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Chapter 2

STEM CENTRIC CAREER DEVELOPMENT
Sputnik II or a Thud?
by Rich Feller

Therapeutic process and alliance skills are the foundation of quality counselor education and career professionals' training programs. Yet, the same preparation offers limited insight about the relationship among science, technology, engineering, and math (STEM) skills, wealth creation and career opportunities. This was not the case during the golden age of counseling and guidance empowered by the 1958 National Defense Education Act (NDEA). History can now be instructive as education and talent development focuses on career assistance and career preparation for economic sustainability.

Will preparation programs take direction from the outcomes NDEA, or miss an opportunity to provide leadership in education, research, and job creation? This article calls for an urgent and expanded dialogue about STEM initiatives and their relationship to career development strategies, resources and opportunities. A proposal for a STEM centric orientation within professional preparation is offered to redirect career assistance and counselor preparation as NDEA did in response to Sputnik.

Reinventing the Talent-Creation System

With the growth paradigm that drove the economy for the past generation exhausted, a quiet crisis challenges American beliefs about educational superiority, scientific and technical talent, college access and social mobility, and the value of career development assistance. Considering Gordon's (2009) appraisal of the U.S. economy emerging as one "of abundance and poverty, abundance of labor, poverty of talent, and economic pain everywhere," (p. 35) career development's strategic role in talent development and workforce policy is needed as it was after Sputnik's "beep" reached Earth on October 4, 1957. "To prevent a chronic job imbalance and a true economic catastrophe, the United States needs to reinvent its talent-creation system" (Gordon 2009, p.35). In every sphere of life, people find they need to know more and to learn continuously to keep pace with new demands.

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The National Academies of Science (2007), noted the rapid erosion in the U.S.'s competitiveness in science and technology—and thus in the U. S. as a global economic leader. The National Academies cautioned that the U.S. position as a global leader may be abruptly lost without a greatly expanded commitment to achieving success in advanced education in science, technology, math, and engineering. The National Science Foundation (2007) stated:

In the 21st century, scientific and technological innovations have become increasingly important as we face the benefits and challenges of both globalization and a knowledge-based economy. To succeed in this new information-based and highly technological society, all students need to develop their capabilities in science, technology, engineering, and mathematics (STEM) to levels much beyond what was considered acceptable in the past. (p. 1)

Friedman (2005) argued that not enough young people in America's schools are now being educating or inspired about interest in advanced math, science, and engineering. "The education in American junior high schools, in particular, seems to be a black hole that is sapping the interest of young people, particularly young women, when it comes to the sciences" (p. 351).

STEM occupations are defined (Shatkin, 2009) as those requiring knowledge of or skill with science, technology, engineering or math with at least two years of postsecondary study or training. These opportunities are driven by the disciplines of chemistry, computer science, engineering, geosciences, life sciences, mathematics, physics/astronomy and social sciences. May 2008 average STEM earnings were $60,664 compared to $32,390 for all occupations. With jobs predominately in aerospace, energy, biosciences and information technology, the Bureau of Labor Statistics reports that STEM job growth between the years 2006-16 will be 15.6 percent compared to 10.3 for all occupations (Shatkin, 2009). In the last 50 years, more than half of U.S. sustained economic growth was fueled by engineers, scientists and advanced-degree technologists, a mere 5% of America's 132M person workforce. As the foreign born share of the U.S. science and engineering workforce nearly doubled from 1980-2000 (National Science and Technology Council, April 2000), and over half of the technical workforce is over age 40 and one-third over 50, the bench strength of U.S. innovation is of great concern (National Science Board, January, 2002). Introduction to, and obtaining, STEM opportunities and careers requires equitable and high-quality career assistance, especially since women constitute half of the college-degreed workforce but less than 25 percent of the science and engineering workforce (and just 23 percent of the physical sciences and 10 percent of engineers). In

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1999 African Americans and Hispanics each comprised 12 percent of the U.S. population with each holding 3.4 percent of science and engineering (Stephan, 2003).

By not engaging women and minorities in the STEM enterprise, 40 percent of America's intellectual talent is ignored and denied opportunities within STEM courses, programs and careers.

This crisis calls for a renewed commitment to career development as essential in developing the nation's capacity to innovate for economic growth, and the ability of American citizenry to thrive in the technologically enhanced global economy. As the Carnegie-IAS Commission on Mathematics and Science Education (2009) notes:

The United States needs an educated young citizenry with the capacity to contribute to and gain from the country's future productivity, understand policy choices, and participate in building a sustainable future. The Commission's own survey research suggests that America's young people care deeply about problems such as global warming, world hunger, and poor health and want to be involved in solving them. We know that math and science are fundamental to sound decision making and to an ever-widening range of careers in nearly every sector, from technology and research to business, teaching, health, community development, and human services. We also know that, in today's economy, the sharp division between preparing for higher education and preparing for a career has effectively disappeared. Knowledge and skills from science, technology, engineering, and mathematics—the so-called STEM fields—are crucial to virtually every endeavor of individual and community life. All young Americans should be educated to be "STEM-capable," or to possess those skills and knowledge, no matter where they live, what educational path they pursue, or in which field they choose to work. (p. 1)

Calls for Improving Career Development Preparation

As a counselor educator within one of only seven CACREP accredited graduate career counseling specialization programs, our graduates complete two career development classes and a Career Development Institute. This field study conducts employment and training audits of various industries, enhanced by an examination of labor market trends, career management practices, and career development competency requirements for an evolving workplace. Presently a NASA Department of Education consultancy advances understanding of the "unconscious incompetence" (Burch, n.d.) about STEM opportunities among school counselors, career development professionals, college and academic advisors, and adult career advisors (gatekeepers). Change within career development preparation is needed as it was after the Sputnik launch to meet emerging needs and create STEM advocates similar to social justice

and human rights advocates. Enhancing gatekeepers' understanding, insight and ability to help those seeking and promoting STEM courses, programs and career options is an additional objective to join those listed in NCDA's special issue of the ***Career Development Quarterly*** on Career Counseling in the Next Decade (Savickas, 2003b).

Beyond the one graduate course requirement within CACREP accredited programs, state licensure or the NCC credential, traditional counselor education has found few ways to bring career development preparation innovation to scale. This remains troubling considering college students identify the need for career planning assistance as the most dominant area of concern that students experience (Niles & Harris-Bowlsbey, 2009), and national studies of student satisfaction indicate that advising is an aspect of college with which students are the least satisfied (Low, 2000). By senior year, more than 41 per cent of college students' parents cite career planning as their number one concern (Savage & Hippert, 2008) and seven in ten adults report, if they were starting over, they would try to get more information about the job (Gallup, 1999). 70 per cent of college academic advisors want to know more about how to help college students with making career decisions, and more than 80 per cent want to know more about how to motivate students with respect to career and academic planning (NACADA, 2007). Within organizations career development is recognized as a key organizational change strategy (Simonsen, 1997) and career coaching continues to gain legitimacy as a business tool (Coutu & Kauffman, 2009).

A special issue of the ***Career Planning and Adult Development Journal*** (Feller and Davies, 1999), the ACES/NCDA Commission on Career Development (Hansen & Associates, 2000), and the recent International Symposium on Vocational Psychology and Career Guidance Practice (Niles, Engles & Lenz, 2009) call for revitalization of career courses and innovation in training career development specialists. Harris-Bowlsbey (2003), Parmer & Rush (2003), Pope (2003) and Tang (2003) each identified the current state of career counselor training within counselor education as a significant weakness. Savickas (2003b) identified a "widespread perception that career counseling has been marginalized because of disinterest among both faculty and students... and counselor educators seem indifferent to career counseling" (p.92). An example of this indifference is noticed by the absence of the term "career counseling" from all 44 chapter titles, and scarcity within the index of ***The Handbook of Counseling*** (Locke, Myers, & Herr, 2001).

Wyrick (2004) found that CACREP's current career development educational requirement appeared less than adequate for school counselors. The development of a new specialization identified as career develop-

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ment facilitators (CDF's) has surfaced as an alternative training strategy and credential, while a burgeoning supply of career coaches and Internet entrepreneurs attempt to meet unmet adult and youth career development competencies.

Parallel calls for a more innovation-based economy and creatively driven workforce able to convert a wealth of technology into commercial enterprises and entrepreneurial start-ups which create jobs and wealth, and the need for a STEM literate citizenry places career development preparation in the forefront of what might be called Sputnik II. Yet, as in many previous education, counselor training, school to work transitions, and employee development reform efforts, a lack of interest and leadership in preparing gatekeepers able to help those seeking and promoting STEM efforts could lead to a big thud!

Complexity Demands Lifelong Learners, STEM Talent, and Innovation

Facing unprecedented economic restructuring within society, increasing percentages of jobs can be completed, outsourced, and created anyplace in the world. About half of the U.S. workforce (85 to 90 million adults) lacks the skills to function well in the global economy, or to earn family-sustainable wages according to the National Commission on Adult Literacy (2008). In addition, American 25-35 year-olds are not as well educated as their parents (Christensen, Johnson, & Horn, 2008) even though employers expect "talent on demand" (Cappelli, 2008). Electronic trading, sophisticated technologies, and globalization have dramatically impacted learning, work, and success expectations. Rapid growth exists for both high education, managerial and professional specialty occupations and low education, in-person service jobs which are hard to automate or outsource.

A growing "risk shift" (Hacker, 2006) between owners and workers demands more personal responsibility for health care, retirement security and lifelong learning as uncertainty and insecurity for workers at all wage and benefit levels grows. Innovation and creativity cumulatively produce change faster than education and students, or adults and employee development can adapt. Complexity, information overload, and infinite course, program and career choices demand focused attention, reflection, and personal resilience in learning the skills needed in a workplace able to move workers and work overnight. As Mellow (2008) stated: "With the advent of what has been termed the Knowledge Era, or the Innovation Economy, a college education is more important than ever before. We are all keenly aware that people in this economy must be highly educated to be both productively employed and to participate meaningfully in their communities. But this is also the bad news, because

it means that in order for us to be of service to the people of our country, higher education has to do a better job. Colleges and universities must learn to not only effectively educate every student who enters our institutions, but we must recruit and succeed with a significantly larger swath of the adult population in America" (p. 3).

In highly developed economies the ability to innovate, create and motivate are skills increasingly in demand. The application of comprehensive responses to complex issues demands broadly educated citizens and increased levels of technological literacy. As a result, a rigorous education advances levels of opportunity. With decreasing supply of these attributes available across all U.S. socioeconomic classes, these attributes are available and rewarded regardless of geography. Within a globally connected world, the supply of mediocrity, redundancy, and passionless effort grows, and it is not well received, appreciated or rewarded. Kenney (2007) observes that whole sectors of the U.S. are "a mediocre quality society" with little future for workers who cannot become knowledge workers even in manufacturing.

Workplace Challenges for Even the Most Talented

Mishel, Bernstein, and Shierholtz (2008) identified five dominant and emerging themes regarding the new workplace: strong growth in productivity; weak growth of jobs; stagnant or falling real household income for families; increasingly unequal distribution of the benefits of economic growth; and increased income immobility produced by the previous factors. Those at the very top 10 per cent of the income ladder reaped 90 per cent of all the growth from 1986-2006. For the top 1 per cent, income more than tripled while the bottom half of the top 10 per cent income grew 32 per cent.

Much of the upheaval contributing to such bifurcated income distribution can be attributed to what O'Toole and Lawler (2006) identified as low-cost operators, global competitor corporations, and high-involvement companies. To keep goods and services prices as low as possible, managers of low-cost companies developed a business model focused on continuously reducing all operation costs. Global competitor corporations are agile, global *wave-riders* that move products, services, capital, jobs, operations, and employees quickly and frequently across time zones and continents. Egalitarian workplace organizations with few class distinctions between managers and employees are called high-involvement companies, offering workers challenging and enriched jobs, a say in managing their own tasks, and a commitment to low turnover and few layoffs. O'Toole and Lawler (2006) reported on how these three kinds of organizations were managed and the consequences they created for American workers, the nation's economy, and society.

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Their analysis suggested the following themes essential to understanding workplace change and gaining insight to employment opportunities:

1. Insufficient creation of new "good jobs"
2. Increased choice and risk for workers
3. Increased influence of competitive and economic drivers
4. Increased tension between work and family life
5. Mismatch between skills and business needs
6. Increased social stratification based largely on educational attainment
7. Changing nature of careers
8. Reduction in community and commitment
9. Shortcomings of the healthcare system
10. The boomer demographic imperative
11. Unrealized opportunities to make more efficient use of human capital (pp.14-18)

Understanding the nature of such changes at the local level and having insights about globalization's impact on careers enhances a career development professional's ability to provide sound career assistance. Holding predominately social sciences college degrees and a strong "social" personality, gatekeepers overwhelmingly have limited STEM experiences. With less natural scientific curiosity, first-hand insights about investigative interests or work environments, or a natural affinity to STEM courses, programs or career options, gatekeepers naturally demonstrate little excitement for STEM options or information. While far from malicious this "unconscious incompetence" creates a bias to helping those with natural or latent STEM abilities find opportunities such as those catalogued at www.stemcareer.com and made available through organizations like NASA (http://www.nasa.gov/audience/foreducators/index.html), Project Lead the Way (http://www.pltw.org), and O*NET (http://online.onetcenter.org/find/stem?t=0&g=Go).

Gordon (2009) identifies a cultural bias that exists "against gaining the education and training required for science and technology jobs, but not against technology itself," and Trilling and Fadel (2009) speak to the lack of focus on the socio-cultural reasons of why parents and kids do not focus on STEM. As a result, intentional learning experiences for developing a gatekeeper's ability to communicate about STEM courses, programs and career options is essential for providing the quality of career assistance needed in the evolving workplace.

The Evolving STEM Workplace

Wealth creation and family-wage job opportunities affect client choices. While in some ways resetting growth and prosperity expectations is needed within the evolving workplace, they increasingly depend on developing math and science skills and knowledge. The ability to analyze

problems, imagine solutions, and bring productive, clean, and lower cost ideas is vital within a 24/7 work environment created by deregulation, advanced telecommunication and worldwide access to college. In large measure, the promise of social mobility, not just for a few select learners, or those fortunate to access certain training, rests on achieving much higher levels of STEM skills, access to mentors, networks, and capital for personal and entrepreneurial investments.

The evolving STEM workplace and learning realities are driven by increased complexity and competition. Understanding the challenges of developing talent, access and social mobility requires integrating the following observations into one's career assistance orientation:

1. The best jobs are filled by those who can manipulate symbols, scan and comprehend reading material quickly, and write (communicate) persuasively and technically; are part STEM expert and part marketing specialist; are technically and digitally savvy; are those who see challenges as problems to be solved; and have convincing intrapersonal and interpersonal skills that can attract, motivate, and inspire followers.
2. Opportunities to learn are everywhere. The obstacles of time and place no longer exist as workers who embrace lifelong learning as a job requirement are asked to access educational opportunities anytime and anyplace in multiple formats.
3. School counselors, career development professionals, college and academic advisors, and adult career advisors can no longer "own" content or data, nor as easily compete with technology's appealing styles and currency of information presentation and dissemination.
4. Technological dissemination means that career information and development is becoming more client-centric, encourages fewer traditional "talk therapy" based strategies, stronger cooperative learning alliances, stimulates (ironically) more client/counselor and learner/teacher interaction, and helps clients take greater responsibility for development and career decision making.
5. Since information drives workplace success, the timeliness of workers' information impacts their ability to add value. Accessing, evaluating, and disseminating information via the Internet provides unlimited "development on demand" opportunities.
6. Flexible, efficient, readily accessible and customer friendly development opportunities are becoming competency based and partnership dependent.

The "New Normal" and New Orientation

Bingham and Ward (1994) note that "if vocational counseling was born from the changing demographics and economic needs of this century, then clearly career counseling will need to change in response to the changing needs of the coming century" (p. 168). With the present eco-

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nomic restructuring, forecasts about a slow and jobless recovery, federal deficits of more than $11.5T, and significant decline in basic research funding, many ask "will there be enough jobs to maintain the American Dream?" Increasing demands for innovation, creativity and entrepreneurial attributes required to maintain family-wage jobs needed by "knowledge nomads" have been identified (Feller & Whichard, 2005) as those employees with the capacity to work globally 24/7, able to add value with intuition and agility anywhere, and at any time. With an ability to maximize technology and negotiate digital databases surpassing the influences of time and geography, knowledge nomads can produce and deliver on-demand excellence. Increasingly, career development professionals recognize the urgency of new models, strategies and orientations to accommodate the "new normal" within the workplace. This context shapes opportunities and helps gatekeepers understand why more workers feel "nervously employed." As a result, providing career assistance requires asking new questions regarding:

...reinvigorating the professionalized benevolence that was championed by Progressive reformers such as Parsons and renovating the models and materials that they use to help individuals cope with changes in the work world that are every bit as daunting as the changes that transformed human nature in 1910 (Savickas, 2003a, p.88).

As a result, the following key questions led to the proposal for a STEM Centric Career Development orientation needed within traditional graduate level counselor education, career development professionals' training, and programs committed to developing adult and youth career competencies.

1. How can career assistance inspire adults and youth to engage in STEM courses, programs and career options necessary to solve problems in the frontiers of alternative energy, climate change, nanotechnology and space exploration? These sectors create high wage jobs; rely on basic research and development, design, marketing and sales, and global supply chain management.
2. How can career assistance strategies and resources address the looming shortage of skilled science, technology, engineering and math workers, the lagging performance of students in science and math, and the limited STEM literacy of citizens?
3. How can career development professionals collaborate with STEM stakeholders to increase college access, a college going culture, high quality career technical education, "rigor and relevance" in course and training options, and use of social networks to maximize personal networks and electronic "real-time" information systems?
4. How can career development professionals motivate clients to develop the technical, leadership, inventive and entrepreneurial competencies

needed in the evolving workplace, inspire internal drive (Pink, in press), accelerative career exploration, and enhance career management?
5. How can trainers of school counselors, career development professionals, and adult advisors stay current in understanding the success traits of the evolving school and workplace, increase competence in STEM initiatives, and expand informal and self-directed technological learning communities?
6. How can advocacy for government funded basic research become understood as a job creation strategy?
7. What role do career development professionals have in articulating the relationship among economic development, technology transfer, wealth creation, and job opportunities? The proposed STEM centric orientation suggests change is needed within career development practice as well. New practices typically stem from preparation programs that identify changes in client needs.

A STEM Centric Orientation

While the Soviet's launch of the satellite Sputnik raised questions about the relationship between math and science superiority and military power, the NDEA elevated the importance of counseling and guidance. Career development efforts expanded as higher levels of funding advanced school counseling, testing and guidance. Educational guidance became a priority and focused on the identification and counseling of scientifically talented students. Counseling training and institutes in colleges and universities were established by this federal legislation.

Since then guidance and counseling moved from a position-services to a strengths-based comprehensive program model. Ideally, career guidance and counseling content is mandated and delivered systematically and regularly through the guidance curriculum, individual student planning and responsive services (Gysbers & Lapan, 2009). Such efforts hold tremendous potential of addressing outcomes sought within a STEM centric orientation as it moves to scale. Unfortunately, too many clients approach career decisions randomly with various levels of readiness and accurate information. Variability is shaped by the influence of educational access, significant role models, intentional experiences, and opportunities to construct personal meaning about their possible selves (Marcus & Nurius, 1986). Developmentally appropriate interventions can prove helpful in accelerating career awareness, stimulating exploration and creating motivation for career planning competency attainment. Brown and his colleagues (Brown & Krane, 2000; Brown, Krane, Brecheisen, Castelino, Budisin, Miller, & Edens, 2003) re-analyzed effectiveness studies and identified the use of written exercises, individualized one-on-one sessions, use of information about the world of work, role-modeling, and helping clients develop their support network as the five most beneficial

career development interventions. Dykeman, Wood, Ingram, Pehrsson, Mandsager and Herr (2003) created a four-cluster taxonomy (advising, curriculum, awareness, and work-based) for structuring the delivery of career development interventions in schools.

Resources and Strategies Supporting STEM Centric Preparation

STEM centric preparation builds upon the power of the therapeutic response and alliance to create readiness for development. When personal awareness, insight and action planning occur together deep learning follows. Like other interventions counseling serves as a treatment and/or stimulus. Career counseling is a therapeutic modality that goes beyond discussing and dispensing information and as a result personal counseling and career counseling goals are inseparable (Crites, p.28). The challenge in counselor and career development preparation is to expand conscious and unconscious competence in understanding the STEM talent initiatives and needs presented here. As gatekeepers move beyond helping clients gain "self" awareness only to insights about interactions with "systems", richer career assistance takes place. Gatekeepers skilled at scanning "systems" for change find greater access to resources and strategies. Those trained to integrate issues related to work and learning options, employment needs, economic and business trends, and relationships among invention, wealth and job creation provide more comprehensive and timely career assistance. STEM centric career development preparation includes intentional efforts so that all clients evaluate STEM courses, programs or career options. This "conscious competence" of a gatekeeper's expanded view of the "self" and "system" interaction makes him or her worthy STEM advocates. As a result, strategy and resource development built on the following examples can enhance STEM talent development and gatekeeper training needed in a Sputnik II era.

www.stemcareer.com is a depository of STEM career information, video tutorials, and research and learner resources updated weekly.

The Real Game www.realgame.com/usa.html is a highly engaging classroom and group simulation that prepares clients for success in life, not just work or education. It's the most effective career resource I've seen to create readiness, and provide interventions which develop career management competencies.

TEST Learning Resource Center http://itestlrc.edc.org provides learnings and resources from projects across the U.S. shared nationally to improve policy and practice in increasing the numbers of students pursuing STEM careers.

NASA's Educational Infrastructure www.nasa.gov/offices/education/about/index.html, and
NASA Educational Programs http://www.nasa.gov/offices/education/programs/index.html are a *goldmine* for those seeking or promoting STEM options.

NASA Space Grants
http://www.nasa.gov/offices/education/programs/national/spacegrant/home/index.html include 52 consortia which fund fellowships and scholarships for students pursuing careers in STEM, as well as curriculum enhancement and faculty development. Member colleges and universities also administer pre-college and public service education projects in their states.

When advising clients about training or course options refer to *as compared to who* so that clients understand that their skills must compete globally. Respect that most STEM graduates, post doctorates and employees have completed rather linear or narrow sequences of courses and experiences. Their success does not naturally include extensive career development competencies and career management skills. When working with *undecided* students temper the idea of *taking exploratory or introductory courses*, those that are generic math and science courses and not transferable to a STEM career pathway. "It is easier to stay on a STEM pathway than to return to it". (Lisa McLoughlin, Greenfield Community College, MA, personal communication, September 4, 2009).

Rather than just confirm expressed STEM interests, affirmatively check to make sure all clients have some form of STEM exploration from which to evaluate STEM options. Multi-potential clients often have no STEM experience from which to consider options. Resist seeing clients as *math or science people* which can limit their view, supports the negative social and cultural bias about *nerds* or *intellects*, and fails to acknowledge that all citizens need greater STEM literacy. Develop modified STEM Career Institutes to immerse gatekeepers in work environments and training programs that stretch their insights about investigative and craft work environments. Make use of assessment tools such as the www.cdminternet.com which affirmatively highlights STEM options. Promote and prize STEM success and the demanding nature of its academic requirements. Recognize that most STEM recruiting efforts are *push* not *pull* efforts, to make STEM mainstream recruiting efforts need to focus on *pull efforts*. Promote more contextual, project based, and high expectation career and technical STEM learning. Bring attention to the socio-cultural reasons why parents and learners fail to focus on or prize STEM *giftedness*. Address the cultural gap where entertainers and athletes make headlines and are revered, but few take notice of scientific

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or engineering breakthroughs. (Charles Fadel, Cisco Systems, personal communication, October 19, 2009). Identify STEM able teacher and counselor education candidates to combat the tragic undersupply of STEM personnel. Promote STEM and invention as "cool." Highlight the relationship of STEM to economic growth and well-being. Teach all clients about the relationship of STEM to the offshoring of jobs. This STEM-centric proposal for career development preparation fails to adequately cover the complexities of curriculum change, or the place of science and basic research in a consumption society. Systemic change within the capacity of a relatively small interdisciplinary field of counselor education and career development is not easy. Yet, significant government leadership, and professional voices articulating the value of developmental processes and intentional STEM efforts can redirect a culture driven by immediate results and short term payoffs. Anything less fails to acknowledge the vulnerable condition of America's competitive position and inability to create a sustainable future. Honoring human potential, fully developing talent, and providing an intentional orientation to STEM opportunities can improve the human condition and move preparation programs to be ready to respond to the potential of Sputnik II.

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