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The National Defense Education Act, Current STEM Initiative, and the Gifted

Oh little Sputnik, flying high
With made-in-Moscow beep,
You tell the world it's a Commie sky
And Uncle Sam's asleep.

You say on fairway and on rough
The Kremlin knows it all
We hope our golfer knows enough
To get us on the ball.

—Gov. G. Mennen Williams (Michigan)

During the past several years, much discussion has focused on developing America's future scientists, technologists, engineers, and mathematicians (STEM) in order to remain viable and competitive in a growing global economy (Friedman, 2005). In retrospect, America has had a long-standing involvement with STEM issues that dates back to the establishment of West Point in 1802. West Point graduates designed many of the railroads, bridges, and roads so important to this country's early expansion. The Morrill Act of 1862, originally intended to establish colleges and universities to study agriculture and mechanical arts, also supported science and engineering programs. This indirectly led to the establishment of the university research system (Butz et al., 2004). In more recent history, parallels can be drawn between STEM initiatives involving the launch of the Soviet satellite Sputnik in 1957, its legislative history, and the current "quiet crisis" over America's ability to compete globally (Friedman, 2005). This article examines the National Defense Education Act (NDEA) and present-day STEM initiatives in relation to gifted education.

More than 50 years ago, on October 4, 1957, the Soviet Union propelled Sputnik, a 185-pound sphere of aluminum, into space; it orbited the Earth for a brief 98 minutes. "As a technical achievement, Sputnik caught the world's attention and the American public off-guard," and also garnered swift action from the U.S. federal government (National Aeronautics and Space Administration [NASA], 2008, para. 4). The United States' reaction to the launch of Sputnik, coupled with an already ongoing criticism of the American educational system, set the stage for an unprecedented infusion of funding from the federal government to reform public education at all levels. In 1958, the U.S. Congress passed the National Defense Education Act (P.L. 85–864) in order to counteract the seemingly superior Soviet school system that focused on training young scientists and creating an "elite generation" of our own pipeline of STEM workers (Passow, 1957).

National Defense Education Act

NDEA was aimed at stimulating and strengthening American education reform by providing

$1 billion over 4 years to be infused into 40,000 loans, 40,000 scholarships, and 1,500 graduate fellowships (Fleming, 1960). The majority of NDEA funding was intended for those academically capable students (particularly in STEM areas) who did not have the financial means to pursue undergraduate or graduate degrees (Fleming, 1960). Matching funds also were available to states in order to bolster additional initiatives identified to help improve America's competitiveness in STEM areas; those that impacted gifted education include Title III, Financial Assistance for Strengthening Science, Mathematics, and Modern Foreign Language Instruction, and Title V, Guidance Counseling and Testing; Identification and Encouragement of Able Students (Flattau et al., 2006).

Title III of NDEA provided states matching funds to strengthen mathematics, science, and foreign language instruction, which included better equipment and materials, along with professional development for teachers. The reorganization of science courses impacted all students, including the academically able (Anderson, 2007; Flattau et al., 2006; Fleming, 1960). A distinguishing characteristic of this reform movement focused on the collaborative efforts between teachers and researchers. Rather than being passive recipients of content and strategies, teachers were treated as fundamental contributors to the process (Dow, 1997).

Representative Carl Elliott, coauthor of NDEA, recognized gifted students as "an underdeveloped resource" that would benefit American society and fulfill a critical need made that much more imperative by the launch of Sputnik (Elliott, 1958, p. 143). Title V of NDEA specifically earmarked funds for the guidance, counseling, testing and identification, and encouragement of gifted students (Fleming, 1960). A by-product of identification and counseling, academically able students would provide a steady stream for the STEM workforce.

Implications for Gifted Education

After World War II, gifted education was an inert state. No state departments of education employed personnel assigned to gifted education and less than 4% of 3,203 cities with populations over 2,500 reported special programming for the gifted (Tannenbaum, 1958). The launch of Sputnik and the subsequent passage of the NDEA catapulted gifted education into relevancy and pushed the field into one of its most productive research periods through expanded programming and a rejuvenated research agenda.

Even prior to the launch of Sputnik, questions arose over what special academic accommodations should be made for rapid learners in science. Pure scientists were certainly a goal but technicians, science teachers, and engineers also were sought (Passow, 1957). Terman's longitudinal study of 1,500 gifted subjects illustrated that none had gained eminence in adulthood (Terman & Oden, 1959), but "for every genius there [were] hundreds of less eminent but highly competent men and women who also contribute[d] significantly to the nation's intellectual progress" (Wolfe, 1951, p. 42).

Recommendations comprised exposing students to rigorous science curricula early in their education and reexamining the organization of subjects, materials, content, sequence, and methodologies (Passow, 1957). NDEA's influence could be felt in both the changing strategies and curricula in STEM areas and the greater implementation of programming for the gifted and talented during the NDEA years (Flattau et al., 2006; Passow, 1957; Wolfe, 1951). Special science programs for elementary schools focused on enrichment that encouraged independent projects and a focus on everyday experiences that represented a scientific phenomenon (Anderson, 1961; Wiszowaty, 1961). Science programs at the high school level incorporated dual enrollment, specialized high schools, or acceleration (Havinghurst, Stivers, & DeHaan, 1955).

The ramifications of Title V for the gifted had immediate and lasting effects on the field of gifted education. Since the inception of the field in the 1920s, the definition of giftedness remained relatively constant, comprising 2–10% of the student population based solely on measures of IQ (Goldberg, 1958). Talent searches were employed as a strategy to identify those with gifts and talents. For example, Project TALENT "intended to find out what talents young people of the country, who are in the 9th to the 12th grades in high schools . . . have to offer" (Flanagan, 1960, p. 51). A battery of aptitude and achievement tests were administered to 460,000 students in 1,000 high schools, as if to create an inventory of what America might expect from its youth if identified and encouraged to pursue the appropriate careers based on their abilities and interests (Flanagan, 1960). As a result, by the mid-1960s systematic standardized aptitude testing included nearly all students in public schools compared the handful of students tested at the time of the launch of Sputnik (Flattau et al., 2006).

During this same period, research influences outside of the field began to impact the unitary definition of intelligence so closely tied to the definition of giftedness. Guilford's work both in creativity and intelligence filtered into how giftedness was considered. Building off of the work of Guilford, J. W. Getzel and Phillip Jackson and E. Paul Torrance illustrated how creativity interacted with intelligence and the ramifications for how to both identify and serve gifted and talented students in schools (Getzel & Jackson, 1958; Torrance, 1961). By 1972, the first federal definition of giftedness included the factor of creativity (Marland, 1972).

Overall, NDEA impacted the educational landscape with "general upward trends" with more rigorous science and mathematics courses along with greater opportunity to explore STEM careers (Flattau et al., 2006, p. VII–1). NDEA also established the federal government's larger role and stake in public education and this "[e]xperience with NDEA suggest[ed] that comprehensive educational legislation [could] have a strong positive effect . . ." (Flattau et al., 2006, p. VII–1). However, funding and interest in gifted education diminished as the 1960s Civil Rights movement moved the focus to underserved populations, including those receiving special education services and minorities (Delisle, 1999).

Current STEM Initiatives

Fast-forward 50 years and the United States finds itself in an analogous situation. Rather than competing with one rival, such as the Soviet Union, the U.S. is operating in a global marketplace (Dow, 1997). Other factors influencing this series of STEM initiatives include a globalized economy, fewer visas available to foreign-born students who want to study in the United States, an increasing lack of interest by U.S. students in STEM careers, and that the very students who sought STEM careers during the time of NDEA are now reaching retirement age (Friedman, 2005). These factors influence an environment where "Forty percent of the general public and 61% of opinion leaders [already] identified math, science, and technology skills as the most important ingredients in the nation's strategy to compete in a global economy" (Zinth, 2007, para. 2).

In contrast to the era of NDEA, the current "quiet [STEM] crisis" as coined by Ann Jackson, President of Rensselaer Polytechnic Institute, has not experienced a galvanizing event such as Sputnik to garner the attention and level of funding on the scale that resulted from Sputnik and NDEA (Friedman, 2005). The latest Trends in International Mathematics and Science Study, or TIMSS, reports students making gains in mathematics but countries like Hong Kong, Taiwan, Russia, England, and Kazakhstan continue to outperform American students in mathematics and dominate in science. Asia's most able and high-scoring students also continue to show rising percentages in both math and science (Dillon, 2008). Confounding this issue, gifted education has found it difficult to gain traction in the midst of 2001's No Child Left Behind Act, which focuses public K–12 energies and monies on seeking proficiency in reading and math as a goal for all students and ignores the needs of the most able students who could benefit from high-level math and science courses (Loveless, 2008).

The Academic Competitiveness Council (ACC), charged with improving America's competitiveness in STEM areas by the federal government, found that in 2006, 105 federal STEM education programs operated with approximately $3.12 billion in funding (with inflation this is half of what was available under NDEA). This includes 24 elementary and secondary (K–12) programs; 70 undergraduate, graduate, and postgraduate programs; and 11 informal and outreach programs. ACC recommendations to federal agencies included the following: (a) update inventory and goals to facilitate coordination between programs on a regular basis (provided by ACC), (b) offer support to programs that demonstrate effective research-based practices, (c) improve coordination of K–12 STEM programs, (d) seek alignment among goals and assessments, (e) institute rigorous outside evaluation of current STEM programs as a requirement for further funding, and (f) facilitate greater collaboration among federal agencies in STEM initiatives (U.S. Department of Education, 2007).

Implications for Gifted Education

The United States National Academies of Sciences' *Rising Above the Gathering Storm* recommend both increasing America's talent pool by improving K–12 STEM education and developing and retaining the best students (National Academy of Sciences, National Academy of Engineering, & Institute of Medicine, 2007). Current STEM initiatives provide an opportunity for gifted education to inform the practices and curricula required of rigorous and high-level coursework, while gifted students also can benefit from access to such high-level coursework (National Association for Gifted Children [NAGC], 2008).

Examples of federal programs that target those students with advanced abilities in STEM subjects include the Academic Competitiveness Grants, which provide university scholarships to economically disadvantaged students who complete advanced STEM courses in high school. The Advanced Placement Incentive Program pays the examination fees tied to the AP courses taken at the secondary level. And, Javits Grants are aimed at increasing advanced curricular exposure in STEM subjects to minorities and females (Subotnik, Edminston, & Rayhack, 2007).

Lessons Learned

Gifted education's relevance fluctuates according to America's perception of critical need for the abilities and talent of the nation's most capable students. The era of NDEA clearly exemplifies gifted education's significance gained due to a national crisis, resulting from the Soviet Union's technological advancements. However, this relevance can easily dissipate when efforts, interests, and funding are directed elsewhere and other critical need areas are identified. The full impact of current-day STEM initiatives on gifted education remained undetermined. Gifted students represent an immense untapped resource—one that should be relevant regardless of the impulse of a critical need. GCT

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