

Technology and Engineering Education and Mathematics Education Report

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Introduction

Public education is the foundation of economic security in Wisconsin in an increasingly competitive global economy. Ensuring our high school students are ready for the workplace, college, and citizenship are important to the well-being and financial competitiveness of our state. In the 21st century, our high school graduates need rigorous coursework to gain the knowledge and skills to be critical thinkers, problem solvers, innovators, and effective communicators. Our students must engage in advanced science, technology, and mathematics coursework.

A high school education that has meaning for today requires united efforts to engage all students in learning to ensure academic achievement and a strong foundation for success. Equally important, education options and pathways to success are not limited. One instructional method does not suit all learning styles.

Academic knowledge can come from many sources. In 2007, the State Superintendent established a task force that recommended to the Department of Public Instruction that students completing certain agriculture courses could receive equivalent science credit.¹ In 2008, a task force was formed that recommended options for students completing approved technology education courses and Project Lead the Way courses to receive equivalent science credit.² And in 2010, a work group was formed to formalize a science credit equivalency option for completion of approved courses in family and consumer science education.³

Technology and Engineering and Mathematics Background

Following the practices established by other previous task forces and work groups, a work group was formed to study possible mathematics equivalency for Project Lead the Way (PLTW) courses. The work group consisted of licensed technology and engineering teachers, including several who have taught PLTW courses, representation from the Wisconsin Technology Education Association (WTEA), and licensed mathematics teachers, including representatives of the Wisconsin Mathematics Council board of directors. The work group also had representation from post secondary faculty from the University of Wisconsin System and the Wisconsin Technical College System. Each brought content expertise in their respective area to the work of the task force.

The task force grounded its work in PI 18.02, Wis. Admin. Code, which defines “equivalent graduation policy” as “a broad policy which meets the credit requirements specified for each subject area, but which permits selected equivalent courses as long as such courses contain the time allotment and substantially the same objectives to develop the knowledge, concepts, and skills of the course for which an equivalent is proposed.” To determine possible equivalency, the work group was given the charge to examine the Project Lead the Way high school pre-

¹ The agriculture and science task force report at <http://dpi.wi.gov/ag/asec.html>.

² The technology education and science task force report at <http://dpi.wi.gov/te/terp.html>.

³ The family and consumer science work group report at <http://dpi.wi.gov/fce/fdsci.html>

engineering courses for mathematics content. The workgroup documented their findings in a standards based crosswalk using the new Common Core State Standards in mathematics. The PLTW Digital Electronics course crosswalk can be found on our website (www.dpi.gov/te/maeq.html). The course content has been cross walked with these mathematics standards.

Equivalency Recommendations

Project Lead the Way is a national organization that offers a standardized pre-engineering curriculum. The PLTW courses are considered technology education courses, and licensed technology education teachers (WDPI #220) are recognized as appropriately licensed to teach all of the following PLTW courses:

- Introduction to Engineering and Design (IED)
- Principles of Engineering (POE)
- Computer Integrated Manufacturing (CIM)
- Biotechnical Engineering (BIO)
- Digital Electronics (DE)
- Civil Engineering and Architecture (CEA)
- Aerospace Engineering (Aero)
- Engineering Design and Development (EDD)

The work group specifically recommended that equivalency credit in mathematics could be given to students completing PLTW-DE course. Furthermore if additional mathematics content is added to PLTW-POE, and the equivalency application process is completed, a school could apply for equivalency credit for this course as well. The group also noted that districts need to consider how students will achieve the level of knowledge and skill in mathematics described in the Wisconsin Standards for Mathematics through a combination of mathematics courses and PLTW courses. As schools align curriculum, assessment, instruction, and course sequences to the Wisconsin standards, they must consider the full scope of mathematics content that students must acquire during their K-12 education. The recommendations are further described below:

Significant Mathematics Content

Digital Electronics

- Digital Electronics (DE) contain significant mathematics content. A high school may offer Digital Electronics for mathematics equivalency credit when a technology education licensed teacher (WDPI #220) is teaching this course.

Some Mathematics Content

Principles of Engineering

- Principles of Engineering (POE) contains some mathematics content but not to the extent as Digital Electronics. However, if a school would like to consider these courses for mathematics equivalency credit when taught by a technology education teacher

(WDPI #220), evidence of supplemental content must be provided through the equivalency process (DPI form PI-1803).

Minimal Mathematics Content

Engineering Design and Development, Introduction to Engineering and Design, Computer Integrated Manufacturing, Civil Engineering and Architecture, Aerospace Engineering, and Biotechnical Engineering

- Engineering Design and Development (EDD), Introduction to Engineering and Design (IED), Computer Integrated Manufacturing (CIM), Civil Engineering and Architecture (CEA), Aerospace Engineering (Aero), and Biotechnical Engineering (BIO) do not contain sufficient mathematics content and are recognized as technology education courses (WDPI #220). Considerable supplemental content would be needed in order for these courses to be offered for mathematics credit.

Because acceptance of mathematics equivalency credit for Project Lead the Way courses by state colleges and universities is critical, the DPI should work collaboratively with the University of Wisconsin System Administration, WAICU (Wisconsin Association of Independent Colleges), and WTCS (Wisconsin Technical College System) for support in acceptance of approved equivalency courses as fulfilling certain mathematics requirements for college admission.

Technology and Engineering and Mathematics Work Group Members

Technology and Engineering Teachers and District Personnel:	Mathematics Teachers and District Personnel:
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