ROBUST STUDENT-BASED UNDERGRADUATE RESEARCH MODELS

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Abstract *— Here is presented the work in progress for research in engineering and engineering technology for undergraduate students. Traditional models for encouraging undergraduate participation in research projects are based primarily on the undergraduate experiences and recollections of faculty members. Today, we still rely on traditional methods and models to encourage undergraduate students of the New Millennium to conduct research. Relatively low numbers of undergraduate students currently entering Engineering and Technology (E&T) research programs, coupled with a lack of college faculty experience with undergraduate participation in their research projects, suggests that these students are not getting the message that they are perceived as valued researchers. The ultimate goal of this study is to create models for promoting research opportunities for E&T undergraduate students. The anticipated outcomes of this study are increased participation of E&T undergraduates in research, achieving more success in research programs, and eventually increased participation of more prepared students in graduate studies.*

Index Terms – Undergraduate research in engineering and engineering technology, engineering and engineering technology education, engineering and engineering technology pedagogy, mentoring undergraduate research in engineering and engineering technology.

INTRODUCTION

New cutting-edge methodologies and techniques for ascertaining and assessing current needs and trends are a priority for improving the involvement and efficiency of undergraduate research resource management practices. Traditional models for encouraging undergraduate participation in research projects are based, primarily, on the undergraduate experiences and recollections of faculty members. Rarely do these models advance at the same pace as technological progress. Today, we still rely on traditional methods and models to encourage and mentor undergraduate students of the New Millennium to conduct research. These methods do not fully utilize the application of technology in their approach, and generally do not fulfill students' needs. For example, "Google" search is now a days a standard method of looking up information for undergraduate students, where the breath of available information from a particular "search term" can easily get mixed up with the depth of the information required for a robust scientific and engineering research by an inexperienced researcher.

A survey of alumni from the College of Engineering at the University of Delaware indicated that the respondents who had participated in research indicated that this experience was "very" or "extremely" important, with a greater perceived benefit for students who had participated in research for a longer time. It was noted that the alumni with research experience were more likely to pursue graduate degrees, and they reported greater enhancement of important cognitive and personal skills. In addition, respondents who had been involved in research were much more likely to have reported that they had a faculty member play an important role in their career choice. [1]

Relatively low numbers of undergraduate students currently entering Engineering and Technology (E&T) research programs, coupled with a lack of long-term college faculty experience with undergraduate participation in their research projects, suggests that undergraduate students are not getting the message that they are perceived as valued researchers. The ultimate goal of this project is to create models for promoting increased research opportunities for the E&T undergraduate students. The anticipated outcomes of this project are increased participation of E&T undergraduates in research.

PROJECT OBJECTIVES

The near-term goal of this project is to revise some of the traditional undergraduate research models and transform them into robust models that are adaptable to the new generation of technology savvy students. Research exposure, among other factors helps improving retention rate of students. This project has the following main objectives: 1) to assess the research interests and needs of the New Millennium technology savvy undergraduate students in engineering and technology, 2) to revise the traditional models and to develop new undergraduate research models based on the technological and personal interests of engineering and technology students, 3) to suggest a research mentoring model system between undergraduate college students and the engineering and technology professionals in industry and in education, all with similar interests and backgrounds.

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METHODOLOGY AND ASSESSMENT

The random sampling techniques are used to assess the research interests of our E&T students at Daytona State College to ensure accurate and unbiased results. We plan to design and execute an internet-based questionnaire, and distribute the URL among the undergraduates with interests in conducting research. These students can fill out and submit the questionnaires in 10-15 minutes, anonymously online. With the help of two undergraduate students, the questions are designed in the form of a matrix in which each question will be tied to an appropriate objective to quantitatively and qualitatively address the objectives of the project. This includes questions to assess the students' research interests and needs. A sample of questions will measure the level of students' familiarity with technology, preferred area of research, type of projects, prior research exposure, etc. There are also open-ended questions to give the students the freedom to fully express their opinions and interests. The time allocated to this activity spans over two semesters of Fall and Spring, during which students have access to the questionnaire. Our target is a sample size of 100 students. At the end of the surveying period, we analyze the results to assess students' research interests and to identify possible trends, directions, and correlations with industry activities. Our assessment plan includes measuring the number of student participants, and their interests in different fields and comparing the results empirically with the industry demands and research activities at the national level. This comparison helps with including more students with the appropriate projects funded by the appropriate industry.

EXPECTED OUTCOMES

It is expected to gain valuable insight toward removing barriers that discourage New Millennium, technology savvy undergraduate students from pursuing engineering research, offering enormous potential for transition to further development of mentoring models in E&T. At the end of this project, we expect to be able to reassess research interests and needs of these students in order to revise some of the traditional mentoring models and techniques currently used, thus increasing opportunities for representation of undergraduate students in engineering and technology related research activities. The outcome of this approach will improve the undergraduate students' research experience and their capstone projects and help with faculty-student mentoring. It may also help the College as a whole by improving efficiency, cost-effectiveness, and resource management for undergraduate research. We envision that successful implementation of this proposal will far exceed its cost by providing new tools for evaluating and addressing the needs of undergraduate students interested in research.

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