Tempered Radical Leadership in Technical Education: Filling the STEM Skills Gap

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Abstract

American industry is struggling to find qualified applicants to fill job openings. This study investigates: the shortage issues related to competent, skilled workers; the link between education and work; the technical education delivery; and the demographic evidence of youth unemployment and an aging workforce. Businesses and higher learning institutions are stakeholders of our nation’s economy. An overview of how one technical college, Ranken Technical College (Ranken), is executing its solutions to this paradigm shift in career training will provide a working model for strategic planning, change, and positive outcomes.

The study findings will identify educational leadership strategies that close the skills gap and provide recommendations for strengthening the bond between education and industry. The development of a learning continuum that spans our academic system and science, technology, engineering, and math (STEM) driven industries will prime the technical occupations’ pipeline with qualified future workers. It is also theorized that the leaders of this movement will personify the tempered radical approach of leadership, a version of transformational leadership.

Ranken Technical College is utilizing its - “Prime the Pipeline”- concept to create career pathways. Its technological milieu and state-of-the-art laboratories offer industrial resources that other colleges cannot. An analysis of the Ranken working model of industry partnerships and STEM outreach programs will be provided, as well as an evaluation of the tempered radical approach to leadership and its effect on change. A strategic plan of best practices recommended to enhance the collaborative efforts between education and industry will be presented.
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Introduction

Our nation is facing a growing technical applicant skills gap, which is affecting business and industry, particularly STEM occupations. The health of the workforce pipeline weighs heavily on the country’s economic prosperity. A surge in birth-rates after World War II, known as the baby boom, produced a swell of labor-force entrants 20 to 25 years later (1977-1982). The United States relished in a time of rising workforce productivity, a richer standard of living, and a rise in college bound citizens. The question steering this research is: In the decades to come, how can our nation’s educational systems and commercial enterprises ensure a reduction of the growing skills gap affecting business and industry (i.e., STEM occupations)?

Recent demographic evidence supports that youth unemployment and an aging workforce will have a substantial effect on the country’s labor market. The U.S. Bureau of Labor Statistics reported that there were over five million job openings in May 2015. Not only was there a lack of workers but candidates lacked general workplace skills (Wyman, 2015, p. 23).

The relationship between education and business depends on leadership poised to build a strong workforce. Without a transformation of our current educational channels into an interdisciplinary system that crosses traditional academic boundaries, the skills gap will broaden. Tempered radical leaders, ready to join the ranks of this futuristic movement, are necessary to prepare tomorrow’s workforce.

Project

Problem Statement

America is experiencing a skills gap crisis and the problem is systemic. Resolution calls for integrating workforce training at both the secondary and post-secondary levels of education. Policy changes to implement a systemic shift in the way students are prepared for careers will help fill the gap and improve regional economies. The inclusion of industry in this redesign remedies guessing what a career-focused curriculum should look like. Industry input regarding
required skills and industry standards will provide the template for essential content.

The greatest advantage of education and industry working collectively is the legitimacy, power, and resources they share (Meyerson, 2004, para. 19). Fleming (2014a) wrote, “In 2018, Harvard University predicts only 33 percent of all jobs will require a four-year degree or more, while the overwhelming majority will be middle-skilled jobs requiring technical skills and training at the credential or Associates Degree level” (para. 6). A two-year investment at a community college or technical college can deliver the credentials and training needed for a prosperous career. The impact of Fleming’s video “Success in the New Economy,” Figure 1, started a grassroots movement that caught America’s eye (Fleming, 2014b). A student-centered, career-focused curriculum including pedagogy technology, is a successful alternative to the four-year university commitment.

Research indicates there are five alternative paths to success that do not require a bachelor’s degree. According to Carnevale, Jayasundera, and Hanson (2012), “The five major CTE (career and technical education) pathways at the sub-baccalaureate level include: employer-based training, industry-based certifications, apprenticeships, postsecondary certificates, and Associate’s degrees” (p. 3). Career and technical training is becoming the entry-level requirement for many middle-skilled jobs.

Carnevale, Jayasundera, and Hanson (2012) reported:
There are 29 million middle jobs in the United States today. In a labor market with roughly 139 million jobs and 61 million jobs that pay at least middle-class wages, one in every five jobs and nearly half of all jobs that pay at least middle-class wages are middle jobs. Some jobs pay significantly more than the average of $35,000. Over 11 million middle jobs pay $50,000 or more annually, and 4 million pay $75,000 or more. (p. 3)

The college-for-all mindset deserves broader interpretation addressing the value of a post-high school credential (Fleming, 2014a, para. 10). This concept is changing the way people think about education. High school counselors are noticing a shift in parental support of skills-based education, but some parents cannot let go of tradition. Parents are still fixed on their kids going to a four-year university (Aubry, 2016).

Ranken Technical College will serve as the working model for this research. Ranken was founded in 1907 by David Ranken, Jr., a potato farmer from Ireland. He arrived in St. Louis in 1862, bringing with him a dream to end the prejudice against manual labor and the notion that common work is not respectable. He founded the David Ranken, Jr. School of Mechanical Trades to educate young men in the mechanical trades and the dignity of labor (Access Genealogy, 2012, para. 1-4).

Ranken Technical College is a private, not for profit institution of higher education accredited by the Higher Learning Commission of the North Central Association of Colleges and Universities. The college awards two-year associates degrees and four-year Bachelor of Science degrees in Architectural Technology and Applied Management, as well as certificates in 14
technical fields. The Ranken mission statement reads: “Ranken Technical College is a private, non-profit, degree-granting institution of higher learning whose primary mission is to provide the comprehensive education and training necessary to prepare students for employment and advancement in a variety of technical fields” (Ranken, 2014, p. 2).

In my role as grant administrator for Ranken Technical College, data collection, program tracking, and distribution of that information are my responsibility. Evidence findings pertaining to the STEM outreach programs Ranken delivers are products of the resulting data collected to support grant goals and objectives.

**Literature Review**

**Transformational Leadership**

The transformational leadership style lends itself to change and improving individual and collective performance within organizations. This approach demonstrates four leadership behaviors: individualized consideration, intellectual stimulation, inspirational motivation, and idealized influence. Transformational leaders are considerate and respectful toward their employees, tend to innovate and welcome change, motivate their employees with high expectations, and behave as good role models (Phaneuf, Boudrias, Rousseau, & Brunelle, 2016, p. 30). This style of leadership illustrates a relationship-oriented personality.

According to Northouse (2016):
Transformational leadership is a process that changes and transforms people. It is concerned with emotions, values, ethics, standards, and long-term goals. It includes assessing followers’ motives, satisfying their needs, and treating them as full human beings. Transformational leadership involves an exceptional form of influence that moves followers to accomplish more than what is usually expected of them. It is a process that often incorporates charismatic and visionary leadership. (p. 161)

A study conducted by Abbas, Iqbal, Waheed, and Naveed Riaz (2012), involving 200 employees from schools, colleges, and universities in Pakistan, examined the relationship between transformational leadership and innovative work behaviors. Two data collection instruments were used: the Multifactor Leadership Questionnaire, and the Innovative Work Behavior Scale (IWBS). The researchers believed transformational leaders are analytical, active, effective, and result oriented. They also considered transformational leadership as the ideal in the educational sector because it promoted pragmatic change and innovation (Abbas et al., 2012, p. 19). The Pearson correlation coefficient, which is a measure of the linear dependence between two variables, was used to reveal that all of the transformation leadership facets had a significant positive correlation with the four aspects of innovative work behavior: idea promotion, idea generation, work commitment, and idea implementation (Abbas et al., 2012, p. 26). The study conclusions promote transformational leadership in the educational realm.
In the primary and secondary school climates, transformational leadership was linked to teachers’ positive perceptions of innovation. According to Allen, Grigsby, and Peters (2015) teacher engagement was stimulated by principals who exhibited transformational characteristics (p. 5). A correlational study conducted in a suburban school district in Texas discovered a significant positive relationship between the inspirational motivation of a leader and the seven dimensions of school climate (order, leadership, environment, involvement, instruction, expectations, and collaboration). Leadership that displays optimism toward initiatives and empowers and motivates its staff has a positive influence (Allen, Grigsby, & Peters, 2015, p. 15).

**Tempered Radicals – The New Transformational Leaders**

The tempered radical approach to leadership parallels the transformational leadership style. Tempered radicals work toward transformational outcomes by incremental means, moving toward their goals while adhering to their values, asserting their agendas, and provoking change without jeopardizing their hard-won careers. Untempered radicals use drama and heroics to effect change, whereas tempered radicals use calm persuasion. Pearce (2014) wrote, “In the tempered radical, both professional and personal identities are equally and simultaneously present” (p. 186).

Meyerson coined the term “tempered radicals” to describe people who can straddle the insider-outsider divide in thinking about organizational change (Kezar, 2012, p. 728). Meyerson upheld, “Tempered radicals are not heroic leaders of revolutionary change; rather, they are cautious and committed catalysts . . . organizational insiders who contribute and succeed in their jobs” (Under-the-Radar section, para. 1-3). Tempered radicals differ from the traditional transformational leader in that they are trying to change the system while transforming others and preserving their true self.

Whether resisting quietly, leveraging small wins, or mobilizing others in legitimate but powerful ways, tempered radicals turn personal identity threats into opportunities to make a positive difference in their companies (Kezar, 2012, p. 729). These change approaches are based on their comfort and understanding of power dynamics. Rather than using formal authority to contest the status quo, tempered radicals choose a variety of strategies to influence individuals. For example, tempered radicals are able to design a personalized change framework working with other bottom-up leaders fostering the exchange of ideas, new ways of framing issues, promoting dialogues, and personal interactions (Kezar, 2012, p. 729).

From a philosophical perspective, regarding what knowledge is and how we gain knowledge, tempered radicals, as strategic entrepreneurs, would likely engage in action research to find solutions for problems. This process of inquiry that creates alternate solutions is suitable for tempered radicals operating as entrepreneurs when delivering strategic initiatives (Pearce, 2014).
Meyerson argues that tempered radicals reflect important aspects of leadership that are void in the more traditional roles of transformational leadership. These leaders are inclined to be less visible, less synchronized, and less affixed with formal authority. Their humble grassroots attitudes allow them to be more local, more diffuse, and more resourceful than their modern-day hero counterparts (as cited in Kezar, Bertram Gallant, & Lester, 2011, p. 133). Kezar et al. (2011) wrote, “Tempered radicals are grassroots leaders because they are the following: working to create change, operating from the bottom up, lacking formal authority, and creating changes often outside the status quo” (p. 130).

Like transformational leaders, tempered radicals can be charismatic and powerful. Their vision for change has the capacity to create strong, positive personal connectedness and invokes a willingness to change among followers. These visions lead followers to go beyond themselves to serve a cause greater than themselves. Fruitful and creative reform conditions have influence on the masses, permitting these visionaries to unfreeze organizations and compel them to change (Cawsey, Deszca, & Ingois, 2015, pp. 113-114).

**Strengths of the Tempered Radical.** Tempered radicals often find themselves breaking away from the expected. Sparks (2005), drawing on his interview with Meyerson, author of *Tempered Radicals: How Everyday Leaders Inspire Change at Work*, inquired about tempered radicals being pressured to conform when challenging the majority and their fear of social ostracism (Holding on to Goals section, p. 22).

In response, Meyerson explained:
Effective tempered radicals hold on to their deepest goals, which enables them to push through their fears and choose their battles effectively. This clarity enables a person to know when to let things go, when to really push, and what kinds of action to take. (as cited in Sparks, 2005, p. 22)

While tempered radicals view giving up too quickly as dangerous, they also recognize when it is time to acknowledge the right choice is to move on (Meyerson, 2008, p. 3094).

A study conducted by Kouzes and Posner identified five fundamental practices that enable transformational leaders to get extraordinary things done. They developed a unique prescriptive model of leadership by interviewing more than 1,300 middle- and senior-level managers. Using the “personal best” experiences of the managers, they identified the following five strategies: model the way, inspire a shared vision, challenge the process, enable others to act, and encourage the heart (as cited in Northouse, 2016, pp. 174-175).

Meyerson (2004) wrote:
The key assumption underlying tempered radicalism is that organizations are continuously evolving, adapting to market conditions, workforce requirements, and technological innovations. Sometimes the changes are dramatic, but most often they take the form of incremental adjustments. Tempered radicals push and prod the system through a variety of subtle processes, rechanneling information and opportunities,
questioning assumptions, changing boundaries of inclusion, and scoring small wins.
(Under-the-Radar section, para. 11)

**Limitations of the Tempered Radical.** Literature provided by Northouse substantiates transformational leadership style critiques useful in demonstrating weaknesses in tempered radicalism. It is suggested that transformational leaders lack conceptual clarity due to the realm of activities they are pursuing (Northouse, 2016, p. 178). Tempered radicals, on the other hand, tout clarity of goals as one of their strengths. A second criticism of transformational leadership is the challenged validity of the Multifactor Leadership Questionnaire (MLQ), an instrument used by leaders to evaluate four factors of their behaviors: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. Further, little distinction exists between the four factors of the MLQ (Northouse, 2016, p. 178). An evaluation of tempered radicalism using the MLQ could not be found. Thirdly, there is a lack of evidence that a causal link exists between transformational leaders and changes in followers or organizations (Northouse, 2016, p. 179). A causal link between the tempered radical and followers was not available. Another criticism of transformational leadership is that it is elitist and antidemocratic, a “heroic leadership,” so to speak (Northouse, 2016, p. 179). These traits are more typical of the untempered radical, not the tempered radical. Additionally, there is potential for abuse of transformational leadership if followers do not challenge what they do not understand (Northouse, 2016, p. 179). The tempered radical is committed to mobilizing others in legitimate but powerful ways. Finally, many scholars emphasize that transformational leadership treats leadership as a personality trait rather than learned behavior (Northouse, 2016, p. 178). The disposition of the tempered radical is characterized by a humble grassroots mindset, which is very likely learned behavior, but the two classifications are not mutually exclusive.

A study conducted by Phaneuf et al. (2016) examined how leaders who have relationship-oriented personalities emerge as transformational leaders. The analysis tested the tempering role of an organization’s objectives on the relationship between personality and transformational leadership. The study employed a sample of 89 leaders and their 643 followers in a public safety organization in Canada. Research findings suggested the connection between the two behavioral models depended on circumstantial mediators (Phaneuf et al., 2016, p. 33). Tett and Burnett (2016) believed the personality trait activation model suggests managers might motivate employees based on their personality traits. Appropriate cues prompt trait expressions that yield mutually valued outcomes. Managers can tap into trait expressive opportunities by means of job design, team building, and strategic employee placement (p. 513). Bartram (2005) proposed that personality variables could be matched with transformational leadership dimensions, compounding performance prediction and the leadership behaviors in use (as cited in Phaneuf et al., 2016, p. 31). The correlation of predictors of transformational leadership can be seen in Table 1 below.
Table 1

<table>
<thead>
<tr>
<th>Compound Variable</th>
<th>Traits included in the compound variable</th>
<th>TL dimension associated with the compound variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supporting &amp; Cooperating</td>
<td>Caring; Democratic; Affiliative</td>
<td>Individualized Consideration</td>
</tr>
<tr>
<td>Creating &amp; Conceptualizing</td>
<td>Innovative; Independent; Conventional (reverse)</td>
<td>Intellectual Stimulation</td>
</tr>
<tr>
<td>Interacting &amp; Presenting</td>
<td>Socially Confident; Outgoing; Modest (reverse)</td>
<td>Charisma</td>
</tr>
<tr>
<td>Leading &amp; Deciding</td>
<td>Need for Power; Persuasive; Decisive</td>
<td>TL – Global Score</td>
</tr>
</tbody>
</table>

According to Phaneuf et al., (2016):
This research is not without limitations. A first limitation is the sample size, which is relatively small. This reduces the statistical power of the analyses, and thus lessens the probability of finding smaller effects. Moreover, the specificity (public safety) of the sample could limit the generalization of the results. (p. 34)

Conceptual Framework

This research examines the need for a paradigm shift in the educational model designed for career readiness. The tempered radical perspective of leadership has the potential to strengthen the bond between education and industry to close the skills gap.

DeWitt (2012) wrote:
Tempered radicals may be teachers, teacher aides, parents or principals who want to see changes because they do not necessarily agree with the status quo, but they don't want to wear their opinions on their sleeves either. Tempered radicals want to work within the present system in order to change it and make it better for all students, not just those who do well on tests or fit into a nicely wrapped box. (para. 5)

Action research methodology. Action research is grounded in present day problems. O’Leary described action researchers as working on real-world problems at the intersection of the production of knowledge and a systematic approach to continuous improvement (as cited in Pearce, 2013, p. 183). The action research process examines a progressive problem and derives workable solutions. Action research can be flexible and spontaneous, which makes it an especially useful methodology for the tempered radical (Pearce, 2013, p. 192).

Twenty-first century skills. The prominence of STEM education and its integration into current scholastic systems continues to gain attention. Educators and policy makers are reassessing current instructional practices and developing teaching methods and standards that will reshape how and what students learn. To be successful in the 21st century, students should be capable of using the lessons they have learned and evidence observed to solve real-life challenges and problems.
One fundamental problem in the K-12 arena is the lack of continuity of STEM curricula and STEM standards. These core educational components are not sanctioned by the federal government, but rather individual states. STEM standards, or achievement markers, correlate with college and career readiness. Content mastery alone falls short without critical thinking. The ability to memorize facts and procedures, the topics most commonly tested in previous state accountability systems, are useless without the ability to apply knowledge and skills within and across disciplines. Pellegrino and Hilton (2014) wrote, “Business leaders, educational organizations, and researchers have begun to call for new education policies that target the development of broad, transferable skills and knowledge, often referred to as ‘21st century skills’” (p. 16). The demands of 21st century STEM careers require 21st century skills (Community for Advancing Discovery Research in Education, 2013, p. 3).

**STEM integration in the educational continuum.** Technical colleges attempting to bridge the skills gap have strengthened the link between work and education, but the optimal solution lies in reaching students at a younger age and making them aware of STEM career opportunities before they reach high school. Placing the inspiration seed is the first step to nurturing students’ interest in exploring career options.

According to Wyman (2015):
High school and college graduates entering today’s workforce lack problem-solving, teamwork, critical thinking, and oral and written communication skills. Like job-specific technical skills, these foundational skills are best learned through hands-on application. Career and technical education (CTE) and training are the best ways to enter and stay competitive in a rapidly changing labor market. (p. 23)

According to Sly (2015), “Research has demonstrated that interdisciplinary teaching can increase students’ motivation for learning as well as their level of active engagement” (para. 4). Dependent on students’ development levels, several teaching strategies emerge that can enhance interdisciplinary learning: place-based learning, project-based learning, experiential learning, Socratic learning, and interdisciplinary learning. When students are able to make connections across multiple disciplines, they are able to see the bigger picture of how things fit together and become more interested in the topic they are studying (Sly, 2015).

**Education and industry partnerships.** Skills translate into reading, writing, math, and the ability to communicate effectively. STEM skills are notably technical skills that require certifications and vocational technical training. Responsibility lies with both industry and educational leaders to partner with and educate the public about the benefits and earning potential a two-year technical degree, certification, or licensure can offer. These partnerships have the capacity to produce skilled talent for business and industry according to their trade qualifications.

Vadnal, Bragg, and Whitt (2012) explained:
Improving STEM education will require a close interaction among organizations, particularly K-12 institutions, higher education institutions, and private industry. The
intent is that if students can be educated, participate and compete in various STEM activities, they will be more open to explore STEM-related education and pursue critically-needed STEM-related employment opportunities in the region. (pp. 4-6)

Research indicates that a shortage of skilled workers exists due to the skills gap. According to Boettcher (2014), “Frequently called the ‘skills gap,’ the problem of finding the right workers with the right skills and credentials exists even in an era of persistent unemployment” (p. 32). A study conducted by the Organisation for Economic Co-operation and Development (OECD) found hiring companies are challenged to find employees with technological skills as well as problem-solving, critical-thinking, communication and life skills. Lower proficiency levels in these skills affect a country’s global competitiveness, and the United States is losing ground in STEM skills compared to peer countries (Boettcher, 2014).

Shoun and Hornberger insisted:
Businesses can play an important role through mentoring programs, internships, job shadowing and other ways to show students the “world of work.” Everyone responds to incentives. Business, education, and not-for-profit agencies need to collaborate and provide incentives that allow rich and lasting educational experiences to fuel the desire for achievement and success. These incentives must be put in place to allow educational accessibility, affordability and opportunity for desiring and deserving students to obtain the knowledge and skills that will benefit them and their families for a lifetime! (as cited in Ranken, 2010, p. 1)

The divide between educational structure and industry demands increasingly complex technologies. Confirmed demographic proof of youth unemployment and an aging labor force are contributing factors to industrial employers’ struggles. Tangible barriers that contribute to the gap are evidence of recreational drug use and criminal backgrounds. With the legalization of recreational drugs in some states, those barriers will intensify when applicants cannot pass a simple drug test or criminal history check.

Every industry has set skills standards. These standards define the academic training criteria and skills mastery required for competent job performance. According to Davis (2006), “Implementation of national industry-based skill standards can help CTE (Career Technical Education) programs assess worker skills and shape relevant education reform efforts, including teacher preparation” (p. 22). Curriculums designed to align with fundamental on-the-job training provide future employees with the needed skills. These collaborations can effectively ensure there are no compromises in the level of educational integrity.

Carnevale, Jayasundera, and Hanson (2012) wrote, “While the American CTE system has prepared workers for 29 million middle jobs, it has the potential to provide even more by increasing its alignment with education and career pathways” (p. 8). Job openings created when people retire or move into higher-level jobs represent the number of new skilled workers needed in a particular occupation. Carnevale, Smith, and Strohl predicted that between 2008 and 2018 there would be 32.4 million replacement job openings. Ninety-two percent of the estimated 2.8
According to the U.S. Department of Commerce, the predicted growth and outlook for STEM jobs is very promising. STEM occupations are projected to grow by 17 percent from 2008 to 2018, compared to 10 percent growth for non-STEM occupations; STEM workers earn about 26 percent more than their non-STEM counterparts; and STEM workers are less likely to experience joblessness than their non-STEM counterparts (Langdon et al., 2011). Demographic evidence supports the assertion that youth unemployment and an aging workforce will have a substantial effect on the country’s labor market. The U.S. Bureau of Labor Statistics reported that there were over five million job openings in May 2015. Not only was there a shortage of workers, but candidates lacked general workplace skills (Wyman, 2015, p. 23).

There is no denying that the stampede of skilled baby boomers bolting for the exits will create problems for America’s technical workforce. Nyce (2007) wrote, “Today, those 55 and older constitute roughly 12 percent of the workforce. The Bureau of Labor Statistics predicts that the 55-plus share of the workforce will reach 20 percent by 2020” (p. 11). Baby boomers occupying the current workforce have developed their own perceptions of job satisfaction, and this perception is expected to influence their date of departure from service. Their experience, values, and search for self-actualization should provoke management’s approach to promoting their higher order needs. While people are retiring later in life, the potential for vacant positions going unfilled by qualified applicants does exist. Life expectancy has risen, and many healthier boomers indicate they want to stay active, and at least work part-time. In order to bridge the job-skills disconnect, America requires at least 25 percent of its skilled boomers to remain at work until 2025 (Gordon, 2013, p. 28). The labor market continues to lose irreplaceable skilled baby boomers. Leadership must better prepare our future workforce.

Technical faculty support. One major concern among higher learning institutions is retention of qualified faculty guaranteeing that they have the resources needed to prime the pipeline with highly skilled workers. Technical college faculty are grounded in their industrial fields, bringing a high level of expertise to the classroom. The majority of them do not have teaching credentials that would otherwise prepare them to teach the masses. For these educators, taking on the K-16 population is a real challenge. According to Kezar & Elrod (2012), “Stakeholders want higher education to encourage interdisciplinary learning so that students graduate with the requisite skills to take on complex jobs in science, policy, business, and industry” (p. 16). Many instructors will not understand the concept of interdisciplinary learning, which is the process of integrating knowledge and skills across disciplines to problem solve. The process may seem foreign to them, although they likely use it in their classrooms every day without realizing it.

Emotional intelligence is having the ability to monitor one’s emotions as well as the emotions of others. Research shows that emotional intelligence is linked to job satisfaction. In regard to teaching faculty, a higher level of emotional intelligence can enhance the teaching experience for both students and faculty. According to Raj & Uniyal (2016), “Today we are in
the world where there are many emotional disturbances which put an adverse effect on the job satisfactions of the teachers. Only emotionally intelligent teachers can control and manage these situations” (p. 97). The college-age timeframe, a crucial period of one’s life, is a contributing factor to faculty job satisfaction. Student success is an indicator that teachers have emotional intelligence. The results of the study conducted by Raj and Unival recommended workshops, counseling sessions, group and social activities, yoga and meditation be introduced to enhance the emotional intelligence and job satisfaction of teachers (Raj & Unival, 2016, p. 106). Higher education institutions that are proactive in supporting their faculty stand a better chance of retaining them.

For teaching faculty who do have a background in education, their retention can depend on the potential of losing them to industry or the K-12 market where their STEM skills and teaching credentials are in high demand. Financial incentives provided by employers in the private sector outweigh compensation offered by non-profit educational institutions. Technical colleges cannot compete with the higher wages companies pay for industrial specialists. Faculty need a clear understanding of what benefits they stand to gain in exchange for their organizational commitment -- a need for affiliation, and to be a part of a greater whole. The rewards should contribute to their self-actualization, enhance their work situation, and/or provide new opportunities while enhancing their psychological well-being. With respect to work, employees derive self-worth from the successful performance of their roles and responsibilities. Management’s recognition of employees’ success ensures they are valued and their work is meaningful. A positive correlation exists between meaningful work and job satisfaction. Studies conducted by Arnold, Kelloway, McKee, Turner, and Barling (2007) found, “Transformational leadership of supervisors exerted a positive influence on the psychological well-being of workers. Perceiving work as meaningful appears to play a role in explaining this positive relationship” (p. 200).

Educational leadership cannot ignore the risk of losing its talent. It must reciprocate the efforts made by its faculty members with transparency and a genuine concern for employees’ needs. The golden rule is perhaps the most important principal of morality and formal ethics. The golden rule compels us to treat others as we want to be treated by them. The platinum rule is an independent version of the golden rule. According to the platinum rule, you ought to treat others as they want to be treated by you. Rönnedal (2014) explained, “The platinum rule is a more recent invention. It is difficult to find any clear examples of people who defend this rule in the literature . . . but it seems to be a quite popular principle among non-philosophers” (p. 223). The difference between the two rules is that the platinum rule accommodates the feelings of others, (i.e. it is other-oriented). Leadership using this approach could have a significant effect on retention. Strong leadership that supports its faculty, continually evaluates its educational outcomes, and invests in all the tools necessary to facilitate education and training, will cultivate a strong communal foundation.

According to Meyerson (2008):
Individual managers, like individual tempered radicals, can make a huge difference in whether the context feels safe or risky, accepting or hostile, and adaptable or entrenched.
Supportive, nurturing relationships with supervisors and peers can be the organizational equivalent of life vests for tempered radicals battling a strong tide. (p. 3276)

Tempered radicals are boundary spanners, able to translate their vision to appeal to the values of different stakeholders. They are capable of maintaining cognitive complexity and observe change from a variety of perspectives. Collective sensemaking is a tool used to connect people around change. Tempered radicals are astute organizational insiders who navigate the organizational culture and are viewed as legitimate change agents within their institutions (Goldfien & Badway, 2015, para. 2).

There are creative, cost-free approaches to improving employees’ work life quality. A reward system that employs flexibility in an otherwise structured workday, can enrich employees work life and their personal lives (Busser, 2012, p. 46). Like transformational leadership, tempered radical leadership involves behaviors that foster exceptional functioning and promotes an atmosphere conducive to communication and buy-in.

**Working Model – Ranken Technical College**

Ranken’s current president has been at his post since 2009. He shares David Ranken, Jr.’s passion for the mechanical trades, and his education and technical background equip him to lead the college in its mission. Shoun exudes the characteristics of a tempered radical leader with ambitions to provide solutions to the STEM skills gap. Shoun stated, “There is going to be a huge gap in technical careers that will need to be filled when the baby-boomers retire. I think it is important to introduce kids to technology at a very early age. Kids need to know about all of the career and education options that are available to them” (Ranken, 2010). Shoun’s charismatic and tempered radical leadership style put him in good favor with people of influence.

According to Jenkins (2016):

Educationalists take part in “creative entrepreneurship” when they seek to produce new ideas, technologies, and pedagogical methods to expand their educational territory both exponentially and geographically through a creative experience. They then go on to connect with like-minded individuals (professionals and colleagues) forming and fostering international partnerships virtually across the world. Entrepreneurship enters the picture when the ideas or theories created from these modern day “think tanks,” turn into actual methodologies, policies, processes or programs. (para. 5)

Shoun’s role as educational entrepreneur requires educating and developing enthusiasm for a new agenda. Though equipped with formal authority, an institutional shift is best achieved by forming alliances and working in concert with managers and faculty who share his vision. Sometimes it makes sense to work alone, but to make the desired kind of difference, it is best to join forces with others and work as a collective body for commonly valued changes. These choices are not mutually exclusive (Meyerson, 2003, p. 123).
One strong suit of tempered radical leaders is enabling others to act, a strategy that inspires followers to cooperate and take part in the plan. Many educators are content with the status quo, others thrive on change and the innovation that technology provides.

DeWitt (2012) wrote:
Education needs more tempered radicals. There needs to be rule followers who will follow along and the extreme radicals who will fight hard to help change the status quo. However, education also needs tempered radicals who have the perspective of being on the inside and knowing what needs to change to make things better. (para. 6)

Ernest Boyer, an innovator of secondary and postsecondary education, proposed that engaged scholarship includes four types of scholarship: teaching, research, outreach, and integration. Integration focuses on the connections across disciplines and the functions of research, teaching, and outreach (as cited in Franz, 2016, p. 2). The two-way connection between education and community focuses on a reciprocal relationship grounded in added value. Ranken embraces this model. The college’s interdisciplinary approach to education parallels the design of its internal and external STEM outreach programs.

In order to build and sustain the pipeline of STEM educational opportunities at Ranken, the college relies on endowments from industry, alumni, and government agencies. It also depends on industry to share its workforce needs for today and tomorrow. Ranken’s administration is vigilant in meeting the evolving needs of the workforce, not only to serve industry, but to ensure its students are career ready. Ranken (2015) reported, “Demand for Ranken graduates is reflected in the number of companies that have participated in the College’s job fairs . . . since 2010, companies attending the job fairs have doubled in number from 90 to 241” (p. 6). The 2016 fall job fair generated record-breaking results, hosting 375 employers eager to recruit Ranken graduates. Figure 2 demonstrates the perceived quality of Ranken students by the number of participating companies at job fairs.
The pipeline vision conceived by Shoun includes the educational continuum (Figure 3); it continues to thrive at Ranken Technical College (Shoun, 2012).
National Science Foundation grant – Priming the Pipeline. In September 2011, Ranken Technical College received a National Science Foundation (NSF) Advanced Technological Education (ATE) grant to fund the “Priming the pipeline for the St. Louis region: Creating a future high technology workforce” project. The three-year project, an $882,000 venture, proposed provision of a continuum of educational opportunities for students. The progression of programs begins in middle school and continues through the attainment of a two-year associate degree and successful job placement in a technical field, or transfer to a four-year bachelor degree program. Project activities included coordination of science, math and technology-based experiences for middle school students through summer academies and other extra-curricular activities (National Science Foundation, 2011).

Ranken instructional model. One key attribute of Ranken Technical College’s instructional model is the integrated work-based experience. Since 2010, Ranken Technical College has promoted the establishment of innovative college-business partnerships that led to multiple enterprises which provide students with work experience, industrial training, college credit, and/or part-time salary (Ranken, 2014, p. 10). Through this program, students participate in external apprenticeships that provide worksite learning activities in area businesses. Students are placed squarely in the environment for which they are training, allowing them to apply classroom-gained knowledge to real-world situations, and introducing them to potential employers. Internally, students are placed in on-campus, industry-sponsored microenterprise work cells, where they produce products and/or services for companies. These partnerships provide students training on the latest technology and current tools and machines. When Ranken graduates enter the workforce, they enter familiar territory, understand the expectations placed on them, and are ready for a successful career in their chosen field. As a result, Ranken students are well prepared to enter the workforce as apprentice-level technicians and employers have a well-stocked pool of technicians available for hire. Ranken has a 96% job placement rate. Lifetime job placement services are provided to all graduates.

Two features that distinguish Ranken programs from other vocational training are a mandatory work ethic component, and an emphasis on competency-based learning. High on an employer’s list of desired employee traits is a solid work ethic. Ranken’s instructional model requires students learn and display strong work traits. Each semester, students are graded on their work ethics which include personal appearance, professionalism, teamwork, and reliability. Additionally, Ranken students are expected to participate in community activities throughout the school year. These activities range from community service food and clothing drives to program specific support to robotics teams requiring specialized tooling, parts and/or mentoring. Ranken students may also assist with the Summer Adventure Academies held for middle and high school students. Students serve as mentors for these career exploration camps.

STEM outreach programs. Ranken Technical College offers several STEM outreach programs that contribute to the enrichment and economic development of the community and align with its mission statement and values. The NSF ATE grant awarded in 2011, allowed Ranken to expand and grow its STEM program repertoire to serve new and diverse groups within the K-12 community. It also fueled the creation of new alliances.
**Dual Enrollment Program.** Eligible high school seniors who meet the college entrance requirements are admitted into the Dual Enrollment Program during the final semester of their graduating year. These students can earn college credit while satisfying their diploma requirements, tuition free. Ranken has enrolled 128 local high school students in the program since 2010. Eighteen students have graduated from the program, with 17 students currently on track to graduate. Ranken was recently selected to participate in a Department of Education experimental program that allows dual enrollment students to apply for Pell Grants.

**FIRST Robotics Programs.** *FIRST* (For the Inspiration and Recognition of Science and Technology) robotics is a growing program in Eastern Missouri. The annual World Festival Championship takes place in Saint Louis in late-April. Ranken supports many local *FIRST* LEGO League (FLL), *FIRST* Tech Challenge (FTC), and *FIRST* Robotics Competition (FTC) teams to prepare them for competition. Funding for registration fees and equipment allow underserved students in the St. Louis region to gain exposure to robotics and technology. Ranken’s precision machining department collaborates with teams in the advanced robotics programs to machine and produce parts. Students bring schematic designs to the college and machine unique parts, equipping their robots with sophisticated mobility and function. Without Ranken’s financial support, training, and mentoring, many teams would forfeit the opportunity to experience these programs. Nearly 900 students, in grades four through 12, have participated on Ranken-sponsored teams since 2010.

**SkillsUSA Program.** This national program invites high school seniors and post-secondary students to test their technical competencies in many disciplines. Contestants are judged on their performance level, expedience, and craft knowledge. The event culminates from regional to state to national championships every year. Ranken has hosted a district championship on its campus since 2007. More than 200 Ranken students and 452 secondary students (from seven neighboring high schools) have competed in the district event since 2012.

**Summer Adventure Academies.** The Summer Adventure Academies program promotes career exploration and STEM education for students in summer camp experiences. Camps expose students to technical skills, encourage them to complete high school, and inspire them to pursue higher education in STEM-related disciplines. The hope is they will eventually join the workforce in their community. The Summer Adventure Academies engage students in real-world, hands-on camps that demonstrate the skills necessary for technical occupations. The program has grown exponentially since 2010 (Table 2). More than 1,600 students have participated since the program began.
Table 2
Local secondary teachers teaching STEM disciplines are invited to co-teach the Summer

<table>
<thead>
<tr>
<th></th>
<th>Growth</th>
<th>Registration Data</th>
<th>Gender</th>
<th>Ethnicity**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># of Pupils</td>
<td>% of Repeat Pupils</td>
<td># MS Camps</td>
<td># HS Camps</td>
</tr>
<tr>
<td>2016</td>
<td>300</td>
<td>-3%</td>
<td>75 40%</td>
<td>11 11</td>
</tr>
<tr>
<td>2015</td>
<td>330</td>
<td>14%</td>
<td>81 29%</td>
<td>14 12</td>
</tr>
<tr>
<td>2014</td>
<td>272</td>
<td>7%</td>
<td>75 31%</td>
<td>13 10</td>
</tr>
<tr>
<td>2013</td>
<td>255</td>
<td>1%</td>
<td>68 9%</td>
<td>12 8</td>
</tr>
<tr>
<td>2012</td>
<td>252</td>
<td>61%</td>
<td>53 11%</td>
<td>17 7</td>
</tr>
<tr>
<td>2011</td>
<td>154</td>
<td>56%</td>
<td>49 9%</td>
<td>11 6</td>
</tr>
<tr>
<td>2010</td>
<td>87</td>
<td>7%</td>
<td>36 9%</td>
<td>7 3</td>
</tr>
</tbody>
</table>

* Number of students participating three or more years since 2010

** AA African American, AP Asian/Pacific Isle, W White, AI American Indian, H Hispanic, O Other

Adventure Academies alongside a Ranken faculty member or industry expert. This paid opportunity informs educators about technical occupations and the educational requirements necessary to obtain rewarding careers. Educators carry beneficial information back to their students in the classroom. Ninety-nine secondary teachers have taken advantage of this opportunity since 2012.

**Summer High School Internship Program.** This program is for graduating high school seniors who are approved to begin a Ranken program in the fall. It provides an opportunity for summer campus employment while students acclimate to college life. Many interns support the Summer Adventure Academies program, assisting Ranken faculty with the delivery of technical aspects of the camps. Responsibilities include training and mentoring visiting students. Ranken has employed 30 summer high school interns since the program began in 2012.

**Summer STEM Academies for Educators Program.** This professional development program consists of week-long courses, delivering 40 hours of instruction in STEM technology and career preparation. Educators learn how they can integrate technology into their classroom activities. Eligible participants are middle school and high school STEM teachers, counselors and administrators. Educators receive a stipend for attending, plus elective education credits. Graduate credit is an option for participants successfully completing a graded assignment. More than 400 primary and secondary teachers have taken advantage of this training since it began in 2012.

**Work-Based Microenterprise Program.** This program, with the active involvement of regional businesses in our community, helps to establish cooperative work-based learning opportunities for Ranken students. Students benefit from paid-to-work opportunities in their fields, while pursuing their studies. Industry receives the benefit of quality, low cost labor

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without having to outsource their work to other states, immigrants, or foreign countries. Companies participating in this partnership also stand to profit by utilizing government tax credits for hiring apprentices.

According to Ranken (2016):
Ranken has taken the business partnership concept further by hosting and running mini-businesses and production lines on campus. These microenterprises offer easily accessible paid jobs so that students can learn in real work settings and earn money while going to school. (p. 6)

Student benefits include: reducing economic barriers that may otherwise prevent them from pursuing or continuing their education; providing valuable work experience needed to secure full-time employment; acquiring career mentors from participating firms; and obtaining college level credit toward their degree or certificate for work-based experience. More than 630 students have taken advantage of this paid, work-based training since 2012.

**Action Research Plan**

A strategic plan, integrating the planning processes of education and industry to close the skills gap, has taken Ranken Technical College to new heights among business leaders in the Midwest. The systematic approach of Ranken’s educational continuum provides an engaging template of activities designed to inspire interest in STEM career exploration. The evidence illustrates the powerful potential in collaboration. Emerging partnerships between education and industry are creating new opportunities for career readiness. STEM pipeline programs, like the initiatives Ranken has developed, carry benefits to employers, K-12 education, non-profit organizations, and the community. The Ranken “Priming the Pipeline” model can and should be duplicated by other technical colleges and career institutes. Healthy, radical change can be accomplished by tempered radical leadership.

Stan Shoun, president, Ranken Technical College, agreed to an interview to discuss his views on Ranken’s role in filling the STEM skills gap. His revelation was inspiring and provided insight into his leadership style.

Shoun explained:
With any new idea, first thing you’ve got to do is have success, success begins success. I think we’re doing excellent locally. I’m pandering to the state and to some national groups to try to get them to adopt and promote our model. We now have something that has enough pedigree, enough success, and enough support that we can take it to a higher level. (personal communication, December 5, 2016)

Shoun also completed a Multifactor Leadership Questionnaire, a tool that measures a broad range of leadership types, during the interview. He ranked exceptionally high on all
factors relating to transformational leadership. As expected, Shoun yielded a score of zero on the Laissez-faire component.

**Recommendation**

I propose the development and implementation of a learning continuum that spans our academic system and STEM industries will prime the technical occupations pipeline with qualified future workers. Higher education and industry must be proactive in making this happen. Opportunities exist to close the STEM pipeline dilemma. It will require partnerships that embrace the paradigm shift and break the bonds of tradition.

The leaders of this futuristic movement personify the tempered radical approach of leadership. Further study is needed on the effectiveness of the tempered radical leadership model. Tempered radicals are grassroots leaders who have the ability to mobilize social, political, and economic communities to build a better workforce and improve the quality of work life. My research supports the success of these transformational leaders with evidence provided by contemporary researchers like Meyerson and Kezar, complemented by my good fortune to work alongside a tempered radical leader/mentor every day.

The absence of information linking positive employment outcomes to improved program delivery to secondary students leaves employers, educators, and governmental agencies at a loss. Carnevale, Jayasundera, and Hanson (2012) noted, “An essential connection is missing between wage records reported to state agencies that administer unemployment insurance and records at secondary and postsecondary institutions that show their specific courses and the curriculums of the courses” (p. 9). The advantage of collecting, connecting, and distributing this data has the potential to profit many. Students and their parents would also gain access to information about fields of study and careers they had not considered.

**Conclusion**

A solution to fill the STEM skills gap and prime the pipeline with qualified skilled workers exists. It begins with collaborative efforts between education and industry to redesign a technology-based curriculum that meets today’s industry standards. Policy makers are reassessing current instructional practices and developing teaching methods and standards that meet 21st century skills requirements. A paradigm shift in education demands leadership that is open to change and innovation. Tempered radicals work toward transformational outcomes by incremental means. Leadership that conveys the need for change, shares an executable vision, and inspires followers will implement change in tandem with its dedicated workers. Ranken Technical College clearly demonstrates best practices that can be easily duplicated by means of STEM programs integrated into the educational continuum. The optimal solution for inspiring youth to explore STEM and consider careers in technical fields lies in exposing them to fun learning opportunities at an early age.

The knowledge I have gained during my investigation of the STEM skills gap has strengthened my conviction to STEM education, strategic planning, and devising solutions to
solve the problem. I have enjoyed the journey. I will go forward with the skills and confidence I have achieved and use my talents to inspire others and reach new goals.

Ms. Barbara E. Bragg is currently the Director of STEM Pathways Development at Ranken Technical College in St. Louis, Missouri. She has developed and led numerous STEM educational programs for more than twelve years, serving middle and secondary students and educators in both Lynchburg, Virginia, and now St. Louis. Those programs include Summer Adventure Academies for middle school and high school students, FIRST robotics competitions, Summer STEM Academies for Educators, SkillsUSA, and Work-based Internships. Prior to joining Ranken, she held the position of Career Pathways Coordinator at Central Virginia Community College, where she worked with regional educators, local colleges, and business and industry to promote technical careers to youth in Central Virginia. She holds a bachelor of arts in business administration with management emphasis from Mary Baldwin College, and a masters in strategic leadership from Stephens College.
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