

New York State Technology and Engineering Educators' Association

Request for Certification Title Change: Technology Education to Technology and Engineering Education

This document presents an argument to change New York State's teacher certification title in "technology" to "technology & engineering". The primary rationale being that the content area taught under this certification title has evolved over the past several years. A new title of *Technology and Engineering Education* better reflects the content taught in New York State public schools, the content and pedagogical courses leading to "technology education" teacher certification from our teacher preparation programs, and the transition our professional organizations have made through title and content changes.

Technology and Engineering taught in our Public Schools

Technology education in public schools in the United States has undergone an evolution where engineering content and engineering course titles are becoming more prevalent. As an illustration, The Technical Foundation of America published the Best Practices in Technology Education (Martin & Martin, 2006) that illustrates the prevalence of engineering design and engineering concepts more than a decade ago through national, state, and local initiatives in leadership development, curriculum improvement, professional collaboration, student learning, teaching effectiveness, and program improvement. The contributions from leaders in technology and engineering education nationally identify significant integration of engineering design and problem solving into technology classrooms. Some of the earliest curriculum development efforts in engineering education coursework can be traced back to work completed in New York State in the early 1990s.

In New York State schools, engineering content and titles have been integrated into middle and high school technology program offerings and are being taught by technology education teachers. NYSED identifies that, "*In NYS, engineering-related courses are a subset within technology education programs. As such, Commissioner's Regulations and policies governing technology education programs in public schools apply to engineering-related courses and programs* (NYSED, 2011)." Many courses are still being offered in traditional technology education content areas including materials technologies, electronics, Computer Aided Design (CAD), digital communications, and production systems. However, engineering content courses have developed in the schools since 1995 when NYSED introduced a curriculum, "*Technology Education Principles of Engineering: An MST Approach to Technology Education* (NYSED, 2011)." Courses with titles including engineering materials, robotics and automation, engineering design, programming/coding, and Computer Integrated Manufacturing (CIM) have become common in New York schools and are being taught by technology education teachers.

New York State BEDS data (NYSED, 2016) identifies 2281 Full Time Equivalent (FTE) technology teachers in New York State based on reported course offerings. A total of 394 courses were reported by school districts with engineering titles. Out of the reported courses, 89% of the courses were taught by certified technology education teachers. The remaining 11% of the courses were taught by a mix of science (physics, chemistry, biology, general science) teachers and other titles (CTE, elementary, math). Engineering course title reporting is limited to titles available in the BEDS reporting system and may be generating incomplete data. Courses with engineering titles may be reported by districts under other categories such as “Materials Processing” or “Other Technology Education.” As an illustration, Webster High School (WCSD, 2016) identifies four different courses with engineering titles in their student handbook, but only Introduction to Engineering Design was reported in BEDS.

Nationally recognized secondary engineering education programs including Project Lead the Way have been traditionally taught by certified technology education teachers. A standards-based program produced by the International Technology and Engineering Educators’ Association (ITEEA) called Engineering by Design (EbD) has been brought to New York through partial support by the New York State Technology and Engineering Educators’ Association (NYSTEEA), and has been adopted as a technology and engineering education curriculum by many New York schools. The goal of the integration of engineering into technology education was not exclusively to develop pre-engineering programs in public schools, but to integrate engineering and design concepts into coursework for all students who can benefit from exposure to engineering technologies through project and problem based learning.

Technology Teacher Preparation Programs

The two largest producers of Technology Teachers in New York State are SUNY Buffalo State and SUNY Oswego. The core content and pedagogical coursework in these initial certification programs are structured around the ITEEA’s Standards for Technological Literacy (ITEEA, 2000), which has foundations in the nature of technology, technology and society, and the designed world. Content coursework has evolved to integrate engineering and design concepts and technology using a systems approach for manufacturing, communications, transportation, and biotechnologies. Teacher candidates in these programs are prepared to teach the technical content in the many content courses taught in public schools. Additionally, candidates learn to use engineering design as a pedagogical foundation for their classroom instruction through project and problem based learning. This transition can be seen in institutions with technology and engineering education teacher certification programs across the United States.

Past accreditation for our Technology Education teacher preparation programs were evaluated based on criteria standards by ITEEA’s Council for Technology and Engineering Teacher Education (CTETE). The technology teacher preparation programs at Buffalo State

College and SUNY Oswego are both recognized by CTETE as accredited programs (CTETE, 2011).

New York State Teacher Certification Requirements

Teacher candidates seeking certification in Technology Education are required to complete multiple assessments including the edTPA for Technology and Engineering Education (SCALE, 2016) and Content Specialty Test (CST) in Technology Education (NYSED, 2015). Both of these assessments contain content and pedagogy specific to both technology and engineering education.

The Technology and Engineering Education edTPA (SCALE, 2016) assessment requires teacher candidates to provide an instructional segment that includes planning documents (e.g. lesson plans), videos of instructional delivery, and assessment of student work that illustrate concepts and relevant technical skills or strategies related to engineering design or problem solving. Candidates need to demonstrate how they actively engage students in engineering design or other problem solving strategies as they work on a project or problem. Teacher candidates are expected to demonstrate academic language functions and vocabulary specific to technology and engineering education and engineering design. The terms engineering and engineering design are not included in any of the other disciplines' edTPA handbooks (e.g. math, science). Engineering and design content knowledge and using design as a pedagogical strategy are not measured in any of the other disciplines.

Each certification area requires candidates to complete a Content Specialty Test (CST) to demonstrate that the candidates have the foundational knowledge and skills necessary to teach the content area that they are seeking licensure for. The Content Specialty Test for Field 118: Technology Education (NYSED, 2015) contains competency areas that include 1) Fundamentals of Technology and Engineering Education, 2) Technological and Engineering Design, 3) Manufacturing, Construction, and Materials, 4) Information and Communication, 5) Transportation and Energy, 6) Biotechnology and Environmental Quality, and 7) Pedagogical Content Knowledge. Teacher candidates are expected to have a thorough understanding of technology and engineering education pedagogies and how to apply technological and engineering design in a broad range of technological areas. In addition to demonstrating proficiency in the competency areas, candidates are expected to complete a constructed-response item in the exam where they demonstrate their pedagogical knowledge for teaching engineering design concepts.

Changes in the Professional Organizations

In 2010, The International Technology Education Association officially changed its name to the International Technology and Engineering Educators Association (ITEEA, 2010). This change was predicated on the evolving field of technology education to technology and engineering education, and its increased role in delivering the “T” & “E” of K-12 Science,

Mathematics, Engineering, and Technology (STEM) education. In 2011, the New York State Technology Education Association (NYSTEA) officially changed its name to the New York State Technology and Engineering Educators' Association (NYSTEEA). NYSTEEA is recognized by the New York State Board of Regents as the professional organization that represents Technology and Engineering Educators in New York State.

Based on the evolutionary changes caused by course content updates, teacher certification requirements, and professional organizations, it may be time for the New York State Education Department to consider updating the certification title for Technology Education to Technology and Engineering Education. This change better reflects the preparation that teacher candidates are receiving as part of initial certification programs, assessments that they need to complete for certification, and the content area that they are teaching in the public schools.

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