Using Social Networking to Mentor 9th-grade Girls for Academic Success and Engineering Career Awareness

Dr. Patricia Carlson, Rose-Hulman Institute of Technology

Dr. Patricia "Pat" A. Carlson is a transplanted middle westerner, having spent her childhood in Norfolk, Va. She came to Rose-Hulman early in her teaching career and has taught a variety of courses over the past three decades. Dr. Carlson has held a number of American Society for Engineering Education summer fellowships that have taken her to NASA-Goddard, NASA-Langley, the Army Research Laboratory in Aberdeen, Maryland, and NASA's Classroom of the Future in Wheeling, W.Va. She was on loan to the Air Force Human Resources Laboratory from 1989 to 1995, managing a project to transition advanced instructional technologies to ten different middle schools located in five states. She is on the editorial board of three professional publications and has served as National Research Council Senior Fellow assigned to the Air Force Human Resources Laboratory. In her spare time, Pat enjoys reading and gardening.

Mr. Ryan Smith, Rose-Hulman Institute of Technology

Ryan Smith has served as webmaster and system administrator of the PRISM Project for the past ten years. He is a 2002 computer engineering graduate of Rose-Hulman Institute of Technology. As part of his duties, Smith manages the PRISM server infrastructure, performs database administration, manages systems security, and coordinates distance education online courses on the PRISM website. In addition, Smith researches new web technologies to implement for the PRISM Project. In 2008, Smith received the Hoosier Educational Computer Coordinators HERO award for his contributions to integrating technology in Indiana education. In 2011, the PRISM team received the Rose-Hulman Institute of Technology Excellence in Service Award.

Mr. Matthew Ryan Davidson, Rose-Hulman Institute of Technology

Matthew R. Davidson (PRISM Programmer) serves as the development arm of PRISM since joining the team in 2006. He continues to improve the reliability and functionality of PRISM's integrated Moodle Course Management System along with expanding the library of PRISM's proprietary tools, which include the Materials library, Lesson Plan builder and hosts of other programs.

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Introduction

EMERGE (http://www.rose-prism.org/emerge) is a tele-mentoring program to enhance both career awareness and academic achievement in science, technology, engineering, and mathematics (STEM) for disadvantaged 9th grade girls. Our goal is to nurture persistence and academic achievement in economically / culturally disadvantaged female learners. Our mission is to increase diversity in STEM professions.

EMERGE combines the efficacy of social networking with the maturity, academic talents, and dedication of Rose-Hulman Institute of Technology's junior/senior women students. A two-year pilot program (2008 - 2010) conducted at three Indiana Wabash Valley high schools produced excellent outcomes. An adapted version of the program is now in operation as part of an economic development partnership between Rose-Hulman (RHIT) and Shelby County, Indiana. (This version involves five high schools, with separate male and female mentoring groups at each school house.)

EMERGE uses both structured and informal activities to motivate students who have an interest in STEM studies, but who need a cohesive learning environment to achieve the focus and resiliency necessary for academic success.

Tele-mentoring – Models and Platforms

Internet-based tele-mentoring has been in use for over a decade now.[1] Beginning with simple email capabilities and growing as the technology evolved, these online exchange programs have proliferated and have reported significant successes. For example, mentoring programs to sustain the interest of African-American males in high school achievement are currently available in a wide variety of forms.[2]

O'Neill and Harris identify four categories of e-mentoring:[3]

- *Ask-an-expert*: professionals answer questions on an *ad hoc* basis.
- *Tutoring*: usually a one-to-one exchange based on a rigorous master-to-apprentice scenario.
- *Curriculum-Based Tele-mentoring*: students pursue in-depth examinations of topics covered in the classroom, guided by their external mentor-expert.
- *A Tele-mentoring Relationship*: exchanges move beyond question-and-answer to achieve goals of broad-based affective and cognitive development.

We have adopted the best practices from these successful approaches in order to use social networking to build powerful mentoring relationships among 9th-grade girls and female undergraduate engineering students at Rose-Hulman.

Early tele-mentoring efforts faced the difficulty of finding an appropriate digital platform for communication and collaboration. For example, noted advocates for constructivism, Bereiter and Scardamalia, built a platform (The Knowledge Forum®) to mediate the types of socio-cognitive exchange needed to nurture electronic learning relationships.[4] Today, a range of learning management systems (LMS) incorporate the synchronous and asynchronous tools necessary for successful e-mentoring.

We have selected Moodle (http://www.moodle.org), an Open Source product that requires no licensing fee and has a number of leading-edge learning mediators. Moodle is part of a movement most commonly called Web 2.0. This refers to Internet-based services -- such as blogging, wikis, podcasting, video-casting, chats, and forums, that help personalize students' learning experiences by focusing on communication and collaboration.

EMERGE Concept Overview

EMERGE partners 9th-grade girls with Rose-Hulman women students for the duration of an academic year (approximately nine months). A well-defined treatment ensures that the dominant tenor of the tele-mentoring is academic achievement, while – at the same time – sustaining the excitement of exploring STEM. The multi-faceted treatment can best be summarized through a graphic (see figure below).
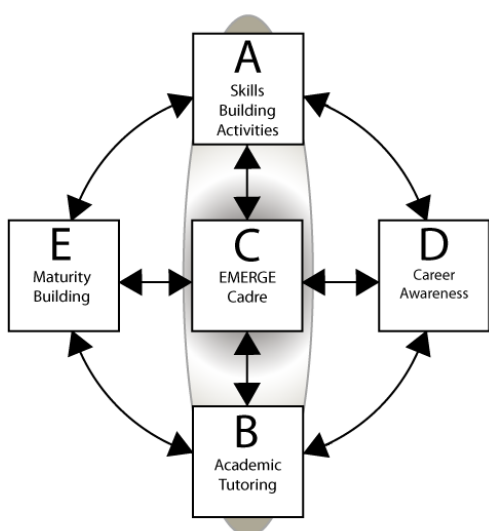
Area C—EMERGE Cadre: Camaraderie lies at the heart of this program. Though most of the interaction takes place in small learning communities, the program also establishes a group identity through EMERGE logos on shirts, backpacks, and school supplies. Creating a cohesive group with a positive image for STEM alleviates many of the negative peer-pressures that permeate high school cultures.

Area A—Skills Building: Each small group (~ eight girls and one mentor) complete an agenda of problem-based "challenges" featuring topics that mirror work done at one of the sponsoring companies. Students learn techniques for spatial/visual, temporal, quantitative, and probabilistic thinking within these active learning modules.

Area B—Academic Tutoring: Rose-Hulman undergraduates provide as-needed help with homework issues. Our mentors focus on STEM subjects, but also help with other disciplines. Additionally, the mentors provide advice and practice sessions for taking college admissions tests (such as PSAT, SAT, and ACT).

Area D—Career Awareness*:* Day-long field trips to near-by high-tech organizations (e.g. Crane Naval Weapons Center, Cook Urological, IU Medical School) help to contextualize STEM learning. Rather than simple walk-throughs, we look for venues where a concentration of Rose-Hulman alumni/ae engineering employees can engage the students with hands-on activities. We supplement these trips with online awareness materials from the Society of Women Engineers (SWE) and from Women in Engineering ProActive Network (WEPAN).

Area E—Maturity Building*:* Fundamental changes in routines, pedagogies, and academic demands are especially challenging for some students as they move from middle school to a high school venue. EMERGE serves as a bridge program to strengthen the socio-cognitive skills require in a more demanding world. We nurture maturity and self-confidence through close bonding with a supportive reference group and a near-age role model.

Implementation Framework

EMERGE is hosted through PRISM (http://www.rose-prism.org), a nationally recognized K-12 educational technology hub sponsored by Rose-Hulman and the Lilly Endowment, Inc. for the past ten years. The tele-mentoring takes place through PRISM's Children's Internet Protection Act-compliant learning management system.

Using the advances of Web 2.0, EMERGE provides a secure means for richly interactive communication and collaboration. Within this private web-space, mentors and mentees can set meeting times, post agendas, update calendars, collect data, share documents and other digital files, vote on issues, and store project materials. Most important are the dialogues and sharing of thoughts enabled by this platform.[5, 6]

Program Objectives**:** Two well-proven approaches for improving student retention, increasing academic achievement, and raising career aspirations for young people are (1) mentoring and (2) membership in a cohesive, supportive learning community. One application of social networking – known by its generic term as tele-mentoring – has shown great promise for fulfilling these requirements. D. A. Scigliano's edited collection -- *Telementoring in the K-12 Classroom* – confirms that both researchers and practitioners have established a foundation for understanding e-mentoring's advantages, both inside and outside the classroom.[7] We also examined materials from the *Tele-mentoring Young Women in Science, Engineering, and Computing Project* – among others – to ensure that EMERGE featured a series of effective interventions to promote career awareness at this early stage in a young woman's develop-ment.[8 - 11]

Three major goals guide all activities in the EMERGE program:

- *Academic Success & Career Awareness* **–** Helping students to adopt a proactive stance on learning and to begin creating their own plan for career and educational choices.
- *Motivation & Maturity* **–** Helping 9th-grade students develop the socio-cognitive skills to bridge the transition into high school.

- *Subject Matter Tutoring* – Providing a consistent, reliable source of encouragement and advice, including scheduled or as-needed online tutoring for academic subjects and help with homework.

Pilot Study Model: During a 2008-2010 field testing, the EMERGE professional-level supervisor trained 18 women engineering and science students at Rose-Hulman in the skills of mentoring. (Participation was by competitive application / interview for these paid positions.) Together, the supervisor and mentors set up small learning communities (typically made up of one college student and from six-to-eight 9th graders). These e-mentoring families stayed together for the entire academic year. Using the powers of social networking, nearly one hundred 9th-grade students remained with the program for their entire freshman year of high school. In February, 2010, EMERGE was named as a finalist in the *Power of Mentoring Awards*, sponsored by College Mentors for Kids.[12]

Not to be overlooked, the program also had an impact on the Rose-Hulman women participants. The pilot program mentors went on to attain careers in science / engineering. Most applied for the EMERGE positions because they had genuine altruistic purposes, but they also wished to develop their management, inter-personal, and leadership skills.

Basic Logistics and Timeline: EMERGE optimally requires a full year cycle. Having a strong working relationship, shared objectives, and a steadfast champion within the high school are all critical to success. Additionally, if local business / industry serve as sponsors, planning and calibration among all constituencies must take place at regular intervals.

EMERGE   We worked to establish an identity and a presence of the group by designing a logo and distributing tee-shirts and backpacks to the 9th-grade girls.

Careful planning must also be given to both student populations involved: mentors and mentees. Most school districts have stringent regulations and need several layers of approval before sanctioning a tele-mentoring program. For example, mentors will probably need to undergo a background check and district school boards may need to be consulted before participating students are surveyed. Because the assessment involves human subjects, an Institutional Review Board (IRB) protocol must be followed and agreements signed. Some districts may require mentors to report "alerts," or situations indicating at-home abuse or other improper situations. Thus, the professional supervisor will need to discuss these ethical / legal guidelines with the mentors. Additionally, the professional-level supervisor will need to set up a training and a reporting regiment for the college-level students.

The mentees will need to have home access to the Internet, as well as parental permission to participate. (Ideally, an orientation session should be held by the EMERGE supervisor with parents to introduce the various activities and advantages of the program.) Mentees need to be trained on the basic operation / interface of the EMERGE web based platform.

EMERGE also blends face-to-face experiences with tele-mentoring, requiring – ideally – at least four comingled events.   A "getting- to- know-you" lunch at the beginning and an awards lunch

at the end deepen relationships. The program also includes two field trips per year. All activities must be closely monitored by the EMERGE staff to ensure both relational appropriateness and program efficacy. Table A gives the basic structure of an EMERGE cycle.

Table A: Time Frame for EMERGE Coordination and Implementation

July/August 20xx	September 20xx	January 20yy,	May 20yy	August 20yy
-- Set up liaison (Dean of Girls, Academic Counselor, and Vice Principal) and finalize deployment plans	-- Train mentors -- Coordination meeting between stakeholders -- Initial meetings between learning cadres and mentors	-- Mid-course assessment/adjustments -- Progress meeting among Rose-Hulman and partners / stakeholders	-- Complete field trips -- Hold awards luncheon -- Consolidate activities and assessment	-- Provide annual report to all constituencies -- Disseminate program materials for establishing satellite tele-mentoring program

EMERGE and STEM Career Awareness

All components of EMERGE encourage the mentees to become the next generation of scientists and engineers. The treatment is exemplary because it combines promoting career awareness with support for academic success. This union of motivation and achievement gives a student not just the *desire* but also the *ability* to pursue a post-secondary degree in STEM.

With each yearly EMERGE cycle, we fine-tune our modules to deliver a more codified treatment. We are currently constructing a collection of outside-the-classroom "challenges" built around specified themes. Our objective is to have a series of online project-based learning modules based on increasingly more complex problems that each group completes under the tutelage of their mentor. These units increase career awareness, build critical thinking skills, and generate self-confidence fundamental to success in STEM subjects. With the help of our corporate partners, we are developing "authentic" tasks embedded within real-world scenarios.

For example, the EMERGE program implemented in Shelby County this academic year (2012 - 2013) operates as part of an economic development agreement between a range of stakeholders (city / county councils, local industries, and four school districts). For this instantiation, EMERGE showcases learning units based on the types of research / development / manufacturing work being done by four companies connected with the consortium.

Using age-appropriate, non-proprietary content, inquiry-based learning units engage the students and contextualize their studies within real-life careers. Each month has a theme that exposes Shelby County students to local industry partners and connects students to Rose-Hulman mentors. These interactions lay the foundation for a clear path to success. Additionally, we have developed a set of documents (e.g. program flier, parental permission materials, and descriptions for corporate partners) that are available by request.

The January theme, Communicating Digitally, was launched with our business partner, Lifeshare Technologies. Both high school and Rose-Hulman mentors learned about Alice, a drag-n-drop,

3D animation program that provides a gentle introduction to computer programming. Students were challenged to create an Alice World that introduced themselves to the online mentoring community. Mentors created a glossary of digital communication tools on the web. These resources are intended for the 9th-grade students to use as they explore different ways to interact in our increasingly digital world.

February focused on engineering careers and was sponsored by Triumph Controls, LLC. Students engaged in discussions about engineering careers and explored some of the many fields represented by the profession. The high school students and mentors worked on a challenge project: to reverse engineer (using only available supplies) a Lifting Machine recently advertised by a hypothetical competitor. In the online environment, mentors answered student questions about engineering careers and course requirements.

In March, the theme was corporate culture. A representative from Ryobi, Inc. met with the high school students and presented the management philosophy embraced by the local office. Examples and role-playing modules personalized the concepts for the students. Also, mentors and mentees read selections from the source book -- Blanchard and Bowles' *Gung Ho!: Turning on People in Any Organization* – and used an online jig-saw approach to build a composite of ideas and examples.[13]

For April, corporate environmental stewardship was introduced by Knauf Insulation, Inc. Students participated in a forensic case study (a la CSI) to study properties of materials, standards for hazardous waste, and biodegradable processes. The discussion of ethics and social obligations for engineers was continued online.

The program celebrated the end of the semester in Shelby County with the high school students travelling to Rose-Hulman for an on-campus visit. Students visited labs and resident halls, shadowed their mentors, meet with other engineering students, and had lunch in the dining hall.

Assessment Results – Pilot Cohort of Young Women

Both cohorts from the EMERGE pilot (2008 – 2009 and 2009 – 2010) were successful. Year one involved Vigo County School Corporation (VCSC) and a single high school, West Vigo High School (WVHS). In year two, the program involved North High School in Vigo County

and Northview High School in neighboring Clay County. In all, approximately 100 9th-graders and 18 Rose-Hulman women students completed the EMERGE pilot program.

We use the assessment done for the first cohort – West Vigo High School (WVHS) – to illustrate both program efficacy and the methods of our evaluation model.

WVHS is classified as a rural school house. It is one of three high schools in the district, with the other two being substantially larger (having a student population over 1,800 each). In 2012, WVHS had 32 teachers and 438 students, a 36% drop in student population since 2007. Nearly 50% of the WVHS population is on free or reduced lunch; only one-half of the student body tested passed the state competency examination for math / language arts in 2009. The school did not make Annual Yearly Progress for 2010-2011 or 2011-2012.

Assessment Instruments: Two online surveys were administered to this 2008 - 2009 cohort: one at the end of the group's freshman year (2009) and the second at the end of their senior year (2012). We present highlights from both self-report questionnaires.

- *Survey #1 (late May 2009)*: An exit survey contained 22 items, answered on a four-part Likert scale (strongly agree, agree, disagree, and strongly disagree). All 35 mentees from this first year completed the online survey in May, 2009. Questions loaded on the three central goals of the treatment. Table B provides sample results from each of the three thematic clusters.

- *Survey #2 (late May 2012)*: Thirty-three of the original 35 participants were still enrolled at WVHS and completed a 34-item exit survey (administered online through the Dean of Students Office). The survey was divided into three types of questions:

  → Profile of STEM engagement (e.g. "How many AP math, science, engineering, and technology courses did you take in high school.") **16 Questions**

  → Questions requiring a narrative answer (e.g. "What do you see yourself doing in five years?") **3 Questions.**

  → Agree/disagree items presented as a five-part Likert scale (e.g. "Participating in EMERGE helped me to improve my academic performance.") **15 Questions.**

  The last group of questions loaded on the same three programmatic goals that structured the first survey. Table C provides sample results from these fifteen survey items.

Quantitative Results: While items in both surveys clustered around three central objectives, the exact questions were tailored for the specific situation. Thus, some of the questions for Survey 2009 and Survey 2012 had a similar focus, but the wording was not the same. Also, Survey #1 (2009) had a four-part Likert scale, while Survey #2 (2012) had a five-part Likert scale. In other words, the first survey did not include a "neutral" category, while the second survey did. These variations preclude statistical comparisons between the two data sets.

Table B: Representative Results from EMERGE Cohort A
Survey Administered in May 2009

N = 35

Cluster #1: *Did EMERGE help students adopt a proactive stance on learning and creating their own plans for future career and educational choices?*				
Question	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**
Participating in EMERGE has helped me to develop better study habits.	11.4%	71.4%	17.1%	0%
Participating in EMERGE has encouraged me to think about what I want to do when I graduate from high school.	51.4%	42.9%	5.7%	0%
Participating in EMERGE has encouraged me to think more seriously about continuing my education beyond high school.	62.9%	34.3%	2.9%	0%
Participating in EMERGE has helped me to see how important my high school education is to my future.	51.4%	48.6%	0%	0%
Cluster #2: *Did students develop better socio-cognitive skills to help bridge the transition to high school?*				
Question	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**
Participating in EMERGE helped me to communicate more clearly with peers and teachers.	8.6%	62.9%	28.6%	0%
Participating in EMERGE helped me improve my skills for working well with others.	17.1%	68.6%	14.3%	0%
Participating in EMERGE helped me handle the demands of my high school environment.	17.1%	65.7%	17.1%	0%
Participating in EMERGE has helped me to be more confident in my own abilities.	14.3%	74.3%	11.4%	0%
Cluster #3: *Did EMERGE provide a consistent, reliable source of encouragement and advice, including support for STEM academic subjects?*				
Question	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**
Participating in EMERGE this semester gave me a sense of belonging to a supportive group.	14.3%	77.1%	8.6%	0%
My EMERGE mentor was interested in me, and I could count on her for support / advice.	28.6%	51.4%	17.1%	2.9%
I feel close to the other girls in my EMERGE group.	34.3%	60.0%	5.7%	0%
I would recommend the EMERGE program to a friend.	40.0%	60.0%	0%	0%

Table C: Representative Results from EMERGE Cohort A
Survey Administered in May 2012

N = 33

Cluster #1: Did EMERGE help students adopt a proactive stance on learning and creating their own plans for future career and educational choices?					
Question	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
There are great career choices for women in science, technology, engineering, and math.	45.5%	48.5%	6.1%	0%	0%
Participating in EMERGE influenced my decision to complete high school.	15.2%	24.2%	21.2%	24.2%	15.2%
The EMERGE program increased my interest in science, technology, engineering, or math as a career choice.	6.1%	33.3%	24.2%	30.3%	6.1%
Participating in EMERGE helped strengthen my belief that girls can do as well in science, technology, engineering, and math as boys do.	33.3%	51.5%	12.1%	0%	3%
Cluster #2: Did EMERGE help build socio-cognitive skills for success in high school?					
Question	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
Participating in EMERGE helped me to communicate more effectively with peers and with teachers	6.1%	42.4%	36.4%	12.1%	3%
Participating in EMERGE helped me to develop skills for handling the demands of a high school environment.	3%	30.3%	51.5%	12.1%	3%
Participating in EMERGE was very valuable for my personal development.	9.1%	39.4%	33.3%	18.2%	0%
Belonging to my EMERGE small group helped me to balance school obligations with other activities.	12.1%	33.3%	30.3%	21.2%	3%
Cluster #3: Did EMERGE provide a nurturing environment that resulted in stronger academic performance?					
Question	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
I would recommend the EMERGE program to others.	18.2%	63.6%	12.1%	6.1%	0%
Participating in EMERGE helped prepare me for taking college admissions tests (such as the PSAT, the SAT, or the ACT)	3%	42.4%	39.4%	15.2%	0%
Emerge helped me to be confident in taking harder courses in science, technology, engineering, and math.	6.1%	39.4%	36.4%	18.2%	0%
Participating in EMERGE helped me to improve my academic performance.	3%	42.4%	36.4%	15.2%	3%

Looking at these data from another perspective permits some degree of comparison. For Table D, we calculated the ratio of respondents selecting agree or strongly agree to those selecting disagree or strongly disagree on both surveys. We report these results for questions that can be considered functional equivalents within the three programmatic goals.

Table D: Representative Results from Equivalent Questions on Surveys 2009 and 2012

Pairs	Question	Year	Ratio A / D
Cluster #1: Did EMERGE help students adopt a proactive stance on learning and creating their own plans for future career and educational choices?			
#1	Participating in EMERGE has helped me to see how important my high school education is to my future.	2009	27 to 1
	Participating in EMERGE influenced my decision to complete high school.	2012	1 to 1
#2	Participating in EMERGE has caused me to be more interested in my current science, mathematics, or technology classes.	2009	2 to 1
	The EMERGE program increased my interest in science, technology, engineering, or math as a career choice.	2012	13 to 12
#3	Participating in EMERGE has made me more confident in my own abilities.	2009	5 to 1
	Participating in EMERGE helped strengthen my belief that girls can do as well in science, technology, engineering, and math as boys do.	2012	28 to 1
Cluster #2: Did EMERGE help build socio-cognitive skills for success in high school?			
Pairs	Question	Year	Ratio A / D
#4	Participating in EMERGE helped me handle the demands of my high school environment.	2009	5 to 1
	Participating in EMERGE helped me to develop skills for handling the demands of a high school environment.	2012	11 to 5
#5	Participating in EMERGE has helped me to balance my time among school work, responsibilities at home, and social activities.	2009	3 to 1
	Belonging to my EMERGE small group helped me to balance school obligations with other activities.	2012	15 to 8
#6	Participating in EMERGE helped me to communicate more clearly with peers and teachers.	2009	2 to 1
	Participating in EMERGE helped me to communicate more effectively with peers and with teachers	2012	28 to 0
Cluster #3: Did EMERGE provide a nurturing environment that resulted in stronger academic performance?			
Pairs	Question	Year	Ratio A / D
#7	I would recommend the EMERGE program to a friend.	2009	28 to 0
	I would recommend the EMERGE program to others.	2012	27 to 2
#8	Because of EMERGE, I want to take more high school classes that relate to math, science, or technology.	2009	3 to 1
	Emerge helped me to be confident in taking harder courses in science, technology, engineering, and math.	2012	5 to 2
#9	EMERGE has helped me to develop better study habits.	2009	3 to 1
	Participating in EMERGE helped me to improve my academic performance.	2012	5 to 2

We emphasize that conclusions drawn from the data represented in Table D are tenuous. In most cases the survey items are only nominally equivalent (with the exception of pairs #4, #6, and #7). Also, these self-report responses are subject to the vagaries and intervening variables occurring during the maturation and changing perspectives that took place over the ages of 15 to 18 for the participants. Nevertheless, we do believe that these results support the claim that EMERGE was highly successful during its inaugural year and also had a lasting, positive impact on the participants.

Qualitative Results: Preliminary review of the profile and narrative sections of the 2012 surveys suggests that the EMERGE cohort of 33 was above the averages in all categories for WVHS women graduating that year. However, we underscore two caveats: (1) the school had only incomplete data for some of the 18 qualitative questions we asked, and (2) the graduating class contained 78 women, meaning that nearly 50% were EMERGE participants. We emphasize that of the 35 original members of the cohort, 33 graduated on time and two moved out of the district. The all-person graduation rate for WVHS in 2012 was 72%, while the rate for the EMERGE participants was 100%.

West Vigo High School students joined EMERGE staff at a 2009 session at Cook Medical's Urological and Women's Health operations near Spencer, IN. The group learned about careers available in engineering and life science fields. Shirts and lanyards helped to establish EMERGE group identity. (Photo provided by Cook, Inc.)

Of special note for EMERGE sponsoring companies, we found anecdotal evidence that the content emphasized in the field trip / learning modules of 2008-2009 had an effect on career choices. For the first cohort, we worked with Cook Urological and Women's Heath to showcase STEM/engineering in medicine and health. A group of Rose-Hulman alumni/ae at the Spencer, Indiana facility took us under their wing and helped with a mini-curriculum for life science / bio-medical engineering activities, including a day-long field trip.

Of the 22 EMERGE participants who answered the fill-in question "What are your plans after high school graduation?," 21 will go on to post-secondary education; one will join the military. This represents 64% of the total sample of 33 respondents. (We make the assumption that the eleven students electing not to respond were not going on to higher education.) Of the 21 electing for post-secondary education, 14 specifically indicated a health or medicine-related career choice. (One will attend Rose-Hulman, majoring in bio-medical engineering.) Therefore, of those going on to post-secondary education, 67% selected a career allied with one of the treatment's major themes.

Program Extensions

A lack of funding caused EMERGE to go into hiatus from September 2010 through September 2012. However, we have found renewed interest in tele-mentoring when embedded as part of a more comprehensive economic development / workforce enhancement plan for disadvantaged counties in the state. The Shelby County consortium is one example; other counties are also exploring partnerships with Rose-Hulman and EMERGE. Consequently, we are now focusing on incremental improvement in two areas: assessment and dissemination.

Refine the Assessment Model: EMERGE will build upon its existing approach to improve the assessment framework. Essentially, we will restructure or add in three areas (1) refine the self-report surveys, (2) use focus groups for iterative feedback, and (3) add digital tools for evaluating the electronically logged usage patterns and mentoring exchanges. Essentially, we will look for improvement in assessment on two levels:

- *Program Implementation*: Monitoring outcomes for sustained quality improvement, such as (1) training of student mentors and (2) examining traffic data to determine trends and patterns, (3) isolating best practices from these data, exercises, and exchanges.

- *Program Efficacy:* Mentees and their teachers (in all subjects) will be asked to provide observations on several dimensions for each student's maturation:

Self-directed learning	Desire to continue education
Critical thinking	Subject grades
Career and workplace awareness	Science and mathematics comprehension

Enable Replication at Other Schools of Engineering: EMERGE not only provides benefits to the students and schools immediately involved, but also serves as a test bed for refining the core competencies of successful tele-mentoring programs.

Next year, the EMERGE staff will codify and electronically disseminate program materials so that other engineering institutions may set up their own tele-mentoring program. These items include "how to" guidance for program implementation, such as (1) training of college student mentors and (2) using EMERGE's Moodle platform to get started. Also provided will be methods for assessing the program's efficacy.

Acknowledgements

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