

**Evaluation Plan, Phase Two:
Virginia Tech SUCCEED Projects, Years 6-10**

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Background

This evaluation plan represents phase two of an overall evaluation effort to describe the value of 28 Engineering projects funded by NSF's SUCCEED coalition at Virginia Tech. Phase one of the summative evaluation was based entirely on faculty interview data. Stufflebeam's CIPP evaluation model provided a framework to sort interview data. Trends were reported across all projects related to *contexts* that influenced the success of projects, *inputs* that were necessary to sustain projects, *processes* that took place in projects, and *products* or outcomes that emerged from those processes. Further, individual project synopses were created to detail work conducted and to archive project artifacts such as reports. A detailed report and Web site were produced to describe overall trends across all projects as well as individual project synopses. This information can be accessed online at: <http://www.edtech.vt.edu/succeed/>

The 28 Engineering projects at Virginia Tech were sorted into four focus areas defined by NSF: faculty development, outcomes assessment, student transitions, and technology-based curriculum. For each focus area, objectives were written at Virginia Tech to define general expectations. Table 1 lists the four focus areas in which faculty-led projects were conducted, along with stated objectives by focus area. Phase one of the evaluation also provided evidence of milestones to help define the extent to which SUCCEED objectives at Virginia Tech were achieved.

Table 1. Focus Area Objectives and Milestones of Achievement

Focus Area Objectives ¹ :	Milestones ² :
<p style="text-align: center;"><i>Faculty Development</i></p> <p>Prepare faculty members to implement effective instructional methods and provide continuing support for their implementation.</p>	<p>at least nine faculty development workshops held on such topics as case-based and online instructional methods; over 300 faculty participants across all offerings; seven graduate teaching assistant seminars also sponsored</p>
<p style="text-align: center;"><i>Outcomes Assessment</i></p> <p>Identify, develop, and test outcomes assessment measures, tools, and methods for critical success factors of engineering graduates.</p>	<p>selected faculty sent to training on outcomes assessment, reported back locally; matrices developed to match program level objectives with A-K outcomes of ABET accrediting body; employer focus groups held to determine additional skills deemed important by industry; Web site and materials developed by writing portfolio program to train others in this assessment process</p>
<p style="text-align: center;"><i>Student Transitions</i></p> <p>Objective 1: Establish an early engineering identity and expand the first-year transitioning to include explicit learning skill development and inculcate clear expectations.</p> <p>Objective 2: Provide students more access to real-world engineering design experience and engineering practice opportunities.</p>	<p>emerging scholars program (ESP) calculus established with additional one-hour small group sessions held to provide selected students with help and additional problem solving opportunities; ongoing minority Bridge program supported for students to take college courses on-site before actual enrollment</p> <p>seven projects: students participated in virtual corporations, emerging scholars program (ESP) statics, building design with vertical and horizontal integration, infrastructure problem solving with nondestructive testing equipment, biological systems real-world design projects, mechatronics design, and career development opportunities such as mock interviews</p>

Objective 3: Improve/increase the exposure to engineering design, ethics, and professionalism in introduction to engineering courses.	engineering fundamentals curriculum updated: freshmen participated in hands-on laboratory and hands-on classroom manipulations as part of EF 1015, design experiences integrated further into early problem solving and design and graphics courses; online engineering ethics course developed
<p style="text-align: center;"><i>Technology-Based Curriculum</i></p> <p>Objective 1: Enhance teacher-student and student-student communication using network-based collaborative environments for academic interaction.</p> <p>Objective 2: Empower faculty to develop electronic media-based instructional content.</p>	<p>engineering advising CD created with faculty and program information, distributed to pre-enrolls, updated to a Web site; multimedia statics CD developed with associated cooperative learning classroom activities; online questions and drills created to support students in gateway courses; multimedia CD created with the assistance of students to document and teach manufacturing processes</p> <p>faculty trained in technology production both on and off-campus; selected faculty provided with technology production assistance to develop such items as self-paced, remedial materials for students and animated segments explaining communication systems</p>

¹ The focus area objectives were taken from the CIT Budget/Task Summary

² The milestones were based on faculty interview data

Rationale for Phase Two

A second evaluation phase is planned for two primary reasons. First, students were not a part of phase one, and their perspective is needed to verify faculty interview data. Second, it is clear from phase one that several issues should be clarified with additional data, such as the extent to which faculty development and outcomes assessment activities led to changes across the College of Engineering, and how new teaching strategies have impacted student knowledge and skills.

Research Questions and Data Sources

Table 2 provides a snapshot of phase two evaluation questions and the surveys planned to inform them. A general survey to all engineering faculty is planned to determine trickle-down effects of SUCCEED-sponsored workshops and assessment-oriented activities (see Appendix A). Faculty involved in student transitions and technology-based curriculum projects will be asked to complete a short table illustrating the number of labs, hands-on experiences, real-world design projects, and cooperative or team-based activities, that took place in their courses prior to SUCCEED in comparison to their courses following SUCCEED. These numbers will reflect real changes in course activities and strategy.

A second data source will involve targeted student surveys to different course groups, to determine the educational benefits of first-year transitioning with emerging scholars sessions, hands-on and early design experiences, and technology-based curriculum. Appendix B lists a number of student outcomes that faculty indicated emerged from their SUCCEED-sponsored courses during phase one of the evaluation (e.g., improved teamwork skills, writing skills, motivation). These outcomes will form the basis for survey items. Students will be asked if the SUCCEED innovation (e.g., small group problem solving) in their specific course (e.g., Math 1205), led to the stated outcomes. Various surveys will be generated in this format as shown in Appendix B. The question format with Likert scale is adapted from the TLT Group's Flashlight Program for evaluating campus innovations.

Statistical consulting services will be utilized to determine differences in how students rated stated outcomes across the different class surveys. If one or two classes are found to generate significantly

higher motivation, leadership, collaboration, or other outcomes of interest, we will select teams of students from those classes to participate in focus groups. Students will be asked to reflect on their course experience and the outcomes of interest to better describe how their instructors or the course structure supported the emergence of those important items.

Finally, a global student survey is planned to all seniors and freshmen to describe differences in their Engineering Fundamentals 1015 and 1016 course experiences prior to and after SUCCEED (see Appendix C). Again, students will be asked to state to what degree their course experiences led to certain outcomes. The outcomes were specified by faculty in phase one of the evaluation as occurring in their courses. Richard Goff and other key project personnel should be consulted prior to the administration of the survey to review and modify the proposed questions. The PI's may wish to determine if students developed additional outcomes through their revised courses.

Table 2. Phase Two Questions and Instruments

impact, outcomes, or effects we would like to document	suggested instruments to obtain this data
<p><i>Faculty Development Focus Area</i> Of the faculty that attended workshops, how many adopted or applied a new practice based on the instruction received? If not, why? What additional follow-up supports or changes are needed to existing faculty development structures?</p>	<p>faculty survey (items written for faculty who attended SUCCEED-sponsored workshops)</p>
<p><i>Outcomes Assessment Focus Area</i> How many faculty are aware of the results of the employer feedback project? Have these comments influenced faculty teaching requirements or strategies? How many faculty have integrated selected outcomes assessment measures into their courses?</p>	<p>faculty survey (items written for faculty in electrical, civil, mechanical, computer engineering) faculty survey ABET accreditation report</p>
<p><i>Student Transitions Focus Area</i> What are the real changes in number of lab, hands-on, real-world, and cooperative activities after SUCCEED projects? What benefits do students realize through emerging scholars program (ESP) small-group problem-solving and tutoring sessions, and through hands-on and early design experiences? How has student learning changed through hands-on and early design activities? What types of experiences and thinking are students exposed to?</p>	<p>faculty survey (table comparing differences in course activities before and after SUCCEED) targeted student surveys by course follow-up focus groups two-group student survey (seniors and freshmen asked to reflect on EF 1015 and 1016 they took at different times which included different activities and pedagogy)</p>
<p><i>Technology-Based Curriculum Focus Area</i> What are student reactions to technology-based curricular materials?</p>	<p>targeted student surveys by course follow-up focus groups</p>

Additional data sources include retention data for freshmen following Engineering Fundamentals coursework. An expectation is that the increased design and hands-on experiences may have increased this retention for recent freshmen following SUCCEED initiatives in comparison to freshmen who took EF 1015 and 1016 prior to SUCCEED initiatives.

Procedures

All procedures are to be implemented during spring semester 2002 at Virginia Tech, and to be completed by the end of the semester in May 2002. The phase two evaluation report will be prepared during summer 2002, to be available by August of 2002. See Table 3 for a complete timeline of evaluation procedures.

Between December 2001 and January 2002, Kevin Oliver will develop question sets for the faculty and student surveys. Questions will be based on phase one evaluation data which suggested faculty strategies and processes as well as potential student outcomes. Phase two may be considered a clarification or verification of stated outcomes that were simply "suggested" by phase one faculty interview data.

During January 2002, College of Engineering staff will interface with the university registrar to pull class rosters from courses of interest listed in Appendices B and C. College staff will develop e-mail lists of students in specific courses for targeted surveys, and for all freshmen and seniors who took engineering fundamentals 1015 and 1016.

During January 2002, Kevin Oliver will meet with assigned staff in the statistical consulting center to verify appropriateness of surveys and the analytical possibilities for comparing the different groups. Following the statistical consultations, Kevin Oliver will generate electronic versions of the student surveys using the Whizquest software and server in the Educational Technologies department. The faculty survey will require a different software program due to its format, probably an online form that feeds to Filemaker Pro. Consultation with Jason Lockhart in the multimedia lab should facilitate the development of the faculty survey.

During February 2002, the appropriate Whizquest survey URLs will be e-mailed to students and faculty from College of Engineering staff. College of Engineering staff will be responsible for all communications with College faculty and students regarding surveys. A form letter should be generated from the appropriate office (e.g., Dean's office), describing the importance of participating in the surveys, or requiring students to participate in surveys if possible. It is expected that a similar form letter from an evaluator would be less effective overall in generating faculty and student interest to participate in online surveys.

Between February and April 2002, Kevin Oliver will track response rates and names after faculty and students begin to complete the online forms. This information will be forwarded to College of Engineering staff at two and four week intervals following the start of the surveys. College of Engineering staff will send e-mail reminders at two and four week intervals to faculty and students who have NOT completed their assigned surveys. Two weeks after the second e-mail reminder, the surveys will be closed and taken offline. Thus, surveys will remain online for six weeks.

During April, 2002, initial survey data will be compiled by Kevin Oliver using Excel spreadsheets. Survey data will be forwarded to appropriate statistical consulting center personnel for descriptive and comparative analysis. Kevin Oliver and interested College of Engineering staff will meet with consulting center personnel to interpret comparative survey results.

Between April and May 2002, Kevin Oliver and College of Engineering staff will plan and conduct follow-up focus groups with student groups in selected classes. Classes will be selected for focus

groups based on the interpretation of survey data, with classes that generate the most desirable student outcomes selected first.

During May 2002, focus group recordings will be transcribed for qualitative analysis. During summer 2002, Kevin Oliver will analyze focus group data and prepare a final phase two report with the following data points: faculty survey data, descriptive statistics from student surveys, statistical group differences across courses, two-group comparative data between current freshmen who took Engineering Fundamentals with SUCCEED course modifications and seniors who took Engineering Fundamentals without SUCCEED modifications, and follow-up student focus group data.

Table 3. Timeline of Procedures

Date	Procedure
Dec. 2001 - Jan. 2002	<ul style="list-style-type: none"> • prepare evaluation plan, question sets, and initial surveys
Jan. 2002	<ul style="list-style-type: none"> • interface with university registrar • meet with assigned statistical consulting center staff • prepare electronic surveys using Whizquest and Filemaker Pro
Feb. 2002	<ul style="list-style-type: none"> • mail survey URLs to identified faculty and students
Feb. - April 2002	<ul style="list-style-type: none"> • track survey data and response rates
April 2002	<ul style="list-style-type: none"> • compile survey data • analyze survey data • interpret statistical results
April - May 2002	<ul style="list-style-type: none"> • select and plan focus groups • conduct focus group interviews with students
Summer 2002	<ul style="list-style-type: none"> • analyze survey and focus group data • complete phase two report by August 2002

Appendix A: Faculty Survey

The first set of questions deal with faculty development workshops and activities. Please complete the table below, listing up to four workshops you have attended in the past four years along with the requested information.

Workshop 1 Name:	Workshop 2 Name:	Workshop 3 Name:	Workshop 4 Name:
Sponsor (select one): <input type="radio"/> FDI <input type="radio"/> CEUT <input type="radio"/> SUCCEED <input type="radio"/> other on campus <input type="radio"/> other off campus <input type="radio"/> not sure	Sponsor (select one): <input type="radio"/> FDI <input type="radio"/> CEUT <input type="radio"/> SUCCEED <input type="radio"/> other on campus <input type="radio"/> other off campus <input type="radio"/> not sure	Sponsor (select one): <input type="radio"/> FDI <input type="radio"/> CEUT <input type="radio"/> SUCCEED <input type="radio"/> other on campus <input type="radio"/> other off campus <input type="radio"/> not sure	Sponsor (select one): <input type="radio"/> FDI <input type="radio"/> CEUT <input type="radio"/> SUCCEED <input type="radio"/> other on campus <input type="radio"/> other off campus <input type="radio"/> not sure
Describe any changes you made to your teaching practice that resulted directly from this training?	Describe any changes you made to your teaching practice that resulted directly from this training?	Describe any changes you made to your teaching practice that resulted directly from this training?	Describe any changes you made to your teaching practice that resulted directly from this training?
If no changes were made, why? What additional follow-up supports or changes are needed to existing faculty development structures?	If no changes were made, why? What additional follow-up supports or changes are needed to existing faculty development structures?	If no changes were made, why? What additional follow-up supports or changes are needed to existing faculty development structures?	If no changes were made, why? What additional follow-up supports or changes are needed to existing faculty development structures?

The following questions seek to determine whether faculty are aware of ABET A-K assessment criteria and how those criteria have impacted their courses.

Are you aware of the A-K criteria recommended by ABET for Engineering curriculum and courses?

Yes No

In the past four years, have you seen or been given a matrix which matches your program-level objectives with the ABET A-K criteria?

Yes No Possibly / Not Sure

In the past four years, have you attended an outcomes assessment meeting on-campus or off-campus that discussed the ABET A-K criteria at Virginia Tech?

Yes No Possibly / Not Sure

In the past four years, have you compared you courses to ABET A-K criteria to determine which criteria your courses address?

Yes No

In the past four years, have you made any changes to your courses to better address ABET A-K criteria (please provide specific examples)?

Please complete the tables below. List up to five courses you teach, then list an estimate of the number of stated activities you conducted in each course before and after SUCCEED initiatives. (Note, on the actual survey, the table will be repeated five times.)

Course Name and Number:											
number of labs		number of other hands-on activities		number of real-world problems		number of cooperative activities or teaming		number of online or technology-based resources		other, please describe:	
before succeeded	after succeeded	before succeeded	after succeeded	before succeeded	after succeeded	before succeeded	after succeeded	before succeeded	after succeeded	before succeeded	after succeeded
If you listed a numeric change before and after SUCCEED, was this change directly attributable to a SUCCEED initiative or project? Circle one.											
Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No

Use the space below to describe any other changes in your courses, whether positive or negative, that resulted from SUCCEED-related projects.

The following questions should be answered by faculty in the electrical, civil, mechanical, and computer departments only.

Are you aware of the employer feedback project in which industry representatives provided feedback about your students and their preparation?

Yes No

If yes, how did you hear about the feedback employers provided about students in your discipline? (Check all that apply)

- Report
- Faculty / Staff meeting
- Word of mouth, from other faculty in my discipline
- Other
- None of the above

Did employer feedback lead you to plan specific changes in your courses or in how you taught your courses (please provide specific examples)?

Appendix B: Targeted Student Surveys

Because of the way this course implemented X, I developed Z[†].

strongly agree agree disagree strongly disagree no basis for judgment/NA

X Pedagogy Values	Z Outcome Values
<p><i>emerging scholars, small group problem solving and tutoring sessions</i> students to receive this prompt include:</p> <ul style="list-style-type: none"> • project ST 1-2, Math 1205 <p><i>real-world design experiences and/or problems</i> students to receive this prompt include:</p> <ul style="list-style-type: none"> • project ST 2-1 virtual corporations; sophomore ECPE 2964, junior ECPE 3964, senior ECPE 4964, graduate ECPE 5964 • project ST 2-3, cancelled integrated building design course (see Sam Easterling for number) • project ST 2-4, sophomores and juniors taking CEE 2984 and seniors taking CEE 4634 • project ST 2-6, BSE 2105-2106 • project ST 2-7, ME 2024 <p><i>a multimedia statics program with cooperative activities</i> students to receive this prompt include:</p> <ul style="list-style-type: none"> • project TBC 1-2, ESM 3704 <p><i>Web-based course materials</i> students to receive this prompt include:</p> <ul style="list-style-type: none"> • project ST 3-3, engineering ethics EF 2984 • project TBC 2-3, five industrial systems engineering courses (see Jason Lockhart) <p><i>multimedia modules</i> students to receive this prompt include:</p> <ul style="list-style-type: none"> • project TBC 2-4, ECE 3614 	<ul style="list-style-type: none"> • writing skills • presentation skills • mechanical, hands-on skills • a knowledge base • leadership skills • the ability to work in teams and collaborate with teammates • the ability to work with students who are younger or older • the ability to work with students in different disciplines • my self-directed learning abilities • interest in engineering as a field of study • motivation • a willingness to persist and stay in the field of engineering (retention)

[†]Note, Z outcome values are based on faculty interview data, suggesting students developed these outcomes in their courses.

Appendix C: Two-Group Student Survey*

Reflecting back on my Engineering Fundamentals course experience (EF 1015 and EF 1016), these courses helped me to develop Z.

strongly agree agree disagree strongly disagree no basis for judgment/NA

Z Outcome Values
<ul style="list-style-type: none"> • writing skills • presentation skills • mechanical, hands-on skills • a knowledge base • leadership skills • the ability to work in teams and collaborate with teammates • the ability to work with students who are younger or older • the ability to work with students in different disciplines • my self-directed learning abilities • interest in engineering as a field of study • motivation • a willingness to persist and stay in the field of engineering (retention)

*This survey covers students impacted by SUCCEED projects ST 3-1, 3-2, and 3-4, or the Engineering Fundamentals 1015 and 1016 courses (i.e., problem solving and graphics).

Appendix D: Statistical Consulting Center Invoice

Client:
Dept.:

Phone:
Fax:

Consultants:

Initiation Date:
Completion Date:

cc: Becky Allen, Eric P. Smith

Description of Service Performed or to be Performed:

Cost of Service:

Budget			
Task	Rate	Hrs	Cost
Coding	\$22.00		
Data Management	44.00		
Programming	44.00		
Design and Planning	58.00		
Analysis	58.00		
Interpretation	58.00		
Reporting	58.00		
Academic Fee*			
Overhead*			
Commercial Fee*			
Supplies/Travel			
TOTAL			

* The *academic fee* does not include university overhead and applies to services delivered to faculty or students of Virginia Tech, and to federal/state agencies. The *commercial fee* includes a 45% surcharge for university overhead, and applies to services delivered to those who are not affiliated with the university or state agencies.

Payment may be made via check to the Virginia Tech Treasurer, and sent to:
Allison Bird, Statistical Consulting Center, 401 B Hutcheson Hall, Blacksburg, VA 24061-0439