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E-assessment of online academic courses via students' activities and perceptions☆

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ABSTRACT

The rapid growth of online courses in higher education has led to developments in the field of e-assessment. This paper presents a study, which examined the quality of online academic courses using a multidimensional assessment of students' activities and perceptions, using educational data mining and an online questionnaire. The assessment focused on four aspects: instructional, communication, course workload and overall learning experience. The course instructional model was found well-structured. The video lectures, assignments and materials designed for the online course were the most used and contributing learning resources. However, the number of students who entered the video lectures decreased as the course progressed. Low activity was found in the discussion forums. Students perceived the course workload as low. Overall, the learning experience was high and the students were highly satisfied. These findings provide insights that may assist in improving the quality of future online courses.
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1. Introduction

Rapid growth has been exhibited recently in online academic courses offered by higher education institutions (Toven-Lindsey, Rhoads, & Lozano, 2015). Indeed, decision makers at academic institutions consider online academic courses to be a critical long-term strategy (Allen & Seaman, 2015; Parker, Lenhart, & Moore, 2011) in improving teaching and providing access to a wide range of audiences (Macfadyen & Dawson, 2010; Roby, Ashe, Singh, & Clark, 2013). The proportion of academic leaders in the United States indicating that online learning is essential for the long-term strategy of their institutions increased from 48.8% in 2002 to 70.8% in 2014 (Allen & Seaman, 2015; Cheng, Jordan, & Schallert, 2013; Parker et al., 2011; Toven-Lindsey et al., 2015).

In light of the increasing rate of online courses in higher education, assessment of these courses becomes particularly critical for faculty and students (Stödberg, 2012; Yao, 2014; Young & Norgard, 2006). Such assessment comprises a crucial element for effective learning and substantially impacts learning (Angus & Watson, 2009). As such, developments recently took place in the field of e-assessment (Sebastianelli & Tamimi, 2011). New evaluation methods and tools based on emerging technologies in the field of Information and Communications Technologies (ICT), such as data mining, were developed to evaluate the quality of online courses (Baker & Inventado, 2014; Gikandi, Morrow, & Davis, 2011; Kazanidis, Theodosiou, Petasakis, & Valsamidis, 2014). These technologies enable tracking, assessing, and responding to student behavior in online courses with far greater depth and speed than was possible prior (Prineas & Cini, 2011).

The purpose of this paper is to present a study, which examined the quality of online academic courses, by conducting a multi-dimensional e-assessment. The assessment focused on examining students' activities and perceptions in four main aspects: instructional, communication, course workload and overall learning experience in the online course.

2. Background

2.1. Approaches towards e-assessment of online courses

In light of the expansion of online courses within academic curricula in higher education and the ongoing debate on the quality of these courses compared to face-to-face courses (Allen & Seaman, 2015), assessment procedures evaluating the quality of online courses are crucial. Furthermore, understanding what students find helpful and what they find to be a hindrance to online learning is important to tailor courses that best meet their needs (Lao & Gonzales, 2005; Young & Norgard, 2006).

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Jaggars and Xu (2013) present four main types of literature regarding online course quality: (1) practitioner oriented literature, which includes theory-based frameworks, case studies of successful courses, papers on perceived best practices, and reviews of such work; (2) surveys which capture students' and instructors' opinions regarding the elements that characterize high-quality online courses; (3) controlled studies, which attempt to assess the causal effects of specific aspects of online learning on students' attitudes or outcomes; (4) course quality rubrics, which were created by educational associations to assess the quality of online programs or courses. The literature points out several main aspects to be considered when assessing the quality of online courses: course development, instructional design; course structure; content; technology and accessibility; communication between instructors and students; learning effectiveness; student and faculty satisfaction; and student, faculty, and institutional support (Chaney et al., 2009; Jaggars & Xu, 2013; Sebastianelli, Swift, & Tamimi, 2015; Sloan Consortium, 2002).

Alongside, in the past years approaches towards quality assessment have changed and became more process-oriented, combining ongoing information on students' activities and needs (Thair, Garnett, & King, 2006). New technology has enabled more frequent and varied assessment measures in the online learning environment, compared to the traditional learning environment (Meyen, Aust, Bui, & Isaacson, 2002). A key assessment procedure in online courses involves educational data mining to trace the students' learning activity (Kazanidis et al., 2014). In the online learning environment, participant activity data is automatically collected into servers. This process makes it possible to trace the trail of individual learners (Chauhan, 2014; Nachmias & Hershkovitz, 2007) and thus to better understand learners' behaviors and to personalize the learning environment. Moreover, it enables the characterization of various patterns of behaviors in the online course and the identification of diversity among learners. Moreover, the analysis of the learners' attitudes towards the online course can provide complementary insights in regard to the strengths and the challenges in the online courses. Such capacities help optimize the online course and improve the teaching and learning offered online (Ai & Laffey, 2007; Lu, Yu, & Liu, 2003; Romero & Ventura, 2007).

2.2. Instructional aspects in online courses

2.2.1. Course design and contents in online courses

A suitable design of pedagogical elements in online courses is crucial to the quality and effectiveness of the online learning. Students report that course design impacts the success of an online learning experience (Song, Singleton, Hill, & Koh, 2004). Challenges in this regard often relate to organization and course structure (UDI Online Project, 2010). As such, the literature indicates the importance of consistency and modularization in the course structure. Bruckman (2002) recommends the use of a well-established, consistent structure – both across and within courses, in order to achieve a standardized format. Modularizing course content into units seems to make it easier for students to manage their learning in an online course, allowing them to focus on learning new material rather than on learning new formats (Jones & Kelley, 2003). As such, greater levels of consistency in course structure and easiness of navigation in the course were found related to higher levels of student satisfaction (Shea, Swan, Fredericksen, & Pickett, 2002; Swan et al., 2000). Clear objectives and requirements of the course were also found to increase student satisfaction (Toven-Lindsey et al., 2015). In contrast, online courses that are constructed poorly or ill managed, can cause a sense of dissatisfaction (UDI Online Project, 2010).

Likewise, it is important to design carefully the contents within the course structure. Course contents should be up to date, challenging, and delivered in a way that motivates the learner (Drago, Peltier, & Sorensen, 2002; Jones & Kelley, 2003; Sebastianelli et al., 2015). A rich learning environment that includes video lectures, presentation slides, and multiple communication methods contributes to the effectiveness of online learning (Balkin, Buckner, Swartz, & Rao, 2005; Crawford-Ferre & Wiest, 2012). As such, students in online courses indicated that they experienced a richer learning environment, which provides access to various information and data sources (Daugherty & Funke, 1998). Moreover, varied content delivery methods should be integrated, including synchronous and asynchronous learning activities (depending on the context) (Liu, Liu, Lee, & Magjuka, 2010; Osman, 2005). Peltier, Schibrowsky and Drago (2007) claim that course content is the most significant driver in students' perception of the quality of the learning experience. Palmer and Holt (2010) indicate that students perceive the ease of access to varied, high quality, and up to date learning materials as benefiting their learning in online course. Additionally, students perceive online learning to provide more autonomy and control and allow flexibility in terms of time and location (Daugherty & Funke, 1998; O'Malley & McGraw, 1999; Palloff & Pratt, 2001; Rodriguez, Rooms, & Montanez, 2008). Moreover, online courses enable more time on learning materials compared to classroom-based learning (Robertson, Grant, & Jackson, 2005).

2.2.2. Assignments in online courses

Integrating assignments into online courses serves as a means for increasing students' involvement and engagement in the course. In addition, it enables the instructor to track and assess students' knowledge, and to provide them feedback. The instructor's feedback enables the students to revise the assignments, and thus to reinforce the course concepts (Bolliger & Martindale, 2004). Research indicates that the feedback on assignments is important and must be given in a timely manner in order to keep the learners involved and motivated (Robertson et al., 2005; Smith & Dillon, 1999). Hara and Kling (1999) report that in courses in which the instructors did not specify expectations for assignments students were frustrated by their uncertainty regarding the instructor's expectations. Furthermore, when designing the course assignments, it is essential to incorporate deadlines, which have been reported in the literature as advantageous to students. It helps them to avoid procrastination, encouraging them to spend time on tasks, supporting them in self-regulation and providing them a context for regular contact with the instructor and peers (Graham, Cagiltay, Lim, Craner, & Duffy, 2001; Northrup, 2002).

2.3. Communication in online courses

Studies have found communication to be an important component in online courses, especially given the absence of physical meetings. Therefore, communication should be carefully designed to enable student-instructor and student–student interactions. Various means facilitate such communication, such as: discussion forums, chat rooms, e-mails, and synchronous meetings (Wallace, 2004).

Student-instructor communication involves faculty feedback to students regarding academic activities and performance, answering questions regarding subject matter, as well as encouraging discussion about course-related and other topics. Such interaction is considered essential for fostering a sense of connectedness and a part of an online learning community among the students (Sebastianelli et al., 2015; Wallace, 2004). Student-student communication is important for collaborative learning. Studies

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