Preparing for the Fourth Industrial Revolution with Creative and Critical Thinking
Patricia Coberly-Holt and Kemi Elufiede

Abstract

We currently find ourselves in the midst of the fourth industrial revolution, a time when everything around us is evolving at an exponential pace, which is disrupting virtually every industry around the globe. With today's transformations and changes in the workplace, there are skills needed to remain employed. As we continue along this path, workplaces will require adaptable people whose jobs are reimagined, enriched, or facilitated by the technology they work alongside. This paper will begin with skillsets that will be needed by workers, followed by current descriptions of two of these crucial skills, and finally discuss how the two opposed skills can be brought together for learners.

Keywords: *Critical thinking; Creative thinking; Fourth Industrial Revolution; Workplace needs; Creative critical thinking*

We have entered the fourth industrial revolution, a time of ubiquitous change characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres (Klaus, 2015). This digitization and automation of work is considered by many to be the most important societal and economic trend in the world—one that will fundamentally change the nature of work, business, and society in the coming decades (Arntz, Gregory, & Zierahn, 2016).

Human resource executives at some of the world's largest companies anticipate profound disruptions from the increased adoption of mobile Internet and cloud technology, the use of big data, flexible work arrangements, 3-D printing, advanced materials, and new energy supplies, according to early results from a survey by the World Economic Forum (Schwab, 2015).

As technology increasingly takes over knowledge-based work, the cognitive skills that are central to today's education systems will remain important, but behavioral and non-cognitive skills necessary for collaboration, innovation and problem-solving will become essential as well (Schwab, 2015). In the future, talent, more than capital, will represent the critical factor of production (Klaus, 2015). Workplaces will rely more heavily on adaptable people whose jobs are reimagined, enriched, or facilitated by the technology they work alongside (Butler-Adam, 2018).

At the 2016 Future of Jobs forum (which looks at the employment, skills, and workforce strategy for the future), chief human resources and strategy officers from leading global employers were asked what the current shifts mean, specifically for employment, skills, and recruitment across industries and geographies (Gray, 2016). According to Gray, the resulting view coming out of the forum is that the demand for higher cognitive skills such as creativity, critical thinking and decision making, as well as complex information processing will grow through 2030 at

cumulative double-digit rates, with two of the four top 10 skills workers will need the most in 2020 being creativity and critical thinking. While both critical and creative thinking are usually viewed as divergent activities, a combination of the two will be necessary in order to remain successful in the new workplace.

Critical Thinking

Scriven (1985) explained critical thinking as "the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action." Critical thinking involves analyzing and developing possibilities to compare and contrast many ideas, the improvement and enhancement of ideas to make effective decisions and judgements, thereby, providing a sound foundation for effective action (Treffinger, 2008).

"If you can't think critically you will behave in ways that have less chance of achieving the results you want" (Brookfield, 2012, p. 1). The ability to digest and analyze information critically is only important if a student can persevere through the challenges associated with the journey of thinking critically and can then act upon this new-found knowledge in a way that brings meaning to the world around them (Pieratt, 2017). From here, we can begin to support them not only by allowing them to better anticipate challenges but also how to support them in their ability to tackle these problems when they arise in the future. This skill set enables learners to persist in the face of challenging work and prepare our students to solve complex problems, many of which are problems we cannot currently anticipate. By preparing future workers and leading them to developing a sense of self and ownership amongst our students we can trust that, coupled with critical thinking skills, our future will be in good hands (Pieratt, 2017).

Critical thinking involves remaining open-minded, willing to consider a variety of viewpoints, evaluating all reasonable inferences and interpretations, and not being too quick to reject unpopular views. There are multiple formats for critical thinking, such as reflection, looking for more than one possible answer, or simply playing with a theory or suggestion. It is important to remember that making and learning from mistakes is part of critically thinking and should be rewarded as a learning experience, by allowing learners to learn from what has not worked.

Creative Thinking

Creative thinking has the ability to bring about a fresh perspective and may lead to an unconventional solution for solving a problem. Newell et al. (1958) noted that the creative process is a method to problem solve because it is a product of thinking, the unconventional strategy to thinking, the motivation for thinking, and the formulation of the problem. Creative thinkers enhance effective communication, the exploration of various opportunities, and the transition of change.

Effective communication is integral to expressing ideas as it must be expressed clearly, so that others can understand the concept. Tripathy (2018) stated that creative thinking is the most

influential role of communication which reacts just like an agent for an impulsive innovation" (p. 4). With a full understanding, new opportunities arise that develop strategies to solving everyday problems and challenges as this process provides a pathway for the change. Sparre (2012) noted that innovation develops change for a new field within different structures.

The reality of creative thinking is to continue to advance skills by considering yourself a creative thinker, supporting creative thinking within groups, recognizing the benefits, and understanding the challenges of creativity. To become a creative thinker, one must be productive in their own thought patterns. Kohls (2012) explained that when people experience a challenges, their thoughts are associated with solutions that focus on the conventional ways of thinking. In collaborative situations, one must be in support of the concept of creative thinking, so that others feel connected interpersonally. While creative thinking has benefits, there are challenges depending on the situation.

Bringing it all Together

Until recently, critical and creative thinking have been viewed as divergent activities, with critical thinking being a left brain function focused on probability and associated with judging involving a logical rationalizing mindset to make informed decisions and creative thinking being a right brain activity focused on possibilities and associated with generating ideas from a fresh perspective in order to conceive of something new or original.

Creativity benefits from our recognizing the role of critical thinking in ensuring the value of novel ideas. In turn, critical thinking comes into clearer focus when we recognize it as a creative act that enriches understanding by giving rise to something that wasn't there before (Bryant, 2017). In fact, many of the great breakthroughs and discoveries in art, science, and innovation have resulted from combining creative and critical thinking skills (Coughlan, 2007-08). Although the approaches to both differ considerably, it is the synergy created by the combination of both skills that can benefit and enrich learning.

Summary

In order to be successful in the Fourth Industrial Revolution, individuals will need to cultivate a new way of thinking, along with a strong skillset, including our creativity and our capacity for thinking critically. This ability to think critically and vet multiple probabilities after creatively generating various fresh possibilities is crucial. "To develop the requisite deeper, more holistic approaches to learning, it is essential to foster creative and critical thinking skills" (Coughlan, 2007-08). Developing the next generation with the skills to innovate and improve our world we can no longer teach students *what* to think–we must teach them *how* to think (Pieratt, 2017). We must empower students to become creative thinkers, critical thinkers, and problem solvers—people who are continually learning and who can apply their new knowledge to complex, novel, open-ended challenges; people who will proceed confidently and competently into the new horizons of life and work.

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Patricia G. Coberly-Holt, received her M.Ed. and Ed.D. in Adult Education from the University of Arkansas in Fayetteville, Arkansas. She is a full professor of Adult Education in the Department of Secondary, Adult, and Physical Education at Armstrong State University, where she also serves as Coordinator for the Adult Education masters' degree program. Her research interests include workforce development, corrections education, adult reactions and emotions associated with learning, and program planning.

Kemi Elufiede, Educator, Author, Editor, Poet, and Entrepreneur, has more than 10 years of professional experience in public, higher, community (education), non-profit sector, and social services. She is the Founder and President of Carnegie Writers, Inc. and K&E Educational Consulting Services. She holds a degree in P-12 Special Education from Abraham Baldwin Agricultural College, B.L.S in Psychology and M.Ed. in Adult Education and Community Leadership from Georgia Southern University, Armstrong Campus. She holds a Doctor of Education from Lipscomb University.