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Letter from the Co-Directors

The STEM Education Research Institute (SERI) officially opened its office doors in November 2012 with three co-Directors and one office manager/researcher. By January a post-doctoral fellow and research associate were added to the SERI staff.

SERI is quickly developing into a STEM Education Research leader on campus by working with faculty, campus institutes, and outside organizations throughout Indiana and the nations. By identifying and nurturing these synergistic activities, and leveraging the successes of our campus’ many prestigious initiatives, SERI is seeking to advance IUPUI’s already accomplished reputation as an internationally recognized research university. With the continued integration of SERI into the broader campus, the dynamic field of STEM education research will become more prevalent in the culture of IUPUI, which will only serve to bolster the competitiveness and innovativeness of our faculty’s research proposals.

Moreover, SERI is constantly striving to play an active role in the evaluation, assessment, and refinement of current and future IUPUI STEM education initiatives. SERI is currently taking a leadership role in the development of multiple grant proposals. We are also reaching out to other STEM education programs in need of evaluation services, fostering links between like-minded researchers, and providing guidance to faculty as they grapple with the introduction of STEM education research into their academic endeavors and funding pursuits.

On behalf of everyone at SERI, we would like to express our genuine excitement as we set out to play our part in the promotion of research excellence at IUPUI.

Sincerely,

Charlie Feldhaus  
School of Engineering and Technology

Andy Gavrin  
School of Science

Jomo Mutegi  
School of Education
SERI Structure

SERI is overseen by the Office of the Vice Chancellor for Research, and is led by a Leadership Team, with representation from the partnering School of Education, School of Engineering and Technology, and School of Science.
Vision and Mission

SERI’s **Vision** is to be a nationally and internationally recognized center of excellence for STEM education research, contributing to the advancement of STEM education in Indiana and the nation.

SERI’s **Mission** is to ...

1. **Promote research on STEM education at all levels**, including:
   - Evaluating the effectiveness of existing and proposed educational practices in STEM
   - Investigating fundamental questions of how people learn STEM
   - Encouraging STEM faculty to participate in the scholarship of STEM teaching and learning.

2. **Promote and coordinate STEM education research initiatives pursued through the institute and in collaboration with external partners.**
Awarded and Submitted Grant Proposals

An overarching concern for producing excellent scholarship and attaining needed funding has informed much of SERI’s recent activities. Proposals for the following programs either have been submitted or awarded. SERI activities have also emphasized the need to identify and organize STEM-related RFPs and Solicitations both for future submission and for dissemination to appropriate IUPUI faculty.

AWARDED

Houser, J.H.W., **Feldhaus, C.R.**, Helfenbein, R.J., & Stuckey, S.M. *A Longitudinal Analysis of Project Lead the Way in Indiana*. Indiana University Collaboration Research Grant (IUCRG) March 5, 2013. ($53,000)

**Summary:** This pilot study will describe PLTW participants who graduated high school in 2008 and examine the impact of program participation on college outcomes including enrolling in college, college major, first year to second year college retention, and college graduation in four years. The educational outcomes of PLTW participants will be compared with their peers via propensity scoring matching. In subsequent years, external funding will be solicited to conduct similar analyses for each cohort. Results will provide robust, high quality research providing insight on PLTW’s impact on real long-term outcomes regarding college success and preparation for STEM professions.


**Summary:** We are proposing the development of a 12 credit hour, 4 course inter-disciplinary graduate-level certificate tentatively titled "Mixed Methods in Health and Technology". The curriculum for the certificate includes two existing courses offered through the Technology program focusing on qualitative and quantitative methodologies, one course from the students’ home department, and a new course Mixed Methods Research. The outcomes from the CEG project will result in a certificate that will allow IUPUI students to be highly competitive in seeking additional graduate and postdoctoral research training and engaging in productive, meaningful research careers in industry or academia.


**Summary:** This program will provide professional development and research experience in mathematics and/or science for approximately 45 teachers of grades 3-8 from the MSD Washington Township. During the summer training experiences, participating teachers will spend their mornings building pedagogical content knowledge in mathematics/science and their afternoons participating in research with faculty members on the IUPUI campus.

SUBMITTED

Summary: This *Pathways* project is a pilot study to assess Indiana afterschool STEM education programs in informal learning environments. “The Indiana Project: Using STEM Standards and High Quality Assessments in Informal STEM Learning Programs” will employ a case study research methodology to produce new knowledge on informal STEM learning (ISL). It will do so by field-testing the *Dimensions of Success* (DOS) observational tool to formally assess and evaluate ISL program quality. Harvard researchers previously received NSF REESE funding to refine the DOS tool, which is designed to assess 12 indicators of quality STEM learning in informal environments. The DOS tool was developed for widespread use in varied ISL environments. Presently, it has been used to train observers in six states.


**Summary:** The Integrated Nanosystems Development Institute (INDI) at Indiana University-Purdue University Indianapolis (IUPUI) proposes to establish *Research Experiences for Teacher Advancement In Nanotechnology (RETAIIN)*, a 6-week immersive research education program for high school teachers. RETAIN will provide 30 Indiana high school teachers over 3 years with nanotechnology research experiences, including seminars on integrating inquiry-based lessons into the classroom and translation of research experiences into teaching modules.


**Summary:** The Integrated Nanosystems Development Institute (INDI) at IUPUI proposes the establishment of *Nanotechnology Experiences for Students and Teachers (NEST)*, a program designed to introduce 9th-12th-grade students and teachers to the field of nanotechnology through 2 separate 2-week summer camps and extensive post-camp opportunities with faculty mentors. Post-camp activities may include independent research projects for students and guided module implementation for teachers.


**Summary:** This project builds on a proven virtual reality-based online platform (VOTE) currently being developed. A VOTE module in advanced manufacturing was recently utilized by the PI in the development of *ME 29500 - Introduction to Advanced Manufacturing*, the first full-fledged online engineering course offered at surrounding K-12 schools. The proposed project will implement VOTE curricula through Massive Open Online Courses (MOOC), while developing, and then integrating, additional STEM-based virtual modules, in advanced manufacturing and nanotechnology.
Scholarship

PUBLICATIONS


Blackwell, E. L. & **Pinder, P. J.** (2013, In Review). What are the motivational factors of first- generation minority college students who overcome their family histories to pursue higher education?


**BOOK CHAPTERS**


  Conference Book Launched Date: June 28 to 30, 2013.

  Conference Book Projected Released Date: October 2013

**PRESENTATIONS AND POSTERS**

**SCHOLARSHIP**

**Pinder, P. J.** (2013, April 5). *Employing a phenomenological inquiry approach to explore a few urban African American math and science teachers’ perspectives on NCLB and assessments.* Poster presented at the Indiana University, Purdue University, Indianapolis (IUPUI) Research Day Symposium, Indianapolis, IN.


**Sorge, B.** (2013, March 18). *The Lilly Science Coaches: Analysis of the Science Coach and Teacher Surveys.* Presentation at the Lilly Science Coach Meeting, Eli Lilly and Company, Indianapolis, IN.


Initiatives and Pilot Studies

IUPUI INTERNAL STEM EDUCATION DATABASE

One of SERI’s initial projects is a search for potential synergies among the many STEM education initiatives ongoing at IUPUI. The ultimate goal of this project is to establish best practices for identifying and implementing such synergistic connections among STEM education initiatives within a single large campus or consortium of geographically connected smaller campuses. The project will be implemented in three phases. During Phase 1, which is currently underway, SERI researchers will non-intrusively identify and categorize campus STEM education initiatives through IUPUI websites, institutional reports, and funding reports from foundations such as NSF and NIH. In Phase 2, researchers will both conduct fact-checking interviews with IUPUI faculty/staff and develop a comprehensive and accessible database of current STEM education initiatives across campus. With Phase 3, researchers will conduct an analysis of IUPUI’s initiatives using the database and, when needed, additional faculty/staff interviews both to assess internal synergy and cost-saving and to identify the potential for additional synergistic development at IUPUI. Following the completion of this tripartite process, results will be gathered and assembled into an NIH or NSF proposal requesting funding to formalize the process and expand it to a sample of other campuses.
Collaborations

SERI is dedicated to nurturing current and newly formed collaborations, while concurrently seeking to identify and initiate additional creative partnerships with dynamic people and institutions at IUPUI, in Indiana, and nationally.

IUPUI COLLABORATIONS
Center for Urban and Multicultural Education (CUME)
Great Lakes Equity Center
Integrated Nanosystems Development Institute (INDI)
Urban Center for the Advancement of STEM Education (UCASE)
Center for Research and Learning
Center for Teaching and Learning
Indy Learning Centers

INDIANA COLLABORATIONS
Indiana Afterschool Network (IAN)
Indiana Science Initiative (ISI)
I-STEM Resource Network
Lilly Science Coaches
Indianapolis Urban League
Center for Evaluation and Education Policy (CEEP)
Indiana Department of Education
Wisdom Tools
Indianapolis Public Schools
Ivy Tech Community College
NATIONAL COLLABORATIONS

- Harvard University’s Program in Education, Afterschool and Resiliency (PEAR)
- Mid-continent Research for Education and Learning (McREL)
- Technical Education Research Centers (TERC)
# STAFF

## Staff

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
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<tbody>
<tr>
<td>CHARLIE FELDHAUS</td>
<td>CO-DIRECTOR</td>
</tr>
<tr>
<td>ANDY GAVRIN</td>
<td>CO-DIRECTOR</td>
</tr>
<tr>
<td>JOMO MUTEGI</td>
<td>CO-DIRECTOR</td>
</tr>
<tr>
<td>GRANT FORE</td>
<td>RESEARCH ASSOCIATE</td>
</tr>
<tr>
<td>PATRICE PINDER</td>
<td>POST-DOCTORAL FELLOW</td>
</tr>
<tr>
<td>BRANDON SORGE</td>
<td>RESEARCH ASSOCIATE</td>
</tr>
</tbody>
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## STEM Education Research Institute

Indiana University-Purdue University Indianapolis  
755 W. Michigan Street UL 1123  
Indianapolis, IN 46202-5195  
Tel 317-278-6081  
Fax 317-274-1024  
seri.iupui.edu