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## **Kentucky P20 Innovation Lab: Preparing Science, Technology, Engineering and Mathematics (STEM) Teachers for Next Generation Learning at the University of Kentucky**

*If our children are to succeed in a world that is increasingly diverse, globalized, and technology-rich, they require learning experiences and environments for learning that are radically different from those the current system of public schools was designed to deliver (Council of Chief State School Officers, Dec. 2009).*

The University of Kentucky (UK) and its partners have created a comprehensive vision to increase the number of transformative teachers in science, technology, engineering and mathematics (STEM) through strategic planning and systemic alignment of pre-school through graduate education (P20). This vision supports creation of the Kentucky P20 Innovation Lab designed to (1) recruit and prepare STEM teachers; (2) provide ongoing, internationally-recognized best practices in professional development to existing teachers and school leaders; (3) conduct extensive educational research; and (4) translate research findings into innovative practices emphasizing higher-order thinking and 21<sup>st</sup> century skills.

### **Recruit and Prepare STEM Teachers**

The newly created STEM Education Department within the College of Education will recruit and educate highly effective teachers by transforming existing curriculum and creating new innovative courses across STEM disciplines. Specific strategies: (1) provide tuition waivers to introduce freshmen to STEM teaching careers; (2) create an advanced introductory course (STEM 501) to encourage people with undergraduate and graduate STEM degrees to enter the teaching profession; (3) restructure biology, chemistry, and physics undergraduate courses for preservice teachers; (4) create “challenging courses” in mathematics and science preservice education programs for UK and its Appalachian university partners through the NSF-MSP; (5) provide service learning opportunities for preservice teachers to identify, analyze and help address needs in their local communities and in doing so, become role models to recruit additional STEM teachers; (6) expand summer STEM programs for middle and high school students on UK campus; (7) target diverse populations through NSF STEP and NOYCE funding; (8) transition graduates into experience-intensive schools supported by mentors from education and industry; and (9) support alums through opportunities to serve as mentors, co-design innovative learning contexts (i.e. digital game-based learning) with computer science colleagues; and pursue advanced degrees in STEM education.

### **Provide Ongoing Professional Development**

The extensive network of partnerships already built by the Appalachian Mathematics and Science Partnership (AMSP), Project Lead The Way, and the campus-wide Partnership Institute for Mathematics and Science Education Reform (PIMSER) will be the foundational support for the **Kentucky P20 Innovation Lab: A Partnership for Next Generation Learning** where every child – from early childhood through adolescence- is prepared for life, meaningful work and citizenship in the 21<sup>st</sup> century. Kentucky P20 is a unique alliance among the University of Kentucky, Kentucky Department of Education (KDE), Kentucky Council on Postsecondary Education (CPE), Kentucky Education Professional Standards Board (EPSB) and Local Education Agencies (LEAs) designed to spark a powerful broad-based transformation of public education aligned with the needs of the country – particularly in STEM education.

### **Conduct Extensive Educational Research**

Creating collaborative research that is truly responsive to the school and community needs yields knowledge that is field-tested and transformative beyond traditional educational research outcomes. Research for transforming STEM education into a student-centered, personalized learning system is required with emphasis on developing world-class knowledge and skills.

### **Translate Research into Practice**

Kentucky P20 fosters interactive instruction for conceptual understanding in STEM education by (1) deepening the content knowledge with inquiry-based teaching of pre-service and in-service teachers through authentic research experiences with scientists and engineers; (2) transferring and sustaining teachers’ authentic research experiences into everyday classroom practice through lesson study, originating in Japan and credited with Japan’s evolution of effective mathematics and science teaching (Lewis, 2002; National Research Council, 2002); and (3) developing technology-rich learning communities that provide meaningful learning experiences for school leaders, teachers, students, and parents that create and sustain innovative practices across classrooms, schools and districts.

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