

“Status Report: Teachers for a Competitive Tomorrow Baccalaureate Program’s Measurable Contributions to the Nation’s Critical STEM (Education) Priorities: One-Half Decade of Optimal Investments of Federal Funds and Matching Contributions”

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The Teachers for a Competitive Tomorrow (TCT) Baccalaureate (TCT-B) program was first authorized in FY 2008 under the America COMPETES Act (ACA) of 2007 (Public Law 110-69, Title VI, Subtitle A, Part I), to develop and implement programs, within a period of five years, to provide integrated courses of study in science, technology, engineering, mathematics (STEM), or critical foreign languages (CFL) subject areas that lead to a baccalaureate degree in these fields with concurrent teacher certification.

The eligible TCT applicants/“eligible recipients” for the TCT-Baccalaureate (TCT-B) Degree Program are institutions of higher education (IHEs), as defined under section 101(a) of the Higher Education Act of 1965, as amended, on behalf of a department of a STEM or CFL area, or on behalf of a department or school with a competency-based degree program that includes teacher certification. The TCT-B grants (a total of five funded recipients – all from the competition held in 2008) were awarded to the College of William and Mary, Mississippi State University, University of Delaware, University of North Carolina, and William Paterson University.¹

In September 2010 (and again in February 2014, in the Presidential “Cross-Agency Priority Goals”²), President Obama announced “Moving the country forward requires recruiting and preparing 100,000 science, technology, engineering, and mathematics (STEM) teachers over the next decade -- by the year 2020.”³ Part of this critical priority includes “expanding STEM education and career opportunities for and participation by underrepresented groups, including women and minorities” – engaging them so that U.S. has one million more STEM undergraduates with degrees in these various technical fields also by 2020.

Since their launching in 2008, the Teachers for a Competitive Tomorrow (TCT) undergraduate programs (TCT-B) have addressed these gaps, especially in schools that have a shortage of certified teachers in these broad content areas.

¹ Note: The five TCT-B grants focused on mathematical and science content areas, and do not partner with departments/schools in their respective institutions of higher education that award degrees in foreign languages. Thus, all TCT-B undergraduate students are working towards degrees in mathematics, science, and related fields along with concurrent teacher certification.

² Cross Agency Priority Goal: STEM Education, FY 2013 Quarter 4 Status Update
http://goals.performance.gov/sites/default/files/images/STEM_Education_CAP_Goal_FY2013_Quarter_4_Update.pdf

³ The White House, Office of the Press Secretary (September 27, 2010) “President Obama Announces Goal of Recruiting 10,000 STEM Teachers Over the Next Two Years” <http://www.whitehouse.gov/the-press-office/2010/09/27/president-obama-announces-goal-recruiting-10000-stem-teachers-over-next->

Although the FY 2008 TCT-B recipients were expected to have an annual appropriation to operate their grant projects, only three years of funds were awarded to date – approximately \$1.092 million in each FY 2008, 2009, and 2010. Both the FY 2011 (via Public Law 112-10) and FY 2012 budgets did not appropriate funds for the TCT-B program, and thereby no additional funds were awarded to each of the TCT-B grantees for their respective NCCs (nor for any new awards through a grant competition). However, the TCT Program Officer obtained permission in both February 2011 and February 2012 to enable TCT-B grants that had sufficient unexpended funds in their accounts (and were making substantial progress towards completing program goals and project objectives), to continue operating in 2011-2012 and 2012-2013, respectively.

The administration’s priorities have been and continue to be to increase the number and quality of Kindergarten – Grade 12 (K-12) teachers who are rigorously trained in science, technology, engineering, mathematics, and other STEM-related field and accompanying pedagogical skills. The evidence-based TCT grant projects, taken collectively, have made various contributions to these critical education matters. Below is a brief assessment of five key TCT-B measurable outcomes on various performance measures that are considered as and aligned with Presidential and Cross- (Federal) Agency Priorities; and ED’s Strategic and Priority Performance Goals – empirical evidence that the TCT-B recipients maximized efficiency in order to attain their five-year mission-driven objectives despite the unforeseen reduction in the proposed Federal funding addressed in Public Law 110-69 in 2007.

1] Participation in the U.S. Department of Education’s funded TCT programs has grown from 56 in 2008-2009 (Year 1) to 454 undergraduates in the STEM “career pipeline” by 2011-2012 (Year 4) – the final year in which all five original TCT-B grants were executing their programs. In Year 5, with three grants still functioning, there were 183 undergraduates pursuing degrees in STEM fields with concurrent teacher certification.

2] TCT-B has “expanded STEM education and career opportunities for and participation by underrepresented groups, including women.”⁴ The total percentage of females has increased from 64 percent (at the onset of TCT-B in 2008) to 78 percent in Year 5 – well above the current national average, showing that women constitute 45 percent of undergraduates pursuing STEM degrees (and comprising 70 percent of the undergraduate student population).⁵

3] Also consistent with the overarching Presidential priorities and cross-agency priority goals, TCT-B undergraduates are engaging in meaningful “hands-on, authentic research and/or

⁴ See Cross Agency Priority Goal: STEM Education, FY 2013 Quarter 4 Status Update http://goals.performance.gov/sites/default/files/images/STEM_Education_CAP_Goal_FY2013_Quarter_4_Update.pdf, which discusses the issue that women are member of traditionally underrepresented groups pursuing education and careers in the STEM disciplines, especially science and engineering.

⁵ Executive Office of the President, President’s Council of Advisors on Science and Technology (February 2012) “Report to the President: Engage to Excel: Producing One Million Additional Graduates with Degrees in Science, Technology, Engineering, and Mathematics” (p. 5) http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-engage-to-excel-final_2-25-12.pdf and Cross Agency Priority Goal: STEM Education, FY 2013 Quarter 4 Status Update (p. 13) http://goals.performance.gov/sites/default/files/images/STEM_Education_CAP_Goal_FY2013_Quarter_4_Update.pdf.

laboratory experiences”.⁶ By 2012-2013 (Year 5), the 2008 TCT-B project directors and staff enabled 47 percent of their undergraduate/preservice participants to apply their expertise, and conduct an annual average of 198 hours of scientific research (including outdoor field experiments) and spend 98 hours working independently in laboratory settings.⁷

4] Although Federal funds were appropriated for only three specific years of the TCT-B programs (FY 2008 - FY 2010), the total number of “well-prepared program graduates” in mathematics and science areas (with initial licensure) is noticeable from October 2008 to September 2013, when the TCT-B initiative produced 160 graduates in the science and mathematical fields, primed with the academic content and instructional skills to teach in the nation’s K -12 schools.

5] The TCT-B educational provisions have helped the nation achieve the mission to “recruit and prepare 100,000 additional Science, Technology, Engineering, and Math (STEM) teachers by 2020.” By TCT-B’s fifth/capstone year, the total number of TCT-B program graduates employed as teachers (in the STEM field in which they are certified/licensed) in the country’s K-12 schools was ninety-seven (97), with 48 of them gainfully employed in partner or other schools designated as “high need.”

Throughout the life of the 5 TCT-B grants, the five Federally-funded IHEs with their key partnering school districts (LEAs) and other entities (such as the “feeder” two-year colleges) have provided documented evidence (through their annual and interim performance reports), to the U.S. Department of Education, of their efforts to engage in capacity building and other strategies in order to **sustain** programs/services with beneficial outcomes in the served higher education institutions and K-12 (and surrounding) high-need schools, once the four or five years of Federal funds (i.e., the foundation dollars – seed money) terminates.

Generous financial and in-kind matching contributions from diverse sources have been committed to TCT since the initial stages – entities that expect to maintain their efforts for successive years. With respect to the fiscal agents/lead universities’ in-kind and financial cost share, project directors/coordinators, budget/expenditure managers, academic faculty, graduate students, recruiters, and others have spent, on average, as much as 40 – 75 percent of “work time,” on average, on the TCT grant, serving as project planners (e.g., “Steering Committee” members); instructors of formal coursework and workshops in strategies to improve K-12 students’ literacy (i.e., curricular and instructional differentiation), embed technology in classrooms, develop inquiry-based science lessons, and analyze standardized tests’ results and other student achievement data; field experience directors; mentors in laboratories and research; veterans to student teachers in the served schools; and guides (to graduating seniors in particular) for active assistance in finding employment positions in schools which have noted voids in qualified STEM teachers.

⁶ Cross Agency Priority Goal: STEM Education, FY2013 Quarter 4 Status Update (pp. 4, 10, 11, and others) http://goals.performance.gov/sites/default/files/images/STEM_Education_CAP_Goal_FY2013_Quarter_4_Update.pdf.

⁷ See Public Law 110-69, Title VI, Subtitle A, Part I, Sec. 6113(b)(3) and 6113(d)(2) – the statutory cites for this performance measure.

Similar notable assistance has been afforded by grants and other monetary sources from Howard Hughes Medical Institute's Biointeractive Grant, Virginia and the National Science Teachers Association, AAAS, Dunn-Seiler Science Museum of Mississippi, Boys and Girls Clubs, Teacher Preparation Analytics, community colleges nearby to the TCT entities (financial and in-kind/"hands-on" support), and charitable alumni.

One significant aspect of **systemic change/reform** in the lead universities is the ensured commitment to retain the communication/collaboration (fostered by TCT) between colleges of arts/science and schools of educational studies, along with their served LEAs. In addition, TCT-developed STEM coursework integrated with pedagogical skills, as aligned with Title VI of the America COMPETES Act, are now part of the grant-funded universities' course offerings. In the second year of TCT, for example, University of North Carolina's project director created the "Teaching and Learning Mathematics in the State of North Carolina" and "Principles / Methodologies of Teaching Physics and Earth Science" – two year-long courses which continue and will remain to fulfill requirements for graduation. Similarly, Paterson and Passaic school systems have "taken over" William Paterson University's TCT funding to support "STEM Professors in Residence," a provision designed and implemented by ED's TCT grant.

Furthermore, each of the TCT-B grants, during its functioning four or five years, whichever was applicable, experienced a steady increase in the number of preservice participants. Consequently, there are, even though each of the five grants has submitted "final" programmatic/financial performance reports, a number of undergraduate STEM students in the "pipeline" who are preparing to transition smoothly and seamlessly to serve the classrooms in "high-need" (as defined by Public Law 110-69, Subtitle A, Part I, Section 6112(3)) and other "most in need" (as defined by individual project directors) K-12 schools. University of North Carolina-Chapel Hill, for example, has 133 STEM undergraduates, who did receive at least some of the years of their academic training while UNC was a TCT grantee, and will complete their degree programs so they can be officially certified/licensed as qualified STEM educators. Due to Department of Education appropriations and supplementary match support, the nation can expect to benefit in forthcoming years from an additional 449 teachers of science, technology, engineering, and mathematics related disciplines who have completed essential licensing examinations and meet the other requirements to teach in their areas of certification.

The enabling legislation for the TCT-B program leaves a legacy of substantial contributions: preservice teachers having completed preparation and entering teaching in STEM fields at high-need schools; teacher preparation programs energized and institutionalized; and, most significantly, thousands of students reached by these motivated teachers, introduced to STEM concepts and skills, and, one hopes, moved toward STEM careers and responsible participation in citizenship.