



KENTUCKY ASSOCIATION OF MANUFACTURERS

Remediation Reduction: A Pathway for Postsecondary Readiness

White Paper Bridging Career Pathways Education & Economic Improvement

Introduction

Has education of the K-12 students across the Commonwealth delivered the workforce necessary to successfully compete in today's global technology-driven economy, bringing jobs to more Kentuckians closer to home? There is a direct long-term relationship between local economic investment in K-12 STEM education and community economic longevity and viability. Investment in strong STEM education for students at the local level, providing hands-on, project-based, problem-solving educational opportunities for all students within a community, leads to prosperity for that community as the students evolve and grow into the entrepreneurs, manufacturers, business leaders and community leaders of tomorrow.

Since the KERA reform of 1990, Kentucky's K-12 educational system has undergone transformative and innovative changes. Further, Kentucky's economic climate has also undergone a transformation, migrating from an agrarian-based economy into a workplace, employer-based economy. Many companies in Kentucky today conducting business and generating revenue were absent from the radar in 1990.

Challenges

K-12 Education

ACT data from the Kentucky Department of Education for the 2008-09 junior class indicate Kentucky students are unprepared¹.

- Only 46% met the English ACT readiness standard of 18
- Only 34% met the mathematics ACT readiness standard of 19
- Only 38% met the reading ACT readiness standard of 20

The ACT results for 2009-10 show signs of improvement in math and reading, while English scores declined¹

- Only 39% met the college readiness standard for English
- Only 36% met the college readiness standard for mathematics
- Only 42% met the college readiness standard for reading

¹ Kentucky Council on Postsecondary Education, http://cpe.ky.gov/NR/rdonlyres/9BDD2211-14F8-425E-949F-B741B07DE304/0/Strategic_Agenda_Report_College_Readiness_Final.pdf accessed 10 Jan 2012,



KENTUCKY ASSOCIATION OF MANUFACTURERS

Of 50 children who can't read in first grade, 44 will remain behind by fourth grade. The educational system is aligned to the agricultural economy and industrial models, although we are in the 21st century driven by technology and innovation. The jobs of 2020 have yet to be invented, developed or discovered. Fifteen million American adults today lack a high school diploma. By fifth grade, 45% of students are scared of math and science. By eighth grade 60% fail to pursue math or science courses. Thirty-one percent (31%) of ninth graders drop out of high school. Juniors and seniors pursue more electives than academics.²

Many students in secondary schools are bored, earning diplomas unable to move into the workplace or postsecondary education without first receiving non-credit remediation. Senate Bill 1 of 2009 was designed to address some of these gaps. However, workplace remediation remains a costly enterprise which diverts resources employers could potentially utilize to expand their enterprises.

Postsecondary Education

More than 90 percent of students entering postsecondary education following adult education GED programming have developmental or supplemental education needs³. In Kentucky, the six-year graduation rate from college is 42%. Of the students entering college as of May 2011, 61% were considered ready. Almost 40% required remediation in college. Further, in the workplace, employers struggle to find workers who are dependable, ethical, willing to learn, can apply math or science, can clearly articulate a problem, solve a problem, think independently and critically, work as a member of a team, or possess other desired employability traits⁴. Although many of these traits and skills are elements of the NAM-endorsed Manufacturing Skills Certification System, these skills apply to all areas of business and industry sectors across the Commonwealth and the nation. Employers are increasingly indicating they are unable to find employees who can simply arrive to work on time, ready to work, and ready to help the business achieve its goals.

Workforce

As most of the constituent members of the Kentucky Association of Manufacturers are painfully aware, along with many employers across all sectors of the economy, in this age of technology and fast-paced technological changes, many students completing K-12 education suffer from a lack of fundamental skill preparation. This is evidenced when students continually focus upon "getting the right answer" instead of using and developing problem-solving processes, critical thinking and analytical skills, and understanding how to decompose and solve problems, particularly in team environments. We also see evidence of the lack of fundamentals when a high school student working at a restaurant is unable to calculate and return an accurate amount of change to a customer during an electrical power outage. Sadly, we also see this lack of fundamental understanding when a student is unable to execute fundamental statistical analysis using spreadsheet tools, such as Microsoft Excel for example, or to recognize if the spreadsheet is providing accurate information. The skills of fundamental critical thinking, analytical processing, problem-solving and basic math are addressed through a nationally-recognized Science, Technology, Engineering and Math (STEM) curriculum called Project Lead The Way

² NAM Roadmap to Education Reform for Manufacturing

³ KY Council on Postsecondary Education, http://cpe.ky.gov/NR/rdonlyres/9BDD2211-14F8-425E-949F-B741B07DE304/0/Strategic_Agenda_Report_College_Readiness_Final.pdf accessed 10 Jan 2012.

⁴ NAM-endorsed Manufacturing Skills Certification System (see associated graphic on page 6)



KENTUCKY ASSOCIATION OF MANUFACTURERS

(PLTW). We advocate PLTW as a component of the solutions to the lack of fundamental workforce-ready skills underdeveloped in the preK-12 classroom.

Solutions

Short Term

In the short term, the Kentucky Science, Technology, Engineering and Math (STEM) Task Force recommended Project Lead The Way (PLTW) as the STEM solution for the Commonwealth in 2007. Project Lead The Way™ (PLTW) is a nationally-recognized elementary, middle and secondary STEM curriculum focused on projects and problem-based contextual learning. PLTW dovetails math, science, engineering and technology concepts in an engaging and fun curriculum; PLTW has been gaining momentum across Kentucky in local school districts as the solution to better preparing middle and secondary students for college and career. Options for students after high school include the military, postsecondary education, or the workforce. Today's preK-12 students constitute tomorrow's workforce, regardless of their postsecondary choice. PLTW prepares students for postsecondary success in any field or path through hands-on, problem-based, real-world, project-based learning, teaching students to think critically and analytically, and ensuring remediation is unnecessary. Expanding PLTW into every school in the short term requires appropriate prioritization within local schools and communities to ensure the students in the local districts have access to this real-world, project-based, proven method of learning problem-solving employable skills.

We encourage and applaud isolated efforts in various school districts across the Commonwealth providing PLTW to the students in their districts. For example, Trigg County, as an early adopter of PLTW over nine years ago, continues to offer the curriculum to over 30% of their high school students, even when unemployment in the county hovers at 16%, with a contracting tax base. Students in Trigg County are pursuing patents, solving industry problems, and working to improve their local economy. In McCracken County, three rival high schools are combining into one facility so that all students in the district can access the benefits PLTW provides. In Muhlenberg County, PLTW is fully funded, and the community leaders recognize PLTW as the source for their economic viability. In Marion County, PLTW students have designed five buildings for the city of Lebanon. In Lawrence County, PLTW students are designing the new commercial kitchen space for the Culinary Arts program within the high school. The common denominator among these varied school districts is the commitment to continually prioritize PLTW within the schools, across the district, and within the community. These are a sampling of the localized pockets of efforts across the Commonwealth communities extend to provide their K-12 students with opportunities leading to long-term economic viability.

Key to Kentucky's successful participation in the knowledge economy is for all Kentucky schools to be given the opportunity to embrace dramatic and lasting change, progressing forward in the STEM education they provide. Communities across the Commonwealth recognize PLTW offers the skills and the knowledge to develop effective teachers and administrators, and the tools to execute the delivery of a proven, recognized, standards-based STEM curriculum. This change encompasses the long-term solution toward engaging preK-12 students to become the dynamic employees of the future.



KENTUCKY ASSOCIATION OF MANUFACTURERS

Long Term

Long term, the critical-thinking, analytical skills, problem-solving skills, and project-based learning offered within PLTW should be available to all students across the Commonwealth beginning in the early grades, even preschool. Students as young as three or four can begin to solve simple problems, considering what to wear based upon the weather, for example, instead of having a parent or teacher decide on their behalf. Teaching children to problem-solve, to think critically and analytically, are critical components of the long-term solution to prepare tomorrow's workforce. Long-term, students who understand how to solve problems, collaboratively and analytically, are equipped to become the local entrepreneurs of tomorrow.

PLTW and project-based learning encourages those students who may have overlooked a STEM career by opening the door of options and opportunity in STEM areas of healthcare, engineering, technology, manufacturing, and any other field a student chooses to pursue. Students understand that engineers do more than simply fix things and drive trains, both of which are true, yet incomplete. In Franklin County, for example, fifth graders learn a design process, using criteria and a matrix, to determine within a group project the best solution to solve a given problem. As one fifth grade student aptly articulated in September, "We are learning STEM....science is the understanding of how things work, technology is used to make things work, engineering is improving how things work, and math, well that is just math." This ten-year-old girl understands and uses technology to solve problems to improve her world, recognizing pain points and working with her cohort of teammates to develop solutions. PLTW provides students a pathway to a successful career, giving them confidence that they can indeed solve problems, work in a team environment, think critically and analytically, while simultaneously generating interest in mathematics, science, engineering, advanced manufacturing, biomedical sciences, energy and other STEM subjects.

The creation of a skilled STEM workforce is the cornerstone for research and development, and consequently the key to innovation and success in the knowledge-based, technology-driven economy. There is broad agreement that STEM education in the United States is not producing the quality and quantity of graduates needed to keep the U. S. competitive. In Kentucky, we have identified a critical need for teaching much more rigorous STEM curricula and for teacher education focused on enhanced STEM disciplines and embedded pedagogy. PLTW has been praised by numerous professional organizations, including the Aerospace Industry Association and the Society of Manufacturing Engineers. Further, PLTW is the only K-12 STEM curriculum identified in the 2007 report, "Rising Above the Gathering Storm" published by the National Academies of Engineering, Science and Health as the path to improving the STEM workforce in this country. The final report of the Kentucky STEM Task Force, delivered in December 2008, acknowledged PLTW as the STEM solution for the Commonwealth.

Research has shown that when schools apply activity-based and problem-based learning, student motivation increases. Additionally, students acquire cooperative learning skills and higher-order thinking, resulting in an increase in overall student achievement, and removing the need for postsecondary remediation regardless of the student's chosen pathway after high school. For example, according to an evaluation by High Schools That Work, PLTW students scored significantly higher in both mathematics and science high school assessments. The National Center for Education Statistics 2006-07 True Outcomes report explains that students who participate in PLTW are five times more likely to graduate college as science, technology, engineering and mathematics (STEM) majors than those who



KENTUCKY ASSOCIATION OF MANUFACTURERS

do not. Depending upon which secondary pathway students choose, PLTW students are more likely to choose engineering or healthcare⁵.

PLTW incorporates and aligns with standards from the National Academy of Sciences, National Council of Teachers of Mathematics, International Technology Education Association, and National English Language Arts. In June 2009, the Education Commission of the States awarded PLTW the 2009 ECS Corporate Award for the organization's commitment to and investment in improving public education.

Cultivating and sustaining the critical employable skills of today's students for tomorrow's workforce depends upon integrated partnerships between elementary, middle and high schools, colleges and universities, and the business and government sectors. Forging partnerships within communities across the Commonwealth to improve Kentucky's educational system at the local levels remains critical to reducing workplace and educational postsecondary remediation. The improvements in preK-12 education to prepare our students for any post-secondary choice hinge upon local community partnerships between business enterprises, industrial and manufacturing enterprises, academic organizations, and parent organizations coming together to create local community Partnership Teams in support of STEM education for the local school system.

The linchpin of the long-term solution hinges upon the ability of a community school system to embed problem-solving, project-based curriculum across the entire academic curriculum. Integrating rigor, relevance, hands-on, project-based learning for all students within a school system sustains the economic viability of a community by preparing the employers and employees of the future. The economic longevity of any community relies upon the availability and capability of students to complete high school and enter the local workforce earning a living wage, with the skills needed to succeed down any chosen path.

⁵ www.pltw.org accessed November 2011



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I. PERSONAL EFFECTIVENESS COMPETENCIES

- Integrity
- Motivation
- Dependability & Reliability
- Willingness to Learn
- Workplace Ethics

II. ACADEMIC COMPETENCIES

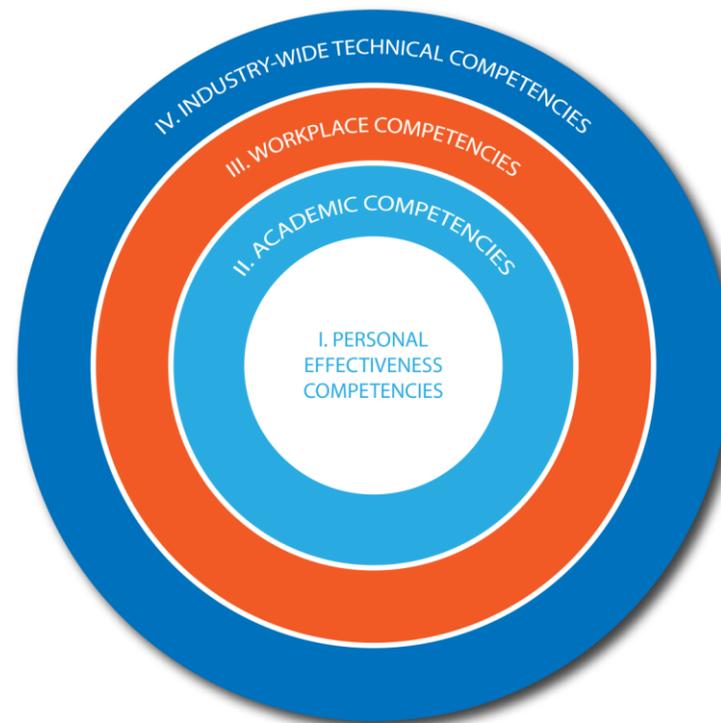
- Applied Science
- Basic Computer Skills
- Applied Mathematics/Measurement
- Reading for Information
- Business Writing
- Listening & Following Directions
- Locating/Using Information
- Speaking/Presentation Skills

III. WORKPLACE COMPETENCIES

- Business Fundamentals
- Adaptability/Flexibility
- Marketing & Customer Focus
- Planning, Organization & Teamwork
- Problem Solving & Decision Making
- Applied Technology

IV. INDUSTRY-WIDE TECHNICAL COMPETENCIES

- Manufacturing Process Development & Design
- Lean & Green
- Production
- Maintenance, Installation & Repair
- Supply Chain Logistics
- Quality Assurance/Continuous Improvement
- Health & Safety



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