Chapter 1
Designing STEAM Learning Environments

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ABSTRACT

This chapter highlights some of the technological changes in society that have led to an increased need to consider instructional and design challenges in implementing STEAM education. Specifically, the chapter discusses how challenges related to designing learning environments in STEAM education can be mediated through application of the Universal Design for Learning (UDL) framework. Consideration is given towards designing for flexible and useable STEAM learning spaces by thinking about and planning for learner variability as a key component towards designing inclusive, humanistic educational experiences. In addition, STEAM learning spaces are discussed in terms of catalyzing learner creativity, providing for individualizing instruction, and empowering 21st century learners to develop collaborative, problem-solving tools, and soft skills.

INTRODUCTION

The increased focus on the crosscutting approaches of curriculum design and education systems emerged from the needs in producing a global citizenry that is prepared for modernity (Basham, Israel, & Maynard, 2010). There is little doubt that the world has changed and is continuing to change. As a global society, we are in the midst of disruption across all aspects of life, from the way we socialize, consume news and information, to buying goods, and work. The World Economic Forum (Schwab, 2016) has identified these changes as the beginning of the fourth industrial revolution.

The revolutions of the past have shaped the schools of today and the emergence of the fourth industrial revolution will reshape the education system of the future. As identified in Basham, Han, Zhang, and Yang (in press) the first industrial revolution (circa 1760s) brought machine based manufacturing and railroads to existence. These changes started to shift populations of people living and surviving in rural villages and towns to larger population centers driven by the new capitalist economy. During this time, the value of education moved informal apprenticeship models to support the rural area to more formalized education models for educating more people. Schools and universities started to develop specialized areas of preparation and training to prepare the workforce for survival in the new economy.

The second industrial revolution (circa 1870s) was about developing technological solutions for society's changing needs. With a more educated populace, came the development and adoption of technological solutions and early standards-based systems in manufacturing, production, health care, sanitation, and communications at scale. During this time, society witnessed the development of steel, expansion of railroads, internal combustible engine, electrification, assembly line factory models, and scientific management of manufacturing and business systems. The education system modeled the newly found need for standardization through forming standards and a level based education system. This increased focus on specializations, beginning the science of education, and a focus on the efficiency of student learning in the system.

The third industrial revolution (circa 1950s) emerged with a focus on globalization of systems through standardized processes and increased capabilities in communications. Today, this is represented in the adoption of digital systems across society in areas such as manufacturing, communications, commerce, and daily life. The education system reacted through development and acceptance of national and international standards, support for wide-scale achievement measures, the classification of learners with differences and disabilities, and increased scientific focus on education and learning. This all placed a greater focus on specializations across education.

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