



# PIMSER Strategic Plan 2009-2014

## Annual Review of Progress

### Unit Mission

The Partnership Institute for Mathematics and Science Education Reform Mission

The mission of the Partnership Institute for Mathematics and Science Education Reform is to enhance learning in mathematics and science for K-16 students and teachers and to prepare students for success in, science, technology, engineering, mathematics (STEM) education and teaching careers.

This mission is achieved by creating programs that enhance pre-service teacher preparation, in-service teacher quality, leadership development and support for implementing high-quality instruction, and student access to advanced learning opportunities."

<b>Unit Goal</b>	UK Goal 5. Improve the Quality of Life of Kentuckians through Engagement, Outreach, and Service
<b>Unit Objective</b>	PIMSER Objective 1.1 Research Barriers to and Best Practices for P-20 STEM education
<b>Related Metrics</b>	PIMSER Metric 1.1.1 Research Five Barriers to P-20 STEM Education Reform
<b>Related Mission Area</b>	Research and Creative Work
<b>Related UK Goal</b>	UK Goal 2. Promote Research and Creative Work to Increase the Intellectual, Social, and Economic Capital of Kentucky and the World beyond its Borders. UK Goal 3. Develop the Human and Physical Resources of the University to Achieve the Institution's Top 20 Goals. UK Goal 4. Promote Diversity and Inclusion UK Goal 5. Improve the Quality of Life of Kentuckians through Engagement, Outreach, and Service

### Assessment Method

We reviewed the statewide and national research conducted by the units within PIMSER to assess the degree to which it addresses barriers and best practices for P-20 STEM education.

### Actual Results

#### Data Tables

#### Descriptive Results

##### Year 1

In year one, we identified five serious barriers to effective and equitable P-20 STEM education identified over the past year are:

1. lack of programmatic articulation between elementary and middle school, middle school and high school, and high school and postsecondary education;
2. lack of focused and efficient use of professional development days by the school districts for K-12 teacher education needs;
3. lack of appropriate weighting of high school mathematics and science higher level courses in Kentucky high schools for greater credit than the traditional grading scale to counteract the disincentive for taking these courses due to the Kentucky Educational Excellence Scholarship (KEES);
4. lack of sufficient numbers of engagement partnerships between faculty from K-12 schools and higher education institutions to address critical STEM educational challenges and barriers; and
5. lack of continuing education programs ( Colleges of Education) following graduation into the workforce contributing to high dropout rates and insufficient continuing education.

The PIMSER research agenda is addressing these five barriers. The research agenda of PIMSER continues to address the best practices to overcome these barriers.

##### Year 2

In Year One, five serious barriers to effective and equitable P-20 education were identified. During 2011, another serious barrier has been identified and researched. It is the lack of K-12 mathematics and science teachers to effectively teach the new Common-Core State Standards in Mathematics (CCSS-M). The same barrier will probably be found for the new Science Standards due out in late 2012.

**Year 3**

**Year 4**

**Year 5**

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 1**

New opportunities that have arisen in the state that have provided justification and support for the research leading to these results include recent initiatives to improve P20 STEM education on the part of the Kentucky Department of Education and the Council on Postsecondary Education. These initiatives have, in some cases, included best practices from the AMSP that supported activities leading to legislation such as Senate Bill 1.

We will increase our efforts to work with the STEM and STEM education related departments to partner with, and obtain funding from, the KDE and CPE, as well as national funding agencies to support the research agenda in PIMSER's goal 1.

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 2**

Analysis of data from the new Science and Mathematics Teacher Imperative (SMTI) of the Association of Public and Land Grant Universities (APLU), the Mathematics Teacher Education Partnership (MTE), shows that the CCSS-M adoption will push the higher level of mathematics instruction into middle and even elementary school. Data also show that currently there are not enough mathematics teachers with the background to teach at this level, nor enough teachers that can deliver the needed professional development to bring the current teacher workforce up to the level needed. Few professional development programs to accomplish this are widely know and used.

PIMSER faculty and staff and other faculty from higher education and the K-12 schools will use the effective Partnership Enhancement Projects (PEP) program to form K-12/higher education faculty partnerships to address this goal in Kentucky and contribute research to the national challenge.

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 3**

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 4**

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 5**

<b>Unit Goal</b>	UK Goal 5. Improve the Quality of Life of Kentuckians through Engagement, Outreach, and Service
<b>Unit Objective</b>	PIMSER Objective 1.2: Initiatives to Improve Quality and Effectiveness of pre-service and in-service P-20 teachers
<b>Related Metrics</b>	PIMSER Metric 1.2.1: One externally funded initiative to improve P12 per-service/in-service teacher education
<b>Related Mission Area</b>	Research and Creative Work
<b>Related UK Goal</b>	UK Goal 2. Promote Research and Creative Work to Increase the Intellectual, Social, and Economic Capital of Kentucky and the World beyond its Borders. UK Goal 3. Develop the Human and Physical Resources of the University to Achieve the Institution's Top 20 Goals. UK Goal 4. Promote Diversity and Inclusion UK Goal 5. Improve the Quality of Life of Kentuckians through Engagement, Outreach, and Service

**Assessment Method**

PIMSER developed a data gathering instrument and distributed it to each of its units and core staff. The results were compiled and reported in the actual results section of this report.

**Actual Results**

**Data Tables**

Newly Funded Initiatives-2010-2014

	Pre-service	In-service	Total
2010	2	18	20
2011	9	14	23
2012			
2013			
2014			

**Descriptive Results**

**Year 1**

**Year 2**

PIMSER had nine pre-service teacher and 14 in-service teacher education initiatives that were externally funded. This is a 10% increase over last year. These were in the P-12 Math and Science Outreach, Pre-Service Teacher Recruitment, and Science Outreach Units. The funding sources were the Kentucky Council on Postsecondary Education (CPE), and the Kentucky Department of Education (KDE), the National Science Foundation, and the National Institutes of Health. The teachers served were in all Kentucky counties and from several other states.

**Year 3**

**Year 4**

**Year 5**

**Analysis of Results and Reflection****Improvement Actions****Year 1**

The initiatives of the PIMSER units relating to this objective were particularly successful. Many of these projects will continue beyond their initial year of funding.

The PIMSER director and core staff will increase its interaction with STEM-related departmental faculty to increase the number of project proposals.

**Analysis of Results and Reflection****Improvement Actions****Year 2**

The number of funded initiatives was 10% greater than in 2010. Some were continuing projects but many were new. The increase in number was due to a consolidation of funded projects by the two state agencies. This trend toward consolidation will continue. However, the P-12 Math and Science Outreach Center was again successful in competing for a new set of grant-supported, in-service outreach projects in 2011 because of past performance. The relationship between this PIMSER unit and the two state funding agencies remains strong. Likewise, the new STEM Education Department's faculty associated with PIMSER significantly increased the number.

With the probability of fewer state and federally-funded K-12 outreach programs, the PIMSER will significantly increase its proposal writing and submission. The Institute added a staff position in the high-needs area of Physics this past year to increase outreach to physics faculty writing proposals to agency programs with bonus and required components of broader impact, including benefits to K-12 schools. These proposals require partnerships with the University's higher education science, technology, engineering and mathematics faculty. There is an increased emphasis within PIMSER to increase these partnerships.

The federal funding environment remains unsettled with the strong possibility of fewer federally-funded programs, especially in the area of education. However, new funding to support the CCSS-M and the related teacher education needs will necessitate both state and federal support. The PIMSER units are well positioned to submit competitive proposals for funding these these projects.

**Analysis of Results and Reflection****Improvement Actions****Year 3****Analysis of Results and Reflection****Improvement Actions****Year 4****Analysis of Results and Reflection****Improvement Actions****Year 5**



PIMSER, at the Provost's level, facilitates these collaborations between the STEM faculties and provides the network to identify K-12 partners.

**Analysis of Results and Reflection** **Improvement Actions**

**Year 3**

**Analysis of Results and Reflection** **Improvement Actions**

**Year 4**

**Analysis of Results and Reflection** **Improvement Actions**

**Year 5**



**Analysis of Results and Reflection****Improvement Actions****Year 2**

The PIMSER Executive Director serves on the Executive Planning Committee of the APLU/SMTI's Mathematics Teacher Partnership initiative to significantly improve the quality of pre-service mathematics teacher education at the middle and high school levels. This initiative engages the PIMSER Outreach faculty in Arts and Sciences and the STEM Education Department as well. The direct and increasingly major contributions of the STEM Education faculty to the overall teacher improvement goals of SMTI have been recognized by the APLU/SMTI leadership. This involvement will support teacher education through curriculum and course improvement at both the University and national levels.

Better ways to create a feedback loop between the K-12 STEM and University STEM disciplinary and education faculty partnerships and what they can contribute to improved teacher education coursework and curriculum. To date, this has not been achieved. Renewed effort will be give to this goal in 2012.

**Analysis of Results and Reflection****Improvement Actions****Year 3****Analysis of Results and Reflection****Improvement Actions****Year 4****Analysis of Results and Reflection****Improvement Actions****Year 5**

<b>Unit Goal</b>	UK Goal 5. Improve the Quality of Life of Kentuckians through Engagement, Outreach, and Service
<b>Unit Objective</b>	PIMSER Objective 2.1: Communicate Opportunities for Collaborative Engagement Partnerships in STEM
<b>Related Metrics</b>	PIMSER Metric 2.1.1: Inquiry about collaborative engagement will increase 5% over 2010-2014. PIMSER Metric 2.1.2. Increase collaboration between STEM IHE disciplinary faculty, education faculty and P-12 teachers
<b>Related Mission Area</b>	Research and Creative Work
<b>Related UK Goal</b>	UK Goal 2. Promote Research and Creative Work to Increase the Intellectual, Social, and Economic Capital of Kentucky and the World beyond its Borders. UK Goal 4. Promote Diversity and Inclusion UK Goal 5. Improve the Quality of Life of Kentuckians through Engagement, Outreach, and Service

**Assessment Method**

PIMSER developed a data gathering instrument and distributed it to each of its units and core staff. The results were compiled and reported in the actual results section of this report.

**Actual Results**

**Data Tables**

	<b>Number of UK Inquiries</b>	<b>Number of P-12 Inquiries</b>	<b>Total Inquiries</b>	<b>Percentage change</b>
2010			147	baseline
2011	84	112	196	33% increase
2012				
2013				
2014				

	<b>Number of Partnerships Formed</b>	<b>Percentage change</b>
2010	34	baseline
2011	91	168% increase

2012

2013

2014

**Descriptive Results**

**Year 1**

**Year 2**

2.1.1:

The number of inquiries about collaborative engagements given in the data table are underestimated because the number of inquires through the PIMSER website ([www.uky.edu/PIMSER](http://www.uky.edu/PIMSER)) were not captured. Nevertheless, the number exceeded last year's inquiries by 33%. Last years data did not include some of PIMSER's units (e.g. Science Fair).

2.1.2:

One of the greatest areas of increase in partnerships was in the KY Girls STEM Collaborative. Five middle and high schools are now in partnership with this unit. The nature of "partnerships" needs to be more precisely defined because some units (e.g., Science Fair and Science Outreach) form partnerships around a specific outreach effort. Nonetheless, the number of partnerships formed has more than doubled from last year.

**Year 3**

**Year 4**

**Year 5**

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 1**

A major change was made this year in response to the PIMSER Advisory Board's recommendation that communication should be through each department chair and dean of the STEM related colleges, rather than sole reliance on the PIMSER Outreach Professors. This has been a very successful strategy.

We will form groups of faculty in each STEM area through the department chairs to further facilitate communication to faculty presently not involved in outreach activities.

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 2**

2.1.1: As the PIMSER engages more STEM and STEM education faculty and also continues to increase the number of grant-supported STEM K-12/higher education projects, this number will continue to increase. The number of inquires from out-of-state is not being captured and has increased. AS inquiries increase they indicate a greater awareness of PIMSER on the part of both faculty and K-12 mathematics and science teachers. It has been observed by PIMSER core

2.1.1:

The number of inquiries about PIMSER services and collaborative engagements is not being adequately

staff that inquiries from school and district administrative personnel have also increased.

2.1.2: As the needs for professional development for in-service mathematics and science K-21 teachers around the Common Core State Standards (CCSS) in mathematics and science (next year) increase, it is expected that the numbers of partnerships will increase. The unit director in the core staff and P-12 math and Science Outreach are already witnessing this concern. The outcome will depend upon funding from state and federal education agencies which is, at best, uncertain.

captured. A "capture" feature will be added to the website and greater effort will be expended to assist some PIMSER units (e.g., P-12 Math and Science Outreach) to record these inquiries when they occur in outreach activities.

2.1.2:

More analysis needs to be performed on the "broad impact" and K-12 partnership requirements now part of many federal agencies' programs. In that some of these are optional, the PIMSER staff and Outreach Professors need to be aware of the opportunities and assist faculty researchers in grant writing to access these additional funds. This is being done in the Physics area but the opportunities exist in all of the other STEM areas.

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 3**

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 4**

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 5**

<b>Unit Goal</b>	UK Goal 5. Improve the Quality of Life of Kentuckians through Engagement, Outreach, and Service
<b>Unit Objective</b>	PIMSER Objective 2.2: Communicate value of PIMSER to CPE, education agencies and IHEs in Kentucky
<b>Related Metrics</b>	PIMSER Metric 2.2.1: Increase partnerships between PIMSER & KY education agencies
<b>Related Mission Area</b>	Education
<b>Related UK Goal</b>	UK Goal 2. Promote Research and Creative Work to Increase the Intellectual, Social, and Economic Capital of Kentucky and the World beyond its Borders. UK Goal 4. Promote Diversity and Inclusion UK Goal 5. Improve the Quality of Life of Kentuckians through Engagement, Outreach, and Service

### Assessment Method

PIMSER developed a data gathering instrument and distributed it to each of its units and core staff. The results were compiled and reported in the actual results section of this report.

### Actual Results

#### Data Tables

	# of Partnerships between KY Ed Organization & Association	% change
2010	23	baseline
2011	25	9% increase
2012		
2013		
2014		

### Descriptive Results

#### Year 1

#### Year 2

The number of partnerships with Kentucky Educational organizations and associations has remained about the same (9% increase). These partnerships are being treated as unique to each PIMSER unit even though some are with the same agencies (e.g., KDE & CPE). However, this year has seen an increase in the diversity of agencies with the greatest increase coming from educational associations specific to mathematics and science teaching.

#### Year 3

#### Year 4

#### Year 5

### Analysis of Results and Reflection

#### Year 1

This past year the KDE has undergone substantial organizational changes which have affected the funding opportunities and projects of the PIMSER. This has required special attention to

### Improvement Actions

PIMSER intends to hold additional open houses and more attention to the effectiveness of its website. This

communication with the statewide agencies. Continuing changes in organization will require additional means of communication over the next year.

will include a survey of the potential STEM audiences.

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 2**

The increase of 22 to 25 (8.9%) partnerships with Kentucky educational organizations and associations is in large part due to the activity of the PIMSER Outreach faculty & staff in Education and Arts and Sciences (Physics). The change in diversity in these partnerships reflects a focus on educational associations directly concerned with disciplinary mathematics and science teaching (e.g., Kentucky Council of Teachers of Mathematics, Kentucky Science and Technology Corporation, and the Pritchard Committee). This formation of partnerships with disciplinary associations is a major movement toward a more direct relationship to the core issues in STEM education. It will allow much more direct faculty involvement in partnerships rather than more administrative and grant-related partnerships with the two major Kentucky educational associations.

There must be a better definition of what is meant by Kentucky associations and organizations. Some PIMSER units form partnerships with school districts and directly with schools at the administrative level. If these are included, the number would increase dramatically (i.e., over 200). PIMSER core staff will modify this goal and its metrics to capture the districts and schools in partnerships.

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 3**

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 4**

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 5**

<b>Unit Goal</b>	UK Goal 5. Improve the Quality of Life of Kentuckians through Engagement, Outreach, and Service
<b>Unit Objective</b>	PIMSER Objective 2.3: Engage other IHEs and education agencies
<b>Related Metrics</b>	PIMSER Metric 2.3.1: Increase partnerships between PIMSER and National/International IHEs or education organizations
<b>Related Mission Area</b>	Education
<b>Related UK Goal</b>	UK Goal 2. Promote Research and Creative Work to Increase the Intellectual, Social, and Economic Capital of Kentucky and the World beyond its Borders. UK Goal 4. Promote Diversity and Inclusion UK Goal 5. Improve the Quality of Life of Kentuckians through Engagement, Outreach, and Service

**Assessment Method**

PIMSER developed a data gathering instrument and distributed it to each of its units and core staff. The results were compiled and reported in the actual results section of this report.

**Actual Results**

**Data Tables**

	National IHE	International IHE	Other Education Organizations	Total
2010	22	1	9	32
2011	39	4	6	49
2012				
2013				
2014				

**Descriptive Results**

- Year 1**
- Year 2**
- Year 3**
- Year 4**
- Year 5**

**Analysis of Results and Reflection** **Improvement Actions**

**Year 1**  
The STEM engaged faculty, especially including the outreach professors, should be supported to increase their contacts with state and national educational associations, foundations, and other funding agencies. Contacts over the past year have resulted in increased funding and this trend should continue.

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**Analysis of Results and Reflection**

**Improvement Actions**

**Year 2**

The number of partnerships between PIMSER and national and international institutions of higher education increased about 50% because of partnerships with four international institutions and six educational organizations. PIMSER was involved with three additional international organizations in the Engineering area of STEM, partnering to create a double degree. PIMSER also has extensive collaborations involving its director and two Outreach Professors, with APLU and its SMTI project. In addition, PIMSER collaborated with South Dakota State University to assist in that institution's creation of a STEM Institute. These national and international activities are consistent with the University of Kentucky's strategic goals with respect to internationalization and creating national reputation.

The University and PIMSER have been advantaged by regional partnerships as funding agencies look for broader impact. This year several of the PIMSER's proposal collaborations have been to continue this trend. This emphasis will continue in 2012.

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 3**

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 4**

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 5**

<b>Unit Goal</b>	UK Goal 4. Promote Diversity and Inclusion
<b>Unit Objective</b>	PIMSER Objective 3.1: Prepare The Leadership Collaborative's analytic framework for increasing quality and quantity of math and science secondary education teachers
<b>Related Metrics</b>	PIMSER Metric 3.1.1: SMTI IAP will be completed by December 15, 2010 PIMSER Metric 3.1.2: Identify and commit sufficient funding for meeting goals of our IAP
<b>Related Mission Area</b>	Education
<b>Related UK Goal</b>	UK Goal 1. Prepare Students for Leading Roles in an Innovation-driven Economy and Global Society UK Goal 2. Promote Research and Creative Work to Increase the Intellectual, Social, and Economic Capital of Kentucky and the World beyond its Borders. UK Goal 3. Develop the Human and Physical Resources of the University to Achieve the Institution's Top 20 Goals. UK Goal 4. Promote Diversity and Inclusion

#### Assessment Method

Verify that the Analytic Framework was submitted.

#### Actual Results

##### Data Tables

The Analytic Framework was completed and is currently in use at UK.

Analysis of funding IAP components has not been completed.

#### Descriptive Results

##### Year 1

##### Year 2

3.1.1: The PIMSER provided direct and substantial support staff support for President Todd's national chairmanship of the SMTI project of APLU. The PIMSER Executive Director served on three committees of the APLU's SMTI project leading to a national plan for a new Mathematics Teacher Education Partnership (MTE-Partnership) including a Request for Proposal for partnerships between member land-grant universities, K-12 schools, and community and technical colleges to improve mathematics teacher education programs in the members' Colleges of Education

In addition, the chair of the new STEM Education Department and two of its faculty, associated with PIMSER, served on two key committees of APLU's SMTI. One of the University's Arts and Science (Mathematics) also serves on The Leadership Collaborative (TLC) of this initiative.

Dr. Lee T. Todd, Jr., now retired (June 1) as President will continue to serve on the APLU's SMTI National Advisory Board. PIMSER will continue to support the initiative.

3.1.2: The PIMSER director is also the University liaison and Team Leader to the Science and Math Teacher Imperative (SMTI). This has required attendance with members of The Leadership Collaborative (TLC) from University of Kentucky, at the annual and two special meetings of the SMTI in 2011. Support for these attendees was provided in large part by the Association of Public and Land Grant Universities (APLU). Funding to achieve the goals of the implementation and assessment plan (IAP) of SMTI has been provided in the form of support for the creation of a new STEM Education Department, one of the first in the nation.

##### Year 3

##### Year 4

##### Year 5

#### Analysis of Results and Reflection

##### Year 1

The Analytical Framework is being considered for national use by APLU. UK's president and the UK The Learning Collaborative Leadership Team is planning further evaluation of it.

#### Improvement Actions

UK's president and the UK The Learning Collaborative Leadership Team is planning further evaluation of the Analytic Framework.

Meetings are scheduled in December 2010 with The Leadership Collaborative, President of UK, and the national leaders of the SMTI initiative to determine the value of the IAP in STEM education reform. The results of these deliberations will contribute to an understanding of the cost implications of the initiative.

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 2**

The involvement of UK's The Leadership Collaborative (TLC) team and its team leader serve on the key committee's of the APLU's SMTI initiative has brought national recognition to the University's STEM education reform activities and goals. This APLU initiative is being funded by the National Science Foundation (NSF). Its project director is the same individual as the project director for two PIMSER-related NSF-supported programs, the Appalachian Mathematics and Science Partnership (AMSP) and the Research, Evaluation, Technical Assistance (RETA) grant. This has led to a closer working relationship with the NSF, our principal external funding agency. All three of the PIMSER's AMSP programs were given a no-cost extension to use its funds for a new direction in Appalachian STEM education research.

The PIMSER will increase the involvement of other mathematical and science STEM and STEM education faculty in the new MTE-Partnership project of APLU and prepare for similar involvement in projects directed to the implementation of the upcoming science standards.

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 3**

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 4**

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 5**

<b>Unit Goal</b>	UK Goal 5. Improve the Quality of Life of Kentuckians through Engagement, Outreach, and Service
<b>Unit Objective</b>	PIMSER Objective 3.2: Determine barriers and best practices to achieving goals of increasing quantity and quality of math & science teachers
<b>Related Metrics</b>	PIMSER Metric 3.2.1: Identify common and institution specific barriers to increasing increasing quantity & quality of P-12 math & science teachers in KY PIMSER Metric: 3.2.2: Complete an estimate of KY's need for high school science and math teachers
<b>Related Mission Area</b>	Education
<b>Related UK Goal</b>	UK Goal 1. Prepare Students for Leading Roles in an Innovation-driven Economy and Global Society UK Goal 2. Promote Research and Creative Work to Increase the Intellectual, Social, and Economic Capital of Kentucky and the World beyond its Borders. UK Goal 3. Develop the Human and Physical Resources of the University to Achieve the Institution's Top 20 Goals. UK Goal 4. Promote Diversity and Inclusion UK Goal 5. Improve the Quality of Life of Kentuckians through Engagement, Outreach, and Service

### Assessment Method

SMTI/TLC developed a survey from the IAP to determine the best practices and barriers to achieving the goals of increasing the quantity and quality of math & science teachers. PIMSER will participate in an evaluation of this survey to determine the efficacy of its value as an assessment instrument.

The PIMSER will work with the College of Education to develop a process for determining the Commonwealth's needs of high school science and math teachers.

### Actual Results

#### Data Tables

The analytical framework for UK has been completed and is now being used to assess the university's readiness to achieve the objectives of SMTI.

### Descriptive Results

#### Year 1

The analytical framework for UK has been completed. An assessment for determining the value of the analytical framework has been developed with PIMSER working with the Office of the President.

#### Year 2

##### 3.2.1

The leaders of the SMTI project and authors of the analytical framework met with Pres. Todd, the director of PIMSER, and key members of the TLC in 2011 to determine how the analytical framework could be more widely used in the nation's effort to improve mathematics and science teacher education. In the summer and fall of 2011, the SMTI leaders started the process of development of a new initiative to focus on improvement of mathematics teacher education programs called the Mathematics Teacher Education Partnerships. Currently UK's leadership team is working with APLU's SMTI to create the requirements for this partnership program. The University of Kentucky plans to join this partnership.

##### 3.2.2

The instrument for measuring Kentucky's needs for high school science and mathematics teachers will be developed as a part of the new APLU/SMTI program, the MTE Partnership. This will involve PIMSER's Research Data Analyst and the PIMSER Outreach Professor that serves as chair of the new STEM Education Department.

#### Year 3

#### Year 4

#### Year 5

### Analysis of Results and Reflection

### Improvement Actions

#### Year 1

The analytical framework has proven to be an invaluable instrument in assisting UK in improving teacher education and the preparation of larger numbers and better prepared teachers in KY. Future meetings involving the Office of the President, College of Education and PIMSER will be directed toward the development of a survey instrument from the analytical framework to determine its validity of the instrument's effectiveness.

Future meetings involving the Office of the President, College of Education and PIMSER will be directed toward the development of a survey instrument from the analytical framework to determine its validity as a tool for assessing the barriers and best practices to achieving goals of increasing quantity and quality of math and science teachers.

**Analysis of Results and Reflection** **Improvement Actions**

**Year 2**

The estimate of Kentucky's need for high school science and math teachers has become more complex due to the creation of the Common Core State Standards in Mathematics and the science standards that will be released next fall. Analyses done in collaboration with SMTI have shown that the content knowledge and teaching methods of the teachers is more important than numbers of teachers. This change in focus will require the assessment of the quality of the teacher workforce as well as the curriculum of the teacher education programs responsible for that quality.

The improvement required to focus on teacher quality and preparedness will necessitate the design of instruments to make this assessment. This process will begin in 2011 and continue through most of 2012. Fortunately, UK will be part of the national initiative created by APLU/SMTI that will directly involve the University's TLC faculty.

**Analysis of Results and Reflection** **Improvement Actions**

**Year 3**

**Analysis of Results and Reflection** **Improvement Actions**

**Year 4**

**Analysis of Results and Reflection** **Improvement Actions**

**Year 5**

<b>Unit Goal</b>	UK Goal 4. Promote Diversity and Inclusion
<b>Unit Objective</b>	PIMSER Objective 3.3: Support UK President in National Leadership Role
<b>Related Metrics</b>	
<b>Related Mission Area</b>	Education
<b>Related UK Goal</b>	UK Goal 2. Promote Research and Creative Work to Increase the Intellectual, Social, and Economic Capital of Kentucky and the World beyond its Borders. UK Goal 3. Develop the Human and Physical Resources of the University to Achieve the Institution's Top 20 Goals. UK Goal 4. Promote Diversity and Inclusion

**Assessment Method**

We will keep a record of requests from the President of UK for assistance with his role as chair of the SMTI commission.

**Actual Results**

**Data Tables**

The PIMSER has been successful in meeting the requests from the Office of the President.

**Descriptive Results**

**Year 1**

PIMSER has responded to each request from the President for assistance and has achieved the goals of the requests.

**Year 2**

The TLC and the PIMSER staff have assisted the president in his national leadership role of the APLU SMTI. This has included advisement of UK's activities in SMTI and attendance with the president at the SMTI national and regional conferences. The president resigned in June 2011, but has remained on this initiatives Advisory Board with other national educational leaders. PIMSER will continue to support UK's past president in this new role.

**Year 3**

**Year 4**

**Year 5**

**Analysis of Results and Reflection** **Improvement Actions**

**Year 1**

The relationship between the Office of the President and PIMSER has been a successful one.

The PIMSER will work closely with the Office of the President to anticipate further needs in improvement of the national SMTI project.

**Analysis of Results and Reflection** **Improvement Actions**

**Year 2**

The new role of UK's former president on the SMTI/MTE Advisory Board will require frequent updates on the activities of the planning committee. The director of PIMSER is a member of this committee.

The assistance of the former president of UK in his new leadership role will require more face-to-face meetings on the campus. Improvement of this role will require the provision of data from PIMSER's Research Data Analyst to appropriately inform him of the background and proposed strategies for addressing the challenge of increasing the effectiveness of STEM teacher preparation.

**Analysis of Results and Reflection** **Improvement Actions**

**Year 3**

**Analysis of Results and Reflection** **Improvement Actions**

**Year 4**

**Analysis of Results and Reflection** **Improvement Actions**

**Year 5**

<b>Unit Goal</b>	UK Goal 5. Improve the Quality of Life of Kentuckians through Engagement, Outreach, and Service
<b>Unit Objective</b>	PIMSER Objective 4.1: Increase the number of P-12 students that take advanced courses in mathematics and science.
<b>Related Metrics</b>	PIMSER Metric 4.1.1: Number of high school students from PIMSER served schools who take advanced math or science will increase by 10%
<b>Related Mission Area</b>	Service
<b>Related UK Goal</b>	UK Goal 1. Prepare Students for Leading Roles in an Innovation-driven Economy and Global Society UK Goal 4. Promote Diversity and Inclusion UK Goal 5. Improve the Quality of Life of Kentuckians through Engagement, Outreach, and Service

**Assessment Method**

PIMSER developed a data gathering instrument and distributed it to each of its units and core staff. The results were compiled and reported in the actual results section of this report.

**Actual Results**

**Data Tables**

**Number of High School Students Taking Advanced Mathematics and Science Course In Schools Served By PIMSER Programs**

	Number of Advanced Courses Taken	Percentage change
2010	40	Baseline
2011	9,386	Baseline
2012		
2013		
2014		

**Descriptive Results**

- Year 1**
- Year 2**
- Year 3**
- Year 4**
- Year 5**

**Analysis of Results and Reflection** **Improvement Actions**

**Year 1**  
The Partnership Enhancement Projects now funded by the Toyota USA Foundation, the AT&T The quality and quantity of STEM courses in the

Foundation and the GE Corporation are now in the process of introducing improved math and science instruction in three schools (2 school districts). Students, as a result of these projects, will be taking advanced courses in 2011. Furthermore, these projects will result in the creation of advanced course offerings.

schools served by PIMSER will be positively impacted by the recently approved STEM Education Department in the College of Education. The faculty of this department are active participants in the PIMSER projects directed toward this goal.

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 2**

For the 2011 year, the most involved high schools in this goal were those served by the programs of PIMSER's P-12 Math and Science Outreach Unit. These programs address leadership issues for teachers of mathematics and science, instructional supervisors as well as the principals and superintendents within the school districts. The data in the table of actual results will be used as the baseline for years 2012, 2013, and 2014. The programs cited above are still ongoing and their outcomes will be seen in the out-years. The total number given is the sum of 4,869 mathematics students and 4,517 science students. The underlying strategy is that, in addition to teacher professional development, there must be an informed and supportive leadership at the school and district level. The strategy is holistic in that it includes the development of Master Teachers in mathematics and science to assist in development of more qualified teachers within the schools on an ongoing basis. The funding agencies are looking for sustainability and this overall strategy appears to be contributing to that goal. The source of these data is

The current activities should be accompanied by more attention to the instructional supervisors and guidance counselors. The Girls STEM Collaborative has an initiative to address this goal that involves both K-12 girls and boys. The PIMSER will identify sources of funding to increase the needed communication efforts. The development of information on the PIMSER website to show students, teachers, and parents the necessary courses that prepare students for college readiness and STEM-related careers has begun but must be continued more vigorously in 2012.

[www.collegeboard.com/apstudents](http://www.collegeboard.com/apstudents).

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 3**

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 4**

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 5**

<b>Unit Goal</b>	UK Goal 5. Improve the Quality of Life of Kentuckians through Engagement, Outreach, and Service
<b>Unit Objective</b>	PIMSER Objective 4.2: Increase the number of high level science, technology, engineering, and mathematics courses available to middle and high school students.
<b>Related Metrics</b>	PIMSER Metric 4.2.1: Number of Advanced Courses in PIMSER served schools will increase by 5% per year
<b>Related Mission Area</b>	Service
<b>Related UK Goal</b>	UK Goal 1. Prepare Students for Leading Roles in an Innovation-driven Economy and Global Society UK Goal 2. Promote Research and Creative Work to Increase the Intellectual, Social, and Economic Capital of Kentucky and the World beyond its Borders. UK Goal 4. Promote Diversity and Inclusion UK Goal 5. Improve the Quality of Life of Kentuckians through Engagement, Outreach, and Service

**Assessment Method**

PIMSER developed a data gathering instrument and distributed it to each of its units and core staff. The results were compiled and reported in the actual results section of this report.

**Actual Results**

**Data Tables**

**Number of Advanced Course Offerings In Districts Serviced by PIMSER Units**

	Number of Advanced Course Offerings	Percentage change
2010	50	Baseline
2011	data not yet available	-
2012		
2013		
2014		

**Descriptive Results**

- Year 1**
- Year 2**
- Year 3**
- Year 4**
- Year 5**

**Analysis of Results and Reflection** **Improvement Actions**

**Year 1**

The PIMSER core staff continues to experience difficulty in obtaining critical data from K-12 partners and will have to develop alternative methods, including the state longitudinal database to further this objective. There is no doubt that the adoption of Common Core Math & Science Standards will encourage partner schools to develop more advanced math & science courses that will be available to their students.

Improvement will be facilitated by the university's development of better systems to reward faculty engaged with the K12 STEM community. This is currently a work in progress with the support of the Provost.

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 2**

The PIMSER core staff continues to experience difficulty in obtaining critical data from K-12 partners and will have to develop alternative methods, including the state longitudinal database to further this objective. There is no doubt that the adoption of Common Core Math & Science Standards will encourage partner schools to develop more advanced math & science courses that will be available to their students.

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**Analysis of Results and Reflection**

**Improvement Actions**

**Year 3**

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 4**

**Analysis of Results and Reflection**

**Improvement Actions**

**Year 5**

<b>Unit Goal</b>	UK Goal 5. Improve the Quality of Life of Kentuckians through Engagement, Outreach, and Service
<b>Unit Objective</b>	PIMSER Objective 4.3: Promote College initiative to increase PD opportunities for P-12 teachers
<b>Related Metrics</b>	PIMSER Metric 4.3.1: Increase number of professional development programs focusing on STEM in PIMSER served schools
<b>Related Mission Area</b>	Overall
<b>Related UK Goal</b>	UK Goal 1. Prepare Students for Leading Roles in an Innovation-driven Economy and Global Society UK Goal 3. Develop the Human and Physical Resources of the University to Achieve the Institution's Top 20 Goals. UK Goal 4. Promote Diversity and Inclusion UK Goal 5. Improve the Quality of Life of Kentuckians through Engagement, Outreach, and Service

**Assessment Method**

PIMSER developed a data gathering instrument and distributed it to each of its units and core staff. The results were compiled and reported in the actual results section of this report.

**Actual Results**

**Data Tables**

**Number of Professional Development Programs with a Focus On P-12 STEM Improvement In Districts Served By PIMSER**

	Number Of PD Programs	Percentage change
2010	16	Baseline
2011	49	306% increase
2012		
2013		
2014		

**Descriptive Results**

- Year 1**
- Year 2**
- Year 3**
- Year 4**
- Year 5**

**Analysis of Results and Reflection****Improvement Actions****Year 1**

The success of PIMSER in obtaining funding for professional development outreach projects from foundations and a corporate sponsor has encouraged further development efforts to identify additional support for this objective. UK's Development Office has offered assistance to PIMSER to further this goal. The Provost has recently approved an additional position in PIMSER for identifying funds to increase professional development engagement in the area of physical sciences. This is a strong indication of continuing university support for activities leading to additional professional development.

The PIMSER will work more closely with UK's Office of Development to improve funding for projects involving professional development of in-service K-12 STEM teachers. In addition, the new STEM Education Department will provide research that should lead to better methods and best practices in professional development.

**Analysis of Results and Reflection****Improvement Actions****Year 2**

Professional development (PD) is one of the major outreach program areas of the PIMSER. The Institute's affiliated units have 49 PD programs in 2011, more than double over last year. It is important to note that three are two principal sources of these programs, the Outreach Professors in Education and Arts and Sciences and the PIMSER Core Staff. The Partnership Enhancement Projects (PEP) program with funding from foundations, delivers a large number of these outreach professional development events. The unique professional development programs deliver by the Outreach Professors was eight for this year. They include innovative programs in physics, mathematics, astronomy, and assessment methodologies. They differ from the PEPs in that there is less teacher involvement in creating the activity, but they are in partnership with teachers in their delivery. More and more, these latter types introduce technology into the inquiry-based instruction. This is a positive and timely feature that will continue.

The professional development will continue to emphasize partnerships with K-12 teachers and schools in the nature of the programs and interactions created. However, in the professional development that introduces technology, there will be a need for the University faculty to continue to innovate and draw upon specialists in the College of Education's STEM Education Department and certain departments in the College of Engineering and Arts and Sciences. Greater collaboration with the Projects Lead the Way (Engineering) will also be initiated in 2012 to improve the professional development in this increasingly popular area in the schools.

**Analysis of Results and Reflection****Improvement Actions****Year 3****Analysis of Results and Reflection****Improvement Actions****Year 4****Analysis of Results and Reflection****Improvement Actions****Year 5**





