

Web-based Mentoring: challenging traditional models to increase women's access

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ABSTRACT *Mentoring relationships can support college students as they strive to develop a sense of career-related identity. However, many students, especially college women pursuing non-traditional careers such as those in the sciences, face barriers to mentoring. Advances in technology-supported mentoring have increased students' access to mentoring opportunities. Many technology-supported mentoring initiatives are designed with only the traditional dyadic mentoring model in mind, which is limiting. When an alternative networking mentoring model provides the conceptual framework for web-based programmes, new opportunities to gain access to mentoring become visible, and the benefits for mentors and students alike are extended and amplified. Caveats, limitations, and future directions are discussed.*

Young people strive to develop a sense of career-related identity, and this task is difficult and especially salient during the college years (Erikson, 1950). College students can gain assistance in this developmental process via mentoring, which traditionally involves a one-on-one relationship between a more senior person such as a faculty member and the more junior student. Mentoring relationships support the student's development by facilitating the novice's transition from student to professional (Jacobi, 1991; Kram, 1983; Levinson *et al.*, 1978) through the provision of career, academic, psychosocial, and role-modelling functions (Scandura & Williams, 2001). In recent years, researchers have highlighted the complexity of mentoring in women's lives. Even though mentoring is regarded as critical for women's career development (Ragins, 1989; Sosik & Godshalk, 2000), women may perceive (Ragins & Cotton, 1991) and experience greater barriers to establishing mentoring relationships (Noe, 1988).

College women considering non-traditional careers such as those in the sciences may find it even more difficult to establish mentoring relationships. While more students are selecting science majors, at least half switch to other majors during college (Seymour & Hewitt, 1997); women still only receive approximately one-third

or less of computer science, physics, and engineering undergraduate degrees (NSF, 2000). Even the most talented women decide to alter their career plans from science to another field (Arnold, 1995; Linn & Kessel, 1996; Seymour & Hewitt, 1997). While there are many reasons for interested and capable women to be deterred from pursuing science, it is clear that one important reason is their lack of access to women mentors.

When viewed through a 'possible selves' framework, mentors who share similar characteristics to students represent possible selves or images of what students' future lives might be like (Markus & Nurius, 1986). However, it is difficult to continue to envision one's own future possibilities when there are few possible selves to emulate in one's sociocultural context (Oyserman *et al.*, 1995). In other words, when the current scientific community is not yet very diverse, it is hard for young women to look at that community and imagine becoming part of it. Women reportedly search for, but often do not find, mentors in the sciences (Astin & Sax, 1996), let alone women who specifically can shed light on combining their personal and professional lives, a discouraging observation to students who desire such a lifestyle (Eccles, 1987, 1994; Frestedt, 1995). This is problematic, as several studies have concluded that the experience of mentoring within the sciences is critical to the retention of women in the sciences (Muller, 2000; Packard & Nguyen, *in press*; Seymour & Hewitt, 1997).

As a result, increasing women's mentoring experiences in the sciences is a top priority held by many organisations, researchers, and educators. At first glance, the dilemma can be viewed as a something similar to a catch-22. Researchers have argued that we need is to increase the number of women who become science faculty or industry professionals so there can be greater access to women mentors in their local environments in the long run (Astin & Sax, 1996; Basow & Howe, 1979). Yet, with few women in these professions, it is currently difficult to provide access to women mentors—the precise resource that research indicates could keep or even attract young women to pursue careers in these underrepresented scientific fields. Increasing the number of women in higher-level scientific positions is more of a long-term goal to continue to work toward, but the first priority might be to develop innovative ways to provide access to the needed female mentors at the present time.

The immediate focus, then, should be to increase the access students have to the diversity of female science professionals who have committed to the field, even if they are geographically dispersed and inaccessible locally. Moreover, to really make use of the mentoring resources that are available, women students also need to consider men or professionals outside of their field of interest as potential mentors, persons who may differ from them along multiple demographic dimensions but could offer important mentoring functions (Bird & Didion, 1992; Lee, W.Y., 1999). This argument has met with some scepticism because cross-demographic mentoring can be unlikely to form given a multitude of barriers (Dreher & Dougherty, 1997; Hansman, 1998); however, current studies report that cross-gender and cross-race mentoring is successful when it does occur (e.g. Blake-Beard, 1999; Sosik & Godshalk, 2000), so giving students the option to decide by providing the initial

access is recommended. Thus, facilitating access to a large pool of potential mentors, despite barriers, is key.

Due to advances in technology-supported mentoring, meeting this need is now in the realm of possibility. While face-to-face mentoring still has an important role in the lives of college women, technology-supported mentoring increases access in terms of expanding the realm of who can mentor and be mentored. This is especially important now, when we have a dearth of female science professionals. We need creative solutions, and available technologies can provide some avenues toward meeting these mentoring needs. In the next section, I review relevant literature to illustrate how technology has extended what is possible in the mentoring domain in and out of the curriculum, shedding light on the implications for college women pursuing non-traditional careers such as those in the sciences.

Relevant Literature

Technology-supported Mentoring: extracurricular initiatives

Traditional, non-technology extracurricular mentoring programmes often pair a mentor with a student (e.g. Frierson *et al.*, 1994). Many of these programmes feature a shared research activity where the student acts as an apprentice to the mentor. A face-to-face programme, such as this, has the disadvantage of restricting students to the professionals they meet in their local vicinity. Some programmes allow students to travel to a new area to find a mentor, but that may require a substantial commitment from both parties, above and beyond the considerable commitment required for the mentoring partnership to begin with.

Technology innovations have begun infiltrating extracurricular mentoring programmes, offering experiences that complement face-to-face apprenticeships. For example, programmes have used e-mail to pair up mentors with children, to foster their learning outside of the school day. A resourceful approach has been to recruit the expertise of emeritus faculty members who have the knowledge and time available to mentor motivated youth on topics that spark a student's interest in school but would otherwise not get explored in depth (Sanchez & Harris, 1996). Since availability of mentors is an issue, emeritus faculty form an under-utilised mentoring source. Programmes such as these are flexible and unconstrained by the time restrictions of the school day (for example, it is not necessary to squeeze a meeting in during lunchtime). It can be difficult for mentors to participate in mentoring programmes during the business day if their workplace does not support the programme (Foster, 1999). The use of e-mail at the mentor's convenience makes the mentor's participation less of an intense time commitment.

For college students, specifically women in the sciences, MentorNet (Muller, 2000) is a visible flagship programme. The programme uses email to pair female college students in science and engineering to professional mentors who work in industry. The programme is mutually beneficial, as the college women learn more about science and engineering professions and become part of those networks early on, and industry can scout qualified young professionals. The mentors find

flexibility in using e-mail, and the use of technology facilitates access to mentors across professional fields and distances; the students can expand their mentor pool because mentor pairing is not limited by geography. The student and professional converse electronically primarily about their backgrounds, the mentor's job, and the student's current college experiences and future plan.

Although extra-curricular mentoring programmes have a significant role in supporting students, it is also important to consider possibilities in the curricular realm. By integrating mentoring into the curriculum, professors can convey that they are interested in helping students to explore their career identity while learning course content. Because college students spend a significant proportion of their time in courses or doing course-related work in preparation for careers, the curriculum is an ideal mentoring context, where career development can become more of an intentional part of learning in the curriculum.

Technology-supported Mentoring: curricular initiatives

Inviting mentors into classes to assist students in the mastery of content learning is not a new idea. Numerous programmes have featured docents scaffolding the learning of students. For example, when the help of college mentors has been enlisted in elementary school classrooms to assist children with science projects (Lee, N.E., 1999; Paris *et al.*, 1998). The number of technology-supported initiatives in the classroom has skyrocketed, increasing students' access to content-specialist mentors across the globe. For example, O'Neill *et al.* (1996) designed an e-mentoring project where scientists volunteered to collaborate on seven-week-long earth science projects with high school students. The scientists e-mailed back and forth with groups of students, allowing for personal attention, authentic scientific advice, and more rigorous science projects. In a similar vein, Mistler-Jackson and Songer (2000) determined that three features were most critical to the success of an internet-rich science course: telecollaboration with scientists, authentic questions, and time to develop integrated understandings of the science concepts in context (p. 475). A number of corporations, such as Hewlett Packard, work in collaboration with schools, where they pair adult mentors and students via e-mail to work on entrepreneurial projects (Foster, 1999). Others have paired college students with high school students as they learn about books (Lesesne, 1997) and the writing process (Duin *et al.*, 1994), using email communication to substantiate the face-to-face meetings.

These aforementioned projects have focused on the initiatives in elementary, middle, and high school courses. Mentoring programmes integrated into the college curriculum are also needed, especially programmes that emphasise the career and personal aspects of the disciplines under study by college students. College students considering science careers are often disappointed and discouraged by poor teaching (Seymour & Hewitt, 1997) and lack of relevance their courses seemed to hold for their future careers (Ivie & Stowe, 2000). One programme, designed to reduce attrition in an introductory computer programming class, paired students who were struggling in the course to distance computer science alumni mentors who sent

e-mail to provide encouragement but not tutoring; the attrition rate was much lower and the grades were much higher in this semester compared to other semesters (Stephenson, 1997). The programme may have helped students to stay motivated and committed to their developing career identity while completing a difficult required course.

Summary of Technology-supported Mentoring Benefits

Technology has begun to expand access to mentoring in and out of school, and accordingly the role mentors can have in the personal, academic, and career development of students. Technology-supported mentoring complements and extends what can be achieved by face-to-face mentoring. Reliance on only face-to-face mentoring by faculty or industry professionals may be impractical due to the time constraints these potential mentors face. Personalised attention, feedback on projects, insight or advice on careers, and encouragement—benefits of face-to-face mentoring—can be provided by electronic mentors. Electronic mentors, though, have increased flexibility to establish contact at times suitable for their schedules across geographic distances. As a result, alumni, emeriti faculty, industry professionals, and even seasoned graduate students, with Internet connections, become possible resources to be tapped to support college students. For college women in the sciences, these technology-supported initiatives provide hope for increased access to the valuable resource of mentoring.

A Challenge to the Traditional Notion of Mentoring

Many of the technology-supported mentoring initiatives reviewed thus far were designed with the traditional dyadic mentoring model in mind, simulating the face-to-face apprenticeship model but using e-mail to facilitate contact. Using only the traditional framework of dyadic mentoring to guide programme development is limiting and may provide a disservice to students. The intensive dyadic relationship can often be portrayed in an idyllic manner, emphasising the transformative power of the relationship for both parties, thereby representing the ultimate form of 'true' mentoring (Healy & Welchert, 1990). However, in order to create and maintain intensive relationships, mentors need to invest plenty of time and energy (Ragins & Scandura, 1999), and like other close relationships, personality conflicts (Nolinske, 1995) and other more dysfunctional outcomes can result (Eby *et al.*, 2000). It is impractical to think that all individuals have the time or desire to enter into such a commitment even when supported by flexible electronic means like e-mail. We may overlook individuals who have a desire to mentor if provided with alternative conditions (Yancey, 1998).

Moreover, contemporary feminist scholars of women's mentoring have criticised the traditional dyadic model, calling it male 'grooming' designed to clone mentees and replicate existing culture, leaving little room for women to create new images in their desired field (Blackburn *et al.*, 1981; Powell, 1999; Swoboda & Millar, 1986). Viewing mentoring from the mentee's standpoint, these scholars caution women

against relying on a solitary mentor, due to the risks of becoming overly dependent on the one mentor, the potential weakening of one's professional training due to the lack of exposure to multiple viewpoints, and disappointment in the mentor's inability to be all things to the student (Kram, 1983; Nolinske, 1995; Swoboda & Millar, 1986). Finding one ideal mentor who can provide all mentoring functions is unrealistic, especially for women in science. These critics recommend that non-traditional notions of mentoring, namely networking and other alternatives, replace the traditional model of dyadic mentoring.

The networking model essentially asserts that networking with multiple, less close relationships is more advantageous than relying on one close relationship (Blackburn *et al.*, 1981). The relationships are less intense and require less commitment from the mentor, and students have greater freedom to choose mentors who may provide only one aspect of the mentoring process; in fact, the advantage is actually having various mentors provide different desired aspects of the mentoring process (Burlew, 1991). Because the relationships are less intense, the participants are less constrained by the compatibility issues salient in long-term dyadic relationships, and the mentee can benefit from collegiality with persons from diverse backgrounds, strengths, and viewpoints (Swoboda & Millar, 1986). This model places more responsibility on the mentee, who needs to take a pro-active role in seeking out and maintaining their network of mentors (Nolinske, 1995; Swoboda & Millar, 1986). Thus, networking is not only about 'more is better'—traditional expectations of mentoring are pushed even further to include shorter-term, less intense relationships that may form in unconventional ways. Individuals, groups, and organisations are viewed as potential mentoring resources. This piecemeal approach (Ibarra, 1999) is strategic in nature, where the student can pull distinct features from a diverse set of mentoring opportunities into a composite of a mentor.

Non-traditional Mentoring Conceptions Call for Non-traditional Programmes

Initiatives using the networking model as a conceptual guide are now on the rise. For example, in the face-to-face realm, the PRIDE (Personal and Racial Identity Development and Enhancement) programme was created as a role model-mentoring hybrid, featuring weekly discussions with a rotating pool of visitors who shared their life experiences, capitalising on the consistency and personal attention elements of mentoring, but with less time requirement from the volunteers and yielding positive benefits to the self-esteem and attitudes of the youth involved (Yancey, 1998). While the PRIDE programme emphasised psychosocial and role-modelling functions of mentoring to meet their objectives, others focused more on career functions, calling for a reliance on same-level peers as well as those who are a step ahead (Ensher *et al.*, 2001), team-based mentoring (Eby, 1997), and serial rotations involving several supervisors in the field (Nolinske, 1995). Even more, going beyond what can be derived from relationships, individuals can make use of alternative structures to elicit important career functions of mentoring; these options include systematic assessments from career centres (Dreher & Dougherty, 1997),

attendance at workshops (Hulse & Sours, 1984), or even visible participation in professional organisations (Eby, 1997).

With networking as a conceptual framework for mentoring programmes, technology can facilitate access to mentoring in additional ways besides supporting conversations between a dyad via e-mail. For example, a simple listserv, or a common e-mail list shared by a group of people, brings together mentors and novices nationwide to discuss shared interests (Echavarria *et al.*, 1995). Virtual consulting rooms, where people consult on career matters from long-distance counsellors, or websites that provide guidance targeting 'frequently asked questions' have been identified as important features in the future of career services (Stevens & Lundberg, 1998). Bulletin boards, an on-line environment where individuals can post inquiries, allow mentees to reach out to a large group of people who can provide career-related mentoring (Miller & McDaniels, 2001). These options can be especially useful when the student knows what kinds of mentoring support he or she needs, but does not have a single individual in mind to ask. In sum, the options for using technology-supported innovations in mentoring are both amplified and extended when a networking model provides the conceptual framework.

In the course of my own work, I collaborated with science faculty to create a web-based role model-mentoring hybrid programme that aligned with the introductory college science curriculum (for more information, see Packard & Hudgings, 2002). During the first phase of the project, alumnae in physics from the all-women's college where the project is housed, who constituted an ideal group of potential mentors by virtue of sharing similar baccalaureate origins with the female students, were recruited. They provided narrative descriptions of their daily work and connections between their work and the course's curricular topics, advice for gaining internship experiences, insights into the combination of personal and professional lives, and their strategies to overcome struggles as women in science—written as though they were communicating directly to the students, rather than in the form of a third person biography. In this initial phase of the project, students had no contact via e-mail or otherwise with the alumnae; students completed two assignments, one assignment after each topical unit of the course, where they read and reflected on the profiles of the women they had 'met' on the website whose professional work corresponded to the curricular topic at hand.

In our research on this phase of the project (Packard & Hudgings, 2002), students in an experimental group who used the website in their course were more likely to report non-stereotypical views of physicists' careers and lives than students in a control group taking the same course but not using the website. Both groups perceived that they learned similar physics content, applications, and problem solving. In addition, students in the experimental group reported that they perceived that the alumnae provided helpful advice to them, fostering their excitement about the possibilities that awaited them as women in the sciences; in turn, the alumnae reported that they were happy to participate in the project as they enjoyed giving back to the college and found submitting their information to be a relatively small time commitment. Therefore, a project like this that invites alumnae to participate

in the mentoring of college students can succeed with minimal investment on the side of the mentor yet still provide a valuable experience for students.

With an eye on future development, many possibilities for expansion are readily apparent given the technological tools that are available. The ideas presented in this section can be viewed as a template, transferable yet mutable to fit other institutions. One proposal is to expand the database of mentors aligned with the course to include male and female alumni from other institutions and graduate students as well; a user-friendly programme could allow participating mentors to submit their profiles and update them annually. Another possible future plan is to allow instructors to customise their own set of profiles from a larger database of professionals to specifically match content area objectives. In this way, the use of the career websites can substantiate and extend in-class learning in a more seamless, integrated, and strategic manner. There can be many layers of mentoring; some professionals provide in-depth career and personal information while others provide short biographies, career information, or internship possibilities—all available within the course structure. Some of these volunteers may be interested in more in-depth mentoring experiences; in those cases, certain highlighted professionals can also become e-mail partners (e.g. Muller, 2000), invited to participate in an on-line chat with the students, or featured with a live web-cam. With the inclusion of chatrooms and listservs, students can discuss the issues that arise from exploring the careers and lifestyles of the professionals, making use of the psychosocial support that can be gained effectively from peer mentoring (Ensher *et al.*, 2001). A 'sampler of mentoring experiences' in and out of the curriculum is more likely when facilitated with technology. Future research can examine whether and how these kinds of technology-supported initiatives actually lead to more in-depth learning, understanding, and motivation regarding the curriculum.

Why Should Networking Alternatives Count as Mentoring?

Even the most liberal mentoring scholar may be hesitant to call some networking alternatives 'mentoring'. Reading a conversationally styled section called 'insights on balancing personal and professional lives' from a website featuring women physicists, sending an e-mail to members of one's professional organisation, culling frequently asked questions about getting into graduate school posted on a bulletin board, lurking on a discussion listserv for students interested in genetic counselling are not the images that typically come to mind when one thinks of mentoring. If they are so different, why call them mentoring at all? The shift is in how we define mentoring. By placing emphasis on deriving mentoring functions, with less focus on the relationship or means by which the mentoring occurs, calling these alternatives 'mentoring' is not so difficult to do. For each alternative example presented in this article, one can visualise a pro-active student seeking mentoring, and deriving psychosocial support, role modelling, and career functions of mentoring from their experiences. As Dreher and Dougherty (1997) argue, such a reconceptualisation and reliance on substitutes for mentoring relationships are necessary if women are

disadvantaged from gaining traditional forms of mentoring. For women in science, this shift in perspective from traditional to non-traditional is absolutely necessary.

What about the alternatives that emphasise role model-mentoring hybrids, lacking two-way communication between students and their mentoring sources? A closer look at the literature reveals that role modelling is considered an important, distinct function of mentoring, separate from general psychosocial support or career functions (Scandura & Williams, 2001). According to Bandura (1977), observational learning, where one observes others rather than directly experiencing relations with them, informs and motivates the observer in its own right. And, just like other functions of mentoring, when deriving role-modeling functions of mentoring from those under observation, multiple models are recommended:

When exposed to diverse models, observers rarely pattern their behavior exclusively after a single source, nor do they adopt all the attributes even of preferred models. Rather observers combine aspects of various models into new amalgams ... It is diversity in modeling that fosters behavioral innovation. (p. 48)

Thus, by observing multiple models, students can gather personal and career knowledge, and take this information to guide their own behaviour in innovative ways. It should not come as a surprise that observing role models could serve an important mentoring function. Taken to an extreme, this idea is reflected in the identification and potential learning that occurs when readers or viewers engage with characters in books, on the television, or on the movie screen. Plost and Rosen (1974, cited by Paludi *et al.*, 1988) concluded that an individual encountered via television may be sufficient for mentoring, despite the lack of two-way communication, because of the powerful effects of observational learning.

Web-based Mentoring Alternatives: caveats, limitations, and future directions

A note of caution is warranted—certainly I am not arguing that any experience can count as mentoring. Rather, the goal of alternative networking approaches to mentoring aims to challenge the longstanding notion that mentoring must be gained from a traditional dyadic and intensive relationship. If some students need to derive mentoring functions from alternative, unconventional venues, and research suggests that these alternatives can be successful, then we should facilitate access to these alternatives and also inform students that these alternative possibilities exist.

However, just as there are weaknesses and limitations to the traditional dyadic approach to mentoring, networking alternatives, especially web-based initiatives in this domain, also possess potential shortcomings. While monitoring bulletin boards and visiting career websites may provide a student with much-needed career information and even role modelling, it is less clear how these web-based networking programmes can provide other mentoring functions. Advocacy and sponsorship are important mentoring functions (Kram, 1983); for college students, this can take the form of mentors writing a detailed letter of recommendation or

making a phone call on behalf of the student. With a network of mentors, it is entirely possible that none of the mentors may know the student well enough to advocate for or sponsor the student effectively. The power gained by having mentors is invaluable, especially for women pursuing non-traditional careers. As a result, it is fruitful to think about these two models of mentoring, dyadic and networking, as complementary to each other. We may encourage students to form some closer relationships, not at the exclusion, but rather as part of a developing network. Given that research is showing more and varied mentoring needs, we need to continue to support the development of alternative forms as well as traditional approaches in order to fully support the career, personal, and academic development of students. Arguably, technology transforms what is possible in the mentoring realm, and ongoing investigation and development in this domain is needed.

Future research should investigate the kinds of training and resources that are necessary to support these web-based mentoring initiatives guided by networking models of mentoring. While training is considered imperative for any mentoring programme (Burlew, 1991), preparing students to take a pro-active role in their own mentoring may be an especially difficult task (Healy & Welchert, 1990). Individuals who have more than one mentor may experience greater role conflict (Baugh & Scandura, 1999), and so helping students manage their network of mentors is necessary. Recruitment and training of mentors for participation in web-based mentoring also warrants attention, and we need to find out what kinds of obstacles mentors might face in wanting to contribute to these endeavours. Facilitating access to technology is also an important priority, as Internet access is not readily available to all individuals.

This article highlighted the barriers that students, especially college women pursuing non-traditional careers such as those in the sciences, face in gaining access to mentoring. web-based initiatives have the potential to increase students' access to a variety of different kinds of mentoring sources and relationships that range in their intensity, forming both informally and formally, in and out of the classroom. The ideas presented in this article are not only relevant for college women in science, but can generalise to other groups including minorities, first-generation college students, and men who pursue non-traditional fields. Arguably, all individuals who desire mentoring but face barriers would benefit from envisioning alternative forms of mentoring and from the additional functionality that technology can provide to these mentoring initiatives. Future research and practice will serve to delineate the costs and benefits associated with this important, emergent domain of mentoring.

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