

Measuring the “SEEC Effect:” Engineering Transfer Student Retention & Success

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Background

The STEM Student Enrollment and Engagement through Connections (SEEC) project seeks to increase the number of engineering graduates at Iowa State University by approximately 100 per year. The means to that end are connections rooted in community: learning communities, community colleges, and Iowa communities. The project is a collaboration between Iowa State University (ISU) and Des Moines Area Community College (DMACC).

The cornerstone of SEEC is the success of learning communities for recruitment and retention. The project builds upon Iowa State’s established learning community infrastructure, leadership, and expertise. Retention at DMACC and ISU will be increased by a new learning community model, called a learning village or meta-community. First-year and gateway engineering courses are being reviewed to better engage students, to provide flexibility, and to support transfer students.

Working with DMACC and the Pathway2STEM Degree project, student-centered advising is being coordinated to broaden the diversity of students enrolled in engineering and to make students aware of the various paths to successfully completing an engineering degree, including transfer from a community college. Students are advised on the range of STEM disciplines. With ISU Extension, we seek to improve the public awareness and understanding of engineering, especially among students and their parents. The methods of the project serve ISU and DMACC in several contexts and will also be adaptable to other institutions.

About SEEC

The goal of the SEEC Project is to increase the number of engineering graduates at Iowa State University by approximately 100 per year. The percentage of women and minority graduates will approach 20% and 10%, respectively. The objectives of the project are:

- To build a Learning Village (LV) that enhances student engagement and creates ISU connections for community college pre-engineering transfer students. (Learning Village)
- To redesign the first-year engineering curriculum to enable flexibility and commonality across LCs; and to make selected engineering gateway courses available to DMACC students. (Connected Curriculum)
- To develop and enhance academic advising and mentoring programs for pre-college, community college, and university students. (Student-Centered Advising)
- To establish a recruiting and outreach network across Iowa and with alumni using ISU Extension, DMACC, and involving parents and teachers; to tap into diverse communities of students; and to improve the awareness and understanding of engineering among those who influence student choices. (Coordinated Networking)
- To evaluate project effectiveness that will enhance project activities. (Evaluation)
- To share best practices on campus in other areas of STEM, with other community colleges in Iowa, with other institutions in the Big 12 consortium, and at national meetings. (Dissemination)

The objectives of the SEEC project will be achieved through a set of recruitment, retention, and engagement activities. These activities include the application of proven, research-based practices, alignment with national recommendations, institutional and SEEC team strengths, and expert evaluation.

Engineering Admissions Partnership Program (E-APP)

The Engineering Admissions Partnership Program (E-APP) was created in 2008 as a SEEC project initiative. E-APP's goal is to increase community college students' engagement prior to coming to Iowa State and thus, increase their retention and graduation rates. Pre-engineering community college students who sign up for Iowa State's Admissions Partnership Program (APP) are invited to join the E-APP Learning Community. This virtual learning community connects students to Iowa State's College of Engineering faculty, staff, and students through multiple channels. Some examples of E-APP activities include:

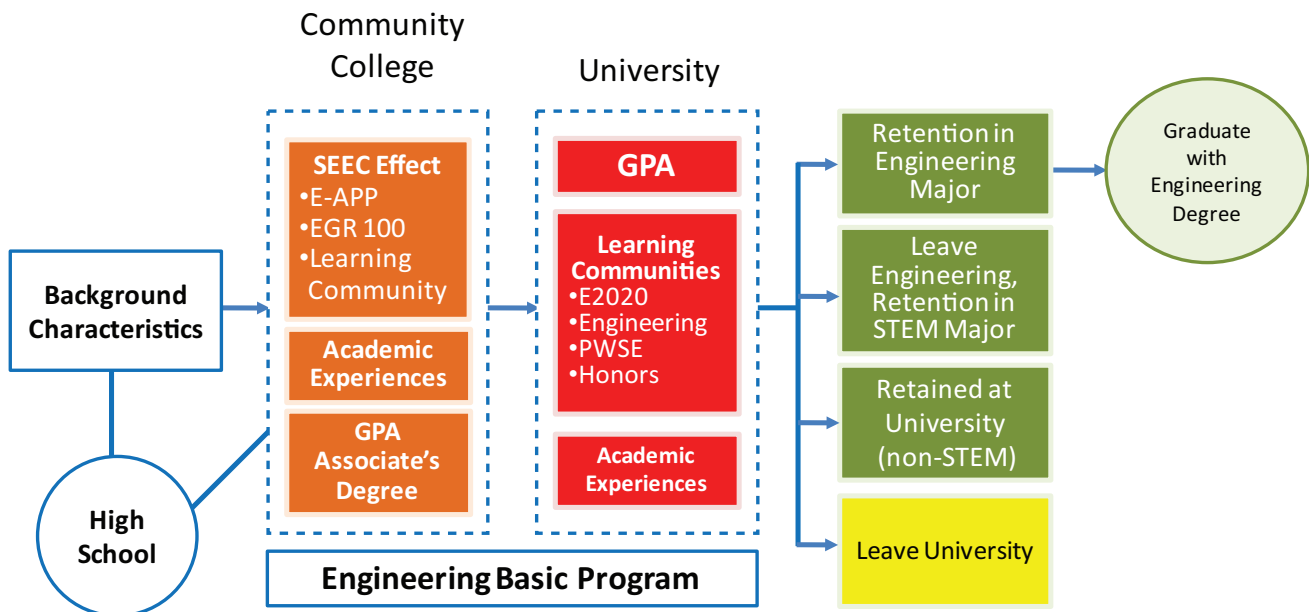
- Interact with Engineering Transfer Peer Mentor
- Interact with Engineer Advisor
- Attend College of Engineering Transfer Student Career Fair Event
- Participate in E-APP Online Professional Network
- Participate in an Engineering 100 course in community college
- Interact with Engineer faculty member
- Develop a Transfer Plan
- Attend Transfer Visit Days

Measuring the "SEEC Effect"

The role of theory is important to our understanding of engineering transfer student retention and success. According to Kerlinger (1979), he defined theory as a "set of interrelated constructs (variables), definitions, and propositions that present a systematic view of phenomena by specifying relations among variables, with the purpose of explaining natural phenomena" (p. 64). More recently, Creswell (1994) elaborated on Kerlinger's definition by stating that the relationships among variables are typically stated in terms of magnitude and direction. Specifically, Creswell (1994) used the metaphor of a rainbow to explain the meaning of theory stating that theory provides a bridge between the independent variables and dependent variables or constructs at any given study.

The SEEC project is comprised of many components including, programs, practices, curricula, etc. In order to measure the "SEEC Effect," we examined the research literature and developed a conceptual model to guide our thinking. Figure 1 illustrates the conceptual model. The objective of the model is to articulate the temporal order of variables as well as organize the variables in a logical order to represent relationships between and among key variables.

Figure 1. Conceptual Model of SEEC Effect Engineering Transfer Student Retention and Success



Source: Laanan, F., Rover, D., Bruning, M., Mickelson, S., Shelley, M., & Darrow, M. (2011). Iowa State University. www.eng.iastate.edu/seec

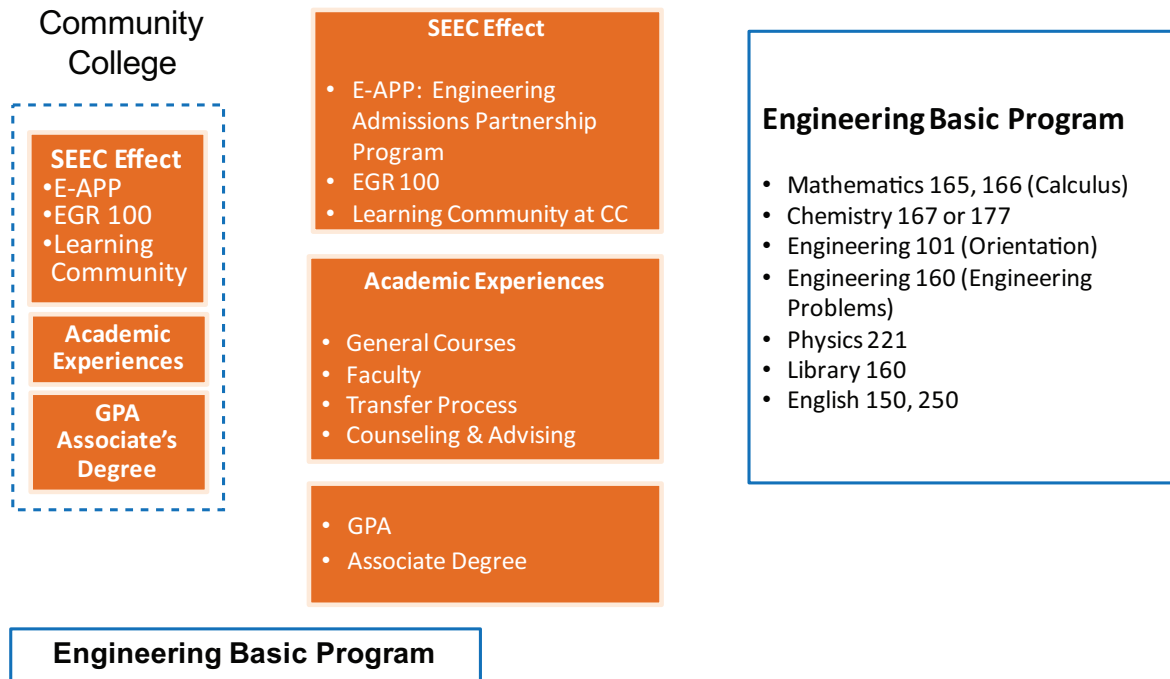
Figure 2 illustrates the community college environment. Specifically, it depicts the “SEEC Effect,” academic experiences, academic achievement (i.e., GPA) and associate degree completion. The SEEC Effect is comprised of a number of activities, programs, and experiences including Engineering Admission Partnership Program (E-APP), enrollment in Engineering 100, and participation in a learning community. For some students, they complete few of the course requirements that meet the Engineering Basic Program (EBP) prior to transferring to ISU. Conversely, a larger percentage of students complete the EBP after transfer.

The academic experiences relate to the in- and out-of-class experiences and levels of student engagement. The research literature suggests that students’ level of

engagement with faculty, coursework, transfer process, and counseling and advising (Laanan, 2007; Laanan, Starobin, Eggleston 2010) relate to transfer students’ adjustment and success at the four-year environment.

The data sources and methodology employed to begin our pilot study of measuring the SEEC Effect includes: 1) student-level data; 2) performance data; 3) academic transcripts; and 4) survey data. Student-level data derived from the Office of Admissions and Office of the Registrar at Iowa State University. Descriptive and inferential statistics were employed to investigate student background characteristics, participation in E-APP and learning community, and various student outcomes (e.g. retention, academic performance, etc.)

Figure 2. Conceptual Model of SEEC Effect: Community College Environment



Engineering Transfer Student Questionnaire (E-TSQ)

In addition to analyzing secondary data from institutional records, another strategy employed is the use of a survey instrument titled “Engineering Transfer Student Questionnaire (E-TSQ). The E-TSQ was adopted using the Laanan-Transfer Student Questionnaire (L-TSQ) (1998, 2004). The purpose of the E-TSQ is to collect data from transfer students at the four-year university. The online survey is organized in four areas: 1) demographic background; 2) community college experiences; 3) university experiences; and 4) open-ended questions.

The target population includes engineering transfer students at ISU who had at least one semester completed. Engineering transfer students are asked to respond to questions about their prior community college experience as well as respond to questions about their current ISU experiences. Examples of survey questions are listed below:

E-TSQ Survey Items

- Participated in E-APP
- Attended ISU's CoE Transfer Student Career Fair Event
- Participated in the E-APP Online Professional Network
- Interacted with an ISU Engineering Transfer Peer Mentor
- Interacted with an ISU Engineering Advisor
- Participated in an Engineering 100 course in your community college
- Interacted with an ISU Engineering faculty member
- Attended an ISU campus event/activity
- Obtained an ISU student ID
- Obtained an ISU email account
- Used ISU's CoE Career Management System (CMS)
- Attended "Experience Iowa State Days"
- Attended Transfer Visit Days
- Attended Admissions Partnership Program (APP) Days
- Came to ISU campus during a prospective student visit
- Developed a Transfer Plan
- Utilized ISU's TRANSIT to develop an ISU Transfer Plan
- Participated in an ISU student organization
- Participated in a community college learning community
- Interacted with community college advisors
- Interacted with community college pre-engineering faculty
- Interacted with ISU's CoE website
- Lived in ISU residence halls

Indicate the services or programs that you participated in at the community college by selecting NO or YES. Please indicate the extent to which they influenced your transfer preparation using the four-point scale: 1) disagree strongly, 2) disagree somewhat, 3) agree somewhat, 4) agree strongly

Demographics

Community College Experiences

- General Courses
- Academic Advising/Counseling Services
- Transfer Process
- Course Learning
- Experience with Faculty
- Learning and Study Skills

Open-Ended Questions

- What factors helped you adjust to university?
- What might the community college have done to enhance your success or ease the transition?
- If you could give some advice to community college students, what would that advice be?
- What have we not asked that you would like us to know about your experience at the community college or university?

University Experiences

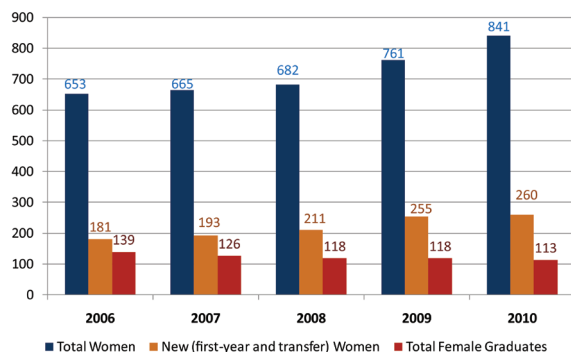
- Reasons for Attending University
- Course Learning
- Experiences with Faculty
- General Perceptions
- Adjustment Process
- College Satisfaction

One benefit of collecting survey data is the ability to link the survey responses to students' academic transcripts. This technique provides researchers with the ability to

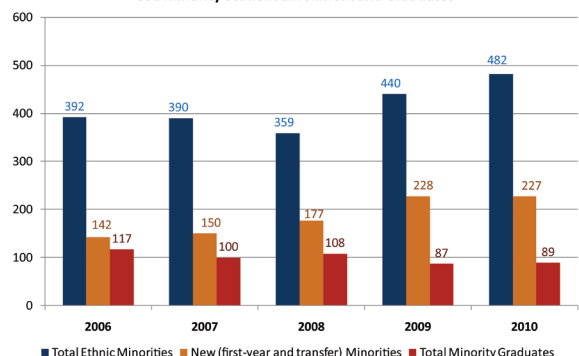
understand affective characteristics of students in terms of experiences, levels of engagement, adjustment, and college satisfaction.

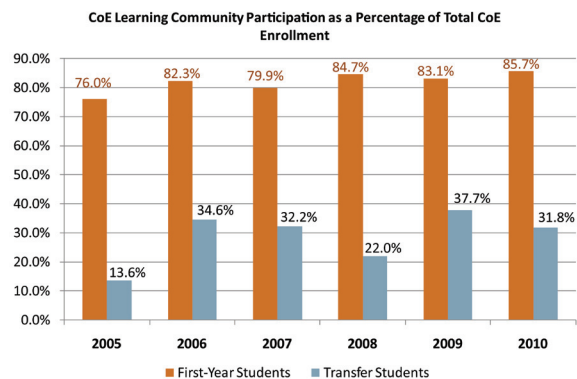
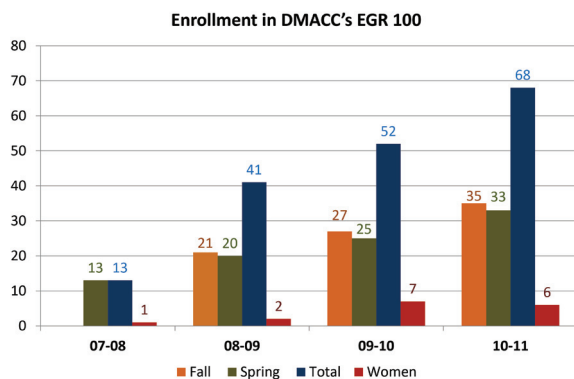
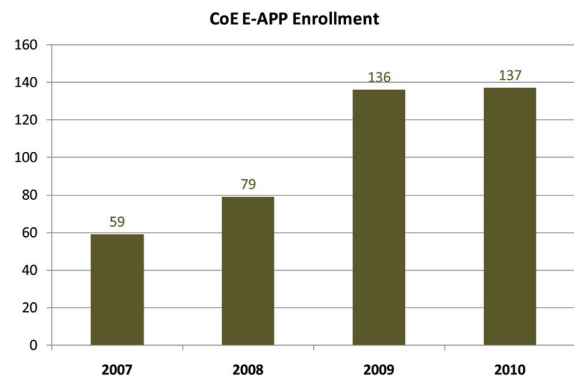
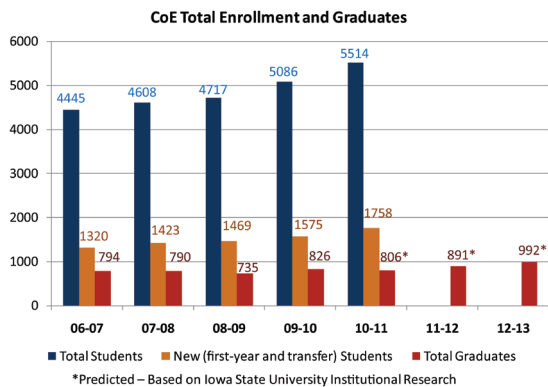
Preliminary Results

CoE Female Enrollment and Graduates



CoE Minority Student Enrollment and Graduates





Implications

The purpose of this SEEC Data Brief was to present a conceptual model that measures the “SEEC Effect.” This model provides STEP program administrators, faculty, staff and other constituents with a tool to begin to conceptualize the complexity of a STEP program. STEP programs are comprised of many components that involve faculty, programs, students, staff, inter-institutional collaboration, as well as researchers and evaluators. Understanding and measuring the impact and/or effect of a STEP program can be a challenging task. Therefore, the use of a conceptual model that is guided by theory is critical to any STEP program aspiring to measure student and program outcomes.

Specifically, for individuals involved in the assessment and evaluation of a STEP program, the conceptual model provides an analytical framework that helps organize key variables and their relationships between and among them to understand short- and long-term outcomes. In addition to the conceptual model, another objective of the Data Brief was to share other strategies (i.e., E-TSQ) currently being employed at ISU and DMACC to better assess and evaluate engineering transfer student experiences. This Brief presented preliminary results regarding engineering transfer students. Future Data Briefs will present additional results that relate to measuring the “SEEC Effect.”

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Additional Resources

- SEEC (www.eng.iastate.edu/seec)
- Pathway2STEM Degree (www.pathway2stemdegree.org)

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