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Essential knowledge for academic performance: Educating in the virtual world to promote active learning

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HIGHLIGHTS

- Academia focuses on content knowledge neglecting procedural knowledge.
- The labor market demands the development of both.
- Simulations offer a way of measuring, training and disentangling both.
- Results show procedural knowledge influences academic performance.
- Teachers should focus on both types of knowledge benefiting universities and students

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ABSTRACT

Education has traditionally focused on the importance of content, and has guided curriculum design according to this principle. While content knowledge is important, to excel in the labor market today graduates need to develop procedural knowledge, with greater emphasis on capacity development for transferable skills. This need is amplified by emergent technologies, which increase the demand to develop knowledge in this domain. To disentangle and measure the impact of content and procedural knowledge on academic achievement, the study occurred in a virtual setting. Based on the findings, we provide recommendations for course designers and course developers to improve students" performance.

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Picture 1

"For the things we have to learn before we can do them, we learn by doing them." – Aristotle

1. Introduction

Globalization and competition increase substantially due to the availability of new technologies, changing the way students elect a program, university, or course. While it is important to acquire conceptual knowledge and expertise in a domain (Alexander, Schallert, & Hare, 1991), to excel in today's labor market, graduates need to develop procedural knowledge, with a focus on skills that are transferable across multiple domains and contexts (Beaudry, Green, & Sand, 2013; Friedman, 2005; Pink, 2006). Consequently, such increases also change the way students prefer to learn and the ways in which teachers can provide more flexible and adaptive education (Christensen & Eyring, 2011). Moreover, today's labor market, accelerated by the current credit crunch, imposes higher demands on workers' qualification levels (IBM, 2010). Trends in the labor market indicate a shift in demand from cognitive tasks to practical execution and transferable skills (Beaudry et al., 2013). Escalating tuition fees and a tight labor market bring about financial and time constraints, making the acquisition of procedural knowledge during curriculum, in the form of internships or part-time jobs, difficult, if not impossible. Such developments question the nature of current education programs and demand continuous assessment of how higher education contributes to the changing demands of the workplace. As a direct result, today's graduates must develop procedural knowledge

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Picture 1.

(know-how) as well as conceptual knowledge (know what) in their domain (Claxton, Lucas, & Webster, 2010; Lucas & Claxton, 2009; Schank, 2011) in order to increase their job prospects (European Centre for the Development of Vocational Training, 2010). Therefore, universities can facilitate and foster such competency development, and support educators to explore areas, which promote student learning and development.

1.1. A different kind of skillset

While employers seeks individuals who can demonstrate an execution of their knowledge to thrive in the complexity of industry (IBM, 2010; Johnson et al., 2013), higher education has been criticized for failing to develop such characteristics and struggles to prepare young people for challenging new jobs in times of exponential change (Boyatzis, Stubbs, & Taylor, 2002; Frenk et al., 2010; Kanes, 2011). Universities are said to focus on teaching conceptual knowledge at the expense of procedural knowledge (Belei, Noteborn, & de Ruyter, 2011; Gijselaers & Milter, 2009; Gijselaers & Milter, 2010; Scardamalia & Bereiter, 2006) , potentially affecting the ability of graduates to perform well in their future jobs (Laveñe, 2006; Page & Mukherjee, 2007).

Some authorities suggest that current changes in the labor market require a fundamental shift in the design and purpose of education in general - higher education in particular (Barber, Donnelly, & Rizvi, 2013; Harasim, 2012), thereby highlighting the need for educators to refocus their teaching (Oblinger & Oblinger, 2005), from theoretical knowledge to transferable skills (Claxton et al., 2010; Scardamalia & Bereiter, 2003).

Research in higher education consistently demonstrates that procedural knowledge is best taught through active learning approaches (Candy, 2000; Wooldridge, 2006). Still, with the exception of early adopters and innovators in the field, higher education remains rather static, with limited opportunities to integrate practice in meaningful ways (Belei et al., 2011; Graeff, 2010; Scardamalia & Bereiter, 2006; Noteborn, Bohle Carbonell, Dailey-Hebert, & Gijselaers, 2012). Therefore, despite the prevalence of student projects and practical assignments, a gap between theory and practice still exists. Yet, one advantage of the increased prevalence and use of emergent technologies is the ability to create unique learning experiences and to connect learners in new ways.

1.2. A fundamental shift

Computer simulations have been lauded for their ability to address difficult, or even impossible, to observe phenomena (Çepni, Taş, & Köse, 2006; Urban-Woldron, 2009). Recently, educators have started to adopt advanced simulations, such as virtual worlds, to support learning in education and to help learners develop essential knowledge (Pena & Antonio, 2010).

There is a growing consensus that virtual learning spaces offer an optimal context to promote the merger of content and execution (Anderson, 1995; Fink & Fink, 2009; Yi & Davis, 2003), suggesting such environments can enable learners to develop the capacity for applying procedural knowledge in parallel to their conceptual knowledge acquisition. As the online learning movement becomes more prevalent, a new capacity for procedural knowledge in emergent technologies also grows across all domains (Clift, Mullen,

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