

## **BROADER IMPACTS OF TEPP**

A TEPP web site will enhance dissemination of the STEM Vertical Alignment model, curricular units, curricular product modules and other deliverables. A monograph describing the model will be created and disseminated to other high school and community college partnerships that desire career pathways for students into two-year colleges from high schools. Dissemination also will take place through national- and local-level presentations and various publications within and beyond the Glove Cities area and New York State. The TEPP management team will present at regional and national conferences such as the NYS Career Pathways conference, the national ITEA conference, the annual Technology Education conference, and the League for Innovation in the Community College conference. The American Society for Engineering Education's Engineering Technology Division (ETD) will be an important venue for dissemination of project activities and accomplishments.

FMCC and H-F-M BOCES students are within commuting distance of a growing concentration of technological industries/companies. This is a common situation for many community colleges across the U.S. Accordingly, many community colleges will benefit from TEPP finding creative ways to obtain product information and industry support. One venue for spreading TEPP deliverables in New York State is other BOCES. H-F-M BOCES will facilitate such dissemination, as BOCES typically have formed partnerships with each other. (See Appendix Item 3: Partnership of Other BOCES with H-F-M BOCES).

## **REFLECTING DIVERSITY**

Students and faculty reflecting the diversity of the component school districts will participate in TEPP. The Upward Bound (UB) program will help ensure student diversity by helping prepare and recruit students (See UB/TriO letter of commitment). UB is a U.S. Department of Education-funded program that helps low income and minority high school students develop skills and motivation needed for success in college and careers. This pre-college math/science enrichment program also helps students attend college, and pursue a Bachelor's degree. UB is most active at the Greater Amsterdam City School District, the most urban of the H-F-M BOCES feeder schools. The FMCC UB annually serves 50 ninth and tenth grade students who have low grade point averages and/or low proficiencies in mathematics and language arts. (See Appendix Item 8: Upward Bound Program Supports a Diverse Population.)

FMCC has a diverse student body. In 2008 the student body consisted of 2049 White, non-Hispanic; 109 Black, non-Hispanic; 126 Hispanic; 19 Asian or Pacific Islander; and 10 Native American students. The total included 1348 females and 1072 males. Seventy-nine were international.

FMCC's New York State legislature-funded Science and Technology Entry Program (STEP) has agreed (see letter of commitment) to have a representative participate on the TEPP Advisory Council and to provide input and recommendations for serving under represented students. STEP will increase awareness of underrepresented students concerning TEPP opportunities. TRiO, an FMCC Department of Education funded program, will help develop awareness of TEPP among students. TRiO assists qualified students in their adjustment to the college

environment, success academically, and adeptness at preparing for careers and/or transferring to four-year colleges. Students qualify if they are first-generation college students, have low incomes, or have a physical/learning disability. TRiO provides tutoring, study/learning skills assessment, academic and cultural enrichment. A TRiO Study Lab equipped with computers and learning resources is available exclusively to TRiO students.

### **LONG-TERM SUSTAINABILITY OF TEPP**

FMCC's long history of ongoing successful collaborative activities with the H-F-M BOCES and its component school districts provides a strong indication, along with letters of commitment, that the proposal activities will be successfully sustained by the partnering institutions after the final year of NSF funding ends. For instance, H-F-M BOCES has agreed to phase out NSF funding for the to-be-hired teacher/curriculum developer during the grant, fully supporting that position before funding ends. That role is to be predominately curriculum development (first year), then curriculum development plus teaching responsibilities with the first cohort (second year), and when grant funding ends for this position, the role is only teaching (third year).

### **RESULTS OF PRIOR NSF SUPPORT**

FMCC has been a subcontractor for several ATE grants located at Hofstra University. PI Richard Prestopnik has been a Co-PI for Hofstra's CCfT and NaMCATE ATE projects. The following outcomes have been achieved for these projects:

*Career Curriculum for Technology (CCfT, DUE-0603403; 2006 – 2009; \$710,000):* This project has completed its third year. It involved three community colleges, four high schools, and two NSF ATE Centers. The project successfully designed, pilot tested, and disseminated a yearlong technology course for high schools, including a textbook. This is the first technology education text book driven by the National Standards for Technological Literacy; it explicitly builds on the richness of cross-disciplinary STEM connections and involves cutting-edge, high-student-interest areas of technology; and informs career decision making in STEM areas. The textbook has a 2010 copyright date but is available now. (See [www.hofstra.edu/ccft](http://www.hofstra.edu/ccft)). Its evaluation report indicates that great emphasis has been placed on ensuring that there is a consistent vision and treatment of the ITEA Standards. Also, the chapters evidence a clarity and depth that only content specialist authors can provide. Along with reviews from classroom teachers, the iterative writing and revision cycle produced a work that maintains fidelity to important ideas and explains them clearly, yet is presented at a level that high school teachers and students find accessible.

*Nanoscale Manufacturing Curriculum for Advanced Technological Education (NaMCATE, DUE-0603421; 2006 – 2009; \$899,999):* This project has completed its third year. Eleven nanotechnology curriculum modules targeted at community college students have been developed by the project as well as a series of modules for the high school level. The project has successfully conducted national field testing at 28 community colleges, and they report a very high rate of adoption at those schools. A significant number of faculty members who attended professional development workshops are using the modules in their classrooms and report that they will continue to do so.

*New York State Curriculum for Advanced Technological Education (NYSCATE, DUE-0053269; 2000 – 2004; \$1,529,984):* NYSCATE was a three-year ATE project that developed 13 curricular modules in three technology fields for high schools and community colleges: bio/chemical, information, and physical. All modules were favorably reviewed and are available at <http://www.nyscate.net>. Through the evaluation, teachers and students stressed that important learning occurred in the areas of problem solving and real-world applications. Reviewers stated that the modules provided exciting ways for students to learn and practice important skills with strong links to the academic standards. Teachers stressed that important student learning occurred in problem solving, particularly that there is not always an immediate and right answer. Students stressed that learning is hard and not always what you might expect.

## EVALUATION PLAN

Project evaluation will be conducted by Margaret Weeks, an educational consultant with extensive community college experience. Ms. Weeks has served as evaluator on several NSF-funded projects that have enhanced STEM education, and has been involved with the TEPP management team in developing all aspects of this proposal. As external evaluator, she will develop assessment tools to improve ongoing project activities and provide formative and summative data for stakeholders. She will regularly communicate with the project PIs; provide quarterly and annual reports for each year of the project, and a final project evaluation report. The process will be grounded in the Program Evaluation Standards<sup>8</sup>, to ensure that the evaluation is useful, practical, ethical, accurate, and timely.

Formative evaluation will focus on ongoing development and implementation of major project objectives:

- Creation of a replicable STEM Vertical Alignment Model and a monograph to disseminate it;
- Development of STEM curricular units exploring a broad range of technologies for 11<sup>th</sup> grade students;
- Development of curricular units for technician education for 12<sup>th</sup> grade students;
- Development of eight student centered, systems based, workplace oriented community college electronics curricular product modules;
- Completion of function/operation comparisons of ten consumer products at the community college level; and
- Creation of an innovative learning environment.

The external evaluator will work closely with the PIs to gather quantitative enrollment and retention data annually. The quality of the curricular materials will be assessed including review and revision of all materials and procedures prior to and following pilot testing. The evaluator will call upon subject matter experts for assistance with this activity. Specially designed pre- and post- assessments will be used to evaluate the effectiveness of the knowledge and skill builder (KSB) strategies. In addition, structured, observation-based evaluation during the school year will be conducted. The evaluator will make visits to H-F-M BOCES and FMCC classrooms before and after the units and product modules are incorporated. Questionnaires will be used to assess learning and attitude of students. Follow up communication with faculty will determine the extent to which they are integrating new and relevant material, pedagogical practices, and educational technologies into their classrooms. Interviews will be conducted with all stakeholders to assess the effectiveness of the STEM Vertical Alignment Model.

TEPP's success will be determined by a review of the strategies used to sustain ongoing activities. The summative review will include a summary of quantitative enrollment and retention data. Industry partners will provide information on whether TEPP is addressing workforce needs. Documentation and a review of ongoing and culminating dissemination activities will assess how well, when, how, and to whom project-related information is distributed.