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Meeting real world demands of the global economy: An employer's perspective

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Abstract

Educational programs prepare students theoretically for the workplace, but many programs are still lacking in the real-world skills that the workplace requires. This is especially evident in Science, Technology, Engineering, and Math (STEM) education where today's graduates hold a fundamental role in advancing science, medicine, sustainability, national security, and the economy, yet the programs to prepare them are falling short of employer expectations. At present, there is a lack of information on the necessary skills for workplace success that is specific to Airline, Aerospace, Defense (A&D) and related Industries' STEM graduates. This paper attempts to fill this gap by offering a model of the skills required of STEM graduates for successful integration into the A&D and related Industries' workplace. The purpose of the case study is to explore the employer's perspective on the job skills that influence the success of STEM college graduates. The case study method was used that involved a purposeful sample strategy of hiring individuals for STEM based positions within the A&D and related Industries. The initial interviews support the job performance skills that have been identified in our research. The highest sought after skills are problem solving, team player, ability to gather data, and adaptability. The lowest sought after skill is negotiation. Two additional skills recommended by the interviewees will be added to future studies – time management, active listening skills. The conclusions reached emphasize the importance of real life applications during STEM classes and programs to better prepare future STEM employees for the workplace.
248 words
Keywords: STEM graduates, employment skills, aerospace and defense industry

Meeting Real World Demands of the Global Economy- An Employer's Perspective Part 2

Introduction

Education and adequate training are prerequisites for success in the workplace. While academic programs prepare students theoretically for the workplace, many programs are still lacking in the real-world skills that the workplace requires. There is a gap of teaching/learning employability skills that are 'essential to business competitiveness, but also for prosperity and fairness' (Maxwell, Scott, Macfarlane, & Williamson, 2009, p. 1). This is especially evident in STEM (Science, Technology, Engineering, and Math) education which has a fundamental role of advancing technology, medicine, sustainability, agriculture, national security, economy, and society (Egarievwe, 2015). STEM programs prepare the next generation of scientists, tech experts, engineers, and mathematicians to meet 21st century real world demands in a global economy. These programs, however, are falling short; young STEM graduates lack many of the soft skills that employers require.

Much money is invested in STEM education, 40 billion in the US alone (Charette, n.d.), as STEM learning is linked to national and global economies (Anajar, Talbi, Radid, Snadrou, & Tragha, 2015) and is considered crucial to future economic success. While economic experts are concerned that a STEM shortage could threaten the US economy (Charett, n.d.), the statistics tell a different story: only 25% of engineering graduates are employable by a multinational company (Blom & Saeki, 2012), and 25% of the 15 million Americans with STEM degrees work in STEM jobs (Millar, 2014). Although STEM students earn more, are in demand, and are valued across the labor market, many students leave university with few ideas about what a real job entails or how to build a career (Hooley, Hutchinson, & Siobhan, 2016). Thus, there is a need to guarantee

future economic prosperity in a competitive global economy by providing an environment which encourages successful partnerships between STEM education and STEM employers and accommodates innovation in STEM-related positions (Panizzon, Corrigan, Forgasz, & Hopkins, 2014; Prinsley & Baranyai, 2015b). While previous studies analyzed the hard and soft skill requirements for STEM students' success in the workplace such as written, oral presentations, interpersonal communication; team player' proactive, problem solving, decision making ability (Appleby, Roberts, Barnes, Qualter, & Tariq, 2012; Hartmann & Jahren, 2015; Maxwell et al., 2009; McGunagle, 2016), this study will apply these skills to STEM students in the A&D workplace and design a model of job skills that will ensure success of the new STEM workforce. This model could be adopted by universities to design more effective STEM programs which prepare the future leaders in innovation, productivity, and social change in the global economy. At present, there is a lack of information on the necessary skills for workplace success that is specific to A&D STEM graduates. This paper attempts to fill that gap by offering a model of the skills required of STEM graduates for successful integration into the A&D workplaces.

Literature Review

Previous research has identified the mismatch or gap between the skills attained in higher education and the transferable skills which are necessary for the workplace (Anajar et al., 2015a; Appleby et al., 2012; Barnett, 2012; Charette, n.d.; Egarievwe, 2015; Prinsley & Baranyai, 2015a; Ridzwan, Ruhizan, Faizal, Mohd, & Irwan, 2015). In short, STEM employees lack practical experience, general workplace experience, or required business knowledge (Prinsley & Baranyai, 2015a). While they have academic knowledge, young STEM employees are criticized for their lack of interpersonal and transferable skills necessary in the business environment. STEM graduates must be able to work in their discipline or area of expertise while making connections with other disciplines (Egarievwe, 2015; Madden et al., 2013) and applying their skills to various contexts (Anajar et al., 2015). They need to be responsive, proactive, adaptable, and creative (Anajar et al., 2015; Prinsley & Baranyai, 2015a) to produce competitive, innovative solutions to real business problems. In short, employers seek employees who have life skills and life experiences beyond their academic knowledge (Appleby et al., 2012) and can apply this experience and theoretical knowledge in the workplace.

Of the skills new STEM graduates are lacking, communication is listed as the most important one (Appleby et al., 2012; Maxwell et al., 2009), followed by leadership skills (Hartmann & Jahren, 2015; Maxwell et al., 2009), problem-solving skills (Blom & Saeki, 2012; Dyke-Ford & Teare, 2006; Maxwell et al., 2009), and team working skills (Appleby et al., 2012; Hartmann & Jahren, 2015; Maxwell et al., 2009). Young STEM employees' gaps lie in the higher-order thinking skills such as analyzing, evaluating, creating (Barnett, 2012; Blom & Saeki, 2012; Charette, n.d.; Maxwell et al., 2009), and effectively communicating their findings to different stakeholders such as colleagues, clients, or management (Millar, 2014). For Dyke-Ford and Teare (2006), 'their success is as dependent on their ability to communicate as it is on their technical skills' (p. 5).

Employers expect young STEM graduates to enter the workplace with higher level communication skills but are prepared to teach skills such as leadership, strategy, and decision-making on the job (Maxwell et al., 2009). Higher level communication skills include communication at different levels of the organizational structure using different channels and respecting purpose, audience, and medium (Barnett, 2012; Dyke-Ford & Teare, 2006; Maxwell et al., 2009). Data cannot simply be amassed; rather, it must be interpreted and repackaged (Dyke-Ford & Teare, 2006) for internal and external audiences with varying levels of expertise in

and comprehension of the discipline (Appleby et al., 2012; Maxwell et al., 2009). It is necessary to change existing perceptions of communication as simply a one-way presentation of facts to a two-way dialogue which includes interpersonal skills (Appleby et al., 2012; Barnett, 2012; Maxwell et al., 2009) and behavioral cues.

Through effective communication, young STEM graduates are expected to make connections with the greater community internally (in the workplace), but also externally, with clients and external stakeholders. These connections can come from the application of authentic, real-world projects which foster creativity and innovative cognitive skills in young STEM graduates through cross-disciplinary problem identification and solving skills (Dyke-Ford & Teare, 2006; Egarievwe, 2015; Madden et al., 2013). Successful STEM employees who have learned to combine their competencies and transfer their skills from one task to the next, from one job to another (Maxwell et al., 2009) are candidates to become leaders in the global workplace. These potential leaders demonstrate early on higher level skills of learning from mistakes, reflective thinking, social responsibility, and lifelong learning (Madden et al., 2013).

Learning is an active, reflective process, and young STEM graduates are on a learning journey (Anajar et al., 2015; Blom & Saeki, 2012; Egarievwe, 2015; Madden et al., 2013; Maxwell et al., 2009; Ridzwan et al., 2015). Higher education STEM programs offer the theoretical knowledge and industry-related competences which should prepare STEM graduates for the work environment. These programs offer opportunities for STEM students to learn by doing (Millar, 2014), learn from experience (Ridzwan & Ruhizan, 2015), learn how to learn (Appleby et al., 2012). Employers expect these STEM graduates to continue learning throughout their career, beyond the 'threshold concept' of learning only the key concepts to master their subject area (Appleby et al., 2012) and become lifelong learners who are capable and willing to learn new skills in the workplace.

Today's workplaces are evolving with an emphasis on continuous professional development and real life problem solving leading to deeper employee engagement (Madden et al., 2013; Maxwell et al., 2009). Employers spend billions annually on training and education, but only a fraction of that is spent within the higher education sector (Maxwell et al., 2009). To prepare potential STEM leaders and fully profit from their investment in young STEM graduates, employers can be proactive. Some actions include mentoring, internships, and co-creation of curriculum for higher education. In mentoring programs, employers create partnerships with higher education institutions and the students themselves (Baxter & Waldock, 2012) to help STEM students hone career-building behaviors, work in teams, see the big picture, and address social expectations, boundaries, limits to adjust to a new job/environment (Veenstra, 2014). STEM students who have had a positive experience with a mentor are more likely to become mentors themselves (Baxter & Waldock, 2012).

Mentoring may be a stand-alone commitment by an employer to a STEM student or it may be part of a larger engagement through an official internship contract between employer, the school, and the STEM student. While '81% of hiring managers believe that college students should have finished a formal internship before graduating and entering the workplace' (Charette, n.d.) to gain a reality check of what the workplace really is (Barnett, 2012; Maxwell et al., 2009) and to bridge the gap between school and work, many STEM companies do not offer them. For employers, internships can be expensive undertakings for legal (Maertz, Stoeberl, & Marks, 2014), administrative (Prinsley & Baranyai, 2015b), or human capital reasons (Prinsely & Baranyai, 2015b). However, employers can benefit from internships as well by profiting from the 'try-out' of extra labor capacity, a 'low cost, low-risk opportunity for employers to evaluate interns as potential employees, even as they contribute productive work' (Maertz et al., 2014). In return, STEM interns gain job related skills and knowledge

as they apply the theory they have learned in STEM programs to real life situations (Barnett, 2012) and social skills such as networking, communication, and interpersonal skills. For higher education, internships create on-going relationships with companies which increases corporate or community visibility of the school (Maertz et al., 2014) and helps students build skills and competencies for every transition in future life, not just the first job (Hooley, Hutchinson, & Siobhan, 2016).

Employers can take a greater role in education by co-creating curriculum with higher education institutions for STEM students which is beneficial for both sides. Instructors could engage in professional reflection with STEM industries (Barnett, 2012; Madden et al., 2013) to teach creative thinking strategies and metacognitive thinking to produce 'creative scientists who can develop innovative solutions to serious global problems' (Madden et al., 2013, p. 546). Employers could provide real world contexts for instructors which encourage engagement between the three stakeholders, the institution, the students, and the employers (Hooley et al., 2016). The importance of dialogue between STEM industries and higher education institutions is the key to improving higher education courses (Maxwell et al., 2009). One way could be to encourage employers to teach at the higher education institutions (Prinsley & Baranyai, 2015) or participate in conferences between STEM industry and the institutions (Egarievwe, 2015; Veenstra, 2014).

The purpose of this case study was to explore the employer's perspective on the skills that influence the success of college graduates. A corporate perspective was used to construct a framework for understanding the skills that affect new college graduate's success. A single case study method was adopted involving purposeful sampling strategy of the Airline, Aerospace, Defense and related Industries. The study provides framework for meeting real world demands and presents a model that will identify key factors in the terms of skills required for the college graduates to succeed in their new positions. The study addresses the following research questions:

Q1: What are the key work skills that will improve the alignment between employer's requirements and high-wage, high-demand jobs?

Q2: How do employers rank the importance of job performance skills of new employees?

Results from the study will provide the college with a better understanding of any gaps in aligning the work skills with employer's expectations. Along with ensuring students are graduating with those skills that will translate to a better skilled workforce.

Methodology

A single case study method was adopted involving a purposeful sampling strategy from the Airline, Aerospace & Defense Industries. The study provides a framework for meeting real world demands and presents a model that identified key factors in the terms of skills required for the college graduates to succeed in their new positions. In a previous study by McGunagle (2016), there were a total of 16 work skills identified that were important in hiring of STEM students. During the interviews with the employers, they were asked to rate the job skills identified in exhibit II. The study utilized a Likert type scoring system of 1-5, with 5 being the highest.

Results

The initial interviews support the job performance skills that have been identified in our research. Out of 432 individuals hired, a higher portion of the students came from Auburn University, DePaul University, and

Rochester Institute of Technology. There were 33 universities identified in exhibit I. The list of colleges represents students being hired for STEM based jobs in the Airline, Aerospace & Defense industries.

Exhibit I

Colleges Identified by Employers

Auburn University	San Jose State
Clemson University	Texas A&M
DePaul	Thurgood Marshall
Embry Riddle Aeronautical University	University of California: Davis
Georgia Tech	University of Central Florida
Howard University	University of Chicago
Illinois Institute of Tech	University of Cincinnati
Michigan State	University of Houston
Michigan Tech	University of Illinois: Urbana
North Carolina State	University of Iowa
Northwestern	University of Michigan
Ohio State	University of Pittsburgh
Penn State	University of Puerto Rico
Purdue	University of Virginia
Rensselaer Polytechnic Institute	University of Wisconsin: Madison
Rochester Institute of Technology	University of Illinois: Chicago
Rose-Hulman Institute of Tech	University of Texas: Austin

While the A&D industry could choose STEM students from universities which specifically prepare them for such positions, Exhibit X shows that these employers actually choose STEM students from a diverse choice of universities and programs. This suggests that talented STEM students derive from many universities, yet their perceived weaknesses in the workplace are relatively stable. Thus, a model for higher education programs which prepare STEM students for their first employment positions must be created and implemented to ensure graduates can indeed meet the real world demands and challenges which are expected of them.

Exhibit II provides a detailed list of the average ratings from the interviews. Exhibit II shows the job skills which employers rated (from 1-5) as the most important for the workplace. These 16 job skills had been identified by A&D employers in an earlier study on STEM students and meeting real world demands (McGunagle, 2016).

Exhibit II

EMPLOYER RATED JOB SKILLS

JOB SKILLS	RATING
Problem Solving	4.75

Adaptability	4.75
Ability to Gather Data	4.5
Ability to Work in Teams	4.5
Proactive	4.25
Self-Motivated	4.0
Customer Oriented	4.0
Verbal skills	3.75
Written Skills	3.75
Synthesize	3.75
Decision Making	3.75
Leadership	3.5
Oral Presentations	3.25
Self Confidence	3.25
Assertive	2.75
Negotiation	2.25

The most sought after skills were problem solving, adaptability, ability to gather data, team player and being proactive. The lowest sought after skill was negotiation skills. Two additional skills were identified during the interviews will be added to future studies. The two skills disclosed during the interviews were time management and active listening skills. Additional comments that were supplied by the companies included the importance of real life applications during their classes. In this way, culture shock when it came to not getting their own way right out of school could be avoided. In some cases, STEM students were summarized as 'being book smart but not exposed to common sense'. This presents a real challenge to higher educational programs which seek to produce the best and brightest STEM students for the future success of society, but are currently lacking in preparing them for the present, short term reality of the day-to-day workplace.

Conclusions and Implications

This study was the second of a series of studies on STEM students and their ability to adapt in the workplace. In the first study, meeting real world demands were analyzed through the hard and soft skill requirements for the STEM based jobs that will ensure the future success of a new job applicant in Aerospace & Defense Industry (A & D) Organizations. It was found that communication skills were the most sought after skill for young graduates, followed by being a team player and problem solving. This study attempted to further the discussion on the real needs of STEM students to successfully infiltrate the workplace. While this study focused on employers and their expectations of STEM students being fully functional immediately upon employment, the next study will focus on STEM student curriculum and the areas which need improvement, namely the problem solving, adaptability, ability to gather (and communicate) data, and teamwork.

There were several limitations to this study. First of all, the sampling for the interviews derived from managers in the A&D industry. A future study could include other industries which rely on STEM students. Secondly, participants were asked to rank the 16 key factors on a Likert scale, but no further ranking was requested. Another study could take the same 16 key factors and analyze them based on specific positions or departments. Further, the 16 key factors could be compared by groups. Thirdly, no STEM students/graduates

were included in the sample. A study which focuses on their expectations would be prudent to make strategic decisions of how to implement new skills into STEM university programs. Finally, this study was conducted at one moment in time; a future study could trace the needs and expectations as the young graduates evolve in the workplace.

Through these studies, we are one step closer to developing a model of key factors for STEM programs which will improve the alignment between employer's requirements and high-wage, high-demand jobs. This study and those that follow will help fill the gap on employer's expectations and the necessary skills required to compete in the global economy. There is no question about the necessity of hiring STEM students to find new solutions, create innovative technology, and shape the future; rather, the question lies in how they will successfully integrate the workplace and produce collaborative works of genius; this is where the future rests.

References

Anajar, A., Talbi, M., Radid, M., Snadrou, K., & Tragha, A. (2015). Quality management in vocational training: Evaluation of a specialized institution in Ict. *Procedia- Social and Behavioral Sciences, 191*, 1928-1933. doi: 10.1016/j.sbspro.2015.04.261

Appleby, Y., Roberts, S., Barnes, L., Qualter, P., & Tariq, V. (2012). Who wants to be able to do reference properly and be unemployed? STEM student writing and employer needs. *Journal of Learning Development in Higher Education*. Retrieved from www.clok.uclan.ac.uk

Barnett, K. (2012). Student interns' socially constructed work realities: Narrowing the work expectation-reality gap. *Business Communication Quarterly, 75*(3), 271-290. doi: 10.1177/10805699/244/360

Baxter, A., & Waldock, J. (2012). Developing employer engagement in STEM through career mentoring. Sheffield Hallam University.

Blom, A., & Saeki, H. (2012). Employability and skill sets of newly graduated engineers in India: A study. *IUP Journal of Soft Skills, 6*(4), 7-50.

Charette, R. N. (n.d.). STEM graduates not workforce ready? Employers should look in the mirror as to why. Retrieved from http://www.advanc-ed.org/source/stem-graduates-not-workforce-ready-employers-should-look-mirror-why

Dyke-Ford, J., & Teare, S. W. (2006). The right answer is communication when capstone engineering courses drive the questions. *Journal of STEM Education, 7*(3/4), 5-12.

Egarievwe, S. U. (2015). Vertical education enhancement- A model for enhancing STEM education and research. *Procedia Social and Behavioral Sciences, 177*, 336-344. doi: 10.106/j.sbspro.2015.02.354

Hartmann, B. L., & Jahren, C. T. (2015). Leadership: Industry needs for entry-level engineering positions. *Journal of STEM Education, 16*(3), 13-19.

Hooley, T., Hutchinson, J., & Neary, S. (2016). Supporting STEM students into STEM careers: A practical introduction for academics. Retrieved from http://hdl.handle.net/10545/231614

Madden, M. E., Baxter, M., Beauchamp, H., Bouchard, K., Habermas, D., Huff, M., Ladd, B., Pearon, J., & Plague, G. (2013). Rethinking STEM education: An interdisciplinary STEAM curriculum. *Procedia Computer Science, 20*, 541-546. doi: 10.1016/j.procs.2013.09.316.

Maertz, C. P., Stoeberl, P. A., & Marks, J. (2014). Building successful internships: Lessons from the research for interns, schools, and employers. *Career Development International, 19*(1), 123-142. doi: 10.1108/CDI-03-2013-0025.

Maxwell, G., Scott, B., Macfarlane, D., & Williamson, E. (2009). Employers as stakeholders in postgraduate employability skills development. *International Journal of Management, 8*(2), 1-11. doi: 10.3794/ijme.82.267

McGunagle, D. (2016). Meeting real world demands of the global economy. *Journal of Management, 10*(3).

Millar, E. (2014). The expectation gap: students' and universities' roles in preparing for life after grad. *Canadian University Report*. Retrieved from www.theglobeandmail.com/news/national/education

Oliver, D., (2013). An expectation of continued success: The work attitudes of generation Y. *Labour & Industry, 17*(1), 61-84. doi: 10.1080/10301763.2006.10669339

Panizzon, D., Corrigan, D., Forgasz, H., & Hopkins, S. (2015). Impending STEM shortages in Australia: Beware the 'smoke and mirrors'. *Procedia Social and Behavioral Sciences, 167*, 70-74. Doi: 10.1016/j.sbspro.2014.12.644.

Prinsley, R., & Baranyai, K. (2015a). STEM skills in the workforce: What do employers want? *Office of the Chief Scientist*, (9), 1-4.

Prinsley, R., & Baranyai, K. (2015b). STEM-trained and job ready. *Office of the Chief Scientist*, (12), 1-4.

Ridzwan, C. R., & Ruhizan, M. Y. (2014). Cultivating learning: A grounded theory of skills acquisition for vocation in modern apprenticeships. *Procedia- Social and Behavioral Sciences, 174*, 275-282. doi: 10.1016/j.spspro.2015.01.658

Ridzwan, C. R., Ruhizan, M. Y, Faizal, M. N. Y., Mohd, B. R., & Irwan, M. I. (2015). Skilling for a job: A grounded theory of vocational training at industrial training institutes in Malaysia. *Procedia- Social and Behavioral Sciences, 204,* 198-205. doi: 10.1016/j.spbspro.2015.08.139

Veenstra, C. (2014). The collaborative role of industry in supporting STEM education. *The Journal for Quality and Participation*. Retrieved from 11.asq.org/pub/jqp