Purpose/Background:
Between Fall 2007 and Spring 2008, the Biological & Agricultural Engineering Department saw 62 students (that had engineering as their intended or declared major) leave their program. The purpose of this study is to examine reasons why students enter, stay in, or leave engineering, and propose strategies that could help increase recruitment and retention in engineering. Although engineering is the main focus, the researchers have also interest in examining parallels with other STEM disciplines.

To increase recruitment it is necessary to identify the reasons why students enter (or not) STEM programs. Similarly, to reduce attrition and enhance the success of students taking STEM courses and students majoring in STEM disciplines, it is essential to be aware of the reasons why students succeed, fail, leave, or stay in the program. In sum, it is necessary to recognize the matches and mismatches between the characteristics, abilities, needs, motivations, and preparation of students in a STEM program and the program itself.

A better understanding of the students and the programs will help propose strategies to enhance and transform both formal (course sequence, course content, and materials) and operational (teaching and learning methods, grouping of students, place and time of courses) aspects of the STEM curriculum, and will provide important information to design extracurricular activities and strategies to increase recruitment and retention (e.g., programs targeting “switchers,” such as mentoring and career guidance; programs informing about a wide diversity of career opportunities in engineering; or programs focusing on addressing social needs of students).

Description of Research Project:
To better understand student choices regarding engineering programs we are interviewing students that are in engineering, that left engineering, and that chose not to enter engineering. For each student, we are asking them to explain the reasons for their choices regarding engineering (not coming, coming, staying, and leaving), and we are also measuring demographics and exploring other characteristics of students (learning styles, academic level, personality profile) that could be a factors influencing their college and career decisions, as presented in the literature (Coyle, Jamieson, & Oakes, 2006; Felder & Brent, 2005; Marra, Bogue, Shen, & Rodgers, 2007; Matusovich, Follman, & Oakes, 2006; Mau, 2003; Seymour & Hewitt, 1997).

We are not as advanced in the research project as we were hoping to be by the end of the funding period of the mini-grant. During the first months of the grant, we devoted our time to an exhaustive review of literature, comparison of on-going research, and analysis of existing STEM recruitment and retention programs. We also focused on better understanding the particularities of the engineering program at UGA. This way, we have
been able to better focus our research on gaps in existing knowledge, and on new or specific questions particular to our institution.

After the initial exhaustive examination of existing knowledge and programs, we prepared and submitted a proposal for research with Human Subjects. The proposal was complex (18 attachments), and it took a while to have the proposal approved, for some additional information had to be added after the first reviews. Finally the Institutional Review Board approved the proposal on March 31, 2009 (Project#: 2009-10692-0).

After March 31, we identified students to interview, and started the interviews and instrument data collection. Due to the short time since we received IRB approval, we have only started conducting the interviews (about 10 so far) and do not have enough to draw any conclusions yet. Interviews will be continued during Summer and Fall 2009 as more students become available.

Data Collection and Analysis:

This is an ex-post facto descriptive, non-experimental study. A very important part of the project has been the analysis of existing literature, research, and programs. Apart from this initial review, the types of data collected so far are as follows:

Interviews and paper instruments: Students have been purposefully selected to participate as volunteers in an interview and answer a series of questionnaires. Initially, we are interviewing students both in engineering and having left engineering. In the interview, the students are asked about their background, their career goals, their experiences in high school and college, and their reasons for starting, staying, or leaving engineering. The interviewees also respond to a series of paper instruments. These instruments include the following: Demographics and academic background questionnaire; Index of learning styles (Soloman & Felder, n.d.); Self-Perceived leadership skills (Brick, 1998); Rosenberg Self-Esteem Scale (Evaluation instruments bank, n.d.); DiSC® Personality Profile System; and Community service attitudes scale (Shiarella, McCarthy, & Tucker, 2000).

The interviews are being conducted following the Lincoln and Guba (1985) methodology for naturalistic inquiry, using the tools they describe to establish trustworthiness (prolonged engagement; persistent observation; triangulation of sources, methods, and investigators; peer debriefing; member checks; thick description; dependability and confirmability audits; and reflexive journals) (Lincoln & Guba, 1985, p. 328). The interviews and qualitative sections of the instruments (open-ended questions) are being analyzed through unitizing, categorizing, filling in patterns. The quantitative part of the instruments is being analyzed using the Statistical Package for the Social Sciences (SPSS v. 11.5.1). In the initial analysis, the following SPSS procedures are being used: Descriptive Statistics (frequencies, means, and standard deviations); Scale (Reliability analysis) (internal consistency with Cronbach Alpha); Compare Means (t-tests and one-way analysis of variance); Correlate (bivariate); and Regression (linear). The probability level of statistical significance was set with an a priori alpha of $p < .05$.

Findings:

It is too early in the project to determine or discuss any findings from the interviews and paper instruments. However, the literature, research, and existing project review shed light to very interesting information regarding recruitment and retention in STEM.
disciplines. A short summary of the literature review findings is attached to this report as additional information.

Conclusions/Recommendations:
It is too early in the project to determine or discuss any findings from the interviews and paper instruments. They will be submitted as they become available.

Dissemination:
After data collection and analysis are more advanced, we will prepare a report for the department of agricultural and biological engineering to consider as a basis for program enhancement and increase retention, and will prepare a summary report for use as a research primer in other STEM disciplines. Also, we plan to present research results in the engineering education annual conference and/or publish in engineering education journals.

Our involvement with initiatives coordinated by the UGA office of STEM Education has facilitated new collaborations. One of them is closely related to the focus of this grant: A new group engaged in writing an NSF ADVANCE grant proposal (increasing the participation and advancement of women in academic science and engineering careers).

References