FORMING AND MAINTAINING CLASSROOM GROUPS THAT ENHANCE LEARNING FOR WOMEN STUDENTS

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Introduction

Group projects can be very interesting and exciting ways of learning, but run the risk of being exercises in futility. Many students dislike the idea of working in groups because they have worked independently for most of their school careers, and because of previous unrewarding experiences when working in groups.

However, a requirement for engineers is that they be able to work on projects in teams, or groups, and undergraduate engineering education must give attention to teaching students to work in groups. One way to accomplish this is to provide more opportunities for students to experience productive group work.

Women, and minority students, may experience difficulties when trying to work in class groups. Some examples of how class groups present difficulties follow.

Setting meeting times when women cannot attend. This may be a major problem for women commuter students and/or students with child care concerns. Often times male group members will be able to meet during evening hours, and will not be sensitive to or accommodating of members who have to use public transportation, or arrange for child care.

Assigning tasks so that women get the least desirable ones. The most appropriate way of determining task assignments is to allow members to choose and negotiate. All group members should take part in decisions and not have decisions based on majority vote, or on autocratic decision making.

Holding unscheduled meetings. An example of this would be when two or more members get together, make decisions about something, and then announce it to the group. Women are unlikely to be part of impromptu meetings for they tend to take place at times and in situations where women would not expect to be present.

Ignoring input from women and/or minorities. In their zeal to lead, control, and accomplish the task, male group members may fail to solicit or consider input from women and/or minorities. They have not been taught how to involve all group members, nor have they usually observed their instructors demonstrating how to do so.

There are many other examples but these serve to highlight some of the difficulties.
Class Groups

The following discussion presents a method of encouraging and facilitating classroom groups. It is based, in part, on using an understanding of how groups form, develop, and move through stages.

Table 1
Group Development Stages

<table>
<thead>
<tr>
<th>Stage</th>
<th>Group Name</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Get acquainted</td>
<td>Characterized by ambiguity</td>
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<tr>
<td></td>
<td></td>
<td>Establishing group norms</td>
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<tr>
<td></td>
<td></td>
<td>Negotiating expected behaviors</td>
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<tr>
<td></td>
<td></td>
<td>Acceptance versus rejection</td>
</tr>
<tr>
<td>2</td>
<td>Conflict</td>
<td>Realizing differences</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clash of values</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Interpersonal conflicts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Controversy</td>
</tr>
<tr>
<td>3</td>
<td>Working</td>
<td>Focus on task</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group cohesiveness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acceptance of responsibility</td>
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<tr>
<td></td>
<td></td>
<td>Respect for varying abilities</td>
</tr>
<tr>
<td>4</td>
<td>Termination</td>
<td>Awareness of time constraints</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Procrastination versus panic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sadness versus elation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Letting go</td>
</tr>
</tbody>
</table>

This method also focuses more on accomplishing a task rather than developing relationships, although relationships will determine how well the task is accomplished, and if attitudes toward working in groups are positive or negative.

Table 2 presents a summary of two major indirect variables that impact the classroom environment, instructor variables and student variables. These are mainly intraindividual variables that are a result of the interaction of prior learning, personality, and culture. They are also most likely to be influential on a non-conscious level, although capable of being understood and controlled by the individual. One of the most important variables for this discussion, is the cultural attitude(s) toward and about women and other racial/ethnic groups. These primarily unconscious, or nonconscious, internalized values and assumptions dictate behavior in and out of the classroom.

Table 2
Indirect Classroom Variables

I. Instructor Variables
   a. style of teaching
   b. assumptions held about students, subject matter, self
   c. knowledge of subject matter
   d. cultural heritage
      -role of instructor
      -expected behavior of students
      -attitudes to and about women
      -attitudes to and about other racial/ethnic groups

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1994 WEPAN National Conference
Table 2
Indirect Classroom Variables (continued)

II. Student Variables
   a. style of learning
   b. maturity level (cognitive)
   c. assumptions held about instructor, self, subject matter
   d. cultural heritage
      - role of instructor
      - expected behavior of students
      - attitudes to and about women
      - attitudes to and about other racial/ethnic groups

This process demands much from the instructor in terms of preplanning and monitoring, and relates to the principles of undergraduate teaching as listed by the American Council on Education (1989).

Table 3
Principles of Undergraduate Teaching
1. FACULTY-STUDENT CONTACT  The quantity and quality of student contact both in and out of class increases student motivation and involvement.
2. COLLABORATIVE VERSUS COMPETITIVE  When students are expected to collaborate teachers find that benefits include improved thinking and deeper understanding.
3. ACTIVE INVESTMENT IN LEARNING  More learning takes place when students relate and apply material to "real world" situations.
4. APPROPRIATE, PROMPT, AND TIMELY FEEDBACK  Systematic, feedback promotes focused learning, and highlights that which is unknown in time to be learned.
5. TIME MANAGEMENT  Students have to be taught that time + energy = learning. That is, how to estimate and use time effectively, have realistic expectations, and how to stay focused on essentials.
6. EXPECTATIONS OF STUDENTS  Having high and realistic expectations of students promotes investment and learning. Expectations should be focused on quality, not on quantity.
7. RESPECT FOR DIVERSE WAYS OF LEARNING  Realizing that there are numerous ways to learn, and that one way is not necessarily the "right" way.

It is crucial that the instructor have a clear understanding of what he/she wishes to accomplish, and have planned and structured class material to incorporate group work. One need not be an expert to use this method. Attention to preplanning, monitoring, and details will suffice.

The described method involves four phases; planning and implementing, team building, working and termination.

Phase 1 - Planning and Implementing
Planning
Purpose: What is the purpose of the group? Why a group rather than individual work?
   - promote interaction
   - break a large task into manageable small tasks
   - develop a team approach to solving problems
   - assess ability(ies) to function as a team member
   - provide hands-on experiences
Phase 1 - Planning and Implementing
(continued)

Objectives: What, specifically, is the group to accomplish? What steps need to be taken, in what order, to accomplish these objectives?
Materials: Written guidelines, instructions, software, process for accessing computers and other needed materials, days and times the instructor is available for consultation.

Implementing

Explain task - There are numerous ways to explain the process of a project. One way that explains and diagrams the process is PERT, Program Evaluation and Review Technique. PERT may be especially appealing to engineering students because it can be diagrammed. An explanation that uses PERT, or something similar, is recommended, especially when groups will be expected to do most of the work on their own. It allows for an orderly sequence of activities, notes the critical events that must occur and when they must occur, and provides a framework for dividing up the work for group members. An additional benefit is that students learn this process.

Forming groups - cluster women and/or minorities to have two more in each group. If there is to be more than one group experience in the class, reform groups each time. If ability levels are known, have a diverse mixture in each group.

Expectations of members -
- each member will take a turn (may be more than one turn per person) writing and submitting minutes of group meetings.
- each member will make a significant contribution to the project or task.
- meeting dates and times will be set to accommodate all group members and all are expected to attend all meetings. Minutes of each meeting will be kept and handed in to the instructor weekly. Minutes will note members attending and those absent. Major decisions, and task assignments.
- Minutes accomplish several objectives; they provide the instructor with information on each group that allows monitoring and can suggest interventions, they require students to practice professional reporting, and can help keep the group focused on the task. If a group should fail to turn in minutes or submit inadequate ones, the instructor can take steps to get the group on track or to identify the problem(s).

Group behavior in Stage 1 - Confusion, resistance exemplified by asking questions that are answered in guidelines and instructions. Struggle for leadership, trying to set or determine group norms, sorting out how or if one "fits" in.

Team building exercises help at this point as do continued class meetings. For example, have groups hold first 2-3 meetings during class time so that the instructor can monitor the groups, provide direction, clarify concepts. These meetings may be short, 20 minutes.

Team building exercises help group members reorganize similarities. (Groups form around similarities and dissolve around differences). These exercises also make it difficult for members to be ignored, discounted or isolated. They are also used extensively in business settings, and take relatively little time to implement.

Phase 2 - Team Building

There will be conflict in the group, and groups are more productive when conflict is worked through rather than being ignored or squashed. The instructor is most useful for conflict resolution, and this is why groups need to submit minutes, the instructor needs to check in with each group, observe group process, and be involved. A hands-off approach does not produce the quality of learning that the instructor involvement does. The following process can be used for conflict resolution.
Phase 2 - Team Building
(continued)

1. **Define the conflict.** Conflicts arise over differing values, attitudes, and/or perceptions. The instructor can pick up on potential conflicts by reading the minutes. Students are absent from group meetings for some reason(s). Absence from several meetings means that there is a conflict of some sort in the group, unless the student has dropped the class.

2. **Clarify the opposing views of the conflict.** There are always two or more perceptions of the same conflict. The instructor can help all views understand the varying perceptions. It is also at this point that the instructor can mediate or even dictate the direction. For example, if conflict has arisen over which part of the project to first complete, the instructor can make a decision. End of conflict.

3. **Propose solutions.** It can be relatively easy to generate possible solutions. Allowing all members to suggest solutions promotes investment in the solution and increases investment in the project.

4. **Use consensus to arrive at the solution.** Do not vote - that produces winners and losers. The team (group) needs every member to buy into the solution. Be sure to have each member indicate their willingness to be a part of the solution.

Phase 3 - Working

The instructor serves as a consultant, trouble shooter, and mentor. The students are doing the needed work and need support more than anything else from the instructor.

Phase 4 - Termination

All groups end at some point. It is very useful to have a definitive ending of the group, not just of the class ending. One way of doing this is to have the students discuss, in their group, the group experience of working together, and generate a list of positive points and suggestions for changes. This discussion may take 20 minutes at most.

**Summary**

The process described for class groups has the potential for increased student learning and satisfaction. While it demands a commitment from the instructor, it also provides far-reaching benefits for the class and for students who graduate from the engineering program. It has the main benefit of including women in a viable, productive way that uses their unique talents and abilities. It has a side benefit of teaching males to work with women as peers.