Work in Progress: Strengthening Engineering Education Research at Historically Black Colleges and Universities

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Abstract - **The Strengthening HBCU Engineering Education Research Capacity (SHEERC) Project seeks to improve engineering education research capacity for engineering faculty at Historically Black Colleges and Universities (HBCUs) through their interaction and collaboration with engineering colleagues, as well as colleagues from other education and social science disciplines. This paper provides preliminary results of the effectiveness and impact of the ongoing professional development activities of the SHEERC Project on its HBCU engineering faculty participants by looking at their experiences at a one-week workshop focused on developing their skills in engineering education research.**

Index Terms - Capacity building, engineering education research, Historically Black Colleges and Universities, faculty development.

BACKGROUND

The Strengthening HBCU Engineering Education Research Capacity (SHEERC) Project is an NSF-funded (HRD-0411994) effort to enhance the engineering education research capacity of faculty at Historically Black Colleges and Universities (HBCUs). The project annually identifies three-person teams (typically with two drawn from engineering and one drawn either from education or a social science discipline) from each of the 11 participating HBCUs to engage in an intensive faculty development program aimed at developing or enhancing the participants' capacity to engage in rigorous research on engineering education and to apply the results of that research to the enhancement of the practice of engineering education on their campuses. Each team engages in three activities:

- Attendance of the one-week Rigorous Research in Engineering Education workshop offered by the Colorado School of Mines (CSM) (see [1] for details);
- Attendance of a three-day Project Kaleidoscope (PKAL) faculty leadership development workshop; and
- Attendance of a one to one and a half day annual meeting of the Center for the Advancement of Scholarship on Engineering Education (CASEE) of the National Academy of Engineering.

These activities not only build engineering education research capacity, but facilitate networking with key communities.

Since its inception in Summer 2004, the SHEERC Project has facilitated professional development and educational research opportunities for fifty-five (55) engineering faculty (26 participants in Year 1, and 29 participants in Year 2) drawn from eleven (11) Historically Black Colleges and Universities. Central to the success of the SHEERC Project is the incubator approach to rigorous research initiated during the five-day Colorado School of Mines (CSM) workshops.

A key advantage of the format of the SHEERC Program is that it allows CSM workshop participants to attend as part of cross-disciplinary teams, in contrast to the other participants who attend the CSM workshop as individuals. During these workshops, the SHEERC participants work across disciplines utilizing McDermott and Snyder's community of practice model [2]. In this implementation of the model, engineering educators, learning scientists, and faculty developers operate in tandem, learning about social science research methods and in turn utilizing this information to develop a clearly-defined research question related to engineering education. Additionally, the participants in the CSM workshops work across disciplines, utilizing cooperative and collaborative learning strategies, to map out comprehensive research plans on topics of personal or professional interest to the participants. The work completed by Project participants during these summer workshops serves as the guiding framework for the teams' continued work throughout the ensuing academic year and beyond. This paper reports on the self-assessed impact of the CSM workshop on the SHEERC participants.

EVALUTION OF THE 2004 AND 2005 COHORTS

Formative evaluations are conducted throughout the academic year and summative evaluations are administered each summer for each of the two cohorts of SHEERC Project participants by an external evaluator, seeking to ascertain the utility, impact, and increased capacity for the Project participants to become more actively engaged in: scholarly research, submission and presentation of their research at disciplinary conferences; peer review of grant proposals for a variety of funding agencies; the development and submission

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of grant proposals to a diverse group of funding agencies; as well as the implementation of educational and interdisciplinary research on teaching and learning in their course curricula and pedagogy.

The evaluation consists of a series of anonymous surveys administered to participants electronically, following their involvement in each professional development activity. Response items were included in each survey to gauge the participants' research development, communication and evaluation experience prior to their involvement in the SHEERC Project, providing a basis of comparison for evaluating the participants' net improvement in research capacity following their involvement in the SHEERC Project, in addition to questions about the utility, relevancy, and applicability of each professional development opportunity. The surveys are completed and submitted electronically to the external evaluator, who in turn compiles and analyzes the results to ensure anonymity of the submissions.

In August 2004, 25 HBCU faculty participated in the CSM Workshop. During the announced two-week response period in November 2004, seven (7) participant responses were received. This response translates into a 28% response rate. While it is recognized that the survey results are not statistically significant, they will be considered representative of the experiences of all participants. All of the survey respondents, except for one, indicated that they believe that they are at least somewhat prepared to contribute to the finalization of their research plan, based on their participation in the five modules of the CSM workshop. The outlier indicated that he or she felt extremely prepared to embark upon the finalization of the research plan. Eighty-six percent (86%) of respondents expressed an increased likelihood or likelihood of presenting their research based on their participation in the CSM workshop, while 14% indicated that they were no more likely than prior to the workshop to present the findings of their research in professional meetings and/or conferences.

In the 12-month follow-up conducted with the 2004 cohort in August and September 2005, responses were received from seven (7) Project participants, a 28% response rate. Eighty-six percent (86%) of survey respondents reported that they had developed one or more engineering education research/development activities since they commenced their participation in the SHEERC Project. In a sign of their increased sophistication in the conduct of education research, seventy-one percent (71%) of survey respondents indicated that they utilized both qualitative and quantitative research methodologies in the conduct of the education research projects. Half of all survey respondents indicated that they had submitted research proposals to granting agencies for funding consideration, and of those responding affirmatively to this survey question, all such respondents attributed their ability to submit these research proposals to funding agencies to their involvement in the SHEERC Project. The funding agencies to which most survey respondents reported having made submissions were the U.S. Department of Education and the National Science Foundation. Of the seven respondents to this survey, only one reported having submitted a conference paper for presentation or a journal article for publication, based on his or her research activities related to the SHEERC Project. This area, therefore, represents one for further attention within the SHEERC Project.

In August 2005, 27 HBCU faculty participated in the CSM Workshop. During the announced two-week response period in September/October 2005, fifteen (15) participant responses were logged into the system. This response translates into a 55% response rate and is considered statistically significant. Eighty-seven percent (87%) of the respondents reported that they considered their post-module capacity to conduct disciplinary or educational research to be either *more effective* or *effective,* as a result of their participation in the CSM workshops. Eighty-eight (88%) of those who participated in the CSM workshops described their ability to distinguish between research and assessment as either *excellent* or *good*. One hundred percent (100%) of survey respondents reported that they either considered themselves *well prepared* or *somewhat prepared* to contribute to the finalization of their team's research plan as a result of their participation in the CSM workshops, with the bulk of these respondents (60%) assigning themselves to the latter category of preparedness. The 2005 cohort has not yet been surveyed to assess the 12-month summative impact of their involvement in the program.

However, the evaluation survey respondents have perceived their involvement in the SHEERC Project overall, and the CSM workshop specifically, as positive and generally beneficial to their professional knowledge and skill development.

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REFERENCES

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