Strategic Collaboration and Retention of First-year Technology Students: An Instrumental Case Study of Woman-Friendly Peer Mentoring in a Mixed-Sex Classroom

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Abstract: *Over the past 20 years, U.S. colleges and universities have developed numerous programs to attract and retain women in science, technology, engineering, and mathematics (STEM) disciplines by addressing their special interests and concerns. However, women-only classes and programs, more widely adopted in the U.S. than in Europe, are now under assault. Facing increasing political and legal pressures, American colleges are opening classes, programs, and scholarships previously available only to women and minorities, to males and non-minorities. This is creating a need to develop STEM courses that attract and retain both women and men. This instrumental case study investigates the use of a team mentoring approach employed in a mixed-sex Purdue University College of Technology freshman seminar designed to achieve this goal. Qualitative differences in student responses to the 1-mentor and 2-mentor design are compared.*

Introduction

Women are less likely than men to be attracted to careers in science, technology, engineering, and mathematics (STEM) disciplines. Those who do enrol in college and university programs in these fields are more likely to drop out before graduating than are their male peers (Seymour 1999; Seymour and Hewett 1997). By 2003, 211 projects had been funded by the National Science Foundation to attract women to and retain them in STEM disciplines (National Science Foundation, 2003). Despite the more than $90 million that had been invested in these projects, there had been no substantial gains (Freeman 2004; Huang, Taddese, & Walter 2000). Moreover, much of the progress that women made in these areas has stalled or eroded (National Council for Research on Women, 2001). The gender gap has closed in the so-called "softer" STEM fields – biology, medical sciences, and health sciences – yet the gender gap in engineering, technology, and computer sciences persists (Clewell and Campbell, 2002; Cronin and Roger 1999).

Over the past twenty years, colleges and universities developed numerous women in science and women in engineering programs to address this problem. The programs are highly diverse in terms of their support, structures, and activities (Knight & Cunningham, 2004). However, women-only classes and programs at colleges and universities in the United States, one of the most common approaches to the problem, are now under assault nationwide. Facing the possibility of litigation, colleges and universities are opening classes, programs, and scholarships previously available only to women and minorities to non-minorities and males (Glater, 2006). In European countries such as France, Austria, and Slovakia, single-sex classes are often viewed negatively. Hence, women in these countries tend to avoid such programs as are available (Sagebiel & Dahmen, 2006).

Students who develop personal relationships and a sense of connection to the campus community are more likely to remain in school through graduation (Bean & Eaton 2001). This is particularly important to women and minority students (Tinto, 1997). Peer mentoring, even for a short period of time, results in greater satisfaction with the university (Sanchez, Bauer, & Paronto, 1989), and has a positive impact on the retention and performance of first year students (Budney, Paul, & Bon, 2006).

Upcraft and Gardner (1989) examined strategies that enhance student success, such as orientation and mentoring. The one they deemed most effective was the freshman seminar. This paper focuses on two semesters of a Purdue University College of Technology freshman seminar, OLS 100 *Introduction to Organizational Leadership*, which enrolled both men and women. The seminar incorporated orientation and mentoring, as well as aspects of learning communities, as integral components. In particular, the paper examines the Strategic Collaboration team mentoring approach the freshman seminar employed, and compares and contrasts student satisfaction with the 2-mentor design used in the first semester and the 1-mentor approach adopted in the second semester.

Mentoring

Formal mentoring is the "deliberate pairing of a more skilled or more experienced person with a less skilled or less experienced one, with the mutually agreed goal of having the less skilled person grow and develop specific competencies" (Murray 2001, p. xiii). This is the most common form of mentoring found in organizations that have formal mentoring programs. However, as discussed below, there are approaches that do not limit mentoring to a dyadic relationship (Haring, 1999; Kram, 1985).

Many newcomers have concerns about their competence, their ability to succeed, and their ability to navigate the new culture in which they find themselves (Kram, 1985). They often feel isolated and uncertain of exactly how to fulfil their requirements (Olsen, 1993), which can ultimately lead to feelings of alienation (Cawyer, Simonds, & Davis, 2002). The mentoring relationship has the potential of facilitating the mentees' successful transition into their new roles (Murray, 2001). Those who are mentored tend to have greater success than those who are not mentored (Chao, 1997).

Mentors can fulfil both professional and psychosocial functions. Their experience within an organization enables mentors to assist their mentees by sponsoring, advising and coaching them. If the relationship between mentor and mentee develops into one of mutual trust, the mentor can provide role modelling, acceptance, validation, counselling, and friendship (Kram, 1985). Mentors, too, benefit from supporting their junior colleagues by putting their knowledge and abilities to work to help others advance. They can also learn new skills or perspectives from newcomers (Kram, 1985).

Creating formal programs based on dyadic relationships can be extremely difficult. Personality differences, failure to make the goals of the relationship clear, lack of sufficient time for the mentor-mentee relationship to grow, different expectations, and the mentor advancing an agenda with which the mentee does not agree, can leave the mentee feeling as though his/her own goals have been marginalized. If the mentor chooses to leave the relationship, the mentee can feel rejected and alone (Haring, 1999). Additionally, mentors and mentees can find that they have very different expectations about how accessible the mentor needs to be (Haring, 1999).

Designs of Formal Mentoring Programs

Formal, facilitated mentoring programs generally utilize one of three models: grooming mentoring, networking mentoring, or a blending of grooming and networking mentoring models. Grooming mentoring refers to a dyadic relationship consisting of a more experienced mentor and a less experienced mentee (Swoboda & Millar, 1986). The success of this model depends upon the continued participation of both mentor and mentee. The grooming mentoring model "is best suited to those mentees whose needs are to succeed in the institution as it now exists and those who are willing to serve an apprenticeship. Ideal grooming mentors are those who wish to pass along their skills and insights to create a new generation in their own image" (Haring 1999, p. 11).

By contrast, networking mentoring is non-hierarchical, and generally involves more than two participants. Women place more emphasis on group affiliations, community, and collaboration than do men (Ragins & Cotton, 1999). Therefore, they are more likely to prosper in mentoring contexts structured in this way (Belenky et al,. 1986). This is especially important for women in STEM disciplines who are often the only women in their departments and are less likely to be part of a professional network (Chesler & Chesler, 2002). Networking mentoring has mentors and mentee exchanging roles as the situation requires. Each person contributes something to the network for the mutual benefit of all. This model is gaining increasing support (Dansky, 1996). It is generally more flexible and less intense than the grooming mentoring model. There is less concern about whether or

not the participants will be compatible (Haring, 1999; Swoboda & Millar, 1986). This model, with features of grooming mentoring, was modified to create Strategic Collaboration.

Strategic Collaboration

Developed by Wasburn and Crispo (2006), Strategic Collaboration combines features of the grooming and networking mentoring described above with elements of Appreciative Inquiry, which is an approach that specifically focuses on those factors that contribute to a positive culture. Appreciative Inquiry uses positive dialogue to foster future success. It responds to the tradition of action research, a deficit model that views organizations as having problems and proposes the development of an action plan to correct them (Cooperrider, 1986). Appreciative Inquiry refocuses discussions of what does not work within an organization to consideration of what works well and is more likely to lead to the achievement of organizational goals (Cooperrider & Srivastva, 1987).

Strategic Collaboration retains all of the positive benefits of mentoring while avoiding the pitfalls that can plague the mentoring process. It provides a positive group of individuals, two of whom are senior and more experienced, who can fulfil the functions discussed by Kram (1986). They can answer questions, provide information, and ease the transition into the university to help combat the isolation that a new environment, especially one as large and complex as a university, can bring.

Strategic Collaboration does not rely upon individual first year students being selected by a senior student to be mentored. All first year students can be part of a Strategic Collaboration team. Personality differences are not nearly as important in this context since no one relationship is privileged over any other. With two senior members in each Strategic Collaboration team, junior members benefit from having more than one perspective on a given topic.

As can be seen from Figure 1 below, through each phase of the process described below, trust must continue to be built. Trust is the essential building block upon which any coaching or mentoring process rests. Being part of a team means, among other things, that members make themselves vulnerable. Junior members must be assured that nothing they say or do during the process can or will be used against them by the senior members of the group (Hunt & Weintraub, 2002).

The four phases of Appreciative Inquiry, Discovery, Dream, Design, and Delivery (Cooperrider, 1986), were incorporated into the model. Taken together, they form the process piece. It is in these phases the real work of the group is accomplished.

The Discovery phase encourages the Strategic Collaboration team members to compile a list of strengths in the form of skills and abilities they bring to the department and university that can contribute to their success. These might include mathematical expertise, facility with interpersonal communication, and abilities such as music or dance.

During the Dream phase, team members assess the strengths that they identified during the Discovery phase, and determine how those strengths can be used to build their future. This stage can be viewed as analogous to a brainstorming session in which creative ideas, regardless of their merit or lack thereof, are considered and then accepted or rejected on a consensus basis.

The Design phase is an opportunity for the Strategic Collaboration team members to determine how they can leverage the strengths that were identified in the Dream phase to plan their futures. In which kinds of positions would their interests and abilities be put to best use? Are their courses and extracurricular activities leading them in that direction? If not, what changes should they make to better achieve their goals?

The Delivery phase is one in which a career development action plan is created for each junior member of the Strategic Collaboration team. Their career plans show the junior members how to select their courses and extracurricular activities to support their career goals. Since Strategic Collaboration is a dynamic model with a cyclical design, the Delivery phase leads back to the Discovery phase where the new skills that have been acquired are again considered with a view toward the student's future, beginning the process once again.

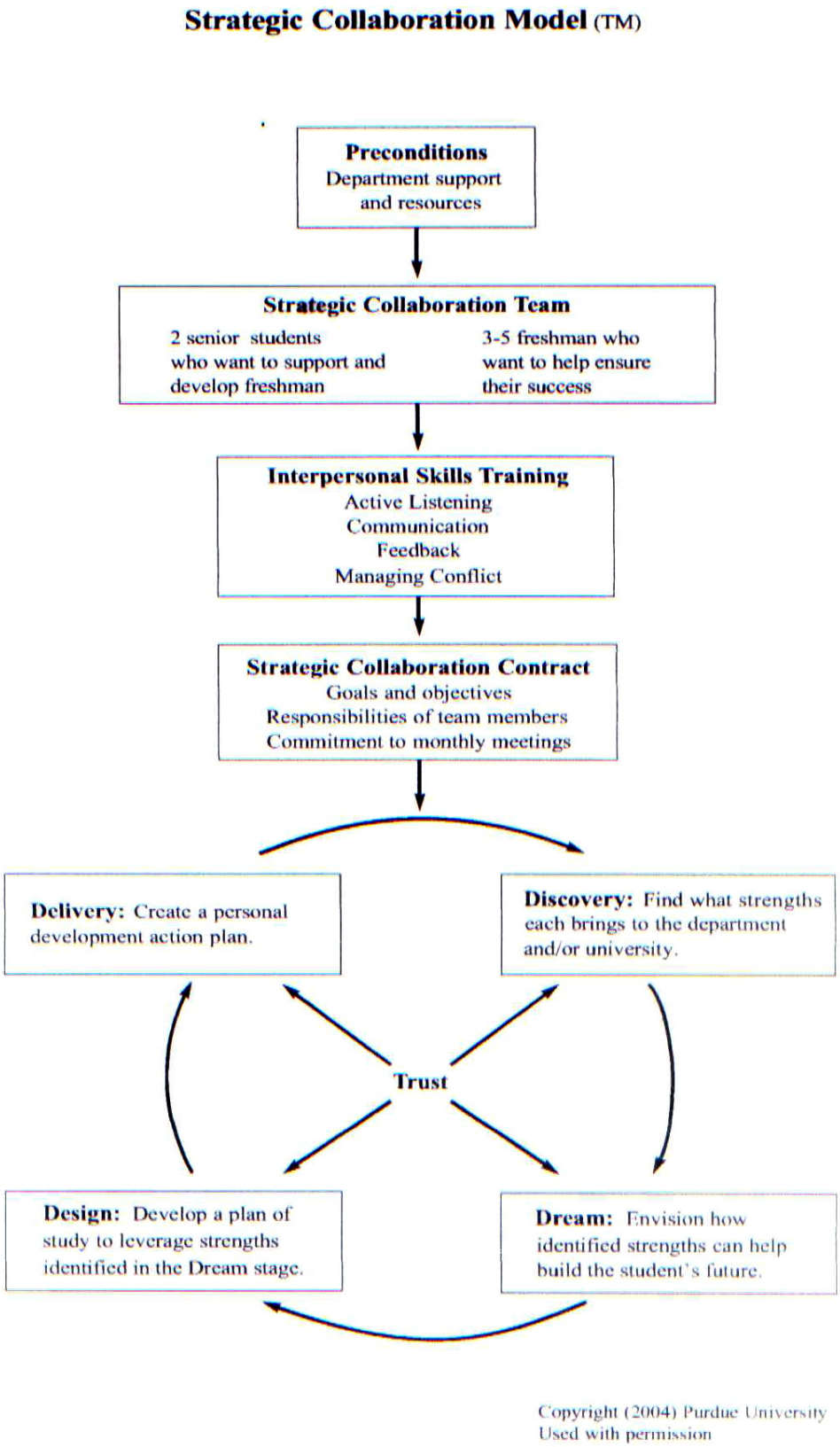

Figure 1: Strategic Collaboration model

Developing the Organizational Leadership Freshman Seminar

In Fall 2004, the Department of Organization Leadership (OLS) in Purdue University's College of Technology required all incoming first year students to enrol in OLS 100, a 1 credit hour freshman seminar. The objectives of the course were to meet the OLS faculty; to learn about the courses they would be taking, to meet the students in their cohort, and to meet regularly with upper class student mentors. At the same time, the students were also enrolled in a human behaviour survey course. The fact that these courses were taken in the same semester enabled students to form a network of colleagues with whom they would take classes and work on group projects throughout their four years.

Peer mentoring has been found to be related to students' satisfaction with their university (Sanchez, Bauer, & Paronto, 2006). Peer mentors were used as an integral part of OLS 100. They were selected by their grades, leadership, and extracurricular activities. A related course on coaching and mentoring, taught by the same instructor, was offered to the peer mentors so they could apply what they learned to mentoring their group of students. They were also given interpersonal skills training to help them interact effectively with their mentees. During this class, the mentors discussed their mentees' progress, and any problems that had emerged. The class as a whole then helped brainstorm a solution.

The syllabus for OLS 100 was developed such that all of the Organizational Leadership professors had an opportunity to come to class, and describe and promote the courses they taught. In that way, the students were introduced to the curriculum in a more personal way. The first year students were expected to take notes so that they would be able to write a brief reaction paper in response to each professor's discussion. The mentors were asked to research each class in advance, particularly those they had not taken themselves. During the last 15 minutes of class, the mentors met with their assigned groups to discuss what they had just heard, and to give their individual perspectives on the courses.

Five times during the semester, each Strategic Collaboration team met outside of class to help the first year students leverage their strengths, plan their course work accordingly, and discuss any obstacles they might have encountered. Additionally, each meeting had a topic identified by the student mentors as the most important things they wish they had known as first year students, topics such as: how to ensure that your professors get to know you, how to prepare for exams; and how to select extracurricular activities. Following each out-of-class meeting, the mentors were expected to write a detailed evaluation of exactly what transpired, including strategies for improving the next session.

Methods and Procedures

Data were gathered on the first year students enrolled in each of the two semesters of OLS 100. The goal was to capture the mentees' lived experience as participants in the mentoring team. The author employed an instrumental case study approach, which uses a particular case to gain insight into an issue or theory, in this instance the participants' differential responses, if any, to a 1-mentor and 2-mentor Strategic Collaboration design. In this type of investigation, details of the experiences of the particular mentoring team contribute to the understanding of the uniqueness and complexity of the case but are less important than the fact that the team serves to illustrate the potential viability of the approach to facilitate the students' integration into university life (Stake, 1995).

There were 52 incoming first year students (37 men and 15 women) and 11 mentors (8 men and 3 women) in fall 2004, and 49 first year students (35 men and 14 women) and 12 mentors (9 men and 3 women) in fall 2005. Each mentor was assigned 4 or 5 students. During the first semester, the 5 out-of-class meetings were structured such that the mentors shared responsibility for regularly attending one meeting with their assigned group and one with a second group for a total of ten meetings per semester. In that way, each student had access to two mentors during the semester. By contrast, during the second semester, each student had only 1 mentor during the 5 out of class meetings. The intent was to hold the rest of the class constant, changing only the number of mentors assigned to each group, in order to assess whether or not the 1 or 2 mentor design affected student satisfaction with the course.

At the end of each semester, all Purdue University courses are evaluated using an instrument developed by their Division of Instructional Services. There are seven closed form questions and a space provided specifically for explanatory comments. The structured questions are rated on a 5-point Likert scale with responses ranging from strongly agree to strongly disagree.

The quantitative data were triangulated with the comment sections of the course evaluations, as well as the data from another Strategic Collaboration group (Wasburn, 2007). However, studying the 101 students enrolled in two sections of OLS 100, with one section serving as the comparison group for the other, limits the inferences that can be drawn. These students may have very different experiences from their cohort in other majors and/or at other universities. Because the instructor and the syllabus were identical both semesters and the findings are consistent with the literature cited above, the course evaluations, particularly the students' comments, will permit some limited inferences to be drawn.

Findings

The first five structured questions focused on instructor expertise, preparation for class, concern for student learning, and the practical applicability of the course material. The last two questions asked for an evaluation of the course and the instructor. Comparing the course evaluations of the two semesters, the percentages were either identical from one semester to the next, or within three tenths of a percentage point of one another. The quantitative results, when viewed alone, suggest that the students were equally satisfied with both of the courses, and that whether a 1-mentor or 2-mentor design was employed was irrelevant. However, the student comments, presented below, tell a different story.

Twenty-seven students used the comment section during the first semester and 24 students did so during the second semester. By far, most of the student comments concerned the mentors. Nineteen of the 27 students (70.4%) who used the comment section referred to the mentors during the first semester, while only 11 of the 24 students (45.8%) discussed them during the second semester.

In the first semester, 2 mentors were assigned to each group. Thirteen of the 19 student comments (68.4%) praised both mentors assigned to their group and to the out-of class meetings:

Our mentors were awesome. They just know so much about Purdue … (Mentor's name) took my math class and had the same problems I did! (The other mentor's name) knew all the clubs.

I thought all the mentors would be guys. It was great that one of our mentors was a girl. So many guys are in the class that you don't expect it.

The regular mentor we had was really good. I got to know him better than the one that was just at the meeting, but he was really great too. It was neat having them there to ask questions.

Another 5 students (26.3%) gave the mentors mixed reviews:

I don't know how you choose (the mentors) but ours didn't take it seriously. She even missed some class meetings. It's a good think we had (other mentor). You need more like that!

(Mentor's name) just sucked! He seemed like he was bored with the whole thing. (Other mentor's name) had to do the work of two, and she did. I can't say enough good about her.

Only 1 student found fault with both mentors:

I didn't have anything in common with (the mentors.) I don't think they tried very hard with me. They seemed to spend more time with the others, which is OK, but I still think they should have tried.

During the second semester, only one mentor was assigned to each group. Of the 11 students who mentioned the mentors in the second semester, 4 students (36.4%) had high praise for their mentors:

I think we had like the best mentor. I can't believe anyone could do so many activities, play (a sport) and still do good in school. He's got me thinking about what groups I should join.

(Mentor's name) and especially our group made the class a great experience for me. We all got along so well, and we got so much out of listening to him. He knows so much about Purdue.

The other 7 students (63.5%) were less enthusiastic about their mentor:

I think (mentor's name) really tried, maybe too hard. She talked so much she didn't give us a chance. We were just like looking at each other. It was like another lecture. How do you tell her?

The mentor we had was too shy for this or something. He couldn't think of things to say. Sometimes I felt like I was the mentor jumping in when the silences got too long.

It would have been nice to have a girl for a mentor. I know everyone couldn't have one, but still. I think you should try to find more girls to do this next semester.

Discussion

The 2-mentor design employed in the first semester resulted in 18 of the 19 students (94.7%)

expressing satisfaction with at least one mentor. This is consistent with the data from another Strategic Collaboration group (Wasburn 2007), whose members found great benefit in having two mentors. Only one OLS 100 student expressed dissatisfaction with both mentors. However, in the second semester 7 of the 11 students (63.5%) were dissatisfied with the mentoring portion of the course.

This study argues that Strategic Collaboration can retain the benefits of more traditional mentoring arrangements while avoiding the pitfalls that can plague that process. Moreover, a 2-mentor design appears to result in more satisfaction than a 1-mentor design. Since Strategic Collaboration is focused on leveraging strengths, the team functions as individual mentors should by helping the mentees move more quickly toward their academic and extracurricular goals. As trust is built into the model, the Strategic Collaboration team should also be positioned to provide role modeling, acceptance, validation, counseling, and friendship (Kram 1985). This was evidenced by the comments of the mentees, who said their groups were an important part of their satisfaction with the class.

Since it relies on the group, rather than the individual, Strategic Collaboration avoids many of the problems that plague dyadic relationships. Personality differences, which can doom a mentoring relationship, are not nearly as important in this context since no one relationship is privileged over another. With two senior members in each team, each junior member benefits from having more than one perspective on a given topic, and a broader knowledge base than any one mentor could have.

The creation and evaluation of similar projects throughout the coming years can provide insights into the model's potential for mentoring first year students at other colleges and universities. While the details of the OLS 100 project may not be found in the mentoring programs of other colleges and universities, the value of the instrumental case study does not depend on being able to defend the typicality of the case (Stake 1995). Instrumental case studies are appropriate for developing theories that facilitate understanding of issues such as pervasive problems within organizations (Stake 1995).

As the comments of the mentees suggest, it may be beneficial to have more care taken with mentor selection, to help ensure that the commitment to fostering student success is present. More care should also be taken to prepare the mentors to avoid the appearance of favoritism, a problem identified by one of the mentees. An effort to actively recruit women as mentors is also necessary, as one of the students remarked, especially in a STEM program where there are relatively few women. Strategic Collaboration is primarily goal oriented, in this case acclimating students to their new environment, and not relationship focused, and that should be emphasized more as future teams are formed.

Conclusion

Selecting an appropriate model for mentoring first year students, when used as part of a mixed-sex freshman seminar, is especially important now that single-sex programs in the STEM disciplines are less viable. Such programs can help support students' successful integration into university life. This is particularly important for women who are less likely than men to be attracted to STEM disciplines and who are more likely than men to leave these programs before completing their course of study.

By combining the strengths of mentoring and Appreciative Inquiry, Strategic Collaboration, using two peer mentors, as described in this article, retains the benefits of mentoring while largely avoiding its potential pitfalls. Future research is needed to determine the extent to which implementation of a freshman seminar that uses Strategic Collaboration, as a component, is successful in helping to foster student acclimation to campus. The model can be customized to meet the needs of a particular university, college, or department. It can then be applied to developing all their incoming students, both men and women, to help ensure that they will be more likely to remain to graduate.

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