

(6) Development of Pennsylvania CAN:
A Value-Added Reform for Closing Racial Achievement Gaps in Math and Science K-12

Part of a Report Prepared for Pennsylvania Secretary of Education Gerald Zahorchak, PhD
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AT THE BEGINNING OF OUR DEVELOPMENT PROCESS, I extended a general call for ideas and reforms that accelerate rates of achievement of Black and poor students over White and middle-class students—the only way we saw possible to close racial achievement gaps in math and science. This call went out to a local and national group of more than 20 prominent researchers, educators, and administrators who agreed to serve on our Math and Science Acceleration Team. Over a period of about four months, papers and ideas along with local discussions seemed to converge on three reforms: curricular (C), axiological (A), and normative (N) which inspired the name of our three-in-one proposal Pennsylvania CAN which we expressly designed to accelerate rates of math and science achievement in African American students K-12. All members of our primary development team—those most actively involved in contributing, writing, and editing our proposal—were seasoned investigators with proven track records of acquiring and managing large-scale research and development awards from federal agencies NSF, USDE, NIMH, and NIA as well as a wide range of local and national foundations. With input from Acceleration Team members, these development team members from Carnegie Mellon University, the University of Pittsburgh, and the Pittsburgh School District spent an additional four months writing and revising Pennsylvania CAN. Exhibit 1 profiles components of our reform that we offer to accelerate rates of achievement in African American students K-12.

Exhibit 1: Pennsylvania CAN Components with Findings

(C)urriculum
Math and Science

(A)xiological
Seven Values for Life (bold)

(N)ormative
Community Empowerment

Science Inquiry: Low-income students performed at a level that *exceeded* the national and international benchmarks based on original test items from TIMSS and NAEP assessment.

Science Immersion: A comparison of immersion units with an NSF scripted design for introducing concepts in electricity found that learning in the immersion group was twice as large as in the scripted group

Engineering Robotics: Students design a robot for mapping a mine, investigate capabilities of an ultrasonic rangefinder to “see” inside the mine, work out a system for gathering, interpreting, and visualizing numeric feedback, and analyze and report their results.

Math Cognitive Tutors: In whole-year classroom studies, Cognitive Tutor Algebra students outperform students in control classes by 50-100% on targeted real world problem solving skills and by 10-25% on standardized tests.

Math Assistent: Providing feedback to teachers on students’ strengths and weaknesses reflected in their style of solving math problems on the PSSA.

Black elementary school students above the median in **self-persistence, self-esteem, or self-reliance** were 5 to 8 times more likely to score at or above the 50th percentile on the math section of the Iowa Test of Basic Skills.

Black students at or above the median on **love and respect, interpersonal skills, or self-esteem** were a minimum of seven times more likely to score at or above the 50th percentile on the SAT-9 for reading.

Following one year’s application of Values for Life in an all-Black public elementary school, we found evidence of academic gains that by far outpaced academic gains associated with the two years prior to intervention.

Black college students high in **self-confidence** reported significantly better study skills, higher occupational and economic aspirations, and greater utilization of academic resources.

Black college students high in **learning orientation** reported more favorable attitudes toward taking technically demanding courses—calculus, chemistry, and biology.

More than 200 public housing students with their parents, grandparents, teachers, and principal showed up at a special Sunday morning worship service at Bethel AME Methodist Church to **recognize students** who had read 25 books or more.

At Sixth Mount Zion Baptist Church, teachers and principals whose students had accelerated scores in reading and math were recognized during morning worship and following service in a fellowship hour where **school personnel** were **welcomed and thanked** personally by congregants.

Distributed posters with pictures and names of achievers and gainers in local businesses and libraries and on billboards located at prominent intersections in the community. One school took on the project of producing t-shirts and buttons in support of this initiative.

Grace Presbyterian, Wesley Center AME, Bethel AME, and Sixth Mount Zion Baptist have **adopted schools** where they offer tutoring and mentoring services to accelerate rates of math, science, and reading

Pennsylvania CAN is directed toward changing the ambiance of school and community in ways that quicken Black students’ commitment to academic engagement and striving toward academic excellence through integrated curricular, axiological, and normative reforms. Curricular and axiological interventions have been developed, empirically evaluated, and validated using experimental and quasi-experimental designs which have been implemented in this region and beyond. Our normative intervention has been developed and vetted over three years of experience in the field. This evidence base and field experience support our expectation that Pennsylvania CAN will fit the structural and educational needs and realities of urban school districts characterized by increasing concentrations of African American students. Documentation of these research studies and field experiences together with theoretical background are documented in our full proposal along with references which are provided there as well. *Finally, we note that Pennsylvania CAN is designed as a value-added reform which enhances without supplanting core curriculum selected by school districts.* Contact jtaylor@cfei.org to request a full copy of our proposal.

