

# **Student Work Group/Teams: Current Practices in an Engineering and Technology Curriculum Compared to Models Found in Team Development Literature**

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## **Introduction**

This paper presents the findings of a research survey/questionnaire (hereafter referred to as a survey) project conducted by the Organizational Leadership and Supervision (OLS) Department of the Purdue School of Engineering and Technology at Indiana University Purdue University at Indianapolis (IUPUI). The survey, distributed to all faculty and students in the school, sought information related to the following topics: formation of teams, frequency of classroom usage, evaluation of team projects, grading of team members, benefits and challenges in the use of teams, and attitudes of professors and students toward the use of teams in the classroom. The survey was effective in producing informative and interesting results.

In addition to the findings, this paper provides a model for appraising any engineering and technology school's current practices in the use of student work teams and focuses on "best practices" found in team development literature. This information is immediately applicable and valuable to those desiring to improve the outcomes and performance of teams currently operating in classroom situations.

A student learning team consisting of six students and one professor designed the student and faculty surveys. The process was similar to that used in industry and utilized a focus group of students and faculty to design questions intended to discover the perceptions and realities of student work teams. The team members were selected from the OLS Department within the Purdue School of Engineering and Technology and were coached and facilitated by the professor. The professor supervised the research and writing of this paper. The student learning team provided distribution and pick-up of the survey and Scantron© answer forms to all of the school's departments. Survey answer forms were tabulated, and statistical analysis performed, by the Integrated Technologies Department of the university

## **Definition of student work groups/teams**

Well-structured student work groups/teams are very similar to high performance teams found in business and industry. Katzenbach and Smith surveyed industry and found that, “A team is a small number of people with complementary skills who are committed to a common purpose, performance goals, and approach for which they hold themselves mutually accountable” (1993, p.37). The authors propose the following definition for the student work groups/team process: *Student work groups/teams (hereafter referred to as teams) are teams of students working together in a group small enough so that everyone can participate on an assigned task.*

### **Findings of the IUPUI Faculty Survey regarding student teams**

In 1996, IUPUI commissioned a university wide survey of all full-time faculty affiliated with 16 academic schools on the IUPUI campus. In the 1996 IUPUI Faculty Survey, responses were received from 708 of the 1,356 faculty to whom surveys were sent, for a 52% response rate (1996, p. 1). The 1996 survey statistical results Display A3 reports the School of Engineering and Technology response rate at 47.2%, from a school that makes up 4% of the IUPUI faculty population (1996, p. 1). The survey was designed to incorporate a variety of items previously used in other survey instruments. Particular interest was given to the items noted as being used from the 1994 Faculty Use of Technology Survey, specifically the question regarding the use of study teams/group assignments. Table #5 of the 1996 survey reveals that in the 1994 survey 30.2% of the full-time faculty currently use study teams/group assignments, while 4.1% would like to use them. This contrasts sharply with the 1996 results that show 24.0% currently use study teams/group assignments, while 9.0% would like to use them (p. 10). Surprisingly, the survey statistical results in Display A25 show that of the 16 schools at IUPUI currently using teams, the School of Engineering and Technology has the highest percentage of use (72%) while the Schools of Law and Medicine were the lowest, both reporting use of teams at 7% (p. 22).

The 1996 survey states, “More women indicate a desire to use team teaching in the future, whereas more men would like to use video materials” (p. 9). Perhaps this indicates that men are more reluctant to interact with students than women are. The survey statistical results in Display A25 inform us that of the 24% currently using study teams/group assignments 33% are female and 20% are male. Considering that, according to the survey statistical results in Display A7, females represent only 12% of the responding faculty from the School of Engineering and Technology at IUPUI (p. 4), it seems unlikely that the use of student teams within the school will increase anytime soon. The decreasing usage of teams at the university level is unfortunate since, according to Doug Jones, “The only reason for applying empowered team concepts in the classroom is to improve the process of education and increase the likelihood of students reaching three basic goals of their educational system: 1. Learning their subjects (including all of Bloom’s taxonomy)... 2. Learning how to learn... 3. Building a commitment to learning” (1996, p. 80). The trends revealed in the data become particularly disturbing in light of what we traditionally assume to be the mission of the university and its schools.

However, it may be much more difficult to gain the acceptance of teams in the classroom than in industry. Jones continues, “Teams in business are enmeshed in a support and accountability structure that permeates their activities, both in and outside of the team, [while] this is not the case for student teams” (1996, p. 85). Accompanying this statement are the

disturbing results reported in the 1996 survey statistical results Display A25. The results reveal that current team usage is divided by rank. Nineteen percent of full professors, 32% of associate professors, 24% of assistant professors, and 11% other (i.e. lecturers and visiting professors) currently use teams in the classroom (p. 21). Perhaps educators are reluctant to use teams in the class room because, as Jones tells us, “The systems interactions that plague the traditional education process are also in effect when incorporating teams into the classroom - the student who is *just after the grade* is still there whether teams are used or not” (1996, p. 82).

### **Findings of the OLS Student/Faculty Team Survey**

The Purdue School of Engineering and Technology at Indianapolis is comprised of seven departments. Of the 72 faculty in the school, 23 participated in the OLS Student /Faculty Survey. Twenty of the respondents are male. Faculty ages range from the early 30’s to over 50. Ten of the respondents are tenured faculty and the rank ranges from full professor to visiting lecturer. Courses taught range from first year college level to graduate level. Ninety one percent of the respondents report the use of teams in their classrooms. Thirty nine percent determine the membership of the teams while 43.5% allow the students to form their own teams. Thirteen percent of the faculty likes to use teams in all cases, 73.9% like to use teams under certain circumstances, while 8.7% of the faculty dislike the use of teams but recognize their value.

There are 1,953 students in the Purdue School of Engineering and Technology at Indianapolis and 486 of them participated in the “Student Work Group Experience Survey.” Twenty two percent of the respondents are female, 66.7% are under the age of 30, and 61.4% have at least 98 overall credit hours with 89.1% of the credit hours being from the School of Engineering and Technology. Fully 70.2% of the student respondents have participated as a member of a work team at their place of employment. Seventy six point six percent of them have been involved as members of student work teams, and an incredible 97.55% of them have participated in at least 12 student teams within the School of Engineering and Technology.

There is no question that teams are being used in the classroom, but are they prepared and are they being used effectively? The response to question 26, “In general, which of the following best reflects your attitude toward student work groups?” gives an indication of the answer to our question, with 74.6% of the students stating that they either like teams or like them under certain circumstances. When the results to question 26 are combined for students and faculty the response to the question indicates that 66.2% of them either like teams or like them under certain circumstances. It is encouraging to see that there is enthusiasm for the use of teams on projects within the school and in fact a paradigm shift may be taking place as students use their team experiences to achieve new ends, but they do not achieve these ends without effort. “Results from the past four years of experience suggest that we are succeeding in encouraging students to view science as the application of a body of knowledge to a collaborative process of organized investigation, not just a mass of facts to be memorized. At the same time, curricular reform ... puts new pressure on students to work together effectively in small groups and to master unfamiliar types of learning tasks” (Miller et al., 1994, p. 33).

## Overview of Survey Results

Survey results showed that some students did not perceive it valuable to their career to participate in student work teams. Many departments within the school do not teach or require their students to participate in courses that provide instruction in team dynamics. If neither the student or professor values participation in teams in the classroom, it should not come as a shock to find that students disagree about whether or not they learn effective group processes in the classroom. There was no significant difference regarding the questions with respect to the gender of the student. Older students perceive a need for more class time to complete team projects. In contrast, students with a greater number of credit hours at the university feel they received enough time in class to complete team activities in comparison to students with a greater number of credit hours within the school who felt that time was short. Students with more credit hours expected to spend more time outside of class to complete their student team projects, as did students who had previous involvement in a student team.

Previous experience with a team at work resulted in the feeling that work completed by the student team members would not be equally shared and this feeling was echoed by students that had participated in previous student team projects. Indeed, similar student perceptions of group work were summarized in research conducted by Duin (1990). Complaints such as “none of the other members do their share,” “other members do not meet deadlines,” and “I end up doing most of the work” summarize student perceptions of group assignments. Conflict occurs not about the content of the assignment but over dysfunctions in the group process. Problems about work distribution, levels of commitment, and domineering individuals occur regularly in some business communication group efforts (Morgan et. al., 1987). Whatever the source of the team dynamics training provided to individuals participating at work or at school, it seems to be inadequate in terms of achieving the goal of synergy. Students with prior team experiences also have a stronger feeling regarding the issue of whether the student team project grade should affect the individual’s final grade, with a significant number weighing in on the side of no effect.

Doug Jones seems to echo the sentiment of many students regarding the establishment of student teams when he points out the prerequisites that must be considered. “There are three principles to the formation of effective student teams: 1.Group dynamics training - Provide student teams with basic training on team member responsibilities and accountability, problem solving skills, planning techniques, and group dynamics. 2.Designed in accountability and responsibility - Ensure that individual accountability and responsibility extends beyond the boundaries of the team. 3.Frequent team meetings and frequent small outputs from the team - Ensure an early and high level of team member interaction” (1996, p.84-5). If we expect student teams to be successful then we must provide them with ground rules and expectations of performance, if not we run the risk of sub-par performance.

## Conclusions

It is obvious then that a number of things operate to hinder the development of a successful student learning team. The university and the faculty are instrumental in providing the environment in which success will occur, but they will have to remain diligent to make sure the

environment is in place. “For maximum change to occur, a group must possess... a learning culture. In permanently structured groups, these ingredients may already be present. However, in most instructional situations, where students usually meet for short periods spread over weeks or months, instructors must create and develop the requisite structure and processes of the group” (Olmstead, 1974, p. 92). But this is a formidable task in an educational environment that is not supportive of the collaborative team process. “The competitive nature of our colleges and universities, our system of evaluation, our past educational experiences, even our academic calendar all create obstacles to successful collaboration. The collaborative learning model, in fact, runs directly counter to our own professional training and reward system” (Ede, 1987, p. 8). Professors operating under time constraints in the classroom and racing the semester calendar to arrive at the successful completion of course material may be tempted to forgo the proper presentation of team dynamics principles, but this can be a foolish thing to do if project grades hang in the balance. “Although most teachers are understandably reluctant to spend valuable class time discussing group process, we suggest that the student disengagement that results from major problems in group dynamics makes the investment of one class period in group work skills well worthwhile. We should teach the skills that we are grading” (Miller, et al, 1994, p. 42).

Formation and maintenance of teams is not easy but the outcomes are worth the effort. “Teams typically outperform individuals when the tasks being done require multiple skills, judgment, and experience” (Robbins, 1995). Indeed, “teachers are faced with a difficult trade-off when they form groups: Cognitive diversity increases group conflict and thus decreases satisfaction, but it also improves performance” (Miller, et al, 1994, p. 38). This performance increase is echoed in the experience of industry. Texas Instruments’ defense group gave self-directed teams credit for helping it win the Malcom Baldrige National Quality Award and for allowing it to achieve the same level of sales with 25% fewer employees (Hillkirk, 1993). The Edy’s Grand Ice Cream plant in Fort Wayne, Indiana, introduced self-managed teams in 1990, and attributes to them the plant’s 39% reduction in costs and 57% increase in productivity (Kirker, 1993). These business success stories did not occur without training and preparation for the work force in areas related to team dynamics and the same holds true for education. “One cannot simply throw students together with their peers with no guidance or preparation and expect a successful collaborative learning experience to result. In fact, to do this would most likely be to perpetuate, perhaps even aggravate the prevailing negative effects of peer group influences: conformity, anti-intellectualism, intimidation, and a drop in quality. To counteract these possibilities requires the instructor to create and maintain a demanding academic environment, one that makes collaboration a genuine part of student’s educational development” (Bruffee, 1984, p. 651).

We can not expect students to learn the principles of team dynamics at home with the family anymore than we could expect them to learn the principles of thermal dynamics in the garage behind the house. Accidental or self-learning can not be depended on to occur in the vacuum of a lack of training, for as Peter Drucker tells us, “the only things that evolve by themselves in an organization are disorder, friction, and malperformance” (Deep and Sussman, 1990, p. 157). Students who learn the process of team dynamics and incorporate it into their self-directed set of performance behaviors can transfer those skills to other situations. Transferability of these skills means that the student can make use of these skills at work, and at home. Students

in possession of a repertoire of team dynamics skills and experiences will enter their post-college years with the ability to be proactive in producing opportunities for leadership and cohesion among work teams and family teams. Universities involved in providing students with team dynamics skills will truly be building bridges to the twenty-first century.

#### **FINAL NOTE:**

This paper is the condensed version of a much longer paper. The survey itself and statistical treatments on many of the items in the survey and an explanation of their implications have been removed. If you wish the entire paper and a copy of the survey you may e-mail your request to the primary author, Cliff Goodwin, at [goodwin@engr.iupui.edu](mailto:goodwin@engr.iupui.edu)

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