

2012

Annual Report – Year Five

SEEC: Student Enrollment and
Engagement through Connections

Report Period: 1 July 2011 – 30 June 2012

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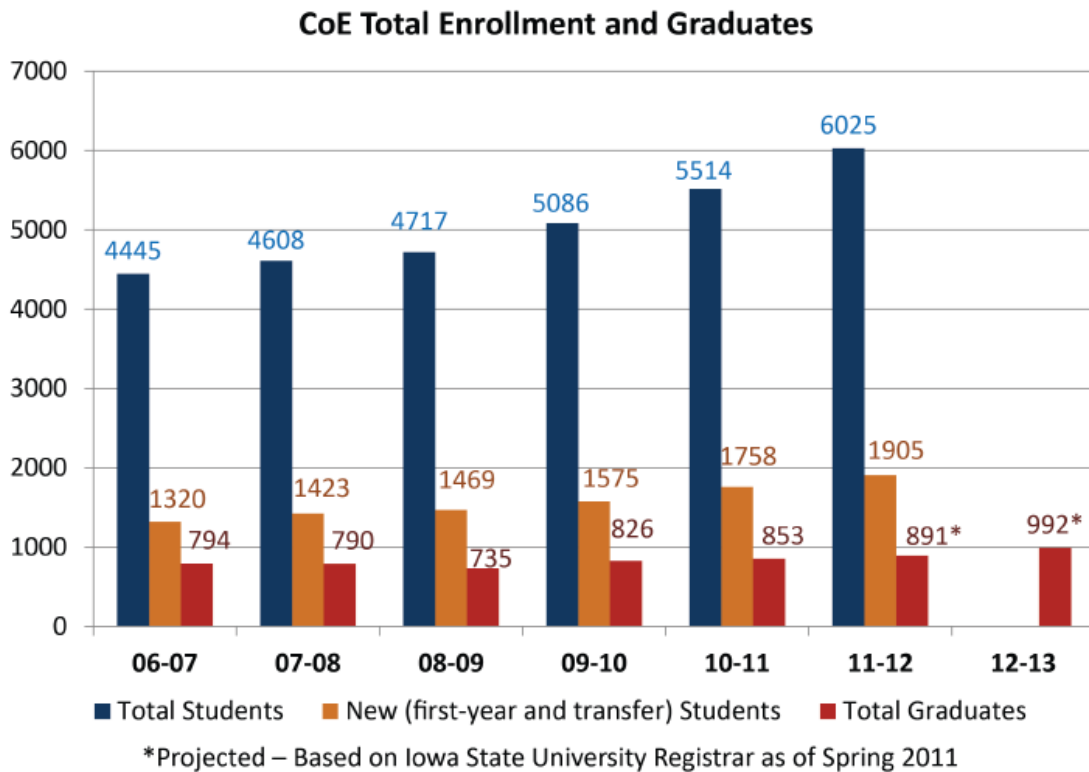
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1. Project Overview and Progress

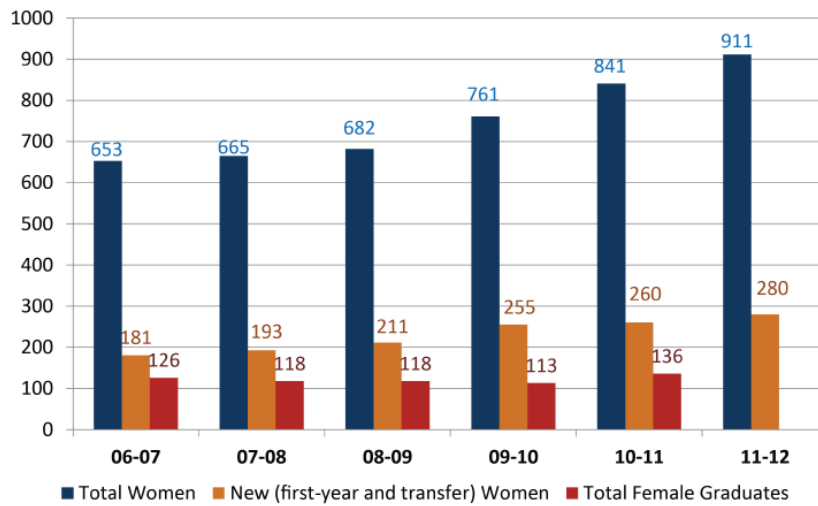
The STEM Student Enrollment and Engagement through Connections (SEEC) project, pronounced “seek,” is a collaboration between Iowa State University (ISU) and Des Moines Area Community College (DMACC). The goal of the SEEC project is to increase the number of engineering graduates at Iowa State by 100 per year, to approximately 900 graduates annually. Included within this goal are increases in the percentages of women and minority graduates in engineering at Iowa State and the number of pre-engineering students at DMACC. The number of students and graduates has steadily grown and is expected to surpass the goal, as shown in the graph below.



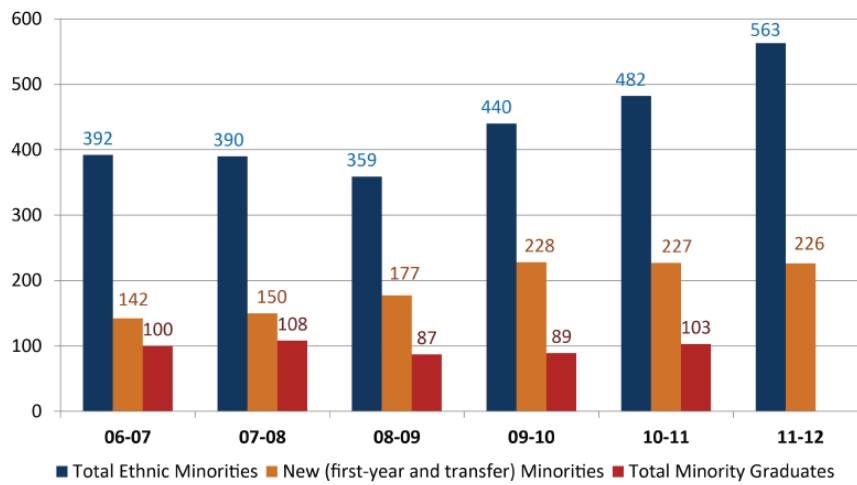
Data since 2006-07, projected out to 2012-13, for the College of Engineering (CoE) illustrate the upward trend in total undergraduate engineering enrollment and new student enrollment (including transfer students). The percentage increase in enrollment from fall 2010 to fall 2011 was 9.3%; this compares with a fall 2011 increase of 4.8% nationally as reported by ASEE for undergraduate engineering enrollment (*ASEE Connections*, May 2012, <http://www.asee.org/papers-and-publications/blogs-and-newsletters/connections/2012May.html#databyte>). Results expected from the SEEC project are being realized with the continued efforts of project partners and collaborators.

The number of women and minority students enrolled in engineering has increased as shown in the graphs below; this is expected to result in increases in women and minority graduates.

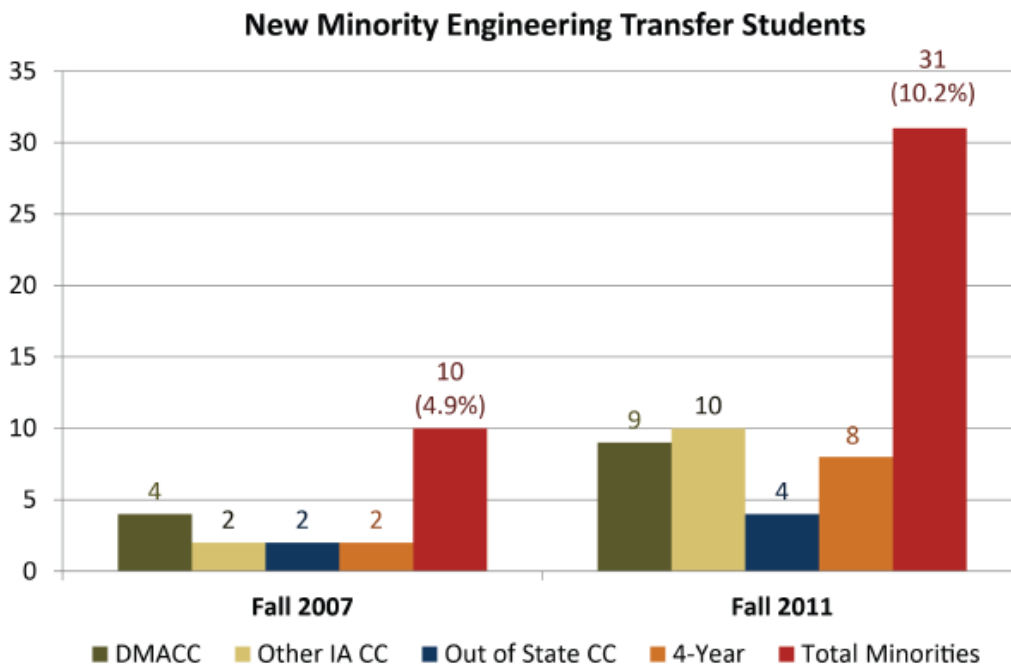
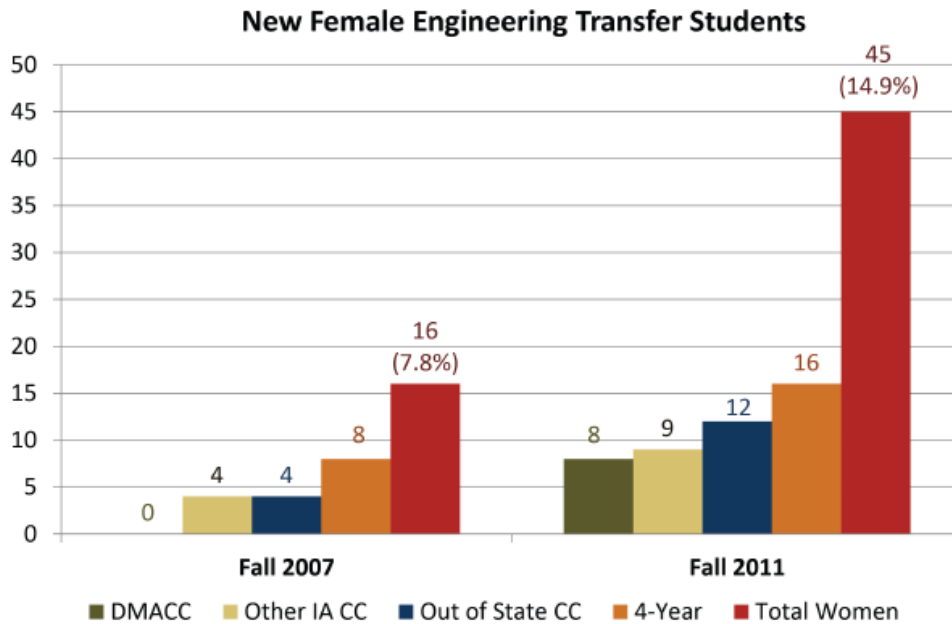
CoE Female Enrollment and Graduates



CoE Minority Student Enrollment and Graduates

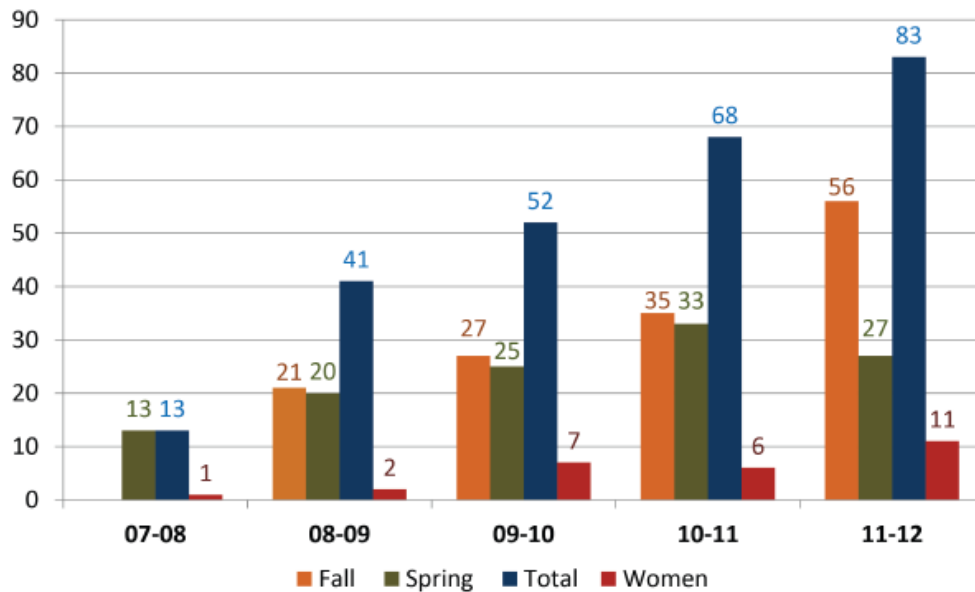


The percentages of women and URM among new transfer students enrolled in engineering have increased, as shown in the graphs below, a positive step to increase overall percentages as well as the number of graduates.



Pre-engineering student enrollment at DMACC is increasing, as evidenced by enrollment in DMACC's engineering orientation course, EGR 100, shown in the graph below.

Enrollment in DMACC's EGR 100



The increased interest in engineering by DMACC and other Iowa community college students is also reflected in enrollment in the Engineering Admissions Partnership Program (E-APP), created in 2008 as a SEEC project initiative. E-APP enrollment is shown in the table below.

Year	2007	2008	2009	2010	2011
E-APP Enrollment	59	79	136	137	145

On the goal of increasing the *percentages* of women and minority graduates in engineering at Iowa State, the percentage data have remained mostly flat. Absolute enrollment numbers have increased, as shown in the graphs above. These increases have not been proportionally greater than the overall increases. There have been exceptions, such as a notable percentage increase in new women students in fall 2009.

The total enrollment and number of graduates are influenced by retention as well as new student enrollment. The CoE has seen a significant improvement in first-year retention of Iowa community college students. Data indicate that E-APP has had a positive and in some cases significant effect on retention in engineering, as described in the table below.

E-APP Effects for Iowa Community College Transfer Students (entering 2008 – 2010)

College	Status	Retained in ENGR after 1 year		Retained at ISU after 1 year		Total Count
		n	%	n	%	
All Iowa Community College Transfers	E-APP	62	74%	77	92%	84
	not in E-APP	258	67%	313	81%	386
DMACC Transfers	E-APP	40	77%	47	90%	52
	not in E-APP	62	58%	81	76%	106

Significantly higher retention rates in **bold**

During year five, major milestones were achieved in evaluation and research to measure and document the effect of SEEC project activities on these results (i.e., the “SEEC effect”). SEEC effect evaluation includes quantitative and qualitative methodological approaches. SEEC effect findings are highlighted in later sections and reported in SEEC Data Briefs and dissertations.

Progress toward project goals has been achieved through six main objectives of the SEEC project as defined below.

- O1. **Learning Village.** To build a learning village that enhances student engagement and creates ISU connections for community college pre-engineering transfer students.
- O2. **Connected Curriculum.** To enhance first- and second-year learning experiences, with an emphasis on student success and engagement and classroom climate.
- O3. **Student-centered Advising.** To develop and enhance academic advising and mentoring programs for precollege, community college, and university students.
- O4. **Coordinated Networking.** To establish a recruiting and outreach network across Iowa to tap into diverse communities of students, and to improve the awareness and understanding of engineering among those who influence student choices.
- O5. **Evaluation.** To evaluate project effectiveness and improve project activities.
- O6. **Dissemination.** To share best practices on campus in other areas of STEM, with other community colleges in Iowa, with other institutions, and at national meetings.

The objectives of the SEEC project are being addressed through a set of recruitment, retention, and engagement activities associated with developing the community, curriculum, advising, and networking components of the project. Both recruitment and retention goals are supported by project components related to objectives O1-O3 (community, curriculum, and advising). Recruitment goals are primarily supported by the networking component of objective O4. SEEC project activities and outcomes associated with each of these objectives have been coordinated using a logic model approach.

2. Participants

Table 1 lists SEEC project participants for 2011-2012, along with their project role, time involvement, and objective team involvement.

Table 1

*SEEC Project Participants, Year Five (2011-2012)**

Participant	Institution	Project Role	>160 Hours	Objective Teams				
				L	C	A	N	E
Diane Rover	ISU	Principal Investigator	Yes		LE			
Harry McMaken	DMACC	Principal Investigator	Yes	CO	CO			
Monica Bruning~	ISU	Co-Principal Investigator	Yes				LE	
Frankie Santos Laanan~	ISU	Co-Principal Investigator	Yes			LE		
Steve Mickelson~	ISU	Co-Principal Investigator	Yes	LE	CO			
Mack Shelley~	ISU	Co-Principal Investigator	Yes				CO	LE
Kari Hensen	DMACC	Co-Principal Investigator	Yes	CO	CO	CO		
Mary Darrow~	ISU	Senior Personnel, GA	Yes	CO	CO	LE	CO	
Sandy Jennings-Hammond~	ISU	Contractor	Yes	CO	CO	CO	CO	
Mani Mina	ISU	Senior Personnel	No	CO	CO			
Derrick Rollins	ISU	Senior Personnel	No				CO	
Andrew Ryder~	ISU	Senior Personnel	No	CO			CO	CO
Karen Zunkel~	ISU	Senior Personnel	No		CO		CO	
Mark Laingen~	ISU	Graduate Assistant	Yes	CO	CO	CO		
Marcia Laugerman~	ISU	Graduate Assistant	Yes	CO				CO
Carlos Lopez~	ISU	Graduate Assistant	Yes			CO		
Virginia Anderson	ISU	Collaborator	Yes					
Tom Brumm	ISU	Collaborator	No		CO			
Holly Bignall	ISU	Collaborator	No				CO	
Paul Castleberry	ISU	Collaborator	No	CO	CO			
Lora-Leigh Crystal	ISU	Collaborator	No	CO			CO	
Nancy Franz	ISU	Collaborator	No				CO	
Beth Hartmann~	ISU	Collaborator	No		CO			
Carol Heaverlo	ISU	Collaborator	No				CO	
Doug Jacobson~	ISU	Collaborator	No		CO			
Joel Johnson	ISU	Collaborator	No			CO	CO	
Amy Kaleita~	ISU	Collaborator	No		CO			
Donna Le	ISU	Collaborator	No			CO		
Jason Pontius	ISU	Collaborator	No					CO
Chris Rehmann~	ISU	Collaborator	No		CO			
Jay Staker	ISU	Collaborator	No				CO	
Ahmed Ageyman	DMACC	Collaborator	No			CO		
Randy Gabriel	DMACC	Collaborator	No				CO	
Randall Jedele	DMACC	Collaborator	No	CO				
Dave Kissinger	DMACC	Collaborator	Yes				CO	
Michael Lentsch	DMACC	Collaborator	No				CO	
Randy Mead	DMACC	Collaborator	No				CO	

Sokish Sands	DMACC	Collaborator	No				CO
Randy Smith	DMACC	Collaborator	No	CO	CO		
Jim Stick	DMACC	Collaborator	No	CO	CO	CO	
17 PWSE undergrad. women students~	ISU	Peer Mentor, K-12 Role Model	No	CO			CO

*Maximum of 25 participants are allowed to be entered into NSF Fastlane System

~Received grant funds

Note: L=Learning Village, C=Curriculum, A=Advising, N=Networking, E=Evaluation; LE=Leader, CO=Contributor/Collaborator

2.1 Partnering Organizations

DMACC is the only external organization partnering and participating in the SEEC grant with ISU.

2.2 Internal and External Advisory Groups

ISU Institutional Advisory Board (Internal to ISU)

Chair: Elizabeth Hoffman, *Executive Vice President and Provost*

Sandy Gahn, *Senior Research Analyst, Institutional Research*

Doug Gruenewald, *Co-Director, Learning Communities*

Connie Hargrave, *Associate Professor, Curriculum and Instruction and Center for Technology in Learning and Teaching*

Thomas Hill, *Vice President of Student Affairs*

Gary Mirka, *Associate Dean and Professor, Industrial and Manufacturing Systems Engineering*

DMACC Institutional Advisory Board (Internal to DMACC)

Chair: Kim Linduska, *Executive Vice President for Academic Affairs, Ankeny Provost*

Ahmed Ageyman, *Academic Advisor*

Randy Mead, *Executive Dean for Program Development*

Randy Smith, *Professor and District Chair of Mathematics*

Carol (Renee) White, *Professor, Civil Engineering Technology*

Laurie Wolf, *Executive Dean for Student Services*

External Advisory Board

Chair: Jim Melsa, *Professor & Dean Emeritus, ISU College of Engineering*

Kimberly Douglas-Mankin, *Director, Women in Engineering & Science Program, Kansas State University*

Robert Driggs, *Dean of Mathematics & Science, Kirkwood Community College*

Leigh Hagenson Thompson, *Technology Manager & Project Leader, The Dow Chemical Company*

2.3 Other Collaborators

The SEEC project collaborates with several ISU offices and programs outside of the College of Engineering. SEEC partners include:

- ISU Extension
- Program for Women in Science and Engineering (PWSE)
- Office of Admissions

- Office of Community College Research and Policy (OCCRP)
- Office of Financial Aid
- Office of the Registrar
- Research Institute for Studies in Education (RISE)
- ISU Learning Communities
- ISU GIS Facility
- Iowa Department of Education
- Project Lead the Way, Iowa
- Iowa 4-H Clubs

3. Activities and Findings

Year five activities and findings, organized by objective, are summarized in this section.

3.1 Learning Village

Learning Village activities in year five of the SEEC project are highlighted below. A number of SEEC effect findings have resulted and are reported in section 4.

The E-APP Learning Community was formed in August 2010 and continues to be operational. The E-APP webpage and an online brochure continue to be updated and utilized:

- <http://www.eng.iastate.edu/transfer/app>
- <http://www.eng.iastate.edu/transfer/app/EAPPBrochure.pdf>

The Engineering Transfer Student Questionnaire (E-TSQ) was administered through OCCRP and results have been analyzed and disseminated. Team members presented the following work at the 10th Annual National Institute for the Study of Transfer Students, Fort Worth, Texas: “STEM Student Enrollment and Engagement through Connections (SEEC): Using Data to Inform Transfer Programming.”

DMACC’s pre-engineering activities are reported in section 3.5.

Various activities and findings related to this objective are reported in the SEEC Data Briefs, which continue to be a central dissemination product of this project. These briefs have been used at multiple meetings at both institutions with faculty, staff, and administrators to highlight student and program outcomes data and inform future practice. The data briefs are listed in the Dissemination section of this report and available at the project website, <http://www.eng.iastate.edu/seec/resources.shtml>.

3.2 Connected Curriculum

Major activities related to curriculum during 2011-12 include:

- Course offerings that provide pre-engineering and engineering students with key learning experiences and professional development (e.g., ENGR 110X and 210X E2020 courses, and DMACC’s EGR 100 course).
- Continued SEEC project emphasis on data analysis of students' academic performance and success related to the Engineering Basic Program and lower-division academic experience.

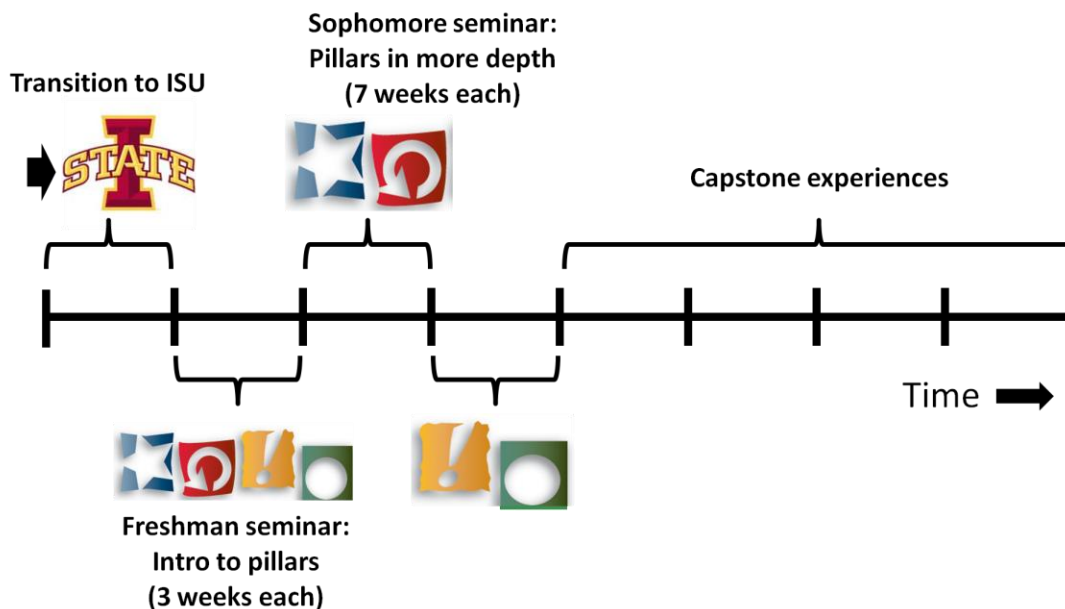
The SEEC curriculum component coordinates with Iowa State’s NSF S-STEM-funded E2020 Scholars Program, www.engineering.iastate.edu/e2020/. This program offers scholarships for cohorts of undergraduate engineering students, including transfer students, giving specific attention to the aspirations and attributes of the National Academy of Engineering's (NAE) vision for the engineer of 2020. During the first two years of the E2020 program, scholars are introduced to four pillars:

1. leadership
2. systems thinking
3. innovation and entrepreneurship
4. global awareness and understanding

The scholarship program promotes student engagement and development centered on these E2020 outcomes. The program provides scholars an opportunity to develop a community of practice with

other scholars, upper-division peer mentors, and engineering faculty who share a common interest in developing competence related to these four pillars. The program builds on Iowa State's strong learning community initiative by having the scholars participate in a degree-program specific learning community (e.g., Mechanical Engineering Learning Community) or a thematic learning community (e.g., Women in Science and Engineering).

As shown in the figure below, the first semester focuses on the transition to Iowa State, and early experiences with the pillars are provided in the freshman (first year) and sophomore (second year) seminars.

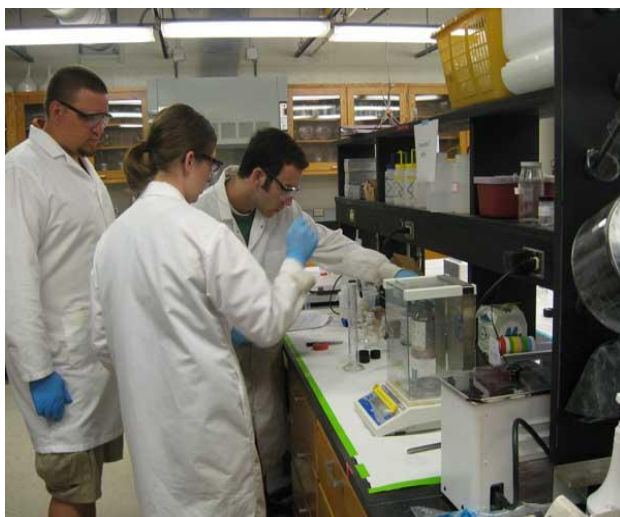


During the second semester of the program, scholars participate in a seminar course (ENGR 110X) that introduces them to each of the four pillars. A three-week learning format is used for introducing each pillar. In the scholars' second year of the E2020 program, fall and spring semester seminar courses (ENGR 210X) provide more in-depth investigation into the pillars. Each semester-long course is split into two halves. Beginning in the third year of the program, scholars continue to develop a deeper understanding of the pillars through capstone-like experiences using project-based learning. During year 5 of the SEEC project, the project-based learning experience was developed, and the first cohort of E2020 scholars began independent study experiences with faculty mentors.

The intention is to use the seminar courses to develop learning experiences to be integrated into the first year experience or other engineering courses for all engineering students. One avenue for integration is in learning community programming. During spring 2012, the first of a series of workshops centered on E2020 pillars was held for Engineering Learning Community coordinators and peer mentors. The E2020 Leadership Pillar Workshop with LCTT was organized by Paul Castleberry and designed by Beth Hartmann, E2020 Faculty Leader; part 1 was held on February 9 and part 2, on March 8.

The story of E2020 scholar Joe Kopacz serves as an example of student engagement, first- and second-year learning experiences, and synergistic project activities. Early in the SEEC Project, the project promoted community college student participation in the ISU BioMaP (Biological Materials and

Processes) REU, which was one of the first at ISU to involve community college students (<http://www.cbe.iastate.edu/research/undergraduate-research/>). The BioMaP REU Program is directed by Monica Lamm, a professor in Chemical and Biological Engineering. Dr. Lamm has acknowledged SEEC team member Mary Darrow as instrumental in helping the program identify strong students from community colleges. During summer 2011, twelve students from across the nation and three from Mexico spent their summer with the program. BioMaP consists of a variety of projects with topics ranging from nanovaccines, drug and gene delivery, to clinical trials with an artificial pancreas. Through research and activities, the goal of the program is to provide students with a graduate school experience and create a desire for lifelong learning. One of the students participating was Joseph Kopacz from Scott Community College, Davenport, Iowa. Joe participated in E-APP and transferred to ISU as an E2020 Scholar in fall 2011; he is now a senior in mechanical engineering. Joe is pictured in the photo below, standing on the left.



(<http://innovate.engineering.iastate.edu/2011/09/20/students-travel-from-across-the-nation-for-biomap-reu-summer-program/>)

Through E-APP, SEEC has helped advertise BioMaP, career fairs, and similar opportunities to community college students from across the state of Iowa.

Findings from the curriculum development activities described above were reported in the following publications:

- Bruning, M., D. Rover, and A. Williams. Work in Progress: Developing Engineers for 2020 – An Innovative Curricular and Co-curricular Approach. Proc. 2011 ASEE/IEEE Frontiers in Education Conf. October 2011.
- Geisinger, B. and Ryder, A. E2020 Scholars Evaluation Survey for Students in ENGR 110X and ENGR 210X: Evaluation Report. Research Institute for Studies in Education (RISE), Iowa State University. December 2011.
- Williams, A., Bruning, M., Rover, D., Laingen, M., Mickelson, S., Brumm, T., & Shelley, M. E2020 Scholars Program. Teaching Poster Symposium. Iowa State University Center for Excellence in Learning and Teaching. April 2012.

3.3 Student-Centered Advising

Student-centered advising activities in year five of the SEEC project are highlighted below. A number of SEEC effect findings have resulted and are reported in section 4.

In an effort to inform program development and foster student success in engineering, team members analyzed and disseminated results of a new Engineering Transfer Student Questionnaire (E-TSQ) administered to all community college transfer students entering the College of Engineering in 2009-10 and 2010-11. The E-TSQ includes survey questions in areas pertaining to community college experiences, Iowa State experiences, and engineering programming.

The project has developed and distributed various transfer advising materials and communications for/with community college stakeholders. The College of Engineering transfer website continues to be updated and used, <http://www.eng.iastate.edu/transfer/>. The Pathway to STEM website, www.pathway2stemdegree.org, and Transfer Student Guide (TSG) were completed. These are products of the Office for Community College Research and Policy, a SEEC project partner. The website provides detailed information for prospective community college students to learn about the STEM pathway. Information about specific majors in STEM as well as academic preparation and transfer/articulation information are provided. Resources for students, faculty and advisors at the community college are components of the Pathway website. The TSG includes eight chapters on topics such as: role of community colleges, crossing the transfer bridge into STEM, understanding transfer, building the transfer bridge, understanding the articulation puzzle, financing your education, and after you cross the transfer bridge. In addition to the website, educational videos highlight the experiences of community college students and transfer students in STEM majors as well as two-year faculty. The goal of the videos is to educate a diverse audience, especially community college students, about the strategies to successfully transfer from a two-year to a four-year STEM degree.

The Advising Team worked with a DMACC team to develop a new pre-engineering informational brochure for students and parents. This brochure is being used widely with current DMACC students including dual enrolled high school students considering engineering. Various events for transfer students were offered by the College of Engineering in partnership with the SEEC project; several are listed at the project website.

Findings from advising-related activities were disseminated during year 5 by team members Laanan, Darrow and others; papers and presentations are listed in the Dissemination section. SEEC Advising Team members assisted in the development of and disseminated the SEEC Data Briefs , also listed in the Dissemination section.

3.4 Coordinated Networking

The networking activities during year 5 of the project continued to implement and refine recruiting initiatives with key partners, including ISU Extension, ISU Admissions, and the ISU Program for Women in Science and Engineering (PWSE). Relationships were also maintained with several state and national organizations that promote STEM workforce development and diversity.

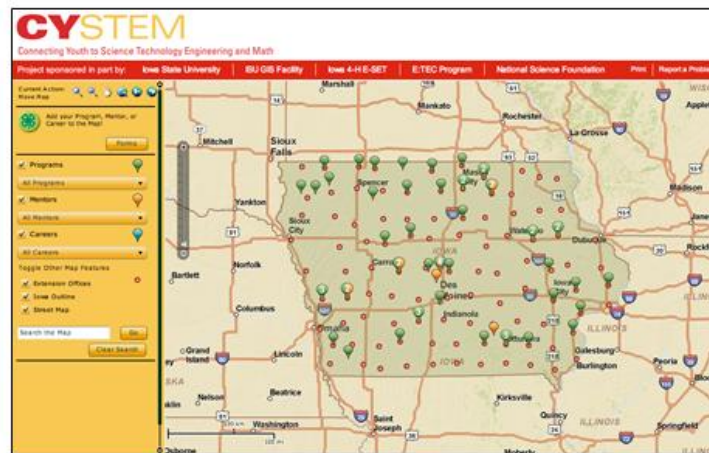
The SEEC project partnered with ISU Extension to continue to implement and administer the Engineering Talent in Every County (E-TEC) program. E-TEC provides \$500 scholarships to incoming first-year and

community college students. There are 99 counties in the state of Iowa, and a goal of E-TEC is to increase awareness about engineering across all counties. Prospective students from over 50 counties submitted applications to E-TEC for fall 2012, a 75% increase compared to 2009, as shown in the table below.

E-TEC Scholarships	2012	2011	2010	2009
Total Applications	123	134	50	63
Total Counties (of applications)	51	49	37	29
Total Awards	60	83	39	51
Total Women (awarded)	17	25	8	7
Total URM (awarded)	7	8	5	4
Total Transfers (awarded)	7	16	6	3

The E-TEC program involves close collaboration with ISU Extension to implement programs to improve awareness, understanding, and interest in engineering in every county in Iowa. With ISU Extension, the SEEC project has piloted a web and database repository of Iowa STEM programs, mentors, and professionals, known as CySTEM and shown in the screen image below. It was demonstrated at professional meetings and at the Governors STEM Summit 2011.

<http://ags.gis.iastate.edu/cySTEM>



Efforts are underway to populate the database with information about STEM programs, mentors, and professionals. To further facilitate E-TEC goals, a mini-grant program was created for 4-H leaders, adult volunteers, and STEM teachers to increase awareness and understanding about engineering with special emphasis on under-served populations; \$8000 in mini-grant funds was awarded. Results from these mini-grants are being collected.

The SEEC project has partnered with PWSE on various activities to recruit women into engineering and to promote an understanding of engineering through the NAE's Changing the Conversation. With SEEC support, PWSE has employed undergraduate students with the goal of connecting ISU undergraduate STEM females with two distinct audiences: 1) prospective and new transfer women in STEM fields and 2) youth across the state. Undergraduate STEM peer mentors hosted individualized visits with prospective transfer students and connected with enrolled STEM transfer women through the WISE

learning communities. SEEC funds were used to enhance and expand visits by undergraduate student role models, who visited classrooms across the state of Iowa. In all the visits, PWSE incorporated the messaging from the Changing the Conversation work that has been integrated into the networking initiatives of SEEC. Recently, partially supported with SEEC funds, PWSE created a poster series highlighting women in STEM from across the state of Iowa; it uses some of the messaging from Changing the Conversation. Several posters are shown below.



The Changing the Conversation report was used early in the SEEC project to inform work done by a Des Moines advertising firm (ZLR Ignition) for College of Engineering undergraduate recruiting materials. The (Be Creative)² campaign materials were introduced in electronic and print media in 2009. Since then, various elements have been used in electronic, web and social media messaging by the college, as shown in the images below, primarily using the theme line “Be > You Imagined”. Clockwise from top left: desktop wallpaper; a Twitter profile picture; department webpage button; and a college ad at cyclones.com, the university’s athletics website.

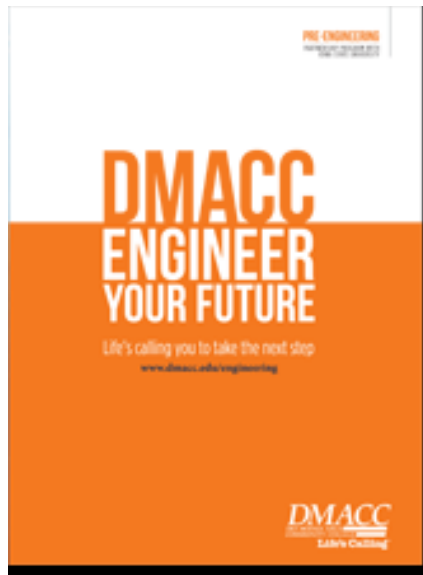


3.5 Des Moines Area Community College (DMACC)

DMACC and ISU continue to work collaboratively across the objectives of the SEEC project. DMACC also has the goal of increasing student participation and interest in engineering with emphasis on racial and ethnic minority and female students.

3.5.1 Expansion of Engineering Curriculum at DMACC

DMACC partnered with the College of Engineering at ISU to develop a recommended course sequence “Basic Program” for pre-engineering students. A new marketing campaign consisting of a brochure and website was designed to promote this new recommended course sequence and best practices for successful transfer (<http://go.dmacc.edu/programs/pdp/engineering/Pages/welcome.aspx>).



DMACC expanded the engineering curriculum and course offerings to the Ames Hunziker Center utilizing the newly renovated physics laboratory. Enrollment in Engineering 100 has grown steadily at DMACC, as shown in the graph in section 1. Future plans include identifying space at the DMACC Urban Campus for course offerings.

3.5.2 Recruitment of Women in STEM

DMACC regularly participates in events that help recruit women and underrepresented minority students into STEM fields. The 2nd annual “Believe in Girls” BIG event sponsored by Girl Scouts of America on March 31, 2012, was held at the FFA Building on the DMACC Ankeny Campus. Two-thousand

Girl Scouts and their families participated in breakout sessions conducted by DMACC faculty from the Biotechnology, Pre-Med, Chemistry and Medical Lab Technology Departments.

On June 18-22, 2012, Girls Discover Engineering Camp sponsored by DMACC, Dowling High School, and Iowa State University offered 7th and 8th grades girls the opportunity to explore the world of engineering with teachers and industry professionals. Eighty students were registered to participate in activities coordinated by STEM faculty. (<http://go.dmacc.edu/news/pages/20120601.aspx>)

3.5.3 Engineering Career Awareness Events

Explore Engineering Day

DMACC held the 2nd annual Explore Engineering Day on November 1, 2011 in Building 5 on the Ankeny Campus. Fifty-one DMACC students in pursuing advanced studies in Engineering met with faculty and staff from both DMACC and the ISU College of Engineering. In addition, students were able to interact with professional engineers from Snyder Engineering, Pioneer Hybrid, Sauer-Danfoss (sponsor), John Deere, Vermeer and the University of Iowa to learn about the breadth of the engineering discipline. Twelve percent of the participants were female.

Discover Engineering Day

The 3rd annual Discover Engineering Day was held on April 3, 2012 at the FFA Building on the DMACC Ankeny Campus for current high school students with an interest in engineering. Fifty-four high school students and thirty-seven parents had the opportunity to interact with professionals from the following engineering firms: Snyder, S-D (sponsor), ALMACO, Accu-mold, Thombert, 3M, Channel Prime Alliance, ASCE Central Iowa and Iowa Younger Member Group. In addition, the participants met with faculty and staff from both DMACC and ISU College of Engineering. Students were able to interact with professional engineers and learn about the breadth of the engineering discipline.

Engineering Seminars

This year DMACC offered monthly seminars on the DMACC Ankeny Campus for current DMACC Pre-Engineering students. Approximately 20 students attended each month and had the opportunity to meet with ISU officials to discuss educational planning, internships, scholarships, career fairs and the transfer experience.

DMACC plans to continue the partnership with the ISU College of Engineering to promote engineering with a special emphasis on underrepresented populations. Discover Engineering and Explore Engineering Days will continue to be annual events.

3.6 Evaluation

The work of the Evaluation Team intersects with all facets of SEEC, helping facilitate all research and evaluation activities involving students as the primary contact with the Office for Responsible Research and the ISU Institutional Review Board; and melding institutional data from DMACC and ISU with additional data collected through surveys, focus groups, and other methods.

The Evaluation Team worked to prepare and analyze DMACC and ISU institutional data, combined with longitudinal student records (engineering basic program data, course enrollment data, and student retention data) to help estimate and interpret statistical models showing which variables predict transfer student retention in engineering or in another college at Iowa State. New research shows a number of positive predictors of community college transfer student success in the College of

Engineering. Data show that community college transfer students' first semester and first year grade point average, as well as the number of community college credits completed are positive indicators of student success in the College of Engineering. Additionally, a grade of B or higher in Calculus I or Calculus II and Physics I at the community college level prior to transferring to Iowa State is a positive predictor of student success in the College of Engineering. Analysis of data also showed that participation in the Engineering Admissions Partnership Program smoothed students' transition to Iowa State University and the College of Engineering and increased student retention rates. These and related research findings are reported in SEEC Data Briefs and dissertations.

The Evaluation Team worked in a facilitative and collaborative manner with the Coordinated Networking Team and members of ISU Extension to strategize a detailed evaluation of the statewide impact of the Engineering Talent in Every County (E-TEC) program. This year's evaluation efforts focused on exploring the role of county and regionally based extension staff in encouraging and recruiting pre-college students to STEM-focused collegiate programs. Three focus groups were conducted with Extension staff members across the state and preliminary results include:

- Organizational changes in personnel and expectations have reduced Extension staff members' perceived role in recruiting students to Iowa State University, regardless of academic program.
- The most commonly cited engineering-related STEM-focused programming for pre-college students is FIRST LEGO League. No other similar programming was consistently reported on a state-wide level.
- Extension staff reported lacking the content knowledge expertise as well as the programmatic resources necessary to effectively encourage and promote student participation in STEM fields.

Evaluation also examined the effectiveness of the E-TEC program in recruiting and retaining students, including considering differences by gender. Data were collected using three student focus groups: males persisting in engineering, females persisting in engineering, and females who persisted in other non-engineering disciplines. Initial findings include:

- Male persisters who participated in the focus group described an almost lifelong involvement working or tinkering with mathematical, mechanical, or electronic problems and devices, indicating that they always assumed they would study engineering. Support from fathers, brothers, and professional mentors were identified as helpful in their ability to persist in their majors.
- Female persisters who participated in the focus group identified several sources of social support for choosing an engineering major, including parents, teachers, other adult mentors, or siblings. Additionally, each of them cited being part of a departmentally sponsored learning community or student-run study group they felt was critical to their persistence and success within engineering.
- Female leavers who participated in the focus group started in the College of Engineering and were encouraged to do so in part because of the recognition of the E-TEC Scholars program. Currently, the focus group participants are all in STEM-related disciplines outside of engineering. They explained that they left the College of Engineering for other majors that were more attractive to them and which provided a stronger sense of community.

A survey studying E-TEC students' persistence in engineering was also conducted late spring 2012 and those results are forthcoming.

During year 5, two joint ISU/DMACC meetings framed the collaborative work and accomplishments of the project. In September 2011, a joint meeting was held on the DMACC campus to share and review data on DMACC transfer student success. At this meeting, extensive student data collected for project evaluation and related dissertation research were presented. This was a highly interactive meeting that delved into the data and led to a shared understanding of the data. This meeting set the stage for strategic meetings on sustainability with administrators and project advisory boards.

In April 2012, a joint meeting was held on the ISU campus to share best practices resulting from the project. The following sessions were presented:

- Community college pre-engineering curricula and programming
 - Steve Mickelson, Iowa State University
 - Randy Smith and Renee White, Des Moines Area Community College
- Transition programming and advising guidance for transfer student success
 - Mary Darrow and Engineering Advisers, Iowa State University
 - Ahmed Agyeman, Des Moines Area Community College
- Student success data model and institutional collaboration
 - Frankie Santos Laanan and Marcia Laugerman, Iowa State University
 - Kari Hensen and Joe DeHart, Des Moines Area Community College
- "Changing the Conversation" about engineering and the community college pathway
 - Joel Johnson, Iowa State University
 - Michael Lentsch, Des Moines Area Community College

This meeting was announced through the university events calendar, shown below, and was open to faculty and staff at ISU, DMACC, and other Iowa community colleges. It was video recorded, and the sessions are being assembled into an online resource to be shared with Iowa community colleges, the Iowa Regents universities, and other institutions in the state and STEP community.

The screenshot shows the Iowa State University Events Calendar interface. At the top, there is a navigation bar with "IOWA STATE UNIVERSITY" and "Events Calendar". A search bar is located on the right. Below the navigation bar, there is a breadcrumb trail: "ISU > Dept > College of Engineering : College of Engineering". A calendar grid shows the month of April 2012, with the 10th highlighted. The event details for the 10th are as follows:

Date/Time:	Tuesday, 10 Apr 2012 from 1:30 pm to 3:30 pm
Location:	Cardinal Room, Memorial Union
Cost:	Free
URL:	http://www.eng.iastate.edu/seec/index.shtml
Contact:	Diane Rover
Phone:	515-294-5933
Channel:	College of Engineering
Categories:	Conferences
Actions:	Download iCalvCal Email Reminder

Best Practices Workshop: Student Enrollment and Engagement through Connections

Learn about research findings and key programs that impact recruitment and retention of, and major factors that influence the success of, engineering students who transfer to Iowa State from community colleges.

The workshop will be divided into 30-minute segments. Participants are welcome to attend any or all sessions as their time permits. Topics will include:

- Community college pre-engineering curricula and programming
- Transition programming and advising guidance for transfer student success
- Student success data model and institutional collaboration
- Changing the conversation about engineering and the community college pathway

A Center for Excellence in Learning and Teaching (CELT) poster session will follow the workshop.

The joint ISU/DMACC meetings involved team members, board members, and other key stakeholders.

Discussions with and feedback from the advisory boards continued to assist the project with evaluation and sustainability planning. A SEEC External Advisory Board meeting was held on November 29, 2011. An ISU Internal Advisory Board meeting was held on December 2, 2011. A scheduling conflict postponed a joint meeting of the ISU and DMACC internal advisory boards from May 2012 to later in the summer. Meeting documents are shared internally on an intranet site, and agenda and minutes are posted to the project website.

3.7 Dissemination

The SEEC project website (<http://www.eng.iastate.edu/seec/>) continues to serve as the portal on project activities for team members, advisory board members, and other interested parties. It also provides resources related to the project. The site saw nearly 500 unique visitors in year five of the project, with 42% of these users being returning visitors. Visitors spent an average of just over two minutes per visit on the site and viewed, on average, two pages. The Resources, Team Members, Newsletters, and Events pages captured the most traffic after the SEEC home page. These statistics are similar to year four.

The SEEC project e-newsletter, *Connections*, serves as a source of project information and activities (<http://www.eng.iastate.edu/seec/newsletter.shtml>). *Connections* was published once in year five in March 2012, and sent to 16 advisory board members and 100 other interested parties. A spike in SEEC website activity occurred when the newsletter was sent. This increase in activity, combined with evidence from the newsletter tracking system, showed that the newsletter helped drive traffic to the SEEC website.

Various publications, presentations, and meetings through which SEEC project activities and findings were disseminated in year five are listed below. Included in this listing are four data briefs published as an ISSN series in 2011-12.

Publications

In ISSN series (SEEC Data Briefs):

- Laugerman, M., Rover, D., Bruning, Laanan, F.S., M., Mickelson, S., Shelley, M., Laugerman, M., Darrow, M., & Pontius, J. How learning communities affect retention. *SEEC Data Brief No. 5*, Ames, Iowa: Iowa State University. October 2011.
- Laugerman, M., Rover, D., Bruning, Laanan, F.S., M., Mickelson, S., Shelley, M., Laugerman, M., Darrow, M., & Pontius, J. Engineering transfer student—graduate profile. *SEEC Data Brief No. 6*. Ames, Iowa: Iowa State University. October 2011.
- Laugerman, M., Rover, D., Bruning, Laanan, F.S., M., Mickelson, S., Shelley, M., Laugerman, M., Darrow, M., & Pontius, J. Data collection and analysis project—retention. *SEEC Data Brief No. 7*. Ames, Iowa: Iowa State University. November 2011.
- Laugerman, M., Rover, D., Bruning, Laanan, F.S., M., Mickelson, S., Shelley, M., Laugerman, M., Darrow, M., & Pontius, J. Basic program—empirical research results. *SEEC Data Brief No. 8*. Ames, Iowa: Iowa State University. December 2011.

In conference proceedings:

- Laanan, F.S. Creating pathways for STEM student transfer success. 9th Annual National Institute for the Study of Transfer Students. September 2011.
- Laanan, F.S., Jackson, D.L., & Lopez, C. Engineering transfer students: Understanding factors that facilitate student success. 9th Annual National Institute for the Study of Transfer Students. September 2011.
- Bruning, M., D. Rover, and A. Williams. Work in Progress: Developing Engineers for 2020 – An Innovative Curricular and Co-curricular Approach. Proc. 2011 ASEE/IEEE Frontiers in Education Conf. October 2011.
- Laanan, F. S., Rover, D., Darrow, M., Mickelson, S., Bruning, M., Shelley, M. & Laugerman, M. STEM student enrollment and engagement through connections (SEEC): Using data to inform transfer programming. 10th Annual National Institute for the Study of Transfer Students. Ft. Worth, Texas. January 2012.

Dissertations:

- Laugerman, M. R. R. Academic and Social Integration Variables Influencing the Success of Community College Transfer Students in Undergraduate Engineering Programs. Iowa State University. Ames, Iowa. June 2012. (Supervised by SEEC co-PI Steve Mickelson)
- Darrow, M. Engineering Transfer Students: Voices from the Sidelines of the Engineering Playing Field. Iowa State University. Ames, Iowa. June 2012. (Supervised by SEEC co-PI Frankie Laanan)

Other reports:

- Geisinger, B. and Ryder, A. E2020 Scholars Evaluation Survey for Students in ENGR 110X and ENGR 210X: Evaluation Report. Research Institute for Studies in Education (RISE), Iowa State University. December 2011.

Presentations (in addition to conference presentations corresponding to proceedings papers)

At NSF meetings:

- Rover, D. Building strong two-year/four-year partnerships. Panel Breakout Session. NSF STEP Grantees Meeting. Washington D.C. March 2012.
- Rover, D., et al., SEEC: Student Enrollment and Engagement through Connections. Poster. NSF STEP Grantees Meeting, March 2012.

At national meetings:

- Laanan, F.S. Pathways to a STEM baccalaureate degree. Association of American Colleges & Universities Ramping Up STEM Success Action Lab II. Seattle, Washington. March 2012.

At local meetings and events:

- Compton, J., Pontius, J. and Rover, D. Student Success Data. Iowa Community College Summit. Iowa State University. November 2011.
- Laanan, F.S. Creating Pathways for STEM Transfer Student Success. Iowa Community College Summit. Iowa State University. November 2011.
- Williams, A., Bruning, M., Rover, D., Laingen, M., Mickelson, S., Brumm, T., & Shelley, M. E2020 Scholars Program. Poster. Teaching Poster Symposium. Iowa State University Center for Excellence in Learning and Teaching. Ames, Iowa. April 2012.

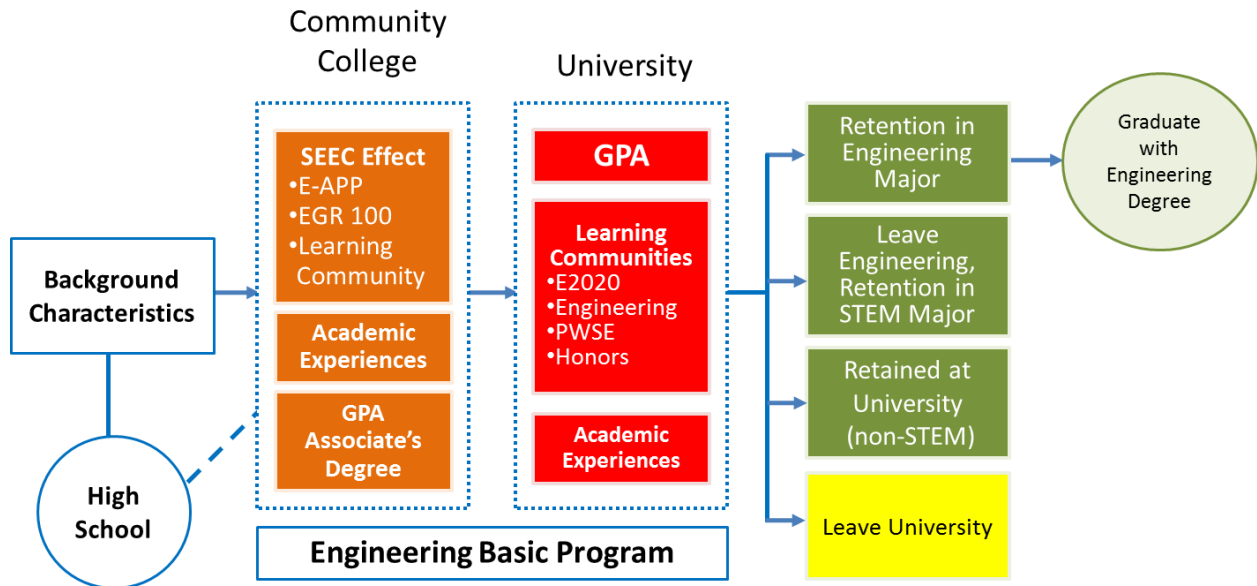
3.8 Project Management

The leadership team continued to meet on a bi-weekly basis to discuss project activities, outcomes, and sustainability. The core leadership team at ISU remained unchanged, consisting of Diane Rover (PI), Monica Bruning (co-PI), Frankie Santos Laanan (co-PI), Steve Mickelson (co-PI), and Mack Shelley (co-PI). During fall 2011, the Transfer Recruitment Coordinator position in the College of Engineering, held by Mary Darrow, was eliminated. Darrow continued with the project as a doctoral graduate student working with co-PI Laanan in Educational Leadership and Policy Studies. At DMACC, associate dean Kari Hensen assumed a leadership role with the project and worked closely with the ISU team.

4. SEEC Effect Findings

During year 4, a SEEC research team compiled a large, longitudinal database of information from Iowa State University's Office of the Registrar and Engineering Career Services for students admitted into the College of Engineering since the fall of 2002. The database includes roughly 13,000 students and tracks their progress on a semester-by-semester basis over a ten year period.

During year 5, team members used the "SEEC Effect Model" below as a conceptual framework to guide the analysis of the data.



In addition to measuring progress and addressing research questions, this strategy focused on translating data into practice at both Iowa State and DMACC, including recommendations for best practices, sustainability and future directions.

Key findings of this work that can be used by/for community college (CC) transfer students as well as non-transfer students are (M. Laugerman dissertation):

1. Participants in the Engineering Admissions Partnership Program (E-APP) have significantly increased first year retention rates over non-participants.
2. Participants in learning communities at the university have significantly increased first year retention rates.
3. Since the implementation of SEEC programs, the overall first year retention rates for CC transfers have increased significantly.
4. Students achieving a Calculus I grade of 3.0 (B) or better at the CC or the university have significantly improved retention rates.
5. Students achieving a Calculus II grade of 3.0 (B) or better at the CC or the university have significantly improved retention rates.
6. Students achieving a Physics I grade of 2.0 (C) or better at the university have significantly improved retention rates.
7. Students achieving an overall GPA in Engineering Basic Program (BP) courses above 3.0 (B) at the university have significantly improved graduation rates.

8. Students achieving an overall GPA in BP courses above 3.5 (B+/A-) at the CC have significantly improved graduation rates.
9. CC transfer students who transfer the sequence of courses Calculus I, Calculus II, and Physics I or Calculus I and Calculus II from the community college have higher retention and graduation rates in engineering (and at the university) compared to those who do not transfer as many of these Basic Program courses.
10. CC transfers who achieve similar university Basic Program GPAs have graduation rates equal to those of students admitted directly from high school (there are no differences between the groups above a 2.5 GPA).
11. The two highest influence predictors of success in engineering for a CC transfer student are university first year GPA and the number of CC BP credits transferred. With both of these, even small increases can lead to significant increases in graduation rates.

In summary, for CC transfer students to have the best chances of graduating with an engineering degree, they need to adopt the social integration strategies offered at the CC, join a learning community at the university and focus on being successful in the BP courses, either at the CC or at the university. It is advantageous in terms of success rates to take Calculus I, II and Physics I or Calculus I and II at the CC before transfer. Particular focus should be on having success in Calculus I and Calculus II with at least a 3.0 GPA or better. Overall, CC transfers can graduate at the same rate as those entering the university directly from high school if they have similar university BP GPAs.

Among the best practices are the presence of an academic advisor at ISU who works directly with students at DMACC, peer mentors at ISU, transfer articulation, increased connections between the community college and the university, learning communities, supplemental instruction to increase grades in math and science courses, summer bridge programs to increase success rates in math and science, and early contact with professional engineers to increase awareness of what engineers do.

Ongoing data analysis is recommended to measure progress, such as: student success in the set of engineering BP courses at both the community college and the university; increasing enrollments in Engineering 100 (EGR 100), learning communities (LC), and E-APP; increasing numbers of women and minority students majoring in engineering at ISU; increasing matriculation rates of community college transfers who participate in EGR 100, LCs and E-APP; increasing participation rates in LCs at ISU; increasing retention and graduation rates in engineering; and increasing retention and graduation rates at ISU. Additional findings may be possible by increasing data sharing between community colleges and Iowa State to better understand background characteristics of community college transfer students.

Overall, there are several sustainable activities that have contributed to the positive effects observed through the SEEC project:

- EGR 100 at DMACC and other Iowa CCs
- Pre-engineering identification at DMACC and other Iowa CCs
- Learning communities at ISU (freshman and transfer)
- E-APP at ISU
- CC recruitment events (e.g., E-APP Day, VEISHEA CoE Visit, CoE Career Fairs)
- Using data to drive advising talking points and guidance for CC transfers
- Joint recruitment efforts between DMACC and ISU

5. Contributions

The following subsections highlight advances made through the project through year five.

5.1 Contributions to the Principle Discipline(s) of the Project

The goals to increase the number of engineering graduates at Iowa State and the number of pre-engineering students at DMACC are being met. Attracting and engaging more students in the discipline and helping students to succeed in engineering will strengthen the academic programs.

Project activities have created or enhanced programs, services, and resources for engineering students, faculty, and staff. A more robust transfer enterprise in engineering has been established at ISU. DMACC has significantly advanced its engineering-related programs and services as a result of the project.

At ISU, the SEEC project is working in concert with an NSF S-STEM project on curriculum and programming to achieve lower-division and upper-division student development outcomes aligned with national studies on engineering education.

The data analysis on the SEEC effect conducted during year 5 has resulted in key findings and recommendations for engineering student success and data-driven decision-making for engineering majors.

5.2 Contributions to Other Disciplines in Science or Engineering

The project has served as a model for each institution's transfer programs and services.

DMACC's activities support not only pre-engineering students, but also students with STEM interests. The partnerships on the ISU campus are not restricted to engineering. There is extensive collaboration with, for example, the Program for Women in Science and Engineering, and the Center for Excellence in Science, Math, and Engineering Education (CESMEE). The partnership with ISU Extension impacts their programs for talent expansion in STEM. Consequently, some of the activities of SEEC involve interactions that address STEM more broadly.

The SEEC effect database and analysis have involved and interested various individuals on campus. Data analysis has now been coordinated or merged to some extent with a university-wide project analyzing student performance in math courses.

5.3 Contributions to the Development of Human Resources

Training and resources for staff and faculty at both institutions help them to more effectively support students. Also, the E-TEC scholarship program and information kit provide Extension youth professionals with resources and training.

Increasing and broadening the interest in engineering and improving the satisfaction and success of engineering students will ultimately grow the engineering workforce, and this goal of the STEP program is the motivation for all SEEC activities and accomplishments.

Two team members, Mary Darrow and Marcia Laugerman, are doctoral students in education who completed dissertation research during year 5 related to issues identified through SEEC project activities.

5.4 Contributions to the Physical, Institutional, or Information Resources that Form the Infrastructure for Research and Education

Institutional partnerships between ISU and DMACC have been created and/or strengthened through the project. The transfer infrastructure in ISU's College of Engineering has expanded, and best practices are emerging and influencing ISU and other institutions. For example, E-APP has improved the information and services available to students and faculty at community colleges across Iowa. New information resources continue to be used at both DMACC and ISU for recruiting and advising. Several initiatives facilitated/supported through SEEC (team member effort and/or funding) have been adopted by the university (e.g., MAP-Works). The longitudinal database on engineering student success is an information resource for the college and university. An ISSN series of data briefs has been created and represents scholarly collaboration between ISU engineering and education faculty. At DMACC, pre-engineering offerings are expanding to several campuses. Also, a newly renovated physics laboratory at the Hunziker Career Academic Center has allowed DMACC to better serve students.

5.5 Contributions to Other Aspects of Public Welfare Beyond Science and Engineering

E-TEC scholarships provide financial aid to students entering engineering.

SEEC activities are improving ISU's recruitment and retention efforts with community colleges. Community college student access to higher education is viewed by many as a public welfare issue.

The collective mission of both institutions and SEEC to change the perception of engineering and emphasize its impact on people and society is part of the national and global movement.