



University of Southern Indiana  
Pott College of Science, Engineering, and Education



# Southwest Indiana STEM



## Strategic Plan

2013–2018

SCIENCE

TECHNOLOGY

ENGINEERING

MATHEMATICS

## From the director



Since 2007, the Southwest Indiana STEM (SwI STEM) Resource Center, housed within the Pott College of Science, Engineering, and Education at the University of Southern Indiana (USI), has developed and implemented initiatives targeted at increasing STEM interest and proficiency among K-16 students in the Southwest Indiana region.

With a wide array of student-centered outreach activities, teacher professional development opportunities, and a robust equipment lending service, the forecast for STEM achievement in the Southwest Indiana region has never looked better!

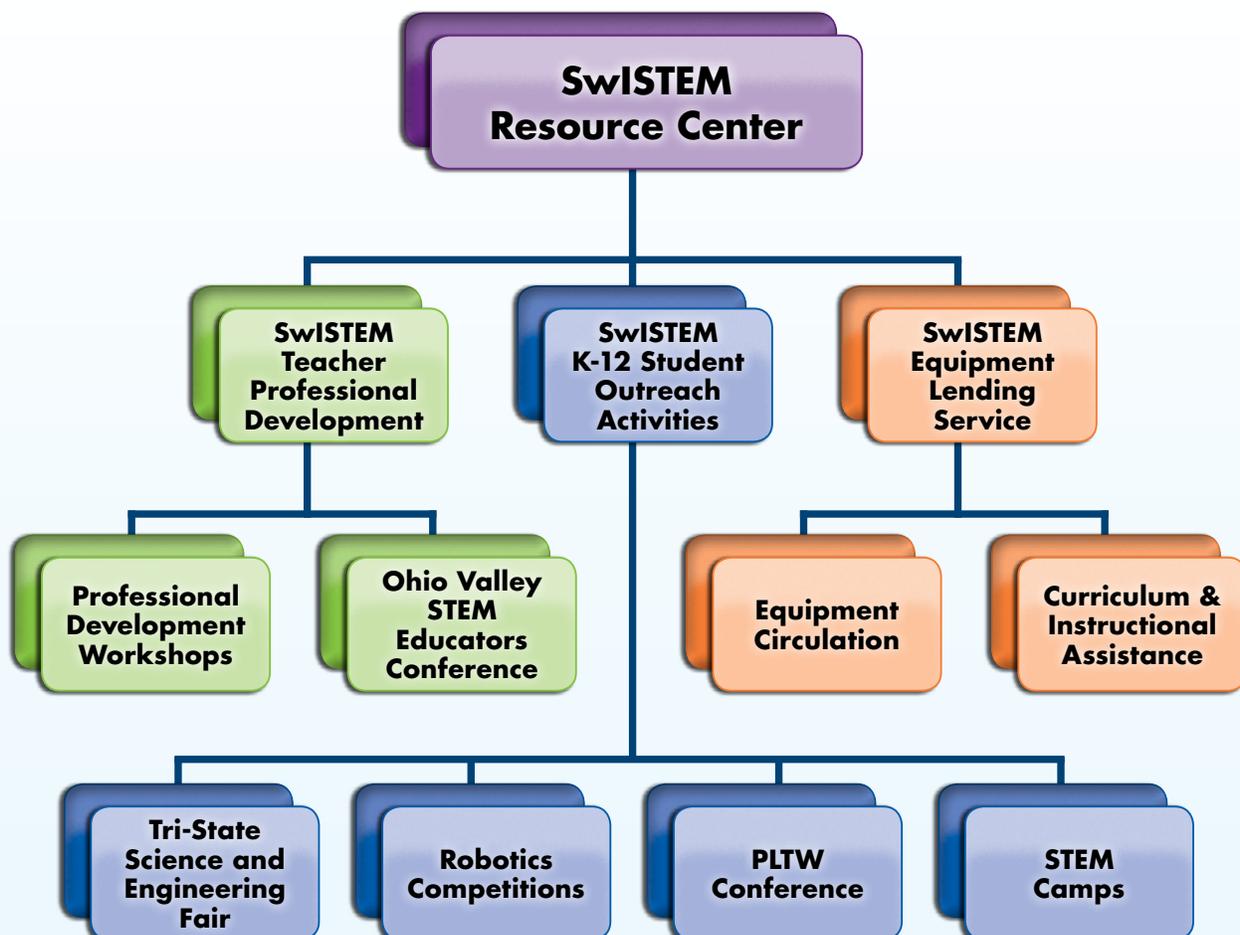
This strategic planning document was developed by members of area business/industry, higher education, informal institutions of education, and K-12 schools. Its contents will be used to guide the direction of the organization as the Resource Center continues to grow and fulfill its vision of developing a STEM-ready workforce.

**Allison F. Grabert**

# Southwest Indiana Science, Technology, Engineering, and Mathematics (SwISTEM) Resource Center

The Pott College of Science, Engineering, and Education has a long-standing record of success in promoting, supporting, developing, enhancing, and improving STEM education in the Southwest Indiana region. The success, breadth, and depth of these outreach and engagement efforts resulted in USI and the Pott College being named as the Southwest Indiana Science, Technology, Engineering, and Mathematics (SwISTEM) Resource Center in 2007. Since inception, the SwISTEM Resource Center has had tremendous success in obtaining funding (both public and private) to sustain, enhance, and expand Center activities. Funding was received from the Indiana STEM Resource Network, a Workforce Innovation and Regional Economic Development (WIRED) grant from the U.S. Department of Labor, and a National Science Foundation (NSF) grant. In addition, USI established a STEM Resource Endowment that continues to seek and obtain support from business, industry, and private citizens in the region. The activity and direction of the Resource Center is guided by an advisory group of K-16 STEM educators and administrators, as well as business

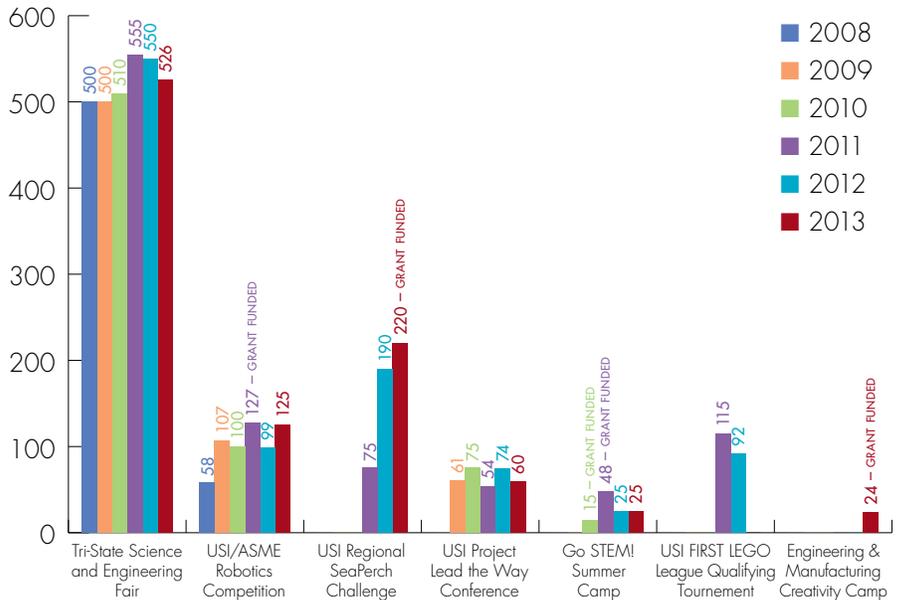
and industry partners. Members of the advisory group understand the need for rigorous engagement at student-centered outreach events, adequate access to resources to involve students in inquiry-based and/or hands-on activities, and STEM teacher professional development opportunities. Over the last several years, the SwISTEM Resource Center and USI emerged as the regional leader in the K-12 STEM community through multiple engagement channels, such as the SwISTEM Equipment Lending Service, STEM outreach events and competitions, and ongoing teacher professional development opportunities. Activities and services such as these have allowed all K-12 Southwest Indiana educational entities the opportunity to provide high-touch, enriching STEM activities both in and out of the classroom in efforts to cultivate the curiosity and excitement of future scientists regardless of demographic and socioeconomic circumstances. As a result of these efforts, the SwISTEM Resource Center received the 2010 *Regional Impact Award* from Leadership Evansville "in recognition of its vision to develop our students of today and workforce of tomorrow."



# Student-Centered SwiSTEM K-12 Outreach Activities

Even before the SwiSTEM Resource Center was established at USI, the Pott College hosted several STEM outreach activities for area students. In 2009, the Resource Center officially assumed management and expansion roles of the outreach program. Since that time, thousands of K-12 students have participated in one or more activities which motivate participants to pursue degrees in the STEM disciplines and ultimately to secure careers in engineering, mathematics, science, and technology.

Some of the outreach opportunities hosted by the SwiSTEM Resource Center are funded through grants. When grants are not available, the cost to participate must be passed down to participants and/or schools through registration fees. Participants are also required to pay for materials needed in order to compete (e.g., FLL robots and SeaPerch kits). When grant funding is not available to support these activities, enrollment rates decline, causing the fluctuations seen in the chart.



**Tri-State Science and Engineering Fair**—In 2006, Pott College began hosting the Tri-state Science and Engineering Fair, which draws hundreds of potential young scientists and engineers from throughout Southwest Indiana. The event for K-12 students is held each spring on the University campus. Students in a 75-mile radius of campus are eligible to participate. The fair offers students an opportunity to display their research and receive recognition for their work. It also serves as a qualifier for the state and international science and engineering fairs. Renewable USI scholarships, computers, cash awards, and plaques are presented to award winners.



**USI Project Lead the Way Conference**—The USI Project Lead the Way (PLTW) Conference offers a unique opportunity for high school students and teachers involved in PLTW curriculum to convene and network with other area students, teachers, and business/industry professionals. During this one-day conference, ideas are shared, team PLTW presentations are made, and updates regarding the newest advances in STEM education and career pathways are disseminated. USI and Toyota Motor Manufacturing, Inc. have served as hosts for the conference in past years.



**USI ASME Robotics Competition**—The American Society of Mechanical Engineers—USI Student Chapter and the SwiSTEM Resource Center collaborate to host a robotics competition for middle and high school students each spring. Teams and their sponsors are invited to attend workshops led by USI engineering students and faculty to introduce and fine-tune robot design and programming skills. Each year, the course for robot competition is changed to reflect a new mission. Winning teams are awarded trophies during a ceremony at the conclusion of the event. This event has grown to include over 100 students since 2008.



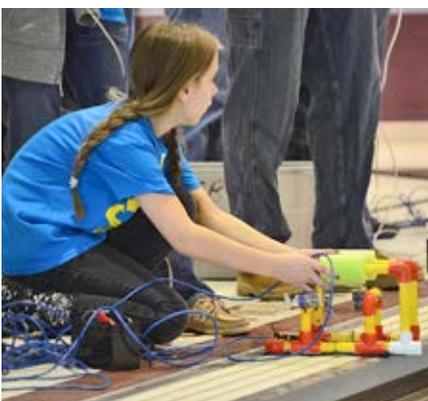
**Girls Only (GO) STEM! Summer Residential Camp**—The Girls Only (GO) STEM! Program focuses on helping high school girls overcome barriers and stereotypes faced while preparing for, and pursuing, STEM-related careers through a five-day residential summer camp experience. GO STEM! also involves female college students in the STEM disciplines by allowing them to work with and mentor these high school students. This experience focuses on the application of the STEM disciplines at Holiday World & Splashin' Safari in Santa Claus, Indiana, by using the amusement park as a laboratory for experiments and activities in chemistry/nutrition, mathematics, biology, and engineering/applied physics. On the final day of camp, participants invite community members to campus for presentations highlighting their laboratory exercise conclusions and camp accomplishments.



**Engineering & Manufacturing Creativity Camp (EMC<sup>2</sup>)**—In the summer of 2013, with generous support from the Alcoa Foundation, the SwiSTEM Resource Center hosted the first week-long Engineering & Manufacturing Creativity Camp (EMC<sup>2</sup>) at USI. Twenty-four high school students from six counties in Southwest Indiana attend this five-day camp to experience the design processes from ideation to prototype and robotics principles that lead to the creation of consumer products. USI engineering students and faculty members facilitate activities that take place on campus in the Business and Engineering Center and the new, state-of-the-art Applied Engineering Center. Participants meet throughout the academic year to continue networking with area business/industry professionals and members of academia to promote a sense of comradery as they progress through STEM coursework.



**USI FIRST® LEGO League (FLL) Regional Qualifying Tournament**—The SwiSTEM Resource Center became an Operational Partner with the National FIRST® LEGO® League in 2011. The USI FLL Qualifying Tournament is an official FLL tournament held each year in November at USI. This robotics program is designed for nine- to fourteen-year-old students and is intended to spark interest in science and technology while teaching employment and life skills. Teams of up to 10 students are charged with designing, building, and programming an autonomous LEGO® MINDSTORMS® robot to score points on a thematic course and to create an innovative solution to a community problem.

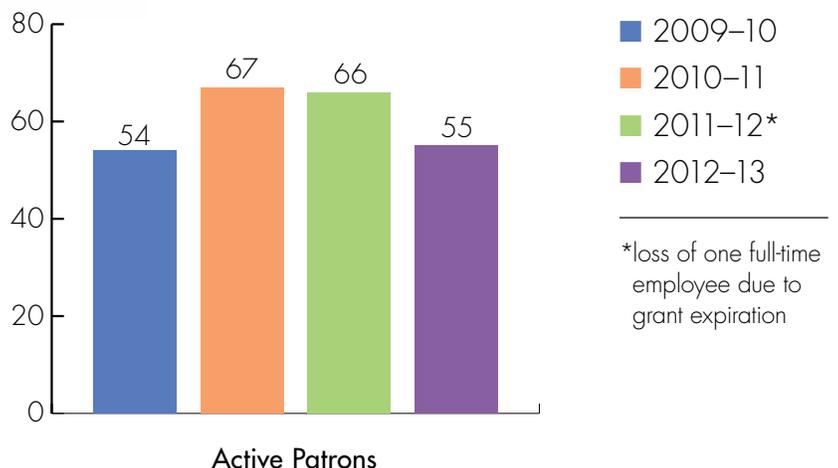
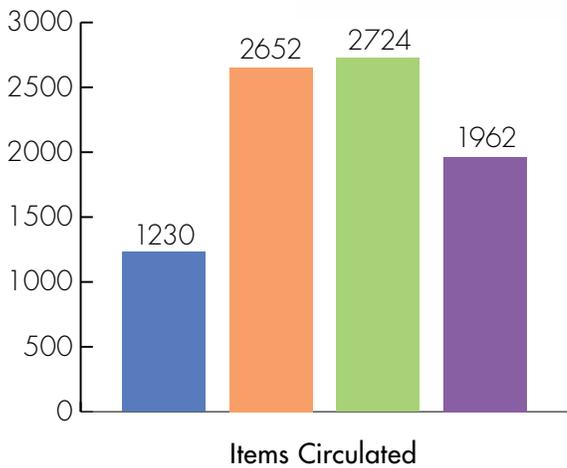


**USI Regional SeaPerch Challenge**—The first SeaPerch Underwater Robotics Competition at USI was held in February 2011 and was an overwhelming success. In conjunction with Indiana SeaPerch, Naval Surface Warfare Center (NSWC)—Crane, and other industrial and education supporters, SeaPerch teams received a kit and training at no charge. Teachers attended a training session during the fall semester led by USI faculty/staff. During the first SeaPerch cycle, 19 teams of Remotely Operated Vehicles (ROVs) went head-to-head in the innovative underwater robotics competition. Since then, the challenge has grown to accommodate over 60 teams and 200 students annually. The excitement surrounding the USI Regional SeaPerch Challenge has spread among students and teachers, creating distinct prospects of program growth.

# Equipment Lending Service



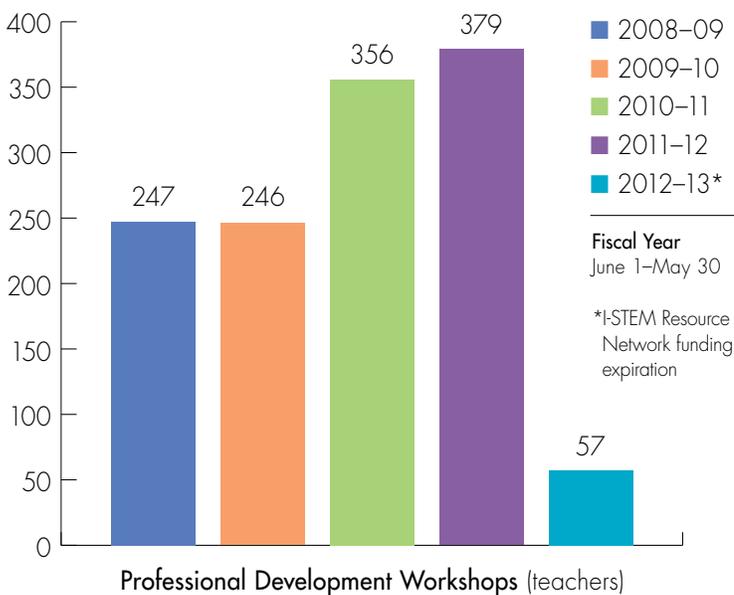
The SwISTEM Resource Center recognizes that teachers need access to scientific equipment in order to provide hands-on STEM activities to their students. To meet this need, the SwISTEM Equipment Lending Service lends a large assortment of laboratory equipment and mathematics/science manipulatives to teachers in the SwISTEM service area, completely free of charge. Equipment is typically loaned in weekly increments. Patrons of the service also are given access to curriculum consultation, lesson plan development, and on-site instructional assistance by the staff of the Resource Center. In 2013 the equipment lending service expanded to include nine additional counties in partnership with Naval Surface Warfare Center-Crane. The expansion district does not currently have access to delivery/pick-up services.



(Patrons receiving equipment one or more times per academic year.)

\*loss of one full-time employee due to grant expiration

# Teacher Professional Development



Schools need highly skilled educators who can motivate and educate students in the fields of science, technology, engineering, and mathematics. The SwISTEM Resource Center offers a nurturing, team-oriented approach to STEM education for teachers who want to remain current in a field that becomes more complex and demanding every year. Recent research-based practices in STEM subjects are offered to teachers participating in professional development opportunities tailored to SwISTEM outreach programs and the K-12 Indiana Academic Standards. Historically, over 200 teachers per year attend one or more professional development sessions hosted by the Resource Center. In 2012, funding for teacher professional development was drastically cut by the Indiana STEM (I-STEM) Resource Network, leading to a significant decrease in opportunities and participating teachers.

# Introduction to Strategic Plan

The strategic planning team included the dean of the Pott College, staff from the SwiSTEM Resource Center, patrons of the Resource Center, entities from local informal education institutions, and members of higher education.

The team's first step was to look at key indicators to assess where the center stands and to compare the center to benchmark institutions.

- Washington State University
- Florida State University—Science on the Move/Office of Science Teaching Activities
- Purdue University—Science Express
- Northeast Indiana STEM Education Resource Center—Science

The team studied the following key indicators: number of services offered, number of students/teachers impacted, student/teacher participation, measurement of students' success, volunteer base, and staff size.

Some of the key findings of the self-assessment are below:

## Strengths

- The scope of services offered to teachers and students through the SwiSTEM Resource Center is more comprehensive in comparison to benchmark institutions.
- The cost of services to participating schools, teachers, and students is lower in comparison to benchmark institutions.
- The SwiSTEM Resource Center offers services to education entities in a large geographical area.
- Due to the Resource Center's location at the University of Southern Indiana, teachers and students have access to a large constituency of supportive and knowledgeable faculty/staff as well as other important resources.
- From 2008–2013, there have been over 110,000 instances of student impact (e.g., using SwiSTEM equipment during classroom activities, participating in outreach activities/competitions, participating in classroom activities lead by SwiSTEM staff, etc.).
- From 2008–2013, there have been over 2,400 instances of teacher impact (e.g., teachers checking out equipment, attending professional development sessions, sponsoring teams for STEM outreach competition, requesting curriculum/instructional assistance, etc.).
- Overall, from 2008–2013 the number of student outreach activities (e.g., camps, competitions, conferences, etc.) has increased.
- Annually, 100+ community volunteers assist in the implementation of various SwiSTEM initiatives.



## Weaknesses

- From 2008–2013, the number of teachers participating in the SwiSTEM Equipment Lending Service has leveled off.
- The number of items circulated through the SwiSTEM Equipment Lending Service peaked from 2010–2012. During the 2012–13 academic year, the number of items circulated decreased by one-third, likely due to a decrease in full-time SwiSTEM staffing.
- From 2008–2013, the number of students participating in SwiSTEM outreach activities has leveled off or declined with the exception of the USI Regional SeaPerch Challenge. Lack of increased student involvement in these activities has been a result of an increase in costs to participate (e.g., registration, supplies, etc.) and decreased funding from third-party sponsorships.
- From 2008–2013, the number of professional development opportunities offered by the SwiSTEM Resource Center has diminished significantly due to lack of funding. Thus, the number of teachers attending also has declined.
- Further expansion of the student outreach engagements is likely not feasible going forward due to limited manpower to coordinate and execute such events.
- Measuring the success of the SwiSTEM program in bolstering student success in the STEM disciplines is difficult without access to a method of tracking students' progress (STNs) through the K-16 educational system.

## Goal One:

### Student Success in the STEM Disciplines

SwISTEM Resource Center will inspire and prepare K-12 students to pursue careers in the STEM disciplines.

#### STRATEGIES

##### One- to two-year strategies

- Host student-centered STEM outreach activities and competitions at USI each year.
- Evaluate the impact of each outreach event versus the effort/resources necessary to implement each event with the SwISTEM Advisory Board (See Goal #3).

##### Five- year strategies

- Replace existing low-impact outreach activities with new STEM outreach events as recommended by the SwISTEM Advisory Board.
- Use Student Testing Numbers (STNs) to correlate K-12 SwISTEM student involvement with undergraduate STEM coursework progress.

#### METRICS

- SwISTEM will coordinate and host between six (6) and ten (10) student-centered outreach activities each academic year.
- A minimum of five thousand instances of student impact will be recorded for SwISTEM outreach activities each academic year.
- Over one hundred SwISTEM students' progress in the STEM disciplines will be tracked using STNs each academic year.



## Goal Two:

### Excellence in STEM Teaching

SwISTEM Resource Center will strengthen teachers' abilities to facilitate rigorous, hands-on, and/or inquiry-based STEM experiences.

#### STRATEGIES

##### One- to two-year strategies

- Create a web-based STEM curriculum sharing site for educators.
- Poll teachers and administrators to identify concerns and areas of interest for professional development.
- Offer professional development and curriculum consultation for teachers that targets the use of hands-on and/or inquiry-based STEM activities. (These activities will include use of equipment available through the SwISTEM Equipment Lending Service and will thus increase its usage.)
- Host activity- and competition-focused workshops aimed at training sponsors and teachers in order to be better equipped to lead successful teams in STEM competitions.

##### Five-year strategies

- Offer online teacher professional development modules and webinars.
- Continuously expand and improve instructional equipment available to teachers through the SwISTEM Equipment Lending Service.

#### METRICS

- Thirty (30) teacher-generated, inquiry-based STEM lesson plans or activities will be shared on the web-based curriculum sharing site each academic year.
- Fifty (50) teachers/sponsors will be trained each academic year to lead teams during SwISTEM outreach activities and competitions.
- One hundred (100) teachers per academic year will participate in SwISTEM professional development (online, on campus, or on site).

## Goal Three:

### Expansion of Community Partnerships

SwISTEM Resource Center will develop and maintain community partnerships and state/national affiliations to enrich learning opportunities for teachers and students.

#### STRATEGIES

##### One- to two-year strategies

- Assemble an active SwISTEM Advisory Board consisting of representatives from business, industry, government, K-12 education, the USI Foundation office, and higher education to make recommendations regarding all SwISTEM activity.
- Increase the number of community partners and volunteers contributing to the SwISTEM Resource Center.
- Establish sponsorship levels for SwISTEM events with the assistance of the USI Foundation office.

##### Five-year strategies

- Develop and nurture relationships with community partners offering financial and human capital to the SwISTEM Resource Center.

#### METRICS

- One hundred and fifty (150) volunteers from community partners will assist with SwISTEM activities each academic year.
- One community partner will financially sponsor a single SwISTEM event each year using a tiered sponsorship donation level recommended by the USI Foundation.
- Charitable contributions from business/industry sponsorships will be greater than \$15,000 per year.



## Goal Four:

### SwISTEM Organization

SwISTEM Resource Center will increase staffing to contribute to the essential functions of the Resource Center.

#### STRATEGIES

##### Five-year strategies

- Increase permanent staffing to include a dedicated STEM coordinator responsible for teacher training, professional development, curriculum consultation, and site-based instructional assistance.
- Enlist the assistance of a graduate student to design a research plan using STNs to link STEM success with access and use of SwISTEM resources.
- Work with the Pott College to hire a full-time grant writer responsible for identifying funding opportunities, coordinating grant writing ventures, and managing awards.

#### METRICS

- One (1) STEM coordinator will be hired.
- One (1) graduate intern will be utilized each academic year to execute SwISTEM efficacy research study using STNs.
- One (1) grant writer will be hired.



# STEM Resource Endowment



USI is dedicated to the preservation of the SwISTEM Resource Center to measurably improve K-12 student achievement in the STEM disciplines. A gift to the STEM Resource Endowment will support programs offered by the SwISTEM Resource Center.

- Student-centered outreach activities
- Teacher professional development
- Free equipment lending service

## Investing in our future...it makes a difference

- Creates a science, mathematics, and technology-literate workforce
- Supports effective STEM education of all students regardless of socio-economic status
- Plays an integral role in providing a continuous supply of highly trained technologists to meet the workforce demands of our economy's growth sectors
- Maintains supportive resources to help Indiana's K-12 schools make gains in STEM achievement for their students.

## Donor Recognition

The sustainability of the SwISTEM Resource Center will be accomplished through a continued focus on teacher quality, student achievement, application for private and public grants, and the invaluable place of philanthropy from an involved and caring community of old and new friends.

### All Donors

All donors to the STEM Resource Endowment will be recognized online in the Honor Roll of Donors.

### Donors of \$1,000 or More

Donors of \$1,000 or more qualify for membership in the President's Associates, receive an invitation to the President's Associates Dinner, and are invited to special events throughout the year.

### Perpetual Members

Perpetual members are recognized for single gifts of \$25,000 annually to a single program.

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Make your pledge or gift at  
**[USI.edu/giving](http://USI.edu/giving)**

## Mission

The mission of the Southwest Indiana Science, Technology, Engineering, and Mathematics (SwISTEM) Resource Center is to provide STEM resources to K-16 educators within the region to augment student preparedness for undergraduate STEM coursework, and to ultimately increase the size and proficiency of the STEM workforce. The Resource Center promotes hands-on and inquiry-based education through teacher professional development, equipment lending, and student-centered STEM outreach activities.

## Vision

The Southwest Indiana Science, Technology, Engineering, and Mathematics (SwISTEM) Resource Center strives to facilitate the growth of a robust STEM workforce by partnering with local business, industry, and K-16 educational institutions.

# Southwest Indiana STEM



Pott College of  
Science, Engineering,  
and Education

8600 University Boulevard  
Evansville, Indiana 47712

[www.swistem.org](http://www.swistem.org)

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