A focus on Integrative STEM education has been building nationally, with recent emphasis on "design pedagogy," which utilizes the Technology and Engineering components of STEM to engage students in a highly integrative, intradisciplinary fashion with deeply authentic teaching and learning experiences. Recently, the Next Generation Science Standards (NGSS) recognized the value of the T & E of STEM and explicitly included engineering design into both their framework and detailed standards for preK – 12 education.

The School of Engineering at TCNJ has substantial experiences and expertise in K – 12 Technology and Engineering education, as well as Integrative STEM education. The School of Engineering's Department of Integrative STEM Education has had strong STEM-oriented education programs since approximately 1987, when a strong shift towards design pedagogy occurred in the department's teacher preparation curriculum.

The Department of Integrative STEM Education started the country's first Integrative STEM teacher preparation program in 1998: the preK – 6(8) iSTEM program (originally named "Math/Science/Technology"). For the past several years, the ISTEM undergraduate program has been the largest disciplinary content area for teacher education candidates at TCNJ. Additionally, TCNJ has been strongly involved nationally, serving on important national committees on PK – 12 Technology and Engineering Education, and has led the development of STEM teaching methods and has published substantially in the field.

Master of Education in Integrative STEM Education

36 credits
Program code: STEM_M.ED 01
Manuel Figueroa, Associate Professor (figuerom@tcnj.edu)

This program is designed for in-service, certified teachers. The program offers an intellectually stimulating course of study that provides its students with integrative, design-centric teaching and learning methods applicable across preK – 12 grade levels. Key components of the Integrative STEM M.Ed. program include:

1. Integrative: Substantial emphasis on Integrative (cross-curricular) methods, between STEM components but also, and as importantly, includes valuable connections with non-STEM content areas.

2. Design Pedagogies: Design pedagogies can be described as design-centric Problem/Project-Based Learning (PBL) methods and are covered extensively within the program. Design processes (the "T&E" of STEM) require higher levels of cognitive thinking, and importantly, often include highly contextualized frameworks.

3. Content Area Knowledge: Content in individual STEM areas is covered throughout the program within both Methods and Content courses, yielding valuable content/context specific applicability. Additional NJ State content endorsements may be possible depending on individual's background.

4. Practical Approach: Gives teachers practical skills and knowledge, including curricular writing, inclusive practices, and deep connections to educational standards (Next Generation Science Standards, Common Core, 21st Century skills, etc.). TCNJ college certificates or NJ State certification paths are possible.

Admission Requirements

Bachelor's degree with a valid teacher certification.
Graduate Record Exam (GRE) – for test waiver information, please visit https://graduate.tcnj.edu/apply/.
Submission of Graduate Application materials, including a Field Setting Report. (See the Graduate Studies website for more detailed descriptions and the most current requirements: https://graduate.tcnj.edu/.)

Graduation Requirements
Cumulative grade point average of 3.0 or higher in the M.Ed. in Integrative STEM program and completion of all program requirements/prerequisites.

Required Courses

I. Teaching & Learning Core 15 cr.
STEM 510/Foundations in Integrative STEM Education
STEM 520/Integrative STEM Pedagogy
STEM 530/Integrative STEM Curriculum
STEM 610/Emerging Trends & Issues in Integrative STEM Education
STEM 660/Creativity & Systems/Critical Thinking in Education
STEM 700/Integrative STEM Education Capstone

II. STEM Education Content & Research 9 cr.
STEM 631/Math & Statistics for Integrative STEM Education
EDFN 508/Introduction to Education Research
Any STEM Education elective course (see Design pathway below for options)

III. STEM Education Electives 12 cr.
Complete the four courses outlined in any of the following pathways.
A. Supervisor Certification
   SUPV 520/Supervisor & Instructor Leadership
   CURR 514/Curriculum: Theory & Practice
   EDAD 617/Advanced School Leadership: Supervision/Administration
   CURR 555/Advanced Curriculum

B. Design
   Select any four courses not already taken from the following.
   STEM 635/Data Visualization & Analytical Information Design
   STEM 641/Biotechnology Systems and Sustainable Design for Educators
   STEM 661/Architecture & Civil Technology Systems & Design for Educators
   STEM 671/Mechanical Technology Systems and Design for Educators
   STEM 681/Electronics Technology Systems and Design for Educators

C. Research
   STEM 680/STEM Education Research
   STEM 710/Thesis
   Any two STEM content courses (listed in the Design pathway)

D. Inclusive Practice/Special Education (three pathways)
   i. Inclusive Practice: English Language Learners
      ESLM 577
      ESLM 579
      ESLM 587
   ii. Inclusive Practice: Students with Disabilities
      EDUC 513
      EDUC 614
      SPED 501
      Choose one: RDLG 579, SPED 624, or SPED 648
   iii. Inclusive Practice: Literacy
      RDLG 579 (prerequisite: a course in teaching reading at the undergraduate or graduate level)
      SPED 624
      Choose one: EDUC 613, EDUC 614, or SPED 624

E. Middle School Math
   Select any four courses of the following courses.
   MATH 591/Number Theory & Systems
   MATH 594/Patterns, Functions, Algebra
   MATH 595/Geometry
   MATH 597/Discrete Math
   MATH 598/Calculus
   STEM 635/Data Visualization & Analytical Information Design

F. Environmental Sustainability Education
   Yields Env. Sustainability Edu. Certificate
   ESED 501/Environmental Science for Teachers and Leaders
   ESED 520/EcoJustice and Socioscientific Issues
   ESED 600/Equity, Diversity, and Inclusion in Environmental Sustainability Education
   STEM 641/Biotechnology Systems and Sustainable Design for Educators

G. Self-Defined
   Four courses approved by the program coordinator.

Graduate Certificate in Integrative STEM Methods
15 credits
Program code: STEM_CER01
Manuel Figueroa, Associate Professor (figuerom@tcnj.edu)

The Department of Integrative STEM Education offers a one-year graduate certificate (15 credits) in Integrative STEM Educational Methods. Students who complete the STEM core sequence (STEM 510, STEM 520, STEM 530, STEM 610), and the capstone course (STEM 660/STEM 700) are eligible for the certificate. The five courses can be completed in one calendar year starting every spring semester. Classes meet once a week in the evenings during the spring and fall semesters and twice a week during the summer semester. Classes are taught in a blended format. Additionally, graduates who complete the Master of Education (M.Ed.) in Integrative STEM (36 credits) will automatically receive the certificate in Integrative STEM Educational Methods.

Required Courses
   STEM 510/Foundations in Integrative STEM Education
   STEM 520/Integrative STEM Pedagogy
   STEM 530/Integrative STEM Curriculum
   STEM 610/Emerging Trends & Issues in Integrative STEM Education
   STEM 660/Creativity & Systems Critical Thinking in Education
   STEM 700/Integrative STEM Education Capstone