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Building a Better Bridge: testing e-training to improve e-mentoring programmes in higher education

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ABSTRACT *Uniting mentoring with e-mail results in expanded opportunities for mentoring, making it possible to overcome the constraints of time limitations and distance to achieve successful mentoring relationships. With these opportunities however, come many of the same challenges that have already been identified through the research on formal mentoring programmes. This article addresses one of these challenges by reporting on the impact of one model of training on e-mentoring outcomes. A series of interactive, web-based case studies was developed as training modules for mentors and protégés participating in the MentorNet programme. The target group for this research study was undergraduate students. Using a control group experimental design, we randomly assigned half the study group to a condition where interactive on-line training was required. The other half was assigned to a condition where the training was optional. Those in the mandatory group exhibited improved outcomes; specifically, they exchanged e-mail messages more frequently with their e-mentors. This study was focused on MentorNet (www.MentorNet.net), a large-scale electronic mentoring programme that matches women in engineering and related science majors with professionals in industry for year-long, structured mentoring relationships conducted via e-mail, in an effort to encourage their retention in the fields in which women are severely underrepresented. We discuss implications for conducting e-mentoring programmes.*

In this article, we examine one feature of a structured e-mentoring programme, a series of interactive, web-based case studies used as training modules, and test its

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impact on well-accepted mentoring outcomes such as involvement, satisfaction, and value. The goal of this study was to identify effective and scalable features for e-mentoring programmes that can enhance and expand the benefits for all.

E-mentoring

While e-mentoring remains a relatively new phenomenon, it has expanded quickly in popularity and scope within a very brief timeframe. The multiple benefits of e-mentoring have led to its rapid acceptance and implementation in the mentoring community. In this section of the article, we define e-mentoring, identify its benefits, and identify some notable programmes that reflect e-mentoring's expansion and varied uses.

E-mentoring, short for electronic mentoring, has also been popularly termed telementoring, cybermentoring, and online mentoring. According to one of the earliest definitions in the literature, e-mentoring is defined as:

> a relationship that is established between a more senior individual (mentor) and a lesser skilled or experienced individual (protégé), primarily using electronic communications, that is intended to develop and grow the skills, knowledge, confidence, and cultural understanding of the protégé to help him or her succeed, while also assisting in the development of the mentor. (Single & Muller, 2001, p. 108)

The rapid increase of electronic communications has made e-mentoring both feasible and advantageous (Muller, 1997). Formal e-mentoring programmes provide flexibility in scheduling and transcend geographical barriers that would otherwise prove prohibitive to mentoring opportunities (Muller, 1997). Because the connections are asynchronous, scheduling is no longer the obstacle it has been for face-to-face mentoring pairs (Noe, 1988). Pairings are not bounded by geographical constraints; as long as access to the Internet is readily available, e-mentoring can flourish (Bennett *et al.*, 1998). With the ability to transcend both spatial and temporal boundaries, e-mentoring extends the ability to provide services to individuals previously unable to access mentoring opportunities (Harasim *et al.*, 1998; Palloff & Pratt, 1999; Ravet & Layte, 1997).

The nature of electronic communication provides additional advantages beyond those available with face-to-face mentoring programmes. Based on the nature of mentoring, higher rank or status people serve as mentors to those with lower rank or status, which can lead, at least initially, to intimidation or lack of candour on the part of the protégé. This unequal relationship exists during the first stages of the mentoring relationship (Frierson, 1997). The assumption is that the protégé lacks the knowledge and skills to interact on the same level. E-mentoring, however, may decrease those initial feelings of intimidation or of discomfort in new or unfamiliar environments because typical symbols of status are often unidentified (Harasim *et al.*, 1998; Palloff & Pratt, 1999). Sproull and Keisler (1991) refer to this as the

attenuation of status differences. Although potentially problematic for individuals not comfortable with electronic communication, e-mentoring allows for equalisation in the mentoring relationship (Harasim *et al.*, 1998; Palloff & Pratt, 1999). In addition, because the interactions are not synchronous, the respondents have time to consider message content. The response prepared by the individual can therefore be more reflective because of the time-delayed nature of the communication (Ravet & Layte, 1997). Thus, e-mentoring leverages the connective benefits of the Internet to provide mentoring opportunities where they would not otherwise exist, and to facilitate the development of relationships among people of different status.

One of the earliest examples of e-mentoring was funded by a National Science Foundation research grant commencing in 1994. This early foray into e-mentoring was with the purpose of testing the e-mentoring format and also to provide female high school students with mentors in science and technology, with the hope of increasing the young women's interest in fields in which women are underrepresented (Bennett *et al.*, 1998). The results of this e-mentoring project validated the usefulness of the electronic format for mentoring. Nonetheless, the researchers also emphasised the need for structure and facilitation to achieve high levels of involvement by the participants (Bennett *et al.*, 1998), results similarly identified with formal face-to-face mentoring programmes (Boyle & Boice, 1998; Freedman, 1992; Murray, 1991).

Unlike formal face-to-face mentoring programmes, which are often constrained to relatively small organisations (with the exception of Big Brother/Big Sister), e-mentoring facilitates large-scale programmes. These large-scale programmes can benefit from economies of size and concentration of expertise to provide mentoring services where they otherwise would not exist (Single & Muller, 2001). Two notable large-scale projects are the International Telementor Programme and MentorNet. The International Telementor Programme (www.telementoring.org) matches industry professionals with students (fourth grade through college) with a focus of serving a diverse student population. In its first three years, 1999–2002, the International Telementor Programme has served over 11,000 students from nine different countries (Lewis, 2002). MentorNet is a nonprofit, industrial mentoring network for women students majoring in engineering, related sciences, mathematics and technologies. Since its inception in 1997, more than 7000 undergraduate and graduate students have participated in the programme, which matches industry professionals with undergraduate and graduate students at participating colleges and universities.

Training as a Way to Increase Involvement

Scholars have identified training programmes and expectation management as integral features of successful mentoring and e-mentoring programmes (Bennett *et al.*, 1998; Boice, 1990; Noe, 1988; Single & Muller, 2001). Training programmes help shape individuals' behaviour and knowledge to improve the match between personal capabilities and success in an organisation (Chao, 1988). The incorporation of training into a structured mentoring programme can be expected to shape individuals' abilities to maximise the benefits of mentoring relationships by facilitat-

ing skill-building and defining the responsibilities of participants (Gaskill, 1993). In the adaptation of such programmes to electronic format, the content and delivery of the information become important elements.

In his overview of the early mentoring movement, Freedman (1992) emphasises the need to establish the expectations and parameters of the mentor–protégé relationships. Training can accomplish this by exposing mentors and protégés to issues that may arise during the mentoring relationship. A training programme is a useful tool to accomplish this transition. By providing the user with opportunities for problem solving of increasing complexity, the training programme can facilitate the development of skills for both the mentor and protégé (Coovert & Craiger, 1997; Ravet & Layte, 1997).

E-training as a Bridge to Improve E-mentoring

The goal of e-training in an e-mentoring programme is to increase involvement, satisfaction, and value. To accomplish this, it is necessary to take the lessons learned from face-to-face mentoring and investigate their application in the e-communication environment. Successful formal mentoring programmes include structure, training for participants, and coaching during the mentoring relationship (Bennett *et al.*, 1998; Boice, 1990; Freedman, 1992). An additional element identified by MentorNet as increasing the success of a mentoring programme is the frequency of coaching: weekly coaching produced greater satisfaction than bimonthly coaching (Single *et al.*, 2000).

Testing Training

A well-designed training programme addresses expectations, domain-specific knowledge, and skills to avoid potential roadblocks (Goldsmith & Kraiger, 1997; Single & Muller, 2001). An important element is expectation management. It is essential that the training identifies the potential benefits and outcomes of participation in the programme. We anticipated that a well-constructed training programme would increase the engagement and satisfaction of the e-mentoring programme for its participants. Coovert and Craiger (1997) identified that practice with interactive modules can provide the student with skills and techniques to stay focused and complete the necessary tasks. Successive levels of problem solving were used to accomplish these outcomes. The training helped the participants establish reasonable expectations of what could be accomplished by participation in the programme. When definitions of expectations are incorporated into training, participants are able to better understand and predict the results of their participation. With this approach, when the programme goals and participant expectations are aligned, then perceptions of the success of the programme are enhanced (Boice & Boyle, 1998; Single & Muller, 2001).

Bennett *et al.* (1998) experimented with training facilitators, who in turn provided training in small groups in an online environment for prospective mentors. This strategy, while reasonably effective for their study, proves costly to undertake on a

large scale. For programmes of increased size and complexity, different strategies need to be identified to accomplish the necessary training. To provide a form of training for a large-scale programme, MentorNet created a set of interactive, online case studies.

Interactive modules have been designed for both the students and their mentors at different educational levels (community college, upper and lower division undergraduates, Master's level, and doctoral students). Each interactive module contains scenarios that reflect the common experiences of the participants. In the undergraduate case studies (which were tested in this project), the problem-solving scenarios include: the imposter syndrome, adjusting to college life, balancing school and family issues, and gender issues. The case studies were available to all students, but for the experimental group in this study, completion of the tutorials was required before the students were matched with their mentors. The following hypotheses were developed for this study.

Hypothesis 1. Engaging in a required training tutorial will increase the number of students who stay involved with their e-mentors in a formalised e-mentoring programme (*Involvement*). Involvement is an important issue since repeated studies and evaluation reports have identified a relationship between involvement and the outcomes of increased satisfaction. Therefore, the second hypothesis is identified as:

Hypothesis 2. Engaging in a required training tutorial will increase the overall satisfaction of students who participate in a formalised e-mentoring programme (*Satisfaction*). Increased involvement also leads to both increased value and benefits. Hypothesis three is as follows:

Hypothesis 3. Engaging in a required training tutorial will increase the perceived value of participation for the students who stay involved with their e-mentors (*Value*).

Method

The purpose of this experiment was to isolate the impact of the training tutorials on involvement, satisfaction, and value of participation in MentorNet, a structured e-mentoring programme. To test the efficacy of the training tutorials for increasing involvement, satisfaction, and value, we designed a control group experiment and conducted comparative analyses to test the study hypotheses. In order to explore the value of the required tutorials, a population of undergraduates was selected. By limiting the population to undergraduates, educational level was not a variable. In addition, research on undergraduate women in science, technology, engineering and mathematics (STEM) fields reveals that the highest attrition is prior to completion of the baccalaureate degree; therefore undergraduates represent the greatest at-risk group (Goodman *et al.*, 2002). This study was conducted on the 2001–02 MentorNet cohort.

Participants

In 2001–02, 3347 students applied for participation in the MentorNet cohort. Of these, 2557 were undergraduate students from four-year colleges and universities. A group of 400 students was randomly selected and assigned into one of two conditions. Half of this sub-sample was assigned to an intervention group where completion of the training tutorials was required and the other half of the sub-sample was assigned to a control group where participation was voluntary. A stratified random sample was used to ensure that the control and experimental groups were equally selected from upper and lower division baccalaureate STEM majors. There were no demographic differences between the control and experimental groups with respect to age, full-time status, and traditional/returning student status.

Mentors were recruited from participating corporations, professional societies, and governmental agencies, previous participants, and various forms of electronic media (the MentorNet website, electronic distribution lists, and e-mail messages). Both students and mentors completed applications that elicit information related to the desired characteristics of the e-mentoring pairs. Due to the programme's focus on academic and pre-professional mentoring, applications collected information about the students' academic programme and career goals and about the mentors' educational and professional experiences. Students and mentors were then matched based on the aforementioned information.

Procedure

After each student completed the application process, 400 undergraduate students were randomly selected to the study sample. Of these, 200 were randomly assigned to the control group and 200 were randomly assigned to the experimental group. Students were matched with mentors to form e-mentoring pairs. The names and contact information were provided by e-mail to students in the control group. For the experimental group, the students were told that their mentors would be identified after they had completed the tutorials. After each student completed the training, the mentor's name and contact information was made available.

Students were requested to complete a comprehensive web-based questionnaire at the completion of the academic year. This questionnaire requested data that were used to evaluate the programme, to suggest modifications for programme development and to provide research data for analysis of the effectiveness of programme components.

Measures of Involvement

For the purposes of this study, involvement was defined as the frequency of contact between mentor and protégé. The questions solicited information about the number of e-mails that were exchanged between mentor and protégé. Each question had numerical options that ranged from zero to 50. The students were asked to provide

TABLE I. Survey items

Involvement
How often did you send e-mail to your mentor? ____times a month
How often did you receive e-mail from your mentor? ____times a month
Satisfaction
How comfortable have you been asking your mentor questions?
How comfortable have you been responding to questions from your mentor?
How satisfied have you been with your one-on-one mentoring experience?
How satisfied have you been with your MentorNet experience this year?
Please rate the 'quality of the match' between your mentor and you*
Value
Has your MentorNet experience affected your self-confidence about your ability to succeed in your field?
Has your MentorNet experience affected your belief that you would enjoy working in industry or a government lab or agency?
Has your MentorNet experience affected your desire to pursue a job in your field?

Note: Scale anchors are 1 (Not at all) and 5 (Very) for value and satisfaction.
*Scale anchors 1 (Poor) and 5 (Excellent).

the average number of times that they sent and received e-mails from their mentors on a weekly basis. The two items relevant to hypothesis 1 are identified in Table 1.

Measures of Satisfaction

Participants rated their level of comfort and satisfaction for aspects of the e-mentoring experience. Responses were rated on a five-point scale, from 1 = 'Not at all' to 5 = 'Very' for four of the five questions. The item that requested an evaluation of the quality of the match between student and mentor had a five-point scale, from 1 = 'Poor' to 5 = 'Excellent'. These five items were grouped together into a constructed variable based on factor analysis conducted in a previous MentorNet evaluation (MentorNet Research Project, 2002). The five items relevant to hypothesis 2 are identified in Table 1.

Measures of Value

The value to students was assessed based on their responses to questions about how the MentorNet experience affected them. The first item addressed self-confidence about the students' ability to succeed in the chosen field. The other items focused on whether they would enjoy working and pursue working in their desired field. The items were measured on a five-point scale that ranged from 1 = 'Not at all' to 5 = 'Very.' The three items relevant to hypothesis 3 are identified in Table 1.

TABLE II. Correlations among the e-mentoring outcomes

Variable	Involvement	Satisfaction	Value
Involvement	1		
Satisfaction	.344*	1	
Value	.274*	.635*	1

*Correlation is significant at the $p < .01$ level (two-tailed).

Results and Discussion

Participation and Response Rates

To determine the relative response rates of the control versus the experimental group, we examined participation rates. All 200 students in the control group were paired with e-mentors and participated in the e-mentoring programme. A number of students in the experimental group (training required) did not complete the training tutorials, and therefore were not matched with e-mentors. Of the 200 students in the experimental group, 80 (40%) students did not complete the tutorials, even after several follow-up e-mail messages reminding them to do so. Therefore, we tried one last contact with the students by telephone. Of these 80 students, we were able to contact 12 students. These 12 students had various reasons for not completing the tutorials: eight stated they were too busy, three were in the process of changing majors, and the last student was a graduating senior who was focusing on her job search. Since the tutorials were mandatory for the experimental group, it is possible that students less committed to the programme may have self-selected out of participation by not completing the tutorials.

Of the 200 paired students in the control group (tutorials not required), 60 (30%) completed the questionnaire at the end of the programme. Of the 120 paired students in the experimental group, 50 (41.7%) completed the year-end questionnaire. The difference between these two groups was significant. The paired students in the experimental group were more likely to complete the questionnaires and therefore have a higher response rate.

Data Analysis

First we ran a correlation matrix to see if the three dependent variables were related. Involvement, satisfaction, and value were all significantly correlated with one another. The correlation matrix for the three variables is shown in Table II. Next, we examined the outcomes of the students, using two-tailed *t*-tests, to determine whether the experimental and control groups performed in a significantly different manner for each of the constructed variables. The results are reported in Table III.

Hypothesis 1. Engaging in a required training tutorial will increase the number of students who stay involved with their e-mentors in a formalised e-mentoring

TABLE III. Involvement, satisfaction, and value for control group and mandatory e-training group

Variable	Control group *M* (SD)	Mandatory e-training group *M* (SD)
Involvement	4.64 (3.06)	6.42 (5.08)*
Satisfaction	21.43 (2.80)	20.62 (4.20)
Value	10.65 (2.94)	10.20 (2.23)

*Denotes significance at the $p < .05$ level.

programme is supported by the data. As can been seen in Table III, the experimental group reported a significantly greater number of e-mails between mentor and protégé. This was significant at the $p < .05$ level. On average, students in the experimental group exchanged 6.42 e-mail messages per month while the students in the control group exchanged only 4.64 messages per month.

Hypothesis 2. Engaging in a required training tutorial will increase the overall satisfaction of students who participate in a formal e-mentoring programme was not supported by the data. The mean scores for the control and experimental groups are listed in Table III. Students in both groups rated the programme very highly.

Hypothesis 3. Engaging in a required training tutorial will increase the perceived value of participation for the students who stay involved with their mentors is not supported by the data. The results in Table III show that the students in the experimental group rated the value very similarly to those in the control group, therefore this hypothesis was not supported by the data.

Conclusions and Implications

If the current trend persists, and we suspect it will, e-mentoring will continue to grow in popularity and size. Consequently, influencing the involvement, satisfaction, and benefits of e-mentoring will continue to be in the forefront of programme development and implementation. To enhance the benefits of face-to-face mentoring programmes, programmatic features such as training play an important role in ensuring that participants stay committed and have the necessary information, tools, and support. The same appears to hold true for e-mentoring.

This research article is one of the early studies examining e-mentoring programmatic features and their efficacy. In this article, we examine the impact that participation in mandatory online training, for one model of e-training, had on e-mentoring outcomes. Our hypotheses were that involvement, satisfaction, and benefits would be related and that mandatory training, as opposed to voluntary training, would increase involvement, satisfaction, and benefits associated with participation in a large-scale e-mentoring programme. Some of our hypotheses were supported.

Involvement (defined as the frequency of e-mail exchanges), satisfaction with the programme, and perceived value from participation were related. In previous empirical examinations of e-mentoring, frequency was correlated, as it was here, with benefits and satisfaction. In addition, the students for whom the training was mandatory sent e-mail messages to their e-mentors more frequently than the students for whom the training was not mandatory. We did not find increased satisfaction or value when comparing the mandatory group with the voluntary group, thus our last two hypotheses were not supported. However, the lack of differences in satisfaction between the control and experimental groups may have been due to a ceiling effect on the satisfaction measure; both groups rated their satisfaction very high. Therefore there was little variability between the two, lowering the likelihood of finding statistically significant differences.

One area of research that we will examine is how mandating e-training for the protégé influences the experience of their e-mentors. Since we reported correlations among involvement, satisfaction and value we can infer that mentors may exhibit the same relationships. We also know that student reports of the frequency of e-mail exchanges are closely related to mentor reports of e-mail message exchanges (MentorNet Research Project, 2002). Consequently, if mentors are sending and receiving more e-mail from their protégés based on the influence of the e-training on the protégés behaviour, we can expect to find the same relationship of involvement, satisfaction, and value for the mentors.

It appears that programmatic features, such as e-training, are beneficial for e-mentoring programmes. We believe that these training features may facilitate the early development of an e-mentoring relationship and therefore allow for the greater frequency of e-mail exchanges. While we could not identify statistically significant differences for benefits, the mentoring literature suggests that increased exchanges do translate into increased benefits. Therefore, based on our results, we support the use of programmatic features, in particular e-training, to support structured e-mentoring programmes. With the explosion of e-mentoring, maximising the benefits to participants will be an ongoing challenge. The results reported in this study indicate that e-training can meet that challenge, creating a bridge to improved success and satisfaction in e-mentoring programmes.

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