

Exploring Faculty Perceptions of the Benefits and Challenges of Mentoring Undergraduate Research

Abstract

A notable limitation in the extant and emerging literature on faculty-mentored undergraduate research is that the focus is often on the benefits to students' with little or no examination of the benefits and challenges to participating faculty. Using the cognitive apprenticeship model as a theoretical framework, descriptions of the benefits and challenges accruing to faculty are drawn from analysis of their responses to open-ended questions. Reported gains include "contribution to research agenda" and the personal satisfaction derived from enhancing students' professional growth while time constraints emerged as an important challenge. Although we cannot make generalizations beyond the scope and context of this qualitative study, the data provides some insight into the impact of mentoring undergraduate research on faculty.

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Introduction and Purpose of Study

Ever since the Boyer Commission recommended (1998) that research universities make research-based learning the standard, the involvement of undergraduate students in the research process has evolved from a “cottage industry” into “a movement” (Blanton, 2008). Faculty-mentored undergraduate research (UR) is increasingly becoming a critical component of baccalaureate education, especially in science, technology and engineering disciplines. Participation in faculty-mentored UR has been linked to positive educational outcomes for students; UR has been shown to enhance students’ understanding of the research and scientific processes (Halstead, 1997; Kardash, 2000; Russell, Hancock & McCullough, 2007), enhance students’ achievement of career clarification and interest in graduate/professional education (Lopatto, 2004; Landrum & Nelsen, 2002; Bauer & Bennett, 2003), and enhance the development and improvement of critical thinking and communication skills (Hunter, Laursen & Seymour, 2007).

While it seems intuitive that faculty mentoring of UR constitute a bidirectional or symbiotic relationship where benefits should accrue to both parties (i.e., faculty and students), the focus of extant and emerging research in this area is often on the benefits to students with little or no attention to the benefits accruing to faculty. Apart from Zydney and colleagues’ (2002) study of the motivations and practices of UR faculty mentors at the University of Delaware, we are unaware of any study focused specifically on faculty experiences in UR. Although the possible benefits and (or) challenges of UR to faculty has been highlighted in some opinion/discussion articles, the propositions are hardly backed up with data. The purpose of this exploratory study is to address some of the observed limitations in the UR literature by providing some insights into the gains and challenges of faculty-mentored UR. The study examines the

benefits and challenges of UR to 18 faculty mentors that participated in an undergraduate research experience program at a mid-western research university.

Perspectives/Theoretical Framework

The Cognitive Apprenticeship Model (CAM) is a useful framework for understanding the dynamics of faculty- mentored UR (Kardash, 2000; Fair, King & Vandermaas-Peeler, 2004). Grounded in Vygotsky's theory of constructivism, CAM holds the assumptions that: "(a) Learning is a social process; (b) competence in a domain is defined in terms of expertise rather than innate ability; (c) meaningful learning is active, constructive and self regulating; and (d) learning activities should reflect real world rather than decontextualized academic tasks" (Shuell, 1997, p. 751, cited in Kardash, 2000, p. 192). Within this theoretical framework, UR is viewed as an apprenticeship learning model in which a novice (i.e., the student) studies under the tutelage of an expert (i.e., the faculty). Through guided participation and extensive collaboration, long-term observation and practice, the novice researcher gradually acquires the skills and expertise needed for effective performance in the profession.

According to Fair et al., (2004) and Kardash (2000), faculty-mentored UR shares some important characteristics and features of CAM: (1) faculty-mentored UR provide opportunities for undergraduate students as novices in the "art" of research to learn to "do" research by working collaboratively with research experts; (2) UR serves as a platform for the initiation and socialization of undergraduates into the research community; (3) students may start their research apprenticeship by performing menial tasks (e.g., washing bottles) but soon graduate into more technical duties, and begin to think and act like researchers. These assumptions and features of

CAM imply that: (1) mentoring is a critical component of research apprenticeship, and (2) both the mentee and mentor are active participants in the learning process.

While the bi-directionality of apprenticeship is evident in CAM, its application to faculty-mentored UR often focuses on the learner/mentee while ignoring the teacher/mentor component. Clearly, mentoring relationships involve two parties- the mentee and the mentor; and could be beneficial and (or) challenging for both parties. The goal of this study is to shed some light on the mentor component of the research apprenticeship by examining some benefits and challenges of UR to faculty mentors.

Methodology

Data for this study was collected as part of a larger study on the effectiveness of an undergraduate research program in a mid-western large research university. The program participants consisted of faculty mentors that supervised undergraduate STEM researchers in the fall semester of 2008. Of the 33 mentors that were requested to complete a multi-section post-participation survey sent to them via e-mail, 18 completed surveys were returned via e-mail (55% response rate). This study uses faculty responses to two open-ended questions in the multi-section survey: (1) Explain how your involvement has been a positive (or negative) experience? (2) What challenges did you encounter in your involvement in the UR experience? Faculty's responses were explored to examine their perceptions of the benefits and challenges of mentoring UR.

Content analysis was used to analyze the qualitative open-ended responses with the aim of generating categories of benefits and challenges of UR as perceived by faculty. For each question, response statements were cut into separate pieces and read through by the authors;

statements conveying more than one thought or concept were further cut into pieces to form different phrases or comments accordingly. The statements/phrases were considered the units of analysis. Responses to the first and second questions yielded twenty-nine and twenty comments respectively. Similar statements were grouped together into themes/categories. Examples of faculty verbatim comments are included to illustrate the benefits and challenges identified.

Findings and Discussion

Perceived Benefits of UR

Analysis of data yielded two categories of benefits of UR to faculty: contribution to faculty research and interpersonal gains. The category labeled *contribution to faculty research* consisted of nine responses reflecting faculty perceptions that UR students make meaningful/productive contributions to the research projects they are assigned to. Specifically, faculty mentioned that students' desire to learn, their commitments, as well as the time, assistance and "help" they contribute to assigned projects advance faculty's research agenda. For example:

My student has been enthusiastic and productive; contributing energy and effort to our projects.

Students have contributed in small ways to the production of new data for my survey project that has been published. The DEM is much more detailed and expansive now as a result of their research.

The second category was labeled *interpersonal gains*. About 51% of faculty comments regarding the benefits of UR referred to the interpersonal gains of mentoring and interacting with undergraduate students. Faculty noted that UR provides opportunities for faculty-student collegiality and professional relationships; they reported that mentoring UR has provided them

an excellent platform to motivate, inspire and contribute to the educational experiences and professional development of future researchers. One half of the comments in this category were comprised of faculty's expression of the personal satisfaction they derive from "watching" the professional growth of their students, including the joy of writing letters of recommendation to support their applications to graduate and professional schools:

I always enjoy watching undergraduate students experience something that is engaging to them and gets them (or keeps them) interested in science.

I have had the opportunity to work with great motivated undergraduate students that show their enthusiasm just because they are able to conduct a small research project. Just seeing them learn (and enjoy what they are doing) is worth it.

It was a great way to impress upon future information scientists some of the tenets of working with digital information and data that will be increasingly important to academic computing in the future.

The other half of the comments in this category referred to the socio-emotional dimension of mentoring students in the research process. Some faculty noted that the collegial mentor-mentee interaction with their URE students has led to longer-term professional and social relationships where students offered to work on faculty's projects beyond the contractual time frame or where students have chosen to join their UR mentor's laboratory/research group as graduate students. For example:

Two of my past students are doing M.S with me currently and they already know what research is all about so training is very easy

Both of them opted to work with me for the second semester too, before being asked by me. I consider that a great asset that the students want to continue with me.

For some of the faculty who teach only graduate courses, URE is an important avenue to meet and interact with undergraduate students, the opportunity for which would have otherwise been impossible:

Since my teaching is at the graduate student level, it has given me a chance to interact with undergraduates who have a very different perspective on life.

Challenges of Mentoring Undergraduate Research

Timing and scheduling seem to be the greatest challenge that faculty faced. Faculty's comments about the challenges of mentoring UR yielded a total of 20 comments, 45% of which comprised the challenges associated with timing and scheduling. Faculty mentors observed their inability to spend as much time as they would like to personally train, motivate and interact with their undergraduate students. Their comments highlighted the challenges of balancing their teaching and research responsibilities with the demands of mentoring UR. The faculty mentors also recognized the other academic commitments of the students and the challenges of scheduling research activities around students' classes:

It is hard to juggle everything and keep track of the student's performance when I am responsible for courses with combined enrollments that surpass 250 students.

The number of students who want to be involved with the project; I do not have time to work with all of them.

The second category of challenges (19%) that emerged from the data referred to faculty's inability to realistically determine the scope of students' responsibility or assignments in a semester, and the difficulty of getting students acquainted with research in fields with which they are not familiar:

Challenges for us--Better definition and understanding of what can be accomplished in a semester.

The main challenge was making the project straight-forward enough to fit within a relatively small number of hours per week over a semester.

Other challenges noted by faculty included the fear of failing to get students motivated or engaged in the research process and the concern that some students were probably not interested in the faculty research per se, but were using the experience for instrumental reasons such as meeting the necessary requirements for medical school:

Some undergrad students in general were not really interested in research and they joined my laboratory for other purposes (e.g., to get some research experience for applying for a medical or dental school).

Conclusion

The current study uses qualitative data from 18 faculty-mentors' responses to two open-ended questions, hence, the results cannot be generalized beyond the scope and context of the study. The findings are exploratory; we hope that the findings would serve as groundwork for a holistic view of the cognitive apprenticeship model and future in-depth studies of the practices, perspectives and impact of UR on faculty mentors. Further studies on the impact of UR on faculty are needed; a good example in this direction is Dolan and Johnson's (2009) study of the impact of UR on graduate students and postdoctoral researchers as proxies for faculty mentors.

The limitations notwithstanding, the results of this study offer some insight into the effects of URE on faculty mentors. While the focus of prior studies is mostly on the professional/academic development of students; our study indicates that: (1) the influences of faculty mentored UR on the research agenda of the faculty cannot be ignored; (2) faculty mentors value the opportunity to mentor and to develop intellectual partnerships with students;

and (3) mentoring UR poses some important challenges to faculty mentors, especially, timing/scheduling constraints. The study holds some implications for effective mentoring of UR in large research universities. Universities may need to provide incentives to faculty that devote time to mentoring UR. Also, faculty and students need to devise specific solutions tailored to address scheduling/timing constraints, e.g., while it is often impossible for faculty in research universities to have weekly one-one meetings with UR students, they may schedule mid or end of term meetings where goals and progress are discussed. Also, with adequate trainings, graduate/postdoctoral researchers may assist faculty in mentoring UR.

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