



# Investigating the impact of learning environments on undergraduate students' academic performance in a prerequisite and post-requisite course sequence

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## ARTICLE INFO

### Article history:

Received 19 February 2016

Received in revised form 16 June 2016

Accepted 9 August 2016

Available online 09 August 2016

### Keywords:

Prerequisite learning

Knowledge transfer

Learning environments

## ABSTRACT

Previous studies have compared student performance for the same or similar classes delivered in both online and face-to-face learning environments, however, few studies have explored the effects of change of learning environment play in the student's ability to transfer knowledge gained in prerequisite courses to follow-on, or post-requisite courses. The purpose of this study was to investigate the impact of the prerequisite course learning environment on student performance in post-requisite coursework. This study focused on undergraduate accounting, and employed a mixed methods approach to answer two main research questions. First, does student performance in post-requisite undergraduate accounting education vary based on the learning environment of the prerequisite course? Second, how do the learning environments of prerequisite and post-requisite courses influence student perceptions of the undergraduate accounting course sequence?

The results of this study indicate that student academic performance in the post-requisite course does not vary based on the learning environment of the prerequisite course. Additionally, while all students report encountering challenges, face-to-face students rely on self-study, collaboration with peers, and tutoring to overcome these challenges. Conversely, online students rely primarily on self-study to resolve similar challenges. The findings of this study suggest administrators should consider offering online prerequisite courses before, or in conjunction with their associated post-requisites, and provide similar access to external resources to assist with student learning challenges irrespective of learning environment.

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## 1. Introduction

Knowledge transfer is broadly defined as the ability to extend what has been learned in one context to new contexts (Perkins & Salomon, 2012). The context, or environment in which knowledge is first acquired, is a key factor in understanding how the process of knowledge transfer works. Within higher education, the once universal face-to-face classroom environment is rapidly being replaced or supplemented with online learning and its many variants (Allen & Seaman, 2014). In fact, online learning is seen as a solution to the capacity constraints growing enrollments place on the current academic infrastructure (Howell, Williams, & Lindsay, 2003). Students are subsequently no longer just choosing which courses to enroll in, but are also making decisions about which learning environment they prefer for a particular course. While the topics and learning objectives of the various enrollment options for a given course may remain stable, the learning

environment may vary greatly. It is unclear whether knowledge gained in one learning environment is as easily transferred when the student moves to another learning environment. Therefore, there is a need to develop a better understanding of how the learning environment of a prerequisite course influences academic performance in post-requisite courses.

## 2. Problem statement

Due to both the escalating costs in tuition at post-secondary universities, and the desire on the part of students for anytime, anywhere learning, many business schools are offering online courses to supplement traditional face-to-face instruction (Allen & Seaman, 2012). In 2013, >7 million college students enrolled in online courses in the United States (Allen & Seaman, 2014). Today, administrative decisions regarding which courses are offered online are driven primarily by economic factors with little or no consideration given to the impact on student learning (Wegner, Holloway, & Garton, 1999). Online courses offer a more cost-effective way to teach more students with fewer physical assets than the equivalent campus-based course (Figlio, Rush, & Yin,

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2013; Lundberg, Merino, & Dahmani, 2008). As stated by Bowen, Chingos, Lack, and Nygren (2014), “the time may finally be at hand when advances in information technology will permit, under the right circumstances, increases in productivity that can be translated into reductions in the cost of instruction” (p. 95). The authors also suggest that increases in online instruction may allow institutions to expand enrollment without a commensurate increase in space, representing significant cost avoidance relative to what institutions would likely need to spend should they choose to stay with a traditional model of instruction. Although business schools have embraced online delivery of individual courses, close to 40% of institutions have yet to offer fully online programs (Allen & Seaman, 2013). As a result, many students are required to complete a mix of both online and face-to-face courses. In fact, over 30% of all higher education students are now taking at least one online course in support of their degree requirements (Allen & Seaman, 2014). Students now have the option to complete entry level, or gateway courses, either online or face-to-face. However, these gateway courses often serve as prerequisite courses for more advanced coursework, which may or may not be offered online. Thus, it has become increasingly more common for students to complete prerequisite and the corresponding required post-requisite courses in different learning environments.

In a comprehensive research bibliography, Russell (1999) documented 355 research reports that found no significant difference (NSD) in student outcomes between alternate modes of education delivery. However, most of the studies Russell examined failed to take into account the cumulative effect of learning, and instead focused on comparisons between a single course offered both online and face-to-face. As a result, Phipps and Merisotis (1999) have called for further research on the impact of online learning over the course of an entire program or series of courses. This study responded directly to Phipps & Merisotis' original call by examining the impact of learning environment in an accounting course sequence.

### 3. Purpose of the study

Given the situation described above, the purpose of this study was to explore the extent to which the learning environment of prerequisite coursework impacts student performance in subsequent required, or post-requisite, coursework. Specifically, the researchers aimed to answer two research questions. First, does student performance in post-requisite undergraduate education vary based on the learning environment of the prerequisite course? Second, how do the learning environments of prerequisite and post-requisite business courses influence student perceptions of the undergraduate business course sequence?

The findings of this study are intended to help instructors better understand the challenges students may face in subsequent coursework based on the learning environment of completed prerequisites, and may serve as a basis for helping administrators in making choices regarding course offerings in online and face-to-face environments by establishing additional criteria beyond simply economic factors.

### 4. Literature review

#### 4.1. Prerequisite learning effectiveness

Drennan and Rohde (2002) investigated the determinants of success in an advanced management accounting course. The authors found that students who had completed prerequisite accounting courses outperformed their exempted colleagues, and that prior knowledge of accounting was the most significant factor in determining students' results in advanced accounting subjects. This claim was supported by several additional studies that found a students' performance in high school accounting subjects had a positive and significant effect on their results in introductory collegiate accounting courses (Auyeung & Sands, 1993; Rohde & Kavanagh, 1996). Johnson and Kuennen (2006) provided

further evidence of the positive influence of prerequisite knowledge. In administering a 15-question multiple-choice basic math skills quiz to 292 students, the authors found a students' score was positively and significantly related to the students' performance in an introductory statistics course, even when controlling for instructor.

Despite the richness of our understanding of the online learning environments, several gaps remain regarding the effectiveness of this learning format that require further investigation. One such gap, cited by Phipps and Merisotis (1999), is the need to study the impact of online learning over the course of an entire program or series of courses. To date, much of our understanding has been a result of emphasizing student outcomes based upon the format of individual courses. Many experimental studies have concluded that students participating in online courses perform as well as their counterparts in a traditional classroom setting (Neuhauser, 2002; Shelley, Swartz, & Cole, 2008; Van Ness, Van Ness & Adkins, 2000; Wegner, Holloway, & Garton, 1999), yet little is known about the cumulative effect of knowledge and skill building over time.

In order to apply knowledge gained in a prerequisite course to an academic performance in a post-requisite course, students must first retain the prerequisite knowledge (Royer, 1979). In one of the first studies that considered the relationship between mode of delivery and knowledge retention, Cosgrove and Olitsky (2015) found that while there was no significant difference in student learning across face-to-face, web-enhanced face-to-face, and blended economics courses, on average students in the strict face-to-face learning environment retained more course knowledge than students in the blended environment. The authors offered two possible explanations for their findings. First, face-to-face environments may encourage greater incentive to actively listen in class, and second, face-to-face students demonstrated greater willingness to seek assistance of the instructor outside of the class than students in blended learning environment.

#### 4.2. Comparing online and classroom learning

In 1983, Richard E. Clark published the results of a meta-analysis that examined the influence of media on learning and concluded that media does not influence learning under any circumstances (Clark, 1983). He argued that the medium is nothing more than a vehicle whereby instruction is delivered, and has no influence on the instruction itself. Clark's position is best articulated through his own analogy: “The best current evidence is that media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in our nutrition” (p. 445). Clark believed only the instructional method was capable of influencing learning, and the only factors that affected the choice of media were simply practical ones such as cost avoidance or convenience. He concluded by suggesting that any benefit that comes from the use of media is passed off as essentially wishful thinking, and “based on this consistent evidence, it seems reasonable to advise strongly against future media comparison research” (p. 450).

Richard Kozma responded to Clark's original work, and in the process triggered a rather visible debate in the literature (Clark, 1994; Kozma, 1994). After reviewing much of the same literature as Clark, Kozma concluded that various media have distinct symbol systems and processing capabilities that can complement those of the learner and produce a unique learning experience (Kozma, 1991). Kozma's contention that medium and method should have a more integral relationship led to a proposal that instructional theory need not depend on necessary conditions of learning, but rather, should describe the synergy between media, content, and learning interactions as a mechanism for focusing on establishing conditions that are sufficient to bring about learning.

The technology available today to assist student learning is vastly different than it was three decades ago during the initial effectiveness of media debate headlined by Clark and Kozma. In order to understand

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