

# Science, Technology, Engineering, Math (STEM) Education Initiative

The STEM Education Initiative continues to work to improve STEM instruction “from K to Gray” on campus, in North Carolina, and across the nation. Having a straightforward goal keeps us focused and even garnered favorable mention in the January 14 issue of *Science* where we were praised for having the improvement of science teaching as part of our mission. We recognize that educational innovation is an important component of the University’s draft Strategic Plan and we strive to do our part to advance that vision.

This has been an unusual year for the Initiative because our Director, Dr. Robert Beichner, spent the last half of 2010 on sabbatical as part of his work as an ACE Fellow. Nonetheless, we were still able to keep things going, as will be seen below. During the fall semester, Dr. Beichner helped Virginia Tech develop their Strategic Plan for Undergraduate Education. He also had an opportunity to meet with leaders of faculty development centers at VT and Western Carolina as well as interview the Presidents of quite a few institutions, including the University of Phoenix and Arizona State. He hopes to put his new knowledge and experience to work making the STEM Ed Initiative even better.

## Education

There has been significant advancement in the implementation of **SCALE-UP** instruction on campus. We financially supported the creation of a new 45-seat room in Harrelson Hall, allowing two biology classes and two mid-level physics courses to be taught in this mode for the first time. We provided release time for some of the curriculum revisions.

A new class for **preservice elementary education teachers** is being finalized. It will utilize the *Physics and Everyday Thinking* curriculum and will be taught in a SCALE-UP setting.

We continue **mentoring** one-on-one with faculty interested in active learning. Dr. Beichner has also presented to several University-wide groups.

Dr. Beichner is on the advisory board of an edited book of articles on research-based methods of **physics teacher education**. It should be published within a few months.

## Research

Multiple Departments and Colleges are using our QERL, Quantitative Education Research **Lab**. It is almost certainly the best such facility in any STEM department anywhere in the world.

The Initiative is working with the Colleges of Education and Engineering to advance our efforts for hiring at least one **engineering education research** faculty member. This may require establishing a new department.

Three STEM education research **grad students earned PhDs** this year and we supported graduate students in three different departments.

We have **supported research and development** of *Expertisa* by Dr. Ed Gehringer and his graduate students. This web-based application helps students peer-review each others’ work.

Dr. Beichner continues his efforts as a member of a **task force** for the National Research Council and the National Academy of Science. He is part of a team developing a report on the status, impact, and future of Discipline-Based Education Research.

Dr. Beichner also continues as editor of the **leading journal** in his field, *Physical Review Special Topics-Physics Education Research*.

### **Service/Outreach**

The **STEM-oriented Early College High School** will be opening on campus in the fall, and administrators and teachers are being hired. Dr. Beichner serves on the Leadership Committee. Several other NCSU administrators and faculty are assisting in leadership and curriculum development.

Dr. Beichner continues to serve on the **JOBS Commission**. He has been asked to work with a task force to develop a statewide plan for STEM education. This legislature-created duty provides the University with an opportunity to heavily influence STEM education across the state. His work with the Commission was incorporated into the EDGES service scholarship project, funded by the Department of Education. He is also on the Advisory Board for the NC STEM Community Collaborative and the liaison group between the Collaborative and the Commission.

Our efforts to create an **Education Extension Service** have progressed. We were asked to put together a proposal for Lt. Gov. Walter Dalton and the JOBS Commission. These efforts are on hold until our extension service administration stabilizes following the upcoming retirement of Dr. Jim Zuiches.

The STEM Education Initiative **website** is being continuously updated. Especially popular is the page of links for three-dozen relevant funding opportunities.

Our **conceptual assessment instrument** page continues to serve the Physics Education Research Community, resulting in more than 80 test download requests annually.

Dr. Beichner is on a small EDUCAUSE team developing **national learning spaces standards**, similar to the LEEDS energy standards. Hopefully this project will be finished this year.

Dr. Laura Bottomley participated in a **Global Town Hall** on STEM education, led by former Vice President Al Gore.

A series of **astronomy videos** developed by Dr. Don Ellison for NC teachers were described in an article in *The Physics Teacher*.

Dr. Beichner served on the steering committee for the **NC Science Festival**, which sponsored demonstrations and presentations across the state.

As **Community Relations Coordinator** for The Science House, Dr. Beichner visited all the satellite offices across North Carolina and met individually with each of their Directors.

## Funding

Dr. Eric Wiebe is directing the MISO (Maximizing the Impact of STEM Outreach) project to establish a **database of STEM outreach efforts**. Dr. Beichner is on the Advisory Board.

**Individual faculty members** continue soliciting and receiving grant support for their work. For example, Dr. David McConnell submitted a proposal for a national Geoscience STEM Center with colleagues from other institutions.

We tried to secure funding for an **MEd program** with physics concentration for Science Certified in-service teachers. We were not successful, but all parties believe the idea is worth pursuing.

A \$5M grant proposal was submitted to NSF, seeking to expand **SCALE-UP into 50 high schools** across the country. We should be hearing from the funding agency shortly.

The Initiative also **assists other NCSU faculty members** with education additions to their proposals like Dr. Jag Kasichainula's nanotechnology lab course class proposal and Dr. Taufika Williams proposal for a Mass Spectrometry Facility.

We also reach beyond NCSU and **assist faculty from other institutions** on their proposals, like Dr. Peggy Thompson's MSP project for a Global STEM Passport School and the American Society of Microbiologists' Biology Scholars Program. Dr. Beichner is on an ASM Advisory Board to them develop a web "home base" for biology education researchers modeled on the one he developed for physics.

We continue to seek ways to work with Dr. Glenn Kleiman to maximize the impact of the **Race to the Top** efforts of the University.

We are also seeking funding to start a collaboration to **study the dissemination of SCALE-UP**, one of the most successful of NSF's large curriculum development projects.

## Speakers

In addition to informal or "**brown bag**" meetings of NCSU faculty and administrators interested in STEM education topics, we have also supported bringing leading education researchers to campus, like Dr. Ken Heller of the University of Minnesota. He presented a colloquium on Student Difficulties with Problem Solving.

During 2010, Dr. Beichner traveled extensively and presented **19 colloquium** or plenary talks on the SCALE-UP project. He also offered several extensive workshops on his pedagogical approach.

## Workshops

Dr. Ed Gehringer facilitated a **whole series** of NSF web-workshops to support our grant-writing faculty. Topics included: "Advancing the Level of Inquiry in Teaching and Learning," "TUES (Transforming Undergraduate Education in STEM) proposal writing strategies," "Project Evaluation," "Introduction to the TUES Program" and a Mock Panel Review of an actual proposal submitted to the TUES Program.

Dr. Beichner also led a **workshop** on “Group Learning in Larger Classrooms.”

### **Miscellaneous**

The Initiative **distributed information** on relevant conferences and other opportunities to faculty and administrators.

We supported **graduate student travel** so they could present their education research at conferences.

We also assisted with funding for USCOTS, the leading forum for **statistics education** practice and research, which will be coming to NCSU in May 2011.

Dr. Beichner was named a **Fellow** of the American Association for the Advancement of Science.

Dr. Laura Bottomley won a **Presidential Award** for Excellence in Science, Mathematics and Engineering Mentoring.

Jenny Allen, the Initiative’s administrative assistant, is **retiring** after more than 30 years of service to the University. We are working with Vicki Pennington on consolidating positions.

### **Future plans**

Once the budget situation stabilizes, we would very much like to **resume hiring** STEM education research faculty members. Dr. Len Annetta, well known for his research on educational gaming, was hired away by George Mason University. Drs. Ruth Chabay and Bruce Sherwood have retired, leaving Dr. Beichner as the only person in the Physics Education Research Group. The Physics Department may not be open to hiring more faculty in this area, but it presents a sizable “gap” in our efforts to have a full array of STEM-based education researchers. Depending on the outcome of negotiations between the Colleges of Engineering and Education, we may request funding to hire one or more engineering education researchers. Of course, we need to pursue other hires in areas like biology and mathematics as soon as this is feasible.

We also want to make sure the idea of an **Education Extension Service** continues to be advanced.

Finally, we would like to express our **appreciation** for the on-going support of the University, especially in these times of extreme financial stress. It says a lot about what NCSU values as important.