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RESEARCH REPORT

Strategically Addressing the Soft Skills Gap Among STEM Undergraduates

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Abstract: *Employers are seeking candidates with uniquely human, or "soft" skills to survive and thrive in their future careers. This article aims to illuminate the soft skills gap of STEM undergraduate students by understanding the soft skills that will be needed in the future of work and the soft skills that students are currently missing. These skills include teamwork, collaboration, leadership, problem-solving, critical thinking, work ethic, persistence, emotional intelligence, organizational skills, creativity, interpersonal communication, and conflict resolution. To address this soft skills gap, this paper also explores various collaboration strategies between employers and academic institutions, such as working jointly on curriculum, raising awareness, establishing leadership support, and building communities of success. These can be implemented to enhance the soft skills capabilities of STEM undergraduate students entering the workforce. This qualitative research examined STEM employers' perceptions of the most essential soft skills needed and missing among recently hired STEM undergraduates. Findings identified the top ten most in-demand soft skills needed for the next five years with leadership and human-connection on the top of the list. Furthermore, the result of this inquiry indicates that the soft skill gap in current STEM undergraduates is not only evident, but it is steadily increasing. To address this problem, this paper suggests that an ongoing synergy is needed between employers and Higher Education Institutions (HEIs) to guide students in developing and acquiring these essential skills. This effort will hopefully improve student employability, increase employer outcomes, and ultimately reduce the nationwide soft skills gap. Also, it provides insights into soft skills that organizations and HEIs should invest in the years ahead.*

Keywords: *STEM education, soft skills, higher education, workforce education*

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Introduction

Since the 1990s, research studies have continuously proven the importance of soft skills for both the workforce and organizational success (Bernd, 2008; Deming, 2017a; Livia et al., 2017; Mitchell, 2008; Nguyen, 1998; Patacsil & Tablatin, 2017; Rao, 2016; Williams, 2015; White & Shakibnia, 2019). World Economic Forum Founder and Executive Chairman Klaus Schwab asserts that emerging technologies are changing everything--how we relate to one another, the way we work, how our economies and governments function, and even what it means to be human (Schwab & Davis, 2018). Further research compliments this view by indicating that programs which enhance soft skill competencies have an important place in our society (Heckman & Kautz, 2012; Heckman & Mosso, 2014). In fact, soft skills are becoming a decisive factor towards graduate employability in the 21st Century economy (Society for Human Resource Management, 2019; U.S. Chamber of Commerce Foundation, 2018; Wilkie, 2019a).

Soft skills and success

James Heckman, a Nobel Prize-winning economist, determined that having soft skills literacy statistically leads to success in life—more so than technical skills literacy. He cites evidence that demonstrates that soft skills competencies are essential for achieving professional and personal life success. Heckman's timeless recommendation to educators--published more than two decades ago--is to consider investing in a sustainable soft skills educational system that trains students in the art of interpersonal, professional, and leadership/management skills in order to help develop a successful pathway for future students (Heckman, 2000).

Balcar (2016) demonstrated a significant correlation between soft skills and wage determination, with individuals possessing soft skills competency tending to have higher salaries than their counterparts. Moreover, research by Deming (2017a; 2017b), found that the combination of soft and technical skills has a positive impact on job promotion and wage increases, enabling improved individual performance and better organizational outcomes.

Defining soft skills

Since the 1990s, the need for soft skills competencies in the workforce has been the subject of many studies (e.g. Bernd, 2008; Deming, 2017a; Heckman & Kautz, 2012; Livia et al., 2017; Mitchell, 2008; Nguyen, 1998; Williams, 2015). Throughout these studies, the concept of soft skills has been defined in distinct ways. Academic discourse on soft skills generally refers to abilities like teamwork, collaboration, leadership, problem-solving, critical thinking, work ethic, persistence, emotional intelligence, organizational skills, creativity, interpersonal communication, and conflict resolution.

According to Colburn (2018), there are two broad categories of soft skills: interpersonal (i.e. skills between the self and others) and intrapersonal (i.e. skills within oneself). Interpersonal soft skills refer to one's core skills that propel the individual's ability to perform and fit into a specific job. These skills include listening, asking questions, working in teams, resolving conflicts, and showing empathy. Intrapersonal skills include self-awareness, proactiveness, goal setting, time management, perseverance, and self-management (Colburn, 2018). According to a recent survey of over 1000 business leaders conducted by the Society for Human Resource Management (2019), there is a lack of soft skills in both categories, specifically in areas of professionalism, business acumen, critical thinking, and lifelong learning.

Pritchard (2013) believes that soft skills should be defined differently, depending on the industry sector in question. For example, the soft skills needed in the manufacturing sector have been identified as problem-solving, reliability, verbal communication, listening, and teamwork. In the healthcare sector, they include communication with clients, written communication, positive attitude, and customer service skills. In office-based settings, skills that are most sought after by employers are verbal communication, written communication, teamwork, professionalism/integrity, and organizational skills (Pritchard, 2013).

The need for soft skills in the future of STEM work

The labor market is projected to undergo significant technological and scientific breakthroughs, which are rapidly shifting the future of the work tasks performed by humans and those performed by machines and algorithms (World Economic Forum, 2018). With the rise of emerging technologies, such as artificial intelligence, machine learning, and automation entering our workforce, the future of employment will necessitate soft skills that machines cannot replace (Wilkie, 2019a).

Due to the increasingly competitive global economy, national surveys of businesses and nonprofit leaders indicate that employers are concerned about whether the U.S. is producing enough college graduates with the skills and expertise to contribute to the changing workplace (Association of American Colleges and Universities, 2018). They wonder whether new hires can help companies and organizations grow and succeed. This is because one of the greatest threats facing organizations today is the STEM talent shortage, and many organizations do not appear to be actively or effectively tackling the issue (LaPrade et al., 2019). For an organization to continue to grow and prosper, it must be understood which skills its future employees must master (Cimatti, 2016). Individuals with soft skills will be in greater demand than those without these abilities--regardless of their technical skills and experiences (American Association of Colleges and Universities, 2018; LinkedIn, 2019).

In fact, as industry reports indicate, employers are placing higher importance on soft skill competencies than they are on technical skills (LinkedIn, 2019; Society for Human Resource

Management, 2019). However, research also claims that soft skills competencies in prospective employees have become a challenge for employers to find, thus impacting their organizational efficacy (Crawford et al., 2011; Sarkar et al., 2016; U.S. Chamber of Commerce Foundation, 2018; White and Shakibnia, 2019). Employers realize that they cannot solve the skills gap issue alone and that more work needs to be done by businesses and educational systems to ensure that the U.S. workforce is prepared for the future of work (Society for Human Resource Management, 2019).

It is essential to assess, enable, and strengthen the STEM workforce to ensure continued U.S. competitiveness and prosperity (Association of American Colleges and Universities). Soft skills are transferable skills across all disciplines. The lack of competency has implications for all stakeholders: students, employers, and educators (Association of American Colleges and Universities, 2018; White & Shakibnia, 2019).

Soft skills gap

Research from the past two decades indicates that employers are seeking and struggling to find well-rounded college graduates that are competent in both hard and soft skills (Cimatti, 2016; Crawford et al., 201; Patascil & Tablatin, 2017; Prichard, 2013; Rao, 2016; Sarkar et al., 2016; White & Shakibnia, 2019; Williams, 2015). A recent survey by the Association of American Colleges and Universities (2018) assessed the opinions of 1000 business executives and hiring managers from diverse organizations in private, public, and non-profit businesses. The survey reported that employers perceive a notable gap between crucial learning outcomes (mostly soft skills literacy) and the preparedness of recent college graduates. These results, listed in Table 1 below, indicate that there is a significant soft skills gap between essential learning outcomes that employers tend to prioritize and the low levels of preparedness that they tend to observe in recent graduates.

Table 1.
College Graduate Preparedness (Association of American Colleges and Universities, 2018)

Key Learning Outcomes (Soft Skills)	**Recent college grad preparedness (%)**	**Considered highly important (%)**	**Preparedness Gap**
Critical thinking	34	78	-44
Appy of knowledge to real-world	33	76	-43
Effective written communication	33	76	-43
Self-motivation	35	76	-41
Effective oral communication	40	80	-49
Ability to work independently	38	77	-39
Ability to work effectively in teams	42	77	-35

The soft skills discrepancy between expectations and reality is affecting graduate employability (Lewis, 2018; Matsouka & Mihail, 2016; Sarkar et al., 2016). A survey of over 1,000 college students indicates that only four in ten U.S. college students feel well-prepared for their future careers (McGraw-Hill Education, 2018). In another study, more than 65 percent of undergraduate students felt very confident about their soft skills competencies, while only 30 percent of employers felt the same (Lewis, 2018). Furthermore, 70 percent of recent college graduates reported a high level of confidence in their critical thinking skills, while just 26 percent of employers conveyed the same confidence in their abilities. Looking at collaboration skills, nearly 80 percent of recent college graduates had a strong perception of their abilities to work successfully in a team. In contrast, less than 40 percent of employers reported the same sentiment (Lewis, 2018). These inconsistencies between students and employers illustrate the complexities of the soft skills gap.

Disconnect between academe and employers

Meanwhile, chief academic officers and other educational leaders argue that they are providing competent, skilled graduates into the job market (Bidwell, 2014). According to the National Academies of Sciences, Engineering, and Medicine (2016a; 2016b), 96 percent of today's educators believe they are providing students with a STEM education that delivers workforce-ready graduates to the job market. However, only 11 percent of U.S. employers agree with these assertions.

Prior research points to a national misalignment in the workforce and connects it to the outcomes of higher education in its mission to prepare college graduates for the workplace (Association Of American Colleges and Universities, 2018; J. P. Morgan, 2019; White & Shakibnia, 2019). This misalignment has been attributed to a widening imbalance that prioritizes technical skills over soft skills (Patacsil & Tablatin, 2017). As a result, according to the U.S. Chamber of Commerce Foundation (2018), somewhere along the path from education to employment, the system is not routinely equipping students with the soft skills they need to succeed. This imbalance is present despite the value that employers across all sectors place on soft skills (Association of American Colleges and Universities, 2018; LinkedIn, 2019).

Most engineering and technology university programs have a thorough curriculum that prepares students with courses that traverse the spectrum of technical disciplines (Darabi et al., 2017). Accreditation bodies like the Accreditation Board of Engineering and Technology (ABET) require students studying in the technology and engineering fields to receive training in soft skills such as lifelong learning, communication, and multidisciplinary teamwork (Accreditation Board for Engineering and Technology, 2017). However, studies continue to find that graduates are insufficiently familiar with these soft skills upon the transition to the professional work environment (Darabi et al., 2017; Livia et al., 2017; White & Shakibnia, 2019).

A study by West (2012) concludes that universities prepare STEM students for a range of professional roles throughout their curricula offerings and teaching approaches, including collaborative practices with employers and other schools. White and Shakibnia (2019) view universities as a key part of the STEM ecosystem and state that universities are not aligned with the needs and demands of the other key partner in the STEM ecosystem: the employers. This misalignment of outcomes between educators and employers is catapulting deficient STEM college graduates into a job market that particularly depends on soft skills.

The magnitude of the soft skills gap is significant, and if student training is not managed correctly, the risk of a widening skills gap pervades (World Economic Forum, 2018). STEM industries across the globe play a central part in maintaining market competition and improvement. When the interests of academia and business are not united, companies struggle to find competent employees, thus impacting their organizational effectiveness within competitive markets. The time to develop the landscape of the future STEM workplace is now (U.S. Chamber of Commerce Foundation, 2018; World Economic Forum, 2018; White & Shakibnia, 2019).

Purpose of the study

The soft skills gap presents an opportunity to explore strategic approaches that offer a high impact pathway focused on closing the skills gap (LaPrade et al., 2019; Sarin, 2019; White & Shakibnia, 2019). The skills gap is not dissipating and appears to be increasing in severity (LaPrade et al., 2019; Society for Human Resource Management, 2019). It is essential to equip students with soft skills that are relevant and valued by employers to create economic success, increase productivity, and continue the path of innovation in the modern global economy. Building and thriving in a vibrant STEM ecosystem can help organizations to participate profitably in the global market (Penprase, 2018).

This qualitative research used semi-structured face-to-face interviews. This methodology has been chosen due to its ability to enhance the depth of conversation and to increase understanding of the causes, effects and possible solutions to the current soft skills gap (Charmaz, 2003; Creswell and Poth, 2018).

Method

Subjects

The participants of this qualitative study were local hiring managers, healthcare executives, and healthcare professionals throughout the state of Kentucky, whose organizations have recently either hired or worked closely with entry-level STEM graduates. The industry of focus is healthcare, since it is the fastest-growing job sector within the local market (Kentucky

Center for Statistics, Education and Workforce Development Cabinet, 2018). Ideal participants for grounded theory research, as Munhall (2012) suggests, are individuals who have experienced the phenomena in question and are willing to articulate their experiences to share relevant information that is reflective and informative.

Purposive sampling was used to focus upon participants who met the following criteria: 1) fulltime employees of STEM-focused healthcare organizations in Kentucky; 2) a minimum of least three years of experience within their respective organizations; 3) have recently hired or worked closely with STEM college graduates. In addition, participants were recruited using snowball or chain sampling, which is used to identify people of interest by leveraging social networks and mutual connections (Creswell & Poth, 2018). There were 27 participants in this study coming from a diverse background, from small entrepreneurs to Fortune 500 organizations. Four of the participants were CEOs, four were Vice Presidents, five were HR managers, six were directors, and eight were managers in their departments. The size of the represented firms also varied. Four participants worked at a small firm, twelve at a medium sized firm, and eleven at a large firm. Twelve of the participants were women, and fifteen were men.

Data collection

Data were gathered through semi-structured interviews to give participants an ample opportunity to reflect on the interview questions and describe their insights and understandings of the soft skills gap phenomena. The structured interview questions focused on analyzing the central phenomena to detail the emerging theory. To ensure that all information was captured during the data collection, a high quality professional Evistr digital voice recorder was used to capture the data from semi-structured interview questions. This qualitative research followed Walker's (2012) guidelines, which suggest that data saturation occurs when continued data collection yields no new insights, but is primarily confirming the findings from previous data, and the abstraction of formal theory emerges from said findings (Glaser & Strauss, 1967).

Data Anlaysis

The data analysis procedures characterized by open, axial, and selective coding – as recommended by Strauss and Corbin (1998) – began soon after the transcriptions from each interview were completed. Using this approach, the researcher sorted, coded, and analyzed the data as it was collected. Themes and patterns were uncovered during the data interpretation phase to make meaning of the raw data. In this phase, the participants' feedback was reduced and broken into themes, clusters, categories, and subcategories based on their characteristics, properties, and dimensions (Wilkin, 2010). Finally, the conclusive results were coded in themes according to the framework of grounded theory (Strauss & Corbin, 1998).

Microanalyses were also conducted to mine for pieces of information that were kept open for possible consideration, to avoid jumping to conclusions. With each participant, the researcher searched for special codes that may have provided valuable insight into the perspectives of the overall participants (Charmaz, 2003; Strauss & Corbin, 1998; Wilkin, 2010). This process was chosen because it enables the illumination of more nuanced insights regarding the soft skills gap.

Coding paradigm

The study was guided by the coding paradigms model established by Strauss and Corbin (2015), which divides the data into emerging categories and subcategories using the following six variables: context, casual conditions, intervening conditions, occurring conditions, action/interactions, and the phenomena. The data within each category and subcategory was consistently assessed for its fitness within each of the six variables mentioned earlier. This data analysis was repeated for each participant until data saturation occurred or the researcher was no longer able to add more content to the existing data set.

Open coding

The coding analysis for each interview began with a process called open coding. It entails breaking down the raw data into discrete parts, then carefully examining each section, line by line, for similarities and differences (Strauss & Corbin, 1998). In grounded theory research, open coding is the analytical process by which concepts are generated using observed data and phenomena. This occurs with the help of labeling concepts, which define and develop categories based on their properties and dimensions. This process then leads to the application of key terms and phrases that are written in the margins of the transcripts to identify concepts and categories (Wilkin, 2010). Key terms are grouped into subcategories based on their characteristics, properties, and dimensions, leading to the emergence of categories that create the foundation for the development of the grounded theory in explaining the phenomena (Corbin & Strauss, 2008; Eaves, 2001).

Axial coding

Axial coding was also used to develop the study's theoretical model. Codes were sorted into groups by refining the concepts. This coding process linked the developed categories identified in the open coding phase with subcategories, by taking their properties and dimensions into consideration. The axial coding process enables the researcher to identify the relationships among the actions, interactions, and consequences associated with each participant's experiences (Böhm, 2004).

Selective coding

Once the axial codes were identified, the next step in the data analysis was to refine the generated codes and categories, to facilitate the development of the grounded theory. This process, called selective coding, includes the following sequential steps: identifying the central category, relating the categories to subcategories, validating those relationships, writing the storyline to connect categories, and finally, refining the data so the grounded theory can help explain the phenomena (Eaves, 2001; Strauss & Corbin, 1998).

Results and Discussion

The following three major themes emerged from the data describing how employers view the soft skills, the soft skills gap, and how they are working to address the soft skills gap within the STEM workforce:

- Theme 1: Soft skills gaps exists among recent STEM undergraduate new hires
- Theme 2: Specific soft skills will be in demand for the future
- Theme 3: Employers and academic institutions are not systematically collaborating to help design undergraduate curricula that foster soft skills competencies

Theme 1: Soft skills gaps exist among recent STEM undergraduate new hires

When employers were asked if they had ever experienced a soft skills deficiency amongst their new STEM undergraduate hires, 100 percent of the 27 interviewed employers said yes. These responses align with prior research, which claims that the misalignment of interests at the intersection of the workforce and higher education is generating a national skills gap across industries, particularly in the area of soft skills (National Chamber of Commerce, 2018; Patacsil & Tablatin, 2017). The most reported soft skills that are lacking amongst recent entry-level STEM hires in the healthcare industry are: forming a 'human connection' with patients or colleagues; critical thinking; creativity; receiving/giving constructive feedback; professionalism; communication and collaboration. The following comments by employers are representative:

> "I see the soft skills gap every day in areas of collaboration, communication, and teamwork mentality. It's very endemic."
>
> "We are constantly working on managing productivity and identifying gaps in productivity. The ability to communicate concisely and effectively is a huge gap—the ability to be self-aware during communication and self-edit, which goes into that same thing. And for the same reason, communication in writing is similarly challenging for those same people."
>
> "Creative thinking shallowness, which is just thinking they can solve a problem right away without going back and researching what's been done before. Have we had this

issue -- had we had communications with this customer before, but just realizing that the world didn't start right in that instant? They have to have more of a well-rounded concept of history and how things run."

"It doesn't matter what qualifications they have; if they do not have the soft skills to implement their technical skills, they are absolutely no good."

Theme 2: Specific soft skills will be in demand for the future

The increasing demand for soft skills renders it essential to understand which soft skills will be most necessary in the healthcare industry. In an attempt to uncover this need, the interviewed STEM employers were asked to express their views on the soft skills that they think future STEM undergraduates will need before entering the healthcare industry, specifically in the period of 2020 to 2025. The top soft skills that employers identified as necessary to have in the future, within the STEM healthcare industry, are shown in Table 2.

Table 2.
Soft skills STEM employers identified as necessary in 2020-2025

Necessary soft skills	**Employers who mentioned this soft skill**
Leadership	93%
Human Connection	89%
Communication	81%
Creativity	70%
Collaboration	70%
Critical Thinking	63%
Empathy	56%
Problem Solving	44%
Emotional Intelligence	37%

Leadership

Employer perceptions ultimately indicate that a change in thinking is necessary to modernize how we think about the future and our subsequent relationship with soft skills education. Specifically, employers noted the emerging changes regarding person-to-person interaction, as well as our personal relationships with data and technology more generally, effective leadership, the evolution of individual work patterns in the face of immense technological advancement, and finally, the skills that will be required to ignite growth throughout the healthcare industry. In fact, the results from semi-constructive interviews demonstrate that 93 percent of all interviewed employers rank the soft skills related to leadership as the single most essential skills to master in the future of healthcare and STEM.

One employer indicated entry-level employees that grew in their organizations are those with these soft skills "coming in every day, showing leadership capabilities. When their team faces a challenge, they're rolling their sleeves up, and they're going with that challenge. They are smiling. They are professional. They are taking that personal initiative to stand out." Another HR employer said, "If I have two candidates and both are bringing the same technical skills to the table, but one is energetic, adaptable, good in a team environment, is a leader, and passionate about what they do, that's going to carry that candidate further down the road." This finding demonstrates that the path to a more inclusive and human-driven future begins with the soft skills of leadership. This means it will become increasingly essential for future graduates to master an array of leadership skills, including the abilities to build relationships and collaborate with others.

The good news is that leadership skills can be taught, just like any other soft skill. Social sciences courses in humanities, philosophy, psychology, and civics, for example, can help improve these skills, and yet STEM academics have failed to recognize their importance in undergraduate curricula and course requirements. For example, a significant skill that is typically lacking in new engineering graduates is the ability to lead a team, or even work effectively as a member of a team, the latter of which is frequently identified as critical to the success of an engineer (Brown & Ahmadian, 2014). Project management is another skill that is often neglected in engineering or science curricula, even though it is important for engineers who end up managing teams, projects, or departments.

In the face of these conditions, employers have indicated four major categories of leadership--self-leadership, peer leadership, team leadership, and organizational leadership--that they believe are essential for future undergraduates to attain. They suggest that courses begin with human interaction-based strategies for mastering self-leadership and peer leadership, gradually transitioning to material regarding team leadership, and then finally organizational leadership. Employers emphasized that leadership skills are even expected from entry-level employees who need these skills to eventually transition into upper management and beyond.

For instance, one interviewee mentioned how self-leadership among graduates is necessary for creating a productive teamwork environment. He noted, "People just need to understand why they're a member of the team. They're expected to be a leader of everything that they do in their team. And that's a necessary factor for them to understand that. That's kind of a hard lesson to learn." Likewise, another employer mentioned the significance of developing self-leadership amongst recent graduates, "…so that they can take future leadership positions as they become available."

One interviewee signified the importance of leadership and the ability to make business decisions with empathy in mind for their business to thrive and succeed: "Individuals with soft skills and capabilities of technical and leadership skills, all of that plays into the nuances of decision making. How we make decisions, and the impacts of our choices will have on the growth of the business. And so in my opinion, those folks that have the soft skills oftentimes are able to make decisions with empathy that think about the human element whenever we make decisions and the impact that they can have on both our employees but also our customers. Often, those decisions have the customer in mind --at the center of our decision-making. That is what is driving the distinction between successful businesses and businesses that are struggling."

Human connection

The future of the STEM healthcare industry necessitates that graduates have the ability and skills to interact with their clients, patients, or colleagues, to form human connections. This goal is also reflected in the World Economic Forum's *Jobs of Tomorrow* report (2020), which asserts that humanity and the ability to connect with people amid the rapid development of new technologies are at the core of what tomorrow's workplace will require. In fact, 89 percent of interviewed employers indicated that human connection would be essential to produce insights for better patient care, creative solutions/outcomes, and strategic differentiation, which supports revenue growth, personal growth, and organizational survival.

Employers also emphasized that future STEM graduates will need soft skills competencies to help facilitate personal interactions with their colleagues, clients, or patients. Many of these individuals placed gret value in the power of human interactions, which essentially serve as the differentiator between humans and emerging technologies, such as artificial intelligence and robotics. Although still at a nascent stage of this spectrum of technological development, employers are already seeking candidates with uniquely "human" soft skills, like conflict resolution, problem solving, the generation of new ideas, collaboration, and critical thinking (Barr, 2019). These skill competencies are a necessary component of the effective delivery of tasks related to technical skills.

Throughout most interviews, employers expressed that future graduates should fundamentally understand what it means to be human. According to employers, when this sense of humanity becomes intertwined with one's technical capabilities, one can become better equipped to achieve desired results. Employers listed the soft skills below that demonstrate the power of human connection in STEM, and notably, how noted soft skills related to human connection can help employees improve at their job:

- Ability to connect with clients and patients
- Knowledge of what it truly means to be a human

- Facilitating interaction with the patient
- Ability to build a relationship and form connections
- Ability to build rapport with someone
- The importance of self-care and being nice to oneself
- Staying connected with the humanity in oneself and surrounding individuals
- Investing in the other humans around oneself
- Understanding what it means to be a human

Communication, collaboration, creativity, critical thinking

Based on participant responses, the major in-demand skills of tomorrow are the Four C's: Communication, Collaboration, Creativity, and Critical thinking. One employer stressed, "the ability to communicate ideas and be a force multiplier" is what empowers employees with the skills that engender innovation and unique service offerings. Another employer indicated that "communication is at the crux of everything." According to these qualitative interviews, the future of the healthcare workforce needs individuals who possess effective communication in all formats--face-to-face, virtual, verbal, non-verbal, email, oral, and written.

Furthermore, 19 out of 27 employers interviewed reported creativity and collaboration as essential skills for their organizations. Future graduates need to foster competencies that enable them to think outside of the box and collaborate to generate innovative ideas. For this to happen, 17 employers believe future graduates need to learn how to use critical thinking capabilities. This skill is imperative for assessing or facing an issue and effectively solving it. Employers need graduates who have self-realized analytical thinking capabilities. Additionally, all four C's are needed to solve problems and generate optimal solutions. By learning these soft skills competencies before graduation, students experience better opportunities in the workplace, therefore enhancing both their personal and organizational growth.

Empathy

Empathy can help professionals solve problems by enabling them, "to understand the emotions that a person is going through," as stated by one participant. In doing so, this mindset can lead to solutions such as enhanced patient care in a hospital setting or a more seamless user experience while navigating a new product or software application. STEM employers want to see future graduates integrate human qualities like empathy and compassion in their jobs as a tool for achieving desired outcomes within organizations.

According to 56 percent of employers interviewed in this study, when future nurses, therapists, engineers, technologists, and dental hygienists deliver services to their customers and colleagues, they need be able to draw upon their empathetic competencies--alongside their technical skills--in order to build trust, respect, and support with their customers and colleagues. Throughout interviews, employers from doctor's offices or hospital settings discussed the need

to show empathy--instead of sympathy--towards their patients. Being able to sit down and successfully empathize with patients and their families will be crucial to the success of both students and businesses.

Another application of empathy that employers disclosed is found in a specific use case. Technology employers expressed the essentiality of teaching future computer scientists or software developers how to be mindful of who will use their services, therefore incorporating empathy in their product designs. For instance, software built for an elderly population might need extra features to make it more user friendly. In designing such an interface, future technologists will need leverage their empathy throughout the development process by foreseeing the outcome of their work and how it is related to the human experience. This means developers will need to empathetically incorporate their technical user experience knowledge and think about how their technological creation may help or hinder the user's ability to solve their problems while using the product.

Problem-solving

In addition to the previously mentioned soft skills, 44 percent of employers in this study prioritize skills related to problem solving, such as the ability to resolve issues creatively. One employer said, "Creative problem solving is one differentiator," while another stated that, "Problem solving skills are going to be super key in the future." Specifically, employers want entry-level graduates to have the ability to solve problems before asking a leader within their organization for assistance. However, employers also want graduates to feel comfortable asking questions if they encounter issues while tackling these endeavors independently.

Moreover, employers prefer for their employees to offer problems and solutions simultaneously. As one employer said, "Don't tell me what is wrong, tell me how to fix it." This skill can be developed in an academic format by teaching students how to leverage multiple types of available resources instead of solely relying on Google. A noted example of a helpful yet untapped resource that can improve said problem solving efforts is the wisdom of colleagues who have experienced similar problems in the past.

Emotional intelligence

Emotional Intelligence (EI) was mentioned by 37 percent of participants as a soft skill that would be needed between 2020 and 2025. One employer described EI as "one's ability to trust their gut" and another describes it as the ability to, "read expression and body language." Being in the healthcare industry, employers also explained that future STEM graduates need to be emotionally intelligent and "not so focused on technology and use their common sense." In fact, one respondent said, "common sense is the superpower."

Research in this space generally concludes that emerging technologies, which include big data, automation, and data digitalization, are transforming the healthcare industry (Barr, 2019; Penprase, 2018). As such, soft skills can play a significant role in connecting these technologies with humans (Barr, 2019). According to the results of this study, soft skills are--and always will be--essential tools for the organizations of both today and tomorrow.

Theme 3: Employers and academic institutions are not systematically collaborating

This study aimed to understand how employers are working with academia to foster soft skills development. The two avenues that were of specific interest were collaboration between academia and industry and the extent that partnerships were effective. As a result of this inquiry, a third theme emerged: systematic, collaborative synergies simply do not exist in the relationships between many employers and local educational leaders. Employers claim that the connection between the two entities is so detached it is blocking the opinions of employers from the design and development of STEM undergraduate curricula.

This lack of dialogue and engagement was evident amongst the employers who participated in this study, 78 percent of whom do not partner with local academia to enhance STEM students' soft skills competencies. A key method of improving this cross-pollination is through the industry advisory boards of universities. According to the interview data, 81 percent of employers do not sit on any such advisory boards, meaning their expertise is not being shared in the academic arena.

Strategic actions to reduce the soft skills gap

Jointly work on curriculum

A strategy one employer suggested was for industry and academia to join forces and craft student curricula together to ensure its relevance for current and future workforce needs. Another suggested approach was to integrate soft skills education into technical STEM courses at all levels. This comprehensive approach would hopefully entrench this way of thinking into the first year of undergraduate education up until graduation. Soft skills development needs to be taught alongside technical skills. When the two skillsets effectively intertwine, students are better equipped to understand the practical relevancy of these skills.

It is essential for soft skills education to be woven through an entire STEM program and not relegated to just one course. There should be a section in each disciplinary curriculum that specifically lists soft skills as a set of learning objectives for each course. Soft skills development takes time to develop, and students need to practice these skills through the diverse perspectives that differing courses can provide. Rather than relying on these skills to magically develop in the workplace post-graduation, STEM courses should have these skills repeatedly targeted to enable

students to learn: 1) how to communicate effectively; 2) articulate themselves; 3) become a dependable team member; 4) demonstrate compassion towards their colleagues; 5) use empathy when creating a technical product; 6) offer constructive feedback; 7) accomplish a task individually or within a team; 8) use creative thinking to solve problems; 9) demonstrate confidence and assertiveness; and 10) how to attain or maintain a job.

According to Heckman (2019), the encouraging element of soft skills development is that soft skills can be mastered by all students, regardless of their technical disciplines or personal attributes. However, this is only possible when educators invest in a sustainable, systematic approach to teaching that is specifically catered towards soft skills education. There is even a proven return on investment concerning soft skills training and proficiency (Deming, 2017a, 2017b; Heckman, 2019). Given these research outcomes, we may find that targeting soft skills competencies might be beneficial for individuals and organizations to not only survive--but *thrive*--within the 21st Century STEM workforce.

Raising awareness

A common solution for addressing the soft skills gap that employers often suggested throughout interviews was to raise awareness of the gap and why there is such a subsequently high demand for soft skills. Employers continuously reiterated that reducing the soft skills gap is a community effort, and it begins with awareness. To ensure awareness of the importance of soft skill competencies in the local healthcare market, local employers and educators should strategically market these skills as a pathway to economic prosperity (Livia et al., 2017; Sarkar et al., 2016; West, 2012). This solution is an avenue for both college graduates and job seekers to develop the skills to be prepared for the local STEM job market. However, STEM undergraduate students in Kentucky are rarely informed about the potential that a soft skills education can provide, as one interviewed employer noted: "One of the things that we are working on, first and foremost, is to build self-awareness. So, if the students aren't aware of the areas in which there are opportunities for growth, then there is no way that they can hone in on the skills that they need."

To address this knowledge gap, STEM employers should develop aggressive outreach strategies to increase the awareness of critical soft skills needed to build a steady talent pipeline. To do so effectively, they should first work jointly with academia to determine what soft skills are needed and then partner with academic institutions to develop strategic counseling and tools that STEM undergraduate students can use to develop their career pathway to meet the needs of the local job market.

Raising awareness can simultaneously illuminate the content that should be integrated into STEM courses and offer students the opportunity to enhance their learning competencies. This idea is supported by prior research which concludes that the integration of technical and soft skills is useful for enhancing the efficacy of student learning (Manullang & Kons, 2010; Woodward et al., 2010). Most of the employers in this study also think that educators need to be made more aware of the soft skills gap too. Without an established relationship between academic institutions and private organizations, this study demonstrates that oftentimes the foundation for this strategy is lacking. It is precisely this lack of connectivity that is impeding the flow of employer needs from being communicated to educators and students.

However, conversations with the small number of employers that were in tune with the academic environment suggested that the collaborative process can start with open communication and relationship building. Both employers and academic institutions can initiate this connection and should equally assume the responsibility to do so.

Establish leadership support

Leadership is defined as "the sets of activities required to articulate an organization's vision and ensure that all its stakeholders will support the vision" (Stid & Brandach, 2009, p. 36). Similarly, Northouse's (2007) definition of leadership "is a process whereby an individual influence a group of individuals to achieve a common goal" (p. 3). In lieu of the lack of strategic direction from academic leadership to facilitate a soft skills education, employers in this study expressed the need to establish leadership support, with the goal of collaborating with internal and external stakeholders. This relationship building, starting from the top of the hierarchy, is essential for initiating any engagement program.

In fact, the results of this study show that employers believe leadership is key for building engagement, collaboration, and long-term partnerships. This is exemplified by employers whose organizations did have the leadership support they needed to pursue a collaborative approach with academia, which subsequently allowed them to cultivate better experiences with their new hires.

However, the success of these outcomes depends on the strength of leadership support on both sides: in academia and in industry. For instance, local STEM employers who observed keen interest from academic leaders to collaborate, consequently felt enticed and inspired to get engaged with local students. An equal level of enthusiasm from leaders in academia and industry is required in to develop the partnership and achieve both parties' goals and objectives. Collaboration that begins at the highest leadership levels, with a student-centric vision at its core, ultimately benefits the community at large.

Active collaboration with academia

There are many traditional ways to collaborate with academia that include internships, co-ops, and externships. However, one employer noted that we need to update these approaches using a more contemporary perspective that targets the needs of students. He noted, "I think that even more can be done [to address the soft skills gap] because this is a give and take. This isn't just the corporations needing a new workforce… students need jobs. So, trying to figure out how to connect these dots is really important for the workforce development of our community."

Another employer emphasized that active collaboration is important for staying informed about the evolving needs and demands of the other party. This perspective is aligned with prior research, which asserts that somewhere along the road between education and employment, the system is not providing students with the skill competencies they need to succeed in the workplace (U.S. Chamber of Commerce Foundation, 2018; White & Shakibnia, 2019). Mutual awareness about each party's needs can enable appropriate accommodation and an ultimate alignment of interests.

Build a community of workforce success

Employers realize that they need to collaborate with academia to simultaneously tackle the soft skills gap and enhance the strength of the community's workforce. One participant said: "This a community effort that must be made a priority." Some employers interviewed were able to do this successfully for several years, enhancing their organizational goals and local communities. As one employer remarked, "We come together, and we talk about what kind of skills we need as people come out of college so that universities can respond to that and build programs that will meet the needs of employers, two, four, eight years in the future."

The labor force has a significant impact on regional economic vitality, and organizations cannot innovate and grow their businesses without skilled workers (LaPrade et al., 2019). If organizations cannot find a talented workforce in their local areas, they migrate to other regions, searching for workers with skills needed to remain competitive. As a result, a decline in the skilled workforce can profoundly impact a region's economic competitiveness and value proposition (LaPrade et al., 2019).

Investing in future graduates' education before they enter the workforce has benefited employers that chose to invest their time and resources in fostering and developing the soft skills competencies of students before they had joined their organizations. Prior research echoes this phenomenon. It indicates that soft skills training has a direct impact on the return organizations and individuals realize from their investments (Balcar, 2016; Deming, 2017; Heckman, 2000). In fact, Heckman's recommendation to educators is to consider investing in a sustainable soft skills educational system that trains students in the art of interpersonal, professional, and leadership/management skills to help develop a successful pathway for future students. This

perspective helps explain why the top skills that interviewed employers tend to value are leadership and human connection.

The employers who participated in this study continuously felt that the only way to secure their competitive advantage was by working strategically with academia to align STEM coursework with the needs of local businesses. In fact, throughout most interviews, employers indicated that it is essential to look at the soft skill gap phenomenon as a community effort, rather than a university-only responsibility. However, many respondents did say that they want educators to initiate this process to demonstrate their commitment to the collaborative relationship--namely regarding academia's willingness to adapt to the suggestions made by employers.

Conclusion

STEM Education

The future of competition in a globalized America is dependent on a strong workforce rooted in science, technology, engineering, and mathematics (National Academies of Sciences, Engineering, and Medicine, 2016). The STEM discipline has played a significant role in the nation's trajectory towards innovation and economic growth, and we will continue to rely on STEM experts to support this trajectory (White & Shakibnia, 2019). However, based on an extensive report, industry and employment experts are concerned that our nation may not have an adequate supply of skilled technical workers to maintain its global competitiveness (Olson & Riordan, 2012). As the global economy grows, ten of the fourteen fastest-growing industries will require a STEM education (Olson & Riordan, 2012). For these reasons, it is essential to proactively prepare workers and students for the occupational needs our society will demand from the STEM fields. A future driven by exponentially increasing technological change requires us to take these employment gaps seriously (Cimatti, 2016; Cinque, 2015; White & Shakibnia, 2019).

STEM education needs to be strategically aligned with the industry needs (Bloomberg, 2018). According to Sarkar et al. (2016), employers are recommending that changes to the pedagogy are needed. One of the significant changes they suggest in regard to teaching tactics is centered around the differences between open-ended and formulaic problem-solving. By incorporating more inquiry-oriented learning, students learn problem-solving skills that can range across a broad spectrum of situations. Additionally, this environment more closely resembles the realities of problem-solving in a professional space. For this reason, integrating an inquiry-oriented teaching approach might provide students with increased opportunities to develop soft skills competencies such as critical thinking, teamwork, self-directed group learning, and communication skills (Rayner et al., 2013).

The calls for systematic and transformational improvements throughout undergraduate STEM education have been numerous and reiterated over the past 25 years (McKenna et al., 2014). According to Khatri et al. (2017), the undergraduate STEM education community has developed a large number of innovative teaching strategies to improve student learning outcomes. The empirical study conducted by Khatri et al. (2017) examined the instructional innovation strategies used within undergraduate STEM education and compiled a list of 43 strategies intended to enhance the student learning outcomes. These innovative teaching strategies are available for use by STEM instructors in the areas of biology, chemistry, computer science, engineering, geoscience, mathematics, and physics. However, the majority of these teaching strategies are going unused by STEM instructors (Khatri et al., 2017).

Some studies suggest including entrepreneurship as a standard component of the STEM education system. This can be done by engaging business leaders, students, and educators either within or outside of the classroom in an effort to enhance students' soft skills competencies. In these activities, all key stakeholders – the educator, employer, and student – work together on a real-world problem within an active project-based team environment. This practice allows students to learn how to combine their technical and soft skills competencies in order to deliver a product or project that corresponds with the demands of the workplace (Besterfield-Sacre et al., 2014; McKenna et al., 2014).

Prior research shows that despite the importance of soft skills competencies as a significant variable in employability (Sarkar et al., 2016), soft skills are not being prioritized nor taught consistently in undergraduate degree programs. This finding supports a central concern that employers expressed in interviews--that soft skills education is not being given the attention it deserves. 100 percent of employers reported that they value soft skills education and think it is needed for in the future of healthcare.

It takes time to develop soft skills competency. So, by knowing the skills that STEM undergraduate students will need in the future, key stakeholders will be better equipped to focus on this market demand and consequently produce workforce-ready graduates. This development process should begin with lessons about leadership, as employers suggested, starting at the freshman level. On that front, employers also indicated that colleges and universities should offer leadership courses to help develop the soft skills of leadership. This realm of knowledge should begin with self-leadership, team leadership, problem-solving, communication, and critical thinking. Towards the final years of students' undergraduate careers, they should be exposed to classes that aim to provide softs skills that equip them with the knowledge and confidence to conduct their employment searches professionally. Examples of skills within this category are resume building, interviewing, and ultimately securing a job.

The findings of this study indicate that an open system does not exist between businesses and academic leaders. This lack of collaboration therefore stunts the community's ability to address soft skills gap at its core. In an open system, organizations are actively engaged in relationships that allow them exchange information. It is precisely this disconnect, or lack of an open system, that is impeding the development of soft skills in undergraduate STEM students. The data from this study indicates that much more work is needed to develop an open system in which organizational outputs align with renewed organizational inputs, thus leading to organizational transformation.

Instead, a synergy is needed to tackle the soft skills gap. Employers need to connect with academia and their internal customers to build engagement and customer advocacy to help establish an active collaboration synergy. Both sides need to lead by example to cultivate a culture of support that recognizes and addresses the soft skills gap. Universities that choose to integrate soft skills into undergraduate STEM courses need to understand the skills that are expected of students, how these skills can be transferred into the workplace, and why this development is essential for students' career successes. Without this understanding, as one employer stated, the rapid development of technology will ensure we will be "outdone by the machine."

Future directions

Because the opinions of academic leaders are also instrumental in addressing the soft skills gap, future researchers should consider conducting a similar study to illuminate the perspectives in academia. This research should focus on how educators are collaborating with employers to address the soft skills gap. It would also be enlightening to conduct a study to determine whether STEM educators are equipped to teach and improve soft skills literacy within their core STEM programs to achieve the desired outcomes outlined by the local STEM workforce. Furthermore, future researchers may consider conducting a qualitative study to explore recent STEM college graduates' opinions about the STEM workforce's soft critical skills. Since the soft skills gap is a global issue that needs to be addressed systematically, a final recommendation would be to replicate this study in industries and communities across the US and beyond.

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