Chapter 21
Cloud Computing as a Catalyst in STEM Education

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ABSTRACT

The under representation of students in STEM disciplines creates big worries for the coming demands of STEM occupations. This requires new strategies to make curriculum interesting to enhance student's engagement in learning. Technology integration in curriculum makes more interesting and engaging, where students can learn with flexibility in time and place. This methodology creates and deepens interest in students towards learning with creativity and innovation. STEM students can work on authentic and real solutions within a technology-mediated learning environment, while inculcating higher order thinking skills. Technology-mediated environments support new ideas, real time collaboration and promotes peer learning. However, affordance as an adoption factor of technology in academics can be addressed by cloud computing technology. STEM education on cloud computing technology will gain access to its content rich features based on flexibility, accessibility, scalability, affordability, and reliability and enhanced agility. The cloud computing based STEM education infrastructure will inculcate development and experimentation skills in students. The present work (a) reviews scholarly work in cloud computing technology for simulations and prototypes for different STEM subjects, (b) outlines the benefits of using cloud computing technology for students pursuing STEM careers, and (c) presents the case studies of the successful implementation of cloud computing in STEM disciplines.

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INTRODUCTION

Education is the backbone of any country for its economic and social development. Science, technology, engineering, and mathematics (STEM) education and skills are required for tough analytical problems-solving and supporting job functions. National Science Board (2014) has researched employment prospects and found that major broad occupation exists in science and engineering categories. Figure 1 shows the employment in STEM disciplines across all education levels in 2012 National Science Board (2014). In coming years, the need for people with STEM skills is heightened due to the diffusion of technology across industries and occupations (Carnewale, Anthony, Melton et al., 2011). According to the report by Carnewale et al. (2011), demands of STEM discipline will cross the three million mark by 2018. To meet the growing demands, quality of STEM education needs to be developed to prepare a high calibre workforce. A survey conducted by Accenture Institute of High Performance found that students are less interested in STEM subjects in various countries (Craig et al., 2011) as shown in Figure 2. The figure shows the least ratio of students studying STEM subjects in different countries. These figures are not sufficient to fulfil the STEM job requirement in coming years. By observing mismatch between the demand and supply of market can be fulfilled not only by improving skills and knowledge of students by reorganizing and effective STEM education, but also by creating the student interests in studying these subjects. For reorganizing STEM education, American government proposes $2.9 billion for federal investment in science, technology, engineering and mathematics, an increase of 3.7 percent over 2014 funding levels ("Progress Report", 2014). This shows the upcoming new requirement of STEM graduates.

Figure 1. Employment in S&E occupation in 2012