

2009-14 Strategic Plan of the Partnership Institute  
for Mathematics and Science Education Reform



## Preamble

The mission of the Partnership Institute for Mathematics and Science Education Reform (PIMSER) is to enhance learning in mathematics and science for P-20 students for success in science, technology, engineering and mathematics (STEM) education and teaching careers.

This mission is achieved by supporting the creation, funding, and implementation of programs that enhance pre-service teacher preparation, in-service teacher quality, leadership development and high-quality instruction and student access to advanced learning opportunities. Special emphasis is given to opportunities to achieve this mission through effective P-12 and higher education faculty engagement partnerships.

The PIMSER was created by action of the University of Kentucky Board of Trustees in May 2005 as a single entity to continue the mission and best practices of the National Science Foundation funded Appalachian Mathematics and Science Partnership. It now serves as an “umbrella” institute for seven units that were established to enhance P-20 STEM education in the full range of approaches within the University of Kentucky.

The justification for the Institute derives from the recognition that the reform and enhancement of P-20 STEM education requires an integrated collaboration of both content and pedagogical areas of expertise and the establishment within the University of a center or “portal” to facilitate and manage the responses to these needs. Included within this operating principle is also the recognition that enhancement and reform of P-20 STEM education is also within the missions and strategic plans of STEM-related colleges and departments in the university. The PIMSER, therefore, serves not as an autonomous unit in which STEM education initiatives enhancement and reform are solely initiated and conducted rather as an institute whose mission and activities complement, synergize, and support those initiatives within the STEM-related academic departments. Membership on the PIMSER Advisory Board includes the deans of the colleges of Arts and Sciences, Education, and Engineering, as well as faculty experts in the disciplinary and education departments of STEM.

In like manner, this strategic plan is directly linked to the University’s 2009-2014 Strategic Plan and is consistent with the compact between the University and the people of Kentucky articulated in its Top 20 Business Plan. The goals of the Institute’s Strategic Plan relate in meaningful ways to all of the goals of the University’s Strategic Plan. However, the most direct relationship is with Goal 5, i.e. “improve the Quality of Life of Kentuckians through Engagement, Outreach, and Service”.

The Top 20 Business Plan promises to “increase engagement in Kentucky’s **schools**, farms, businesses, and communities.” The PIMSER Strategic Plan is wholly consistent with its basic premise that “Top 20 Universities go hand-in-hand with more **educated**, healthier, and financially secure populations.”

## PIMSER Strategic Plan 2009-2014

### **Goal 1:**

**Promote and support research that advances the discovery, understanding, and application of best practices for P-20 STEM pre-service and in-service education enhancement and reform.**

*Objective 1.1: Develop a research agenda that identifies and addresses the principal barriers to and best practices for P-20 STEM education enhancement and reform at the district, state, and national levels.*

Metric 1.1.1: The research agenda will include five principal barriers to P-20 STEM education reform at the district, state, and national levels.

Strategy 1.1.1.1: Engage IHE STEM disciplinary and education faculty through their departments and department chairs and Outreach Faculty-led interest/focus groups to provide input into a nationally-benchmarked research agenda for STEM education reform that involves participation from the P-12 education community.

Strategy 1.1.1.2: The PIMSER core staff will assist faculty researchers and P-12 teacher partners in literature reviews, focus groups/online surveys and data mining and analyses that facilitate identification of barriers to P-20 STEM education reform. Communication with, and identification of, faculty researchers will be through department chairs associate deans, and PIMSER Outreach Professors. P-12 teacher outreach, including identification of, and approval for, P-12 partners will be through PIMSER contacts and school and district administrators.

*Objective 1.2: Develop research-based initiatives and projects to improve the quality and effectiveness of pre-service and in-service P-20 teacher education in a manner that complements and supports this agenda in the STEM disciplinary and education departments of UK and other partners.*

Metric 1.2.1: There will be at least one externally-funded collaborative initiative or project whose goal is to improve P-12 pre-service and or in-service teacher education each year from 2010-2014.

Strategy 1.2.1.1: PIMSER outreach faculty and their P-20 STEM interest groups will be informed through STEM-serving departmental chairs and associate deans, the PIMSER website, emails, and meetings of research opportunities from external funding sources relevant to this objective.

Strategy 1.2.1.2: PIMSER core staff will call planning meetings with its Outreach faculty, faculty interest groups from the IHEs and P-12 partners, and for staff from the Office of Sponsored Projects Administration to facilitate proposal preparation and submission. Prior to these meetings will be communication with and through their department chairs and/or associate deans of the colleges.

Strategy 1.2.1.3: PIMSER will establish, post, and appropriately update a schedule of new grant opportunities from the principal funding agencies in the STEM education areas. Information will be coordinated through the Office of Sponsored Projects Administration and regular communication the agencies.

Strategy 1.2.1.4: Meetings of STEM-related faculty identified through the above-referenced channels will be scheduled to discuss funding opportunities and new initiatives not identified and communicated by the funding agencies.

***Objective 1.3: Assist the College of Education in establishing a P-20 Innovation STEM Lab related to an education research agenda that includes outreach and engagement programs.***

Metric 1.3.1: PIMSER will collaborate with STEM and STEM Education faculty in developing a mission and vision for the STEM component of the P-20 Innovation Lab. In addition, PIMSER will assist in coordinating and collecting statewide proposals with objectives to create research partnerships to advance novel teaching and learning and to create innovative, technologically-rich classroom environments.

Strategy 1.3.1.1: STEM and STEM education faculty identified through the strategies for metric 1.1.1 will meet with the PIMSER Director and the Dean of Education to formulate STEM Innovation Lab plans and procedures.

Strategy 1.3.1.2: A STEM Innovation Lab graduate student will be hired to assist with correspondence between Innovation STEM Lab partners as initial research proposal abstracts are collected and analyzed for merit. Successful proposals will present their plans, data, and results at the annual STEM Education Conference at UK.

***Objective 1.4: Promote, support, and collaborate in initiatives to increase the quality of P-12 pre-service education in the STEM areas.***

Metric 1.4.1: The number of new and or quality-enhanced pre-service courses in the STEM areas will increase by twenty-five percent over the years 2010-2014.

Strategy 1.4.1.1: Collaborate with and or support the initiatives with the STEM-related disciplinary and education departments to enhance pre-service teacher education.

Strategy 1.4.1.2: Facilitate and support IHE-P-12 faculty engagement partnerships that develop challenging, standards-based pre-service courses.

**GOAL 2:**

**Enhance the communication and realization of opportunities to advance P-20 mathematics and science education reform through partnerships within the University of Kentucky, the Commonwealth, the nation, and beyond.**

*Objective 2.1: Effectively communicate to University of Kentucky mathematics, science and engineering disciplinary and education faculty, through their respective department chairs and college associate deans, and the Commonwealth's P-12 teachers, the internally and externally supported opportunities for collaborative engagement partnerships that address, enhance and reform science, technology, engineering and mathematics (STEM) education.*

Metric 2.1.1: The number of the University of Kentucky and P-12 faculty inquiring about collaborative engagement opportunities to enhance and reform STEM education will increase by 5% over the five year period from 2010-2014.

Strategy 2.1.1.1: Communicate the mission, goals, organization, and role of PIMSER as an institute that complements, enhances, and synergizes, rather than competes with the STEM engagement activities at the college and department levels.

Strategy 2.1.1.2: Communicate to the administration and faculty of the colleges and departments engaged in STEM education the value-added support services provided by the PIMSER core staff for inter-departmental, interdisciplinary, research-based, engagement activities resident in the PIMSER. These include regular communication of grant opportunities; assistance in background data acquisition and project evaluation; facilitation of contacts and communication with the P-12 districts' school administrators and faculty in the extensive network of the Appalachian Mathematics and Science Partnership (AMSP) and PIMSER.

Strategy 2.1.1.3: Establish interdisciplinary STEM engagement groups of faculty identified through department chairs and coordinated by PIMSER's outreach faculty in mathematics and science. Create similar groups in engineering, medicine, health sciences, and agriculture. Regular meetings of these groups with other faculty interested in STEM engagement projects will be held.

Strategy 2.1.1.4: Continue to develop and maintain the PIMSER website ([www.uky.edu/PIMSER](http://www.uky.edu/PIMSER)) as a portal to the UK community and external STEM stakeholders.

Strategy 2.1.1.5: Utilize the leadership of the PIMSER Advisory Board to communicate, advocate, and continually improve the goals and activities of PIMSER and their internal and external support among their constituencies.

Strategy 2.1.1.6: Communicate through the PIMSER website portal, email listservs and STEM faculty focus groups the external grant opportunities from the relevant funding agencies.

Metric 2.1.2: The number of collaborative partnerships that form among the STEM disciplinary and education faculty and P-12 teachers to address education enhancement and reform through research, outreach, and engagement will increase by 5% over the five year period from 2010-2014.

Strategy 2.1.2.1: With the approval of the appropriate deans and department chairs, recruit from the existing pool of science, mathematics and engineering disciplinary and education faculty with an interest in P-12 outreach and engagement activities in a manner consistent with the relevant promotion and tenure guidelines.

Strategy 2.1.2.2: Work with the University administration, colleges and governance bodies and their committees to advocate for the creation of faculty incentive and reward structures for engagement and outreach partnerships with the P-12 community to serve STEM education reform needs.

Strategy 2.1.2.3: Utilize the Science and Math Teacher Imperative (SMTI) of the Association of Public and Land-Grant Universities (APLU) to create partnership teams of Arts and Sciences (A&S), Engineering, and Education faculty that achieve the goals of this imperative under the leadership of the University of Kentucky's President and Provost.

Strategy 2.1.2.4: Communicate and utilize the resources of PIMSER core staff to facilitate the background research, proposal writing, identification of P-12 partners, and evaluation necessary to acquire funding support from external sources.

***Objective 2.2: Effectively communicate the value of PIMSER as a partner in achieving the goals of the Commonwealth of Kentucky in enhancing P-20 STEM education improvement and reform to the Kentucky Department of Education, the Council on Postsecondary Education, and other universities, educational organizations and associations, and higher education institutions (IHEs) in Kentucky.***

Metric 2.2.1: The number of partnerships between PIMSER and Kentucky Educational organizations, association, will increase 5% over the five year period from 2010-2014.

Strategy 2.2.1.1: Meet periodically with the leadership and the program administrators of the principal Kentucky educational associations to inform them of partnership opportunities with PIMSER from external funding (or matching) sources and to proactively develop programs with them to acquire support from national or foundation funding agencies.

Strategy 2.2.1.2: Monitor and communicate to the faculty of the University of Kentucky through their respective departments and department chairs, the P-12 network, and other IHEs in the state the funding opportunities from the principal Kentucky educational associations and “flow-through” funding to the state.

Strategy 2.2.1.3: The PIMSER staff and faculty will attend and participate in meetings and conferences held by the principal educational associations, IHEs, and other organizations of Kentucky to communicate the opportunities for partnerships.

***Objective 2.3: PIMSER and PIMSER sponsored faculty will effectively engage national and international IHEs and other educational organizations in partnerships that enhance P-20 STEM education and its reform***

Metric 2.3.1: The number of STEM education partnerships between PIMSER and PIMSER sponsored faculty and national or international IHEs or other educational organizations will increase by five during the years 2010-2014.

Strategy 2.3.1.1: PIMSER will work with national and international IHEs and other associations and organizations whose missions include P-20 STEM education enhancement and reform to develop partnerships with the institute or institute-sponsored faculty.

Strategy 2.3.1.2: PIMSER core staff will monitor the websites and announcements of national and international IHEs, organizations, and associations for collaborative opportunities to address P-20 STEM education enhancement and reform.

**Goal 3:**

**Provide leadership and support for the mission and goals of the Science and Mathematics Teacher Imperative (SMTI) of the Association of Public and Land Grant Universities (APLU) at the University of Kentucky, the Commonwealth, and Nation.**

*Objective 3.1: Work with the STEM-related departments and department chairs of the Colleges of Education, Arts and Sciences and Engineering to prepare an analytical framework for increasing the quality and quantity of science and mathematics secondary education teachers from the University of Kentucky using The Leadership Collaborative's model.*

Metric 3.1.1: An analytical framework consisting of an Implementation and Assessment Plan (IAP) that gives the goals and strategies of UK's institutional team will be completed by December 15, 2010.

Strategy 3.1.1.1: The Leadership Collaborative of the University of Kentucky and the PIMSER core staff will work with the administrators and faculty of the Colleges of Education and Arts and Sciences to obtain and analyze the data necessary to produce realistic goals for STEM teacher production and reform of pre-service education at the University of Kentucky.

Strategy 3.1.1.2: The Leadership Collaborative of the University of Kentucky will attend the meetings of the APLU's TLC and SMTI to benchmark its goals in the IAP and to learn and consider for incorporation the best practices of the approaches taken by peer universities.

Metric 3.1.2: Sufficient funding to accomplish the goals of the Leadership Collaborative of the University of Kentucky's Implementation and Assessment Plan will be identified and committed.

Strategy 3.1.2.1: The TLC will work with the faculty and administration of the colleges of Education and Arts and Sciences to create a business plan for funding the necessary support to achieve the goals of the IAP.

Strategy 3.1.2.2: The Executive Director of PIMSER, as the TLC Leader, and the TLC will work with the deans of the colleges of Education and Arts and Sciences, the Provost and the President of the University of Kentucky to identify sources of funding for achieving the goals in the IAP.

***Objective 3.2: Work with representatives of the Colleges of Education and Arts and Sciences of the higher education institutions with teacher education programs in the Commonwealth to determine the barriers and best practices at the institutional and state level in achieving the goals to increase the quality and quantity of P-12 mathematics and science teachers in the state and the estimation of the number of these teachers needed as specified in the University of Kentucky's Implementation and Assessment Plan submitted to The Leadership Collaborative.***

**Metric 3.2.1:** By September 1, 2010 the TLC of the UK SMTI will have identified the principal common and institution-specific barriers and best practices to achieving the goals of increasing the quality and quantity of P-12 mathematics and science teachers in the Commonwealth.

**Strategy 3.2.1.1:** PIMSER core staff will assist the dean and faculty of TLC of the SMTI in surveying the teacher education program coordinators of Kentucky's institutions of higher education to obtain their data-based statements of the principal barriers to and best practices for enhancement of STEM-related, pre-service teacher education.

**Strategy 3.2.1.2:** PIMSER core staff will assist TLC faculty in arranging and conducting meetings with the relevant personnel at the Kentucky Department of Education (KDE), the Council on Postsecondary Education, the Kentucky Science and Technology Center and the Pritchard Committee to solicit their evidence-based opinions concerning the barriers to and best practices for effective STEM-related pre- and in- service teacher education.

**Metric: 3.2.2** By September 1, 2010 an estimate of the Commonwealth's needs of high school science and mathematics teachers will be completed.

**Strategy 3.2.2.1:** PIMSER core staff will work with the relevant personnel of the KDE to obtain district level data on science and mathematics for P-12 teacher needs.

**Strategy 3.2.2.2:** PIMSER core staff will use the current educational association databases to determine the numbers of existing science and mathematics teachers at each level and within each P-12 discipline.

**Strategy 3.2.2.3:** PIMSER's P-12 Coordinator and Research Data Analyst will work with the Director of PIMSER's Evaluation Unit to determine the demographics and other characteristics of Kentucky's P-12 mathematics and science teachers.

***Objective: 3.3: Assist the President of the University of Kentucky in his national leadership role as head of the APLU SMTI Commission to achieve the Commission's national goals.***

Metric 3.3.1: The PIMSER's core staff and TLC Team Leader will provide all information requested by the President and his staff to support efforts with the APLU SMTI leadership to create a SMTI Commission.

Strategy 3.3.1.1: The Team Leader of the University of Kentucky's TLC and SMTI will work with the President's staff, the Provost, and the APLU leadership of the SMTI to provide assistance, as requested, in creating the new SMTI Commission and defining the President's leadership role.

**Goal 4:**  
**Promote P-12 student learning in mathematics and science education to increase the number of students prepared for postsecondary education programs that are dependent upon these disciplines.**

*Objective 4.1: Increase the number of P-12 students that take advanced courses in mathematics and science.*

Metric 4.1.1: The number of P-12 high school students served by programs created, implemented, or assisted by PIMSER that take advanced mathematics and/or science courses in high school will increase by ten percent.

Strategy 4.1.1.1: Seek support for and implement programs that inform P-12 students, parents and guidance counselors of the mathematics and science high school prerequisites required to enroll in postsecondary programs of their choice.

Strategy 4.1.1.2: Support or conduct programs for middle and high school students, parent, and guidance counselors that effectively communicate mathematics, science, technology, and engineering courses necessary to enter various careers of interest.

*Objective 4.2: Increase the number of high level science, technology, engineering, and mathematics courses available to middle and high school students.*

Metric 4.2.1: The number of advanced course offerings (e.g. AP, IB, PLTW) will increase in the schools and districts served by PIMSER and PIMSER supported initiatives will increase by five percent per year from 2010-2014.

Strategy 4.2.1.1: Seek funding to support the establishment of advanced course offerings in the P-12 STEM-related curricula.

Strategy 4.2.1.2: Create and seek support for IHE-P-12 faculty partnerships that develop challenging standards-based P-12 STEM-related courses that promote student achievement in these areas.

***Objective 4.3:** Promote, support, and collaborate in departmental and college initiatives to create, increase, and or focus existing professional development opportunities for P-12 teachers in the STEM-related areas.*

Metric 4.3.1: The number of professional development programs focused on improvement of P-12 STEM-related education in the districts served by PIMSER programs will increase by twenty percent during the years 2010-2014.

Strategy 4.3.1.1: PIMSER core staff will work with IHE and P-12 STEM-related, disciplinary and education faculty to conduct online and focus group surveys to determine the specific needs for improvement of P-20, STEM-related education that will inform the focus of P-12 professional development.

***Objective 4.4:** Increase P-12 student achievement in STEM-related courses.*

Metric 4.4.1: Student achievement, as measured by summative assessments used by the schools served or assisted by PIMSER programs, will increase by statistically significant margins in core mathematics and science courses each year from 2011-2014.

Strategy 4.4.1.1: The programs described in the above objectives of Goal 4 will be monitored and evaluated for effectiveness resulting in increased or decreased support or program modification.

Strategy 4.4.1.2: PIMSER will assist in the offering of professional development programs identified by the above-referenced surveys (e.g. formative assessment and strategies for differentiated instruction that serve to increase the effectiveness of instruction for all groups of P-12 learners.

Strategy 4.4.1.3: PIMSER will assist in the creation, promotion, support and implementation of programs that directly support the STEM-related learning of P-12 students, including innovative programs of peer-mentoring and after-hours instruction.

**Goal 5:**

**Replace the non-recurring state dollars currently supporting the P-12 Mathematics and Science Outreach Unit with funds from external grants and contracts.**

*Objective 5.1: The P-12 Mathematics and Science Outreach Unit will become self-funding by September 30, 2012.*

Metric 5.1.1: The P-12 Mathematics and Science Outreach Unit will become 75% funded by September 30, 2010 and 100% funded by September 30, 2011 through external grants and contracts.

Strategy 5.1.1.1: The unit will restructure its business plan to recover more of its operating costs through external grants and contracts.

Strategy 5.1.1.2: The unit will reduce its operating costs through an increase in efficiency of operation, including holding more of its institutes and workshops in the renovated space of the old Northside Library.

Strategy 5.1.1.3: The unit will include in its operating budget of its 2011 business plan the maintenance costs for its programs in the renovated Northside Library facility.

**Appendix**

<b>Science Outreach Center Strategic Plan</b>	<b>A-1</b>
<b>Kentucky Girls STEM Collaborative Strategic Plan</b>	<b>A-3</b>
<b>P-12 Math and Science Outreach Strategic Plan</b>	<b>A-6</b>
<b>Math Sciences Strategic Plan</b>	<b>A-13</b>

## Outreach Center for Science and Health Career Opportunities

### Strategic Plan 2010-2014

#### Goal:

Foster Science Education and Science Careers at the University of Kentucky

Preamble: The Outreach Center for Science and Health Career Opportunities opened at the University of Kentucky Medical Center in July 1993, to provide a central site of coordination for the university's science education activities designed to link those "doing science" at the medical center with students, teachers and the general population throughout Kentucky. By providing an infrastructure for outreach programs and by being highly visible to the public, the center attracts extramural funding, allows tracking of the student participants and facilitates the development of science education partnerships between the university and Kentucky communities. Our mission is to: Encourage and stimulate interest among students in the study of science, mathematics and technology and make them aware of the opportunities and career possibilities inherent in these areas; Introduce teachers, students and parents to the relevance of research with respect to the socioeconomic implications embodied in scientific endeavors; Coordinate the many Medical center educational outreach and career development programs, existing or proposed, in order to increase their viability and accessibility; Establish communication links between those "doing science" within the university departments and members of the community at large; Strengthen the commitment of the University of Kentucky in participating and enhancing the learning experience of Kentucky's children; Provide a base for the development of cooperative initiatives with the Kentucky education Reform Act, Rural Health Initiatives, Area Health Education centers and other entities whose purposes include educational improvement, career development and access to opportunities for all Kentucky citizens; Instill confidence with potential funding agencies that UK is committed to improving science education and has the administrative expertise to conduct new ventures. The PIMSER umbrella has provided the opportunity to enhance the impact of these specific aims and objectives by integrating the Outreach Center's efforts with the many campus units involved with similar missions. The Goal of the UK Outreach Center for Science and Health Career Opportunities fits well with Goal 5 listed in the University's Strategic Plan for 2010-2014.

Objective 1.1: Encourage and stimulate interest among students in the study of science, mathematics and technology and make them aware of the opportunities and career possibilities inherent in these areas.

Metric 1.1.1: Engage 2500 to 3000 precollege students annually.

Strategy: On-site and Off-site visits of schools throughout the Commonwealth

Objective 1.2: Introduce teachers, students and parents to the relevance of research with respect to the socioeconomic implications embodied in scientific endeavors.

Metric 1.1.2: Incorporate the importance of scientific research in all presentations.

Metric 1.1.3: Participate in community based activities, i.e., Science Fairs, American Heart, American Lung and other community based activities.

Objective 1.3: Coordinate Medical Center educational outreach and career development programs existing or proposed.

Metric 1.1.4: Continue to implement the state mandated PEPP program by recruiting 70 qualified students.

Metric 1.1.5: Make the space within the outreach facility accessible to all outreach programs

Objective 1.4: Establish communication links between those “doing science” within departments and students/ members of the community at large.

Metric 1.1.6: Increase our potential faculty preceptors to 75 to assure that at least 25 undergraduate students can be placed in summer research experiences of their interest.

Metric 1.1.7: Double the number of our faculty that present talks at schools or local organizations.

Objective 1.5: Provide a base for the development of cooperative initiatives within the state government.

Metric 1.1.8: Establish closer ties with the College of Education and the University of Kentucky Administrative offices to increase our ability to be more effective with respect to our role in working with state-wide initiatives.

Objective 1.6: Increase extramural funding in support of the mission of the outreach center.

Metric 1.1.9: Continue to foster our relationship with NIH-NIGMS in support of our grant to maintain a Web-based, successful grant-writing course on the internet funded through 2014. This program focuses on improving the competitiveness of faculty at minority serving institutions and includes on-site workshops and access to the course. We will continue to work with faculty, research administrators, post-doctoral and graduate students in this program.

Metric 1.1.10: Lobby for increasing the state appropriation to the PEPP program allowing for more students seeking careers in the Health Sciences to be included in this summer program.

Metric 1.1.11: Collaborating with other units in the PIMSER Program to pursue other funding sources.



## Kentucky Girls STEM Collaborative Strategic Plan 2010-2014

### Mission:

Kentucky Girls STEM Collaborative Project brings together businesses and other organizations and individuals who are committed to informing and motivating girls to pursue careers in science, technology, engineering and mathematics to encourage collaboration and improve inter-program communication.

### Vision

To bring together programs that inform and motivate girls to pursue educational choices in science, technology, engineering and mathematics (STEM) in order to build a strong, diverse workforce in Kentucky.

### GOAL #1

**Strengthen the state's capacity to increase the number of women pursuing degrees in science, technology, engineering and mathematics (STEM).**

*Objective 1.1: Secure commitment from public universities (aka academic partners) to participate in the Kentucky Girls STEM Collaborative*

Metric 1.1.1: The number of relationships with other universities and colleges in Kentucky will increase fivefold by 2014

Strategy 1.1.1: In addition to Northern Kentucky University, will establish regional academic partners at five university/colleges sites: University of Louisville, Kentucky State University, Murray State University, Western Kentucky University and Eastern Kentucky University

*Objective 1.2: Develop supportive relationships with professional and community organizations that work with young women*

Metric 1.2.1: The number of relationships with professional and community organizations within the Commonwealth will increase by 10% by 2014

Strategy 1.2.1: Establish relationships with professional and community organizations in Kentucky such as Kentucky Commission on Women, Society of Women Engineers, Girl Scouts, Bluegrass Alliance for Women, Women Leading Kentucky, etc.

Strategy 1.2.2: Develop a web-based, centralized internship database of professional and community organizations to match KY Girls STEM participants with potential internship sites

Strategy 1.2.3: Initiate a web-based mentoring program with professional and community organizations within the Commonwealth

*Objective 1.3: Increase resources available for participants in and organizers of girl-serving STEM programs*

Metric 1.3.1: The number and variety of resources for participants in girl-serving STEM programs will increase by 50% by 2014

Strategy 1.3.1: Identify and develop a network for existing STEM programs throughout Kentucky by expanding program directory and developing a state STEM website

*Objective 1.4: Increase the effectiveness of the Kentucky Girls STEM Collaborative's programs and activities*

Metric 1.4.1: By 2014, all Kentucky Girls STEM Collaborative programs and activities will be evaluated for effectiveness

Strategy 1.4.1 Develop, identify and/or adapt tools to evaluate the effectiveness of all Kentucky Girls STEM Collaborative programs and activities

Metric 1.4.2: By 2014, all Kentucky Girls STEM Collaborative programs and activities will be designed to increase the STEM content knowledge and/or attitudes toward STEM courses or careers

Strategy 1.4.2: Develop guidelines, aligned with evaluation criteria, for all Kentucky Girls STEM Collaborative programs and activities

<b>GOAL #2: Increase the sustainability of the Kentucky Girls STEM Collaborative</b>
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*Objective 2.1: Further develop and implement an organizational structure for Kentucky Girls STEM Collaborative*

Metric 2.1.1: The Kentucky Girls STEM Collaborative will formalize their leadership structure to continue their effectiveness and sustain their outreach to girls and women in Kentucky

Strategy 2.1.1: Institutionalize a State Leadership Team

Strategy 2.1.2: Institutionalize a Champions Board

Strategy 2.1.3: Develop by-laws

Strategy 2.1.4: Develop a marketing plan to reach women, business and industries to populate and use databases

*Objective 2.2: Develop and implement a financial plan to assure self-sustainability of Kentucky Girls STEM Collaborative*

Metric 2.2.1: The Collaborative will be self-sustaining by 2012

Strategy 2.2.1: Solicit business and industry support for Kentucky Girls STEM Collaborative Project mission and vision

Strategy 2.2.2: Secure funding through foundations and grants

Strategy 2.2.3: Collaborate with development offices of academic partners to secure funding sources for future programming, including mini-grants

Prepared & submitted by:

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## **P-12 Math and Science Outreach Strategic Plan 2010-2014**

The research related to the impact of the classroom teacher on the academic achievement of students is extensive and readily accepted by educators across the world. There is no other factor in a student's academic environment that influences his/her success in school more than the classroom teacher. That is why the P-12 Mathematics and Science Outreach Unit of the Partnership Institute for Mathematics and Science Education Reform at the University of Kentucky is dedicated to the challenge of improving the effectiveness of the classroom teacher. The four goals in this plan focus on providing training and support that aim at improving classroom instruction and ultimately improving student achievement in P-12 mathematics and science.

**Goal 1:**  
**Provide high quality research-based professional development that supports the advancement of P-12 mathematics and science education.**

*Objective 1.1: Maintain a pool of highly skilled facilitators who keep abreast of the current research regarding mathematics / science education and effective professional development.*

Metric 1.1.1: The number of trained facilitators working for the P-12 Outreach Unit will increase by 25% over the years 2010-2014.

Strategy 1.1.1: Develop and implement standardized procedures and guidelines for recruiting new facilitators.

Strategy 1.1.2: Provide a paid internship program to both attract recruits and provide a means of transitioning new recruits into regional teacher partners.

Metric 1.1.2: The amount of high quality, timely professional development provided for the facilitators working for the P-12 Outreach Unit during the monthly training sessions will increase by a rate of 100% over the years 2010-2014

Strategy 1.1.3: Incrementally increase the number of hours utilized for professional growth during the monthly regional teacher partner sessions until the current number is at least doubled.

Strategy 1.1.4: Choose leaders to attend nationally recognized education conferences/workshops/institutes and serve as trainers during the monthly training sessions.

***Objective 1.2: Enhance existing professional development offerings and develop new offerings that address the current needs of P-12 mathematics and science educators both within and beyond the Commonwealth of Kentucky.***

Metric 1.2.1: The number of new and/or revised professional development offerings provided by the P-12 Outreach Unit will increase 25% over the years 2010-2014.

Strategy 1.2.1: Continue the spring “retreat” concept but reorganize it to include a leadership planning team that meets for an extended time of intensive planning followed up by 1-2 days of a whole group meeting for sharing and training.

Strategy 1.2.2: Utilize existing data and seek new data to inform choices regarding program offerings.

Strategy 1.2.3: Enhance communication of opportunities as suggested in Goal #4.

Metric 1.2.2: The total number of P-12 Outreach Unit participants completing perceived needs surveys will increase by 5% per year from 2010-2014.

Strategy 1.2.4: Create, administer, and collect pre- and post- surveys of educational improvement needs for all participants involved in sustained professional development programs provided by the P-12 Outreach Unit.

Strategy 1.2.5: Contact and provide needs analysis surveys to previous participants.

Strategy 1.2.6: Utilize technology to increase the efficiency of the surveying process.

***Objective 1.3: Build leadership capacity within schools and/or districts that is supportive of P-12 mathematics and science educational improvements.***

Metric 1.3.1: The number of participants in the P-12 Outreach Unit professional development offerings designed to develop leadership will increase 5% per year from 2010-2014.

Strategy 1.3.1 Provide statewide mathematics and science leadership networks to serve as professional learning communities for educational leaders in P-12 mathematics and science.

Strategy 1.3.2 Include leadership components in all sustained programs.

***Objective 1.4: Actively seek funding sources for new and existing professional development programs.***

Metric 1.4.1: The amount of funding provided to the P-12 Unit by sources outside the University of Kentucky will increase 25% during the years of 2010-2014.

Strategy 1.4.1: Continue to seek grant funds for mathematics and science improvement programs through the Kentucky Department of Education and the Kentucky Council on Postsecondary Education.

Strategy 1.4.2: Monitor and apply for funding opportunities from national level educational associations.

Strategy 1.4.3: Expand the search for funding to include partnerships with community and business and industry organizations.

<p><b>Goal 2:</b> <b>Develop and promote partnerships that support the advancement of P-12 mathematics and science education.</b></p>
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***Objective 2.1: Develop and support higher education partnerships.***

Metric 2.1.1: The number of representatives from institutes of higher education partnering with the P-12 Outreach Unit will increase by 25% over the years 2010-2014.

Strategy 2.1.1: Continue to seek Math Science Partnership funding that promotes IHE and P12 improvement programs.

Strategy 2.1.2: Attend conferences and meetings that provide opportunities to associate with representatives from institutions of higher education.

Strategy 2.1.3: Contact mathematics, science, and education departments within institutions of higher education and arrange informational meetings to share partnership opportunities with a focus on advancing P-12 mathematics and science education.

Metric 2.1.2: The number of institutions of higher education partnering with the P-12 Outreach Unit will increase by 25% over the years 2010-2014.

Strategy 2.1.4: Attend conferences and meetings that provide opportunities to associate with representatives from institutions of higher education that are beyond the P-12 Outreach Units current scope of impact.

Strategy 2.1.5: Communicate the mission, goals, and role of the P-12 Outreach Unit that complement the mathematics and science education goals of departments, organizations, and individuals within institutions of higher education that are beyond the P-12 Outreach Units current scope of impact.

***Objective 2.2: Develop and support partnerships with stakeholders that are not affiliated with institutions of higher education.***

Metric 2.2.1: The number of governmental agencies, professional organizations, and foundations partnering with the P-12 Outreach Unit will increase by 25% over the years 2010-2014.

Strategy 2.2.1: Consistently monitor sources of information regarding possible partnership opportunities.

Strategy 2.2.2: Communicate the mission, goals, and role of the P-12 Outreach Unit that complement the mathematics and science education goals of various governmental agencies, professional organizations, and foundations.

**Goal 3:  
Promote research designed to support the advancement of P-12 mathematics and science education.**

***Objective 3.1: Utilize data collected from the P-12 Outreach Unit programs for both formative and summative purposes.***

Metric 3.1.1: Data collected from previous sessions provided by the P-12 Outreach Unit will be analyzed and used to inform decision making during planning sessions for 100% of all new sessions and programs during the years 2010-2014.

Strategy 3.1.2: Utilize technology to facilitate the efficient collection, analysis and communication of data created through the various programs provided by the P-12 Outreach Units.

Strategy 3.1.3: Provide summaries of data collected from prior sessions to planning teams at least one day prior to their planning sessions.

Metric 3.1.2: Data collected from all P-12 Outreach Unit programs will be analyzed and used to inform decisions regarding overall program evaluation and planning on an annual basis during the years 2010-2014.

Strategy 3.1.4: Utilize technology to facilitate the efficient collection, analysis and communication of data created through the various programs provided by the P-12 Outreach Units.

Strategy 3.1.5: Provide a report that summarizes data collected from all P-12 Outreach Units projects that took place during the year prior to the annual leadership team planning retreat.

***Objective 3.2: Provide meaningful data for research that promotes the discovery, understanding, and application of best practices for P-12 mathematics and science educators.***

Metric 3.2.1: Partner with a researcher/evaluator from higher education on every new externally-funded project that is funded through the years 2010-2014.

Strategy 3.2.1: Communicate the mission, goals, and role of the P-12 Outreach Unit that complement the goals of higher education researchers and evaluators.

Strategy 3.2.2: Utilize technology to facilitate the efficient collection, analysis and communication of data created through the various programs provided by the P-12 Outreach Units.

Strategy 3.2.3: Actively seek quality researchers/evaluators from the STEM related departments and organizations affiliated with the University of Kentucky to partner with the P-12 Outreach Unit.

***Objective 3.3: Provide meaningful data that can be utilized for the purpose of supporting program funding requests.***

Metric 3.3.1: Maintain electronic files of data collected and summarized for all programs implemented within the years 2010-2014.

Strategy 3.3.1: Utilize technology to facilitate the efficient collection, analysis and communication of data created through the various programs provided by the P-12 Outreach Units.

Strategy 3.3.2: Provide reports that summarize the data for each of the programs provided by the P-12 Outreach Unit annually and/or at the completion of a program.

Strategy 3.3.3: Assign the management of data files to one person or group of people and monitor the files monthly.

Metric 3.3.2: Create, maintain, and update annually a file of data from nationally recognized sources that support the goals of the P-12 Outreach Unit.

Strategy 3.3.4: Assign the management of data files to one person or group of people and monitor the files monthly.

Strategy 3.3.5: Solicit data sources from all leaders, facilitators and partners of the P-12 Outreach Unit.

#### **Goal 4:**

**Enhance communication and realization of opportunities to advance P-12 mathematics and science education provided by the PIMSER P-12 Mathematics and Science Outreach Unit at the University of Kentucky.**

*Objective 4.1: Enhance communication of the opportunities for advancing P-12 mathematics and science education provided by the P-12 Mathematics and Science Outreach Unit.*

Metric 4.1.1: The number of visitors to the P-12 Outreach Unit website will increase by 25% during the years 2010-2014.

Strategy 4.1.1: Include the website address prominently within all informational and promotional materials produced by the P-12 Outreach Unit.

Strategy 4.1.2: Encourage program participants to utilize the website as an educational resource as well as a way to monitor the logistics information for their program meetings.

Strategy 4.1.3: Instruct SharePoint users to access SharePoint by way of the website.

Strategy 4.1.4: The opportunities communicated by way of the P-12 Outreach Unit website will be updated each month during the years 2010-2014.

Metric 4.1.2: At least one new venue with which to communicate opportunities provided by the P-12 Outreach Unit will be utilized per year during the years 2010-2014.

Strategy 4.1.5: Create and present exhibits at mathematics and science education events.

Strategy 4.1.6: Distribute pamphlets/business cards, and other promotional materials at meetings.

Strategy 4.1.8: Submit proposals to make presentations at state and national conferences.

***Objective 4.2: Effectively communicate the value of the P-12 Outreach Unit as a partner in advancing P-12 mathematics and science education.***

Metric 4.2.1: The number of new partnerships formed with the P-12 Outreach Unit will increase by 25% during the years 2010-2014.

Strategy 4.2.1: Communicate the mission, goals, organization, and role of PIMSER as an institute that complements, enhances, and synergizes, rather than competes with the STEM engagement activities at the college and department levels.

Strategy 4.2.2: Submit articles to various forms of media that promote/acknowledge the work done by the P-12 Outreach Unit.

Strategy 4.2.3: Submit proposals to make presentations at state and national level conferences that are affiliated with potential partners.

Strategy 4.2.4: Create special brochures aimed at potential partners as the audience.

Strategy 4.2.5: Distribute pamphlets/business cards, and other promotional materials at meetings.

## Math Sciences Strategic Plan

Math Sciences' primary mission is the provision of technical support to the UK mathematics faculty in achieving its instructional, research, and outreach objectives. In discharging this responsibility the unit: (a) conducts programs of research and development in web-based instructional support technology (including distance and distributed instruction), and (b) operates large scale programs of mathematics instructional support. Beyond general desktop support and specialized computation services for the mathematics faculty and graduate students, these latter responsibilities include the operation of the Mathskeller in the basement of the White Hall Classroom Building and the web homework services used for the majority of mathematics instruction.

The capacities and expertise developed through its R&D and service programs are shared with the College of Arts and Sciences both in support of general technical operations through facilities such as the machine room in POT which houses the college servers, the provision of web homework services for Spanish classes, and the sharing of Math Science computing labs in White Hall Classroom Building with the Geography department. These capacities are further shared through partnerships with other Kentucky institutions both in P-12 and higher education in support of the university outreach mission. These collaborations have contributed to numerous grants and contracts whose outputs have in turn produced new resources for sharing and served as platforms for yet new partnerships. For this reason the strategic plan for the unit is best described in terms of its near and moderate-term technology development objectives with reference to the expected contributions to: (a) the UK mathematics department and the College of Arts and Sciences, (b) the development and support of Kentucky P-16 partnerships, and (c) the potential sources of external funding.

The principal technical objectives are:

- a. Expansion of the WHS system to include fully integrated synchronous conferencing capability. The expanded system will then be a comprehensive system supporting integrated local and distance education.

This capacity, which is currently in operational prototype, is designed to support local and distributed instruction with particular emphasis on professional development, both academic and non-academic. Further development depends on external funding which will be sought in conjunction with components of teacher professional development initiatives.

- b. Co-development with Lexmark International of a hard-copy interface for web-based assessments.

While web-based assessments are an attractive alternative to conventional hard-copy evaluation, they have significant drawbacks when attempted at any scale in a school environment. Among these are the logistic and resource issues encountered in scheduling limited computing laboratory capacity. Math Sciences will continue its collaboration with Lexmark International on the integration of its "Education Workstations" which are networked office duplicators with high speed scanning capacity. The resulting system will permit locally or

externally produced evaluation instruments to be locally duplicated, securely administered, and scanned back into WHS. Machine-scored components are handled automatically and open response items are directed to designated graders where they can be corrected, scored, and graded with the results managed by the WHS system. When appropriate the system returns watermarked PDF images of the graded instrument to the student through a secure communications environment within WHS. This capacity will permit rapid handling and processing of instruments for common mathematics examinations, the KYOTE placement exams (including open response math and language composition).

The prototype system has been used for grading of the UK MA162 uniform exams in the fall semester, 2010 and is partially funded through spring 2010. Continued development will require external funding which will be sought in conjunction with teacher professional development initiatives, workforce development initiatives, and school/ college transition initiatives related to SB1 and "Race to the Top" funding.

- c. Development of an integrated interface for WHS which supports student transitions among activities. The transition from P-12 to STEM-requiring careers or STEM degrees can be made smoother and more efficient through placement and planning mechanisms that go into effect no later than the senior year in high school and are maintained as the student moves through the system. A "student portal" interface to WHS, currently under development with support from a contract with NKU, will provide a mechanism through which students who take secure KYOTE examinations can direct their results, together with other relevant information, to the participating institutions of their choice. The resulting communication links will thereafter provide the means for the student and the institution(s) to manage his/her career path through the system. In the process, the system, which is patterned after programs in other states, will provide a fully integrated mechanism for students, their families, teachers, and advisors to collaborate in managing their P-12/college/workforce transition.

Development on this system has begun with the expectation of an operational system for Fall 2010. Initial funding is from NKU. Additional funding will be sought in conjunction with initiatives such as college readiness components of SB1/Race to the Top, statewide IHE math curriculum alignment, and workforce preparation programs.

The main mechanism through which Math Sciences intends to see these and related tactical initiatives achieve additional funding and have a statewide impact is through collaborations with groups of P-12 and IHE partners in statewide initiatives. These include:

- The statewide KYOTE consortium which develops and makes freely available a collection of college placement and readiness examinations. The exam system is a corollary of the WHS instructional support environment and currently accounts for much less than ½ % of the scoring transactions and entails no desktop or other personal support services. Making the exams feely available generates an enormous amount of good will among P-12, KDE, CPE, funding agencies, legislators etc., which is key to the formation and maintenance of the partnerships and collaborations and is therefore strategically key to

the generation of external funding.

NKU, EKU, KSU, much of KCTCS, and WKU currently use the free KYOTE math placement exams.

This consortium includes members from most of Kentucky higher ed., KDE, CPE, and a number of school districts. It plans a statewide meeting in late February to initiate the next KYOTE development cycle.

- A college readiness/college placement consortium including NKU, EKU, KSU, and KCTCS. This group is seeking funding for SB1-related initiatives through such vehicles as direct requests to the KY Legislature, seeking inclusion in the state Race to the Top proposal.
- A statewide P-12 college transition group including the college readiness consortium members and over 50 school districts. This group projects its growth by Fall 2010 to include over 70 statewide IHE centers and over 100 school districts. It is currently preparing an NSF MSP initiative which fundamentally depends on Math Sciences technology. It is further developing an NSF ATE program and projects the development of proposals to major foundations during 2010-2011.