratings, the satisfaction ratings used a Likert scale ranging from 1 (very dissatisfied) to 5 (very satisfied). There was no significant difference in satisfaction ratings between the experimental group and the control group. The mean score for satisfaction ratings of the experimental group was 3.5 and the mean score for the control group was 3.69.

Interestingly, the control group was slightly more satisfied with their teams than the experimental group, even though the control group did not have a choice in determining group membership. None of the students in the control group reported being dissatisfied

or highly dissatisfied with their team. In contrast, 15.8% of the students in the experimental group reported being dissatisfied with their team (Figure 5). There may be a variety of reasons for this, including the personalities of the team members which may have resulted in different qualitative experiences for students in the experimental group versus the control group. Additionally, it is possible that the experimental stimuli (allowing the students to choose their group members after the first team presentation) had an effect on the satisfaction level of the experimental group.

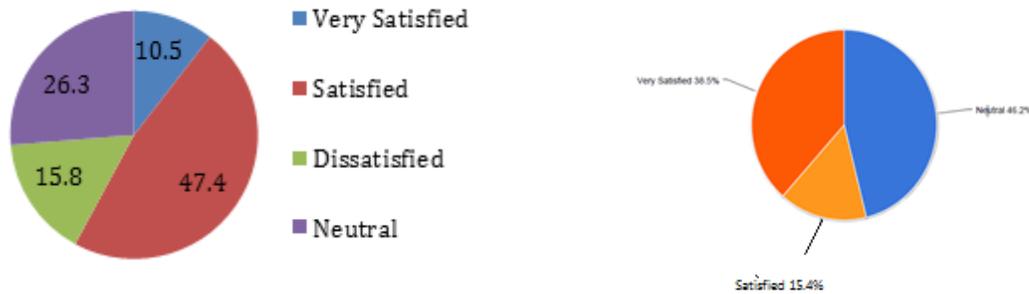


Figure 5: Team Satisfaction - experimental group (left) & control group (right)

### Recommendations for Effective Teamwork in Homogenous Groups

- “Give teams time to jell” (Katz, 2001, p. 62). Despite the fact that all students in the current study were Arab females and the majority of teams consisted of all Emirati females, instructors heard complaints about team membership during the early stages of the random team formation. As teams worked together over the semester, however, they learned about each other’s habits and skills and the focus changed from team membership to task fulfillment. Thus, it is important to remember that intra-group variation and sub-group preferences can play a role in group processes, even within same-gender teams that appear to be culturally homogenous. Allowing students to work out their differences given time, direction, and instructor support may be a better option than dissolving teams early in the process. This was clearly shown in the current project when the majority of the team members in the experimental cohort decided to remain with their original group, instead of continuing the course with the new team members they had chosen of their own volition.
- When creating randomized teams, allow students to choose one partner. A subgroup within the larger group can help students face conflict with greater ease because they will have the psychological support of at least one group member with whom they are familiar. This may lessen the fear of embarrassment so that students can voice their opinions with the knowledge that at least one team member is more likely to stand by them, thus emphasizing a support network within the team (Gibson & Vermeulen, 2003)

- Have students create a team charter at the onset and use it throughout the project to validate team decisions and address conflict. Effective teams within the classroom environment should model the same criteria that are useful in professional contexts. Cox, College, and Bobrowski (2000) note the importance of a shared vision and team goals to enhance productivity among team members. Katzenbach and Smith (1993) found that setting team expectations at the outset can deter social- loafing behaviors. A team charter can be a useful tool in this endeavor (Cox, College, & Bobrowski, 2000; Hunsaker, Pavett, & Hunsaker, 2011), but only if it is actually applied during team processes.

## **Conclusion**

Teamwork is an essential component of the engineering design process. As such, it is important for students to have a variety of experiences working in teams prior to their entry into the workforce. The current study illustrates that providing female students with a choice in group membership does not necessarily mean that the teams will be more effective or that students will be more satisfied with their team. As the study focused solely on all-female teams, however, further research on all-male teams or mixed-gender teams in the UAE is needed to determine how group creation affects perceptions of team effectiveness and team satisfaction in this cultural context. Even though some students may prefer to have an influence on group creation in the classroom, random team assignments may be an effective way to provide students the opportunity to work with a variety of people so that they are better prepared for the types of interactions that they may face in the workplace.

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