

Faculty Perception of Undergraduate Research in NSF-Funded CSEMS Scholarship Programs

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Introduction

This scholarship program provides financial incentives for qualified low-income undergraduate students to enter the skilled workforce with degrees in computer science, engineering, and/or mathematics from the institution that administers the program. This incentive is provided through offering competitive scholarships as well as academic support, career advising, and mentorship. Main focus of this program is to promote undergraduate research. However, there were instances, the approvals of these scholarship programs come toward beginning of the academic semester. As such, the awarding of scholarships in the first year cannot occur due to extent of preparation required and need for adequate potential students selected to award scholarships. Only low-income students depend on Federal Financial Aid loan programs are considered eligible for scholarships. The extent of paperwork and process that is sometime rigorous and unimaginable keeps potential students from applying. On the other hand, financial aid requires repayment with an exorbitant rate of interest need to be pointed out to eligible students.

This article describes the importance of student mentoring for undergraduate research. Its relevancies to faculty perception of undergraduate research, methodology and analysis of a survey conducted to this effect and goals of carefully designed academic activities as a part of mentoring will be discussed in the sections to follow.

Student Mentoring

Student mentoring is an important facet of this scholarship program. Arranging a properly planned orientation not only makes sure the recipients are aware of the scholarship requirements, but also helps them excel in their chosen programs of studies under the auspicious of mentoring. Key items of any orientation program designed for these scholarships are to promote Science, Technology, Engineering, and Mathematics (STEM) disciplines. A carefully planned orientation may include a reminder of scholarship requirements such as maintain-

ing full-time status at the awarding institution, pursuing programs in mathematics, computer science, or engineering, keeping a minimum of GPA requirement, working with the assigned faculty mentor, renewal of the scholarship, and planning to attend academic/career conferences and workshops. Undergraduate research opportunities must be provided. Meanwhile, a current scholarship recipient can talk about his or her experience with the fellow recipients. Refreshments and additional items can be included as some of them require monetary resources. In addition, the Office of Career Services can provide information for additional career opportunities. A person from the Office of Financial Aid can provide relevant calculations necessary in determining the unmet needs of each student. These scholarship programs emphasize the student-mentoring as a key prioritized component. It is trivial as it provides funding for low-income students for undergraduate studies in STEM disciplines; they need to be guided to be emergent on their educational objectives and career choices. Mentoring is a collective effort among program administrators, students and faculty involved altogether to make it successful. The faculty perception on this issue can vary from one faculty to another; however, the objectives remain the same.

Faculty Perception of Student Research

The main theme of the program is to provide the students with financial assistance to pursue the STEM programs in an effort to fill the country's shortages of mathematics, engineering, computer science, and engineering graduates [1]. Mentoring graduate students is one of the most important roles to be played by faculty and scholarship administrators. In many fields such as the sciences and engineering, selecting and mentoring of the students can determine the success of a faculty member's research program. This improves research caliber among undergraduate students. If it was to be done properly, a panel of faculty from a range of disciplines who have highly successful student mentors can discuss their experiences

Abstract

As in any other educational activity, scholarship programs offer mentoring to the recipients. In order to cultivate the maximum benefit, each recipient needs to be guided and appropriately advised, first to achieve the goals of the program and secondly, to benefit themselves from the scholarship. The purpose of the article is to investigate faculty perception of undergraduate research aspect of the program when mentoring is conducted for the National Science Foundation (NSF)-funded Computer Science, Engineering and Mathematics Scholarship (CSEMS) programs.

Keywords: NSF, CSEMS, STEM, scholarships, low income undergraduates, research, mentoring

in mentoring students, including: from lessons learned, important things to keep in mind for other faculty common pitfalls, how to help students get a good start in their laboratories, how to determine a good fit to their programs when selecting students to work on research project, how to keep students on track and spot signs of trouble resources available using Q&A from audience.

Mentoring has been discussed for faculty as well. This can be based on their experience and prior scholarly activities [2]. In this regard, a group of faculty from STEM disciplines is asked to self-report their involvement in mentoring aspect of the programs. The role of a mentor has been identified by faculty as very challenging [3]. This study's purpose was to explore perceptions of faculty who assume the role of a group mentor. Four themes which emerged from the study include uncertainty, evolution, mutuality, and milieu as the primary issues. The undergraduate research programs have grown rapidly over the years. There have been many discussions about the theme of undergraduate research and how it should look like. This has been the subject of many national conferences sponsored by the National Science Foundation [5], the Howard Hughes Medical Institute, and the National Council on Undergraduate Research (NCUR) [4].

Methodology and Analysis

The faculty has a diverse opinion on student mentoring. A survey has been designed to include the most important aspects of student mentoring and attitude among faculty to undergraduate research [7]. The purpose of this survey is for it to be considered as an internal assessment tool. A promise is made to keep the results completely anonymous. The scholarship administrators only seek the aggregate feedback about the services offered to students throughout the period from 2003 to 2008 for a program concluded at Texas A&M International University (TAMIU), Laredo, Texas. Information provided will certainly enhance the quality of mentoring currently being provided to students in the program and future programs. To help the programs grow in a positive direction, all faculty who mentored the recipients have been asked to take the time to provide their anonymous responses to the questionnaires. While participation is voluntary, the scholarship administrators will derive enormous benefit from feedback, so they asked seriously consider participating. The survey comprised of six questions mainly dealing with learning needs, types of preparatory

skills, research education, needs of financial support, and ability to learn and carry out research. A seventh question is open-ended for faculty to comment on the barriers to mentoring undergraduate research projects. A set of pie charts and a column chart showcase the main findings of the survey as appear in Figures 1-5. A summary of the survey is found in the appendix. The findings are self explanatory thus, do not require further elaboration and included in the conclusions.

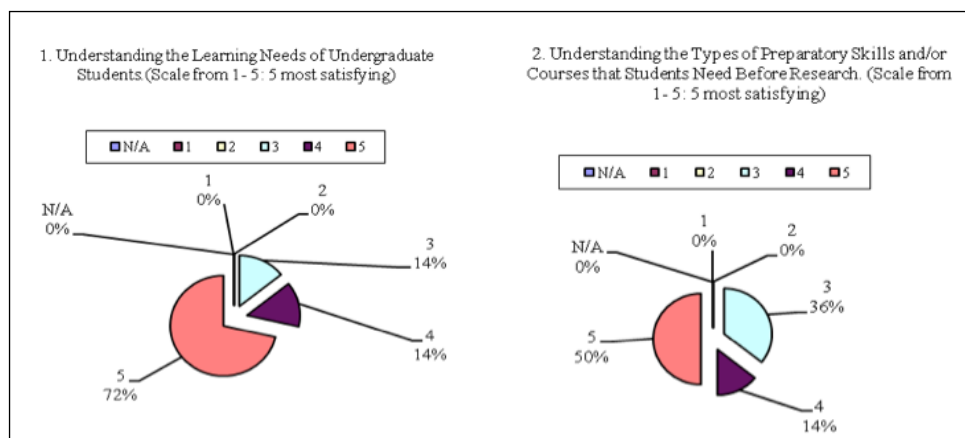


Figure 1: The extent of understanding the learning needs of undergraduate students and the types of preparatory skills and/or courses that students need before doing research

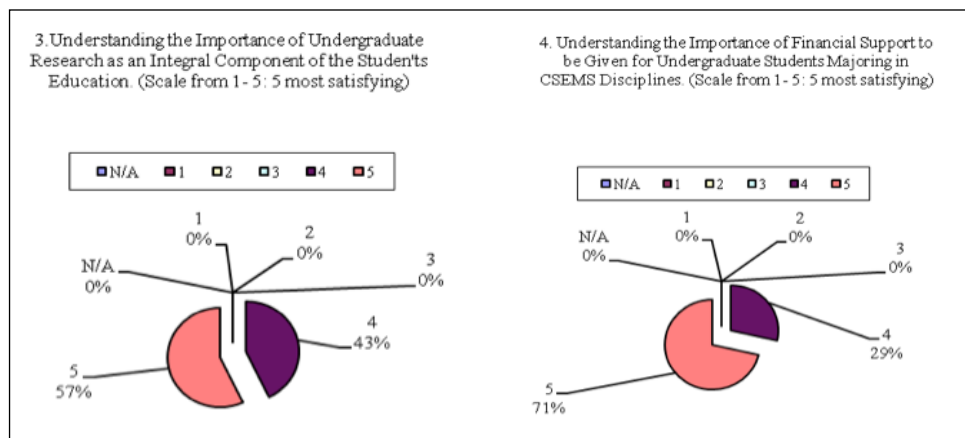


Figure 2: The extent of understanding the importance of undergraduate research as an integral component of the student's education, regardless of her/his career choice and the importance of financial support to be given for undergraduate students majoring in CSEMS disciplines

The open-ended question invited the faculty to comment on the barriers to mentoring undergraduate research projects, and provide recommendations for reducing these barriers. Overwhelmingly, the attention has been drawn to better preparation for students. The lack of recognition and rewards has been the least concern of them all.

Goals of Academic Activities

The objectives of scholarship programs focus on the timely completion of degree requirements, increasing internship/research opportunities, improving the quality of professional development, expanding career explorations, and developing job placement in STEM disciplines. Long-term benefits are dedicated by encouraging students from the targeted populations to pursue their studies in CSEMS fields using mentoring and cooperative learning experiences, expanded knowledge of the research projects, establishment of internships and employment opportunities, and development of networking in the University and local communities. There is an urgent need to enhance a highly educated workforce through first rate undergraduate and graduate programs for science and mathematics majors and them to stay competitive and relevant in an ever-changing global economy. Concept presentation, classroom discussions, applications in the classroom, experimentation, and problem-solving in the laboratories are used as pedagogical approaches to effectively deliver instructions to this effect. There have been many programs to promote use of technology in STEM courses. One such program was concluded in 2005 at North Carolina Central University [6]. In addition, student activities such as conference presentations and projects are being facilitated to promote students' learning and research in these disciplines. Figure 5 shows over the years there has been an increasing male and female participation in the program.

Conclusions

The data suggested that the faculty need to understand the learning needs and preparatory skills of students before they facilitate undergraduate research. It also supported that the research must be made an integral component of the student's education regardless of their career choice and financial needs. The faculty must provide students ideas from their own understanding of academic preparation and research. Among the barriers existing for under-

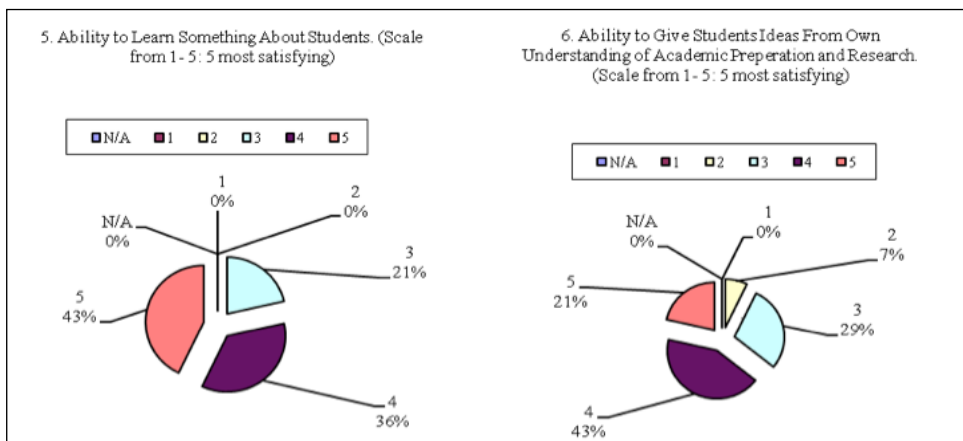


Figure 3: The extent of ability to learn something about students and to give students ideas from the faculty's own understanding of academic preparation and research

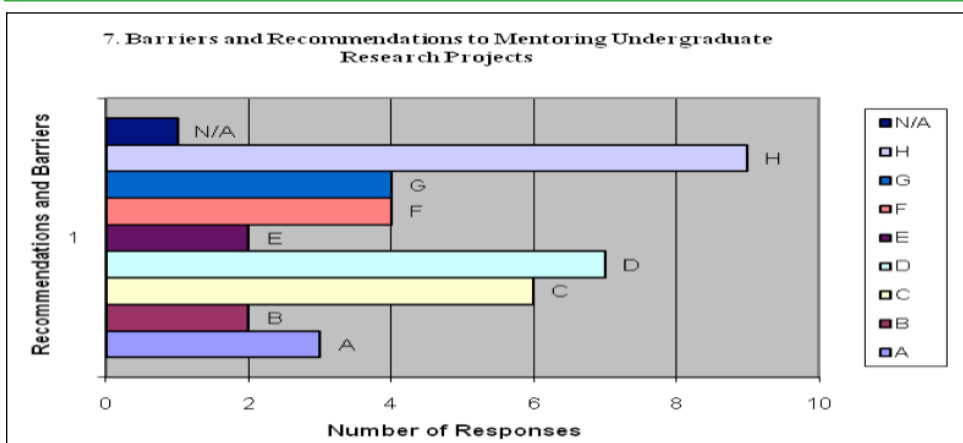


Figure 4: The barriers to mentoring undergraduate research projects, and provide recommendations for reducing these barriers (A-Not enough time, too time consuming, B-Lack of recognition, rewards, C-Students lack skills, motivation, and commitment, D-Provide more support, resources, E-Provide more recognition, F-Give course credit, G-Improve undergraduate courses, H-Better preparation for students)

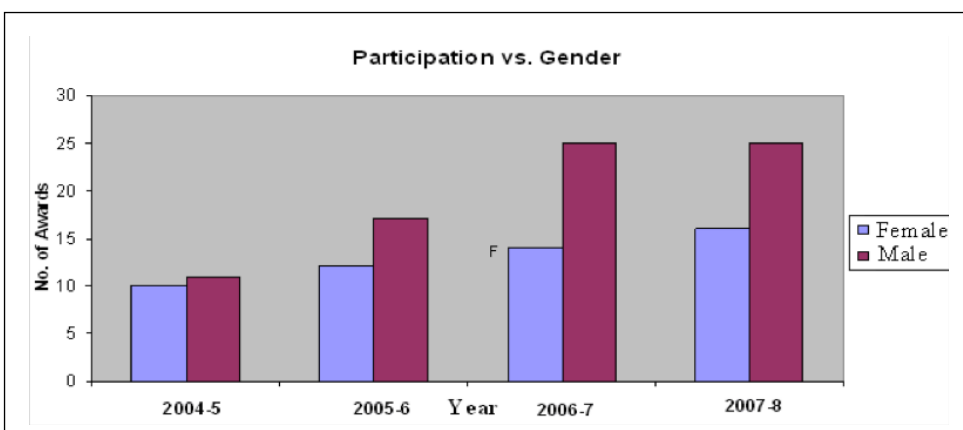


Figure 5: The number of participants in each year of the program vs. gender

graduate research, it is the majority opinion that more support and resources must be provided and students must be better prepared. The data also supported that the number of participants in each year of the program, regardless of gender has risen due to increased awareness of the program. Furthermore, the award of scholarship based on the determination of low-income status of the applicants made this program unfriendly for some students. Adequate comparison needs to be made to provide information about the use of financial aid vs. the benefits of these CSEMS scholarships. Emphasizing the difference between financial aid and scholarships is, therefore, worth advancing. This program has promoted graduate studies in STEM disciplines by the recipients as a result of adequate emphasis on student mentoring. Promoting undergraduate research has been given a focus even though some issues yet to be adequately considered to address faculty concerns. Its relevancy to student mentoring is advocated to be a great success of the scholarship program.

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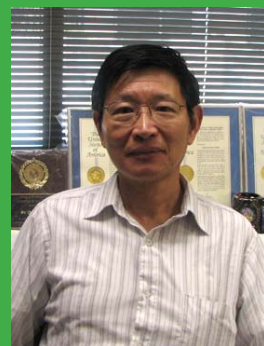
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Appendix: A summary of CSEMS Faculty Survey

This item asks faculty to self-report their involvement in student mentoring aspect of the program.

1. Were you able to understanding the learning needs of undergraduate students?

N/A 1 2 3 4 5

2. Were you able to understanding the types of preparatory skills and/or courses that students need before doing research?

N/A 1 2 3 4 5

3. Were you able to understanding the importance of undergraduate research as an integral component of the student's education, regardless of her/his career choice.

N/A 1 2 3 4 5

4. Were you able to understanding the importance of financial support to be given for undergraduate students majoring in CSEMS disciplines, Computer Sciences, Engineering, and Mathematics?

N/A 1 2 3 4 5

5. Were you able to learn something about students?

N/A 1 2 3 4 5

6. Were you able to give students ideas from my own understanding of academic preparation and research?

N/A 1 2 3 4 5

7. This open-ended item invites faculty to comment on the barriers to mentoring undergraduate research projects, and provide recommendations for reducing these barriers. (Please check all that applies to you).

- a. Not enough time, too time consuming
- b. Lack of recognition, rewards
- c. Students lack skills, motivation, and commitment
- d. Provide more support, resources
- e. Provide more recognition
- f. Give course credit
- g. Improve undergraduate courses
- h. Better preparation for students