STEM Task Force
Higher Education Sector

1. Big Idea – Identify one "big idea" that could dramatically enhance Kentucky's performance in the STEM disciplines.
    - Hang it on a specific issue – e.g. solving the energy problem.
    - Use technology to drive incentives to learn mathematics and science. Prepare teachers in technology use.
    - Expectation with accountability agreed on by all sectors that this is a real issue that MUST be addressed immediately with a bold and aggressive action plan: all universities must show evidence that science and math departments and colleges of education are working to increase the knowledge base of teacher education candidates P-12 and in-service teachers.
    - Put pressure on P-16 to improve student interest in and retention in STEM disciplines.
    - Put pressure on postsecondary institutions to improve teacher preparation programs.
    - STEM subjects and competencies are not optional. Early focus on teachers and families. Highlight men and women and the excitement of discovery.
    - Increase the number of students that consider STEM as a career in which they can find gainful employment within the Commonwealth by attending Kentucky's institutions of higher education. Reward continuous progress especially beyond the level of proficiency.
    - Implement recommendations of the American Diploma Project and Kentucky's Math Alignment Task Force.
    - Help college graduates with STEM skills make the transition to the work force. If the jobs are there, more students will seek the training.
    - Cross collaboration between schools of education and STEM disciplines. STEM graduates interning at P-12 institutions – working with teachers and parents to strengthen curriculum. Establish seamless K-16 STEM education infrastructure.
    - Curriculum alignment that is transferable across institutions.
    - Increase public awareness of need for STEM discipline success. Public relations campaign that science and math are key to fueling the future of the Commonwealth and the nation.
    - Media "blitz" from STEM Task Force (leading academics, politicians, administrators, and business leaders) to convince parents and the educational system of the urgency of the STEM need and potential rewards. We must convince the layperson.

- Attract industries to Kentucky who need employees with this skill set. STEM initiatives can position Kentucky for sustainable growth and development.
- Money to support STEM programs and students.
- Bring in executives from the national Council of Teachers of Mathematics to help lead Kentucky to a focused version of mathematics teaching and learning.
- Indicate the dangers of not having STEM.

2. Collaboration – What partnerships or collaborations could leverage Kentucky's investment in the STEM disciplines?
    - 3-2 engineering tracks for all private institutions and KCTCS not offering engineering incentives to move traditional content departments into strong overlaps with pedagogy.
    - Professional societies should help develop curriculum within their subject areas as well as the integration of knowledge and visiting STEM professionals.
    - STEM Czar to organize and coordinate activities, identify potential partnerships and help make them work.
    - Educational institutions partnering with business to implement strategic applications.
    - Parent/teacher, K-12/Higher Education, Business/Higher Education, Business/Higher Education/K-12/Government, K-12/Adminstrators
    - Encourage university faculty to devote energy and time to teaching. Our current rank and tenure rules reward research, but not collaborative teaching.
    - Be sure all pre-service and in-service mathematics and science teachers are well trained in differentiation, especially in relation to the gifted students services plan (GSSP) and challenging students to dig deeply into concepts.
    - EPSB and CPE to raise teacher quality.
    - Business and industry with students for internships and research.
    - Use partnerships/resources already available:
        i. AMSP project is an example of partnerships/collaboration that shows promise.
        ii. 6-12 students – Lexmark Teacher Education Academy is excellent prototype. Cross-train teachers in a practical, hands-on initiative. High exposure and corporate ownership.
        iii. The Kentucky Center for Mathematics is available to coordinate efforts. www.kentuckymathematics.org can be used as a clearing house of information.
    - Start more programs like the old NSF Young Scholars that put students and teachers in STEM labs in the summer, Saturdays, or after school with math, science, technology and engineering mentors.

3. Action – Identify three actions that your sector might undertake that could improve Kentucky's capacity to create knowledge economy jobs within the Commonwealth.
    - Collaborate to develop courses and professional development that promote excellence and relevance in teaching math and science.
    - Portable traveling exhibits on energy, science, careers in STEM fields to attract young people into STEM fields.
    - Analyze curriculum that supports learning of relevant mathematics and science.
    - Well tooled and focused mobile science, energy, careers units visiting all grade levels.
    - Incentive funds to outfit campus labs for public school use and enrichment camps.
    - Statewide STEM rally with world class scientists (like Kentucky's Phil Sharp) coupled with larger financial incentives announcements. STEM needs a forceful legislative shoehorn other than public and private bonds.
    - Organize a statewide "meeting of the minds" utilizing how businesses in Kentucky and other states have been successful in creating new jobs.
    - Develop seamless integration between secondary and KCTCS institutions and KCTCS and the universities. This will require multiple methods of collaboration including dual credit, articulation and middle college and will create career pathways.
    - Develop meaningful distance/hybrid learning to meet the needs of all Kentuckians to receive critical content that can be utilized at the senior year in high school and at KCTCS. As many studies have noted for many Kentucky students the senior year is wasted, thus this would begin the transition to more meaningful work. A leveling of the playing field is needed, all Kentuckians must have access to the critical STEM classes required for professional study in STEM subjects, not just those that have the means to enroll at a university or live in a major metropolitan area.
    - Encourage K-12 teachers to identify/track/encourage STEM students.
    - Interface students with faculty mentors to help regional constituents in STEM areas.
    - Bring higher education teachers to the K-12 schools and partner college faculty to mentor high school teachers in STEM.
    - Masters in Math Education, areas of science and other areas of teacher certification as a consistent thread tailored to their needs and online.
    - Recognition for work with districts for tenure and promotion.

- Higher education STEM faculty must participate with K-12 educators/classes/schools to support/advance STEM as part of tenure review.
- Differential pay.
- Require 3.0 GPA to enter and graduate from Teacher Education.
- Establish standards for pre-service math/science courses across the state institutes for higher education.
- Partner with business, community, government (state and local), mayor, judge-executive and chamber of commerce to stay in touch with STEM needs. Market STEM to gain buy-in and support.
- Develop scholarships in STEM subject areas and loans that can be forgiven for students who remain in Kentucky and work in STEM areas upon graduation; including teacher education candidates who choose math or science.
- Establish a benefit program for young students – a parallel to college scholarship – that reinforces their participation and success, and demonstrates value to other members of the community.
- Extend the Best in Class loan forgiveness program to elementary teachers with a minor/area of emphasis in mathematics or science who specialize in these areas in Kentucky elementary schools.
- Encourage and reward high level math/science at all ages – AP calc, physics and chemistry rewards are a great start. Look at rewards for performance in competitions such as American Math competitions, Science Fairs, Math Talent Search, video programming.
- Internships in companies where graduates may find employment.
- Internships/apprenticeships in STEM disciplines as required aspect of the curriculum.
- Sponsor industry advisory groups to inform the higher education faculty and K-12 teachers and students of professional job opportunities.
- Partner KSTC with energy corporations to identify and develop intellectual properties.
- Educate the populous on the advantage of a particular industry being part of the Commonwealth – not just the economic advantage but the community benefit from intangibles such as community service participation, community esteem, and hope for the future.
- Share information about contacts, programs, initiatives that are underway.
- STEM requirements for all education majors. Require two math courses for all education majors – college algebra and pre calculus or two mathematics education or science education courses at the pre-service level.
- Provide incentives to hire more university faculty in the area of elementary or middle grades mathematics education, perhaps by

providing funding for an endowed chair in this area. We need faculty who know and can teach how young children learn math.

- Faculty rewards for quality K-12 involvement.
- Implement Seimens Mechatronics curriculum.
- Expand the mathematics demonstration/training sites on each campus to support full-time regional coordinators to coordinate pre-service and in-service P-12 math education with work in the field, especially with exemplary mathematics teachers and coaches. These sites are currently founded for ¼ time regional coordinators through the Kentucky Center for Mathematics.
- Require graduate students in STEM disciplines to be involved with K-12 educators/classes/schools to support/advance STEM.
- Faculty exchange programs: arts/science faculty and school district personnel.
- Help recruit/retain companies employing STEM graduates.
- Create targeted opportunities to develop a common-wealth niche for a knowledge economy industry. Recycling critical materials; coal-based energy products.
- PR campaign to show families the advantages of STEM related disciplines.
- Lobby legislature to target STEM goals/objectives. Also to provide incentives to business based on the number of new jobs created.
- Develop a tax credit plan for businesses that create new jobs within the Commonwealth.
- Relevant research to identify what models work to improve student achievement.