Chapter 51
Using the Flipped Classroom to Improve Knowledge Creation of Master's-Level Students in Engineering

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ABSTRACT

Student engagement in traditional teacher centered model of teaching is limited to independent working or working in a small group on a task designed by the teacher. Flipped classroom is a blended learning strategy that reverses the traditional educational arrangement by delivering instructional content, often online, outside of the classroom and moves activities, including those that may have traditionally been considered homework, into the classroom. Various studies support and recommend flipped model of teaching at graduate and undergraduate level but very less have analyzed the impact of flipped classroom on academic performance and especially knowledge creation at post graduate level. In this paper we are analyzing the performance and knowledge creation of master's level students using Data Mining Techniques in a flipped classroom model.

INTRODUCTION

Student engagement in traditional teacher centered model of teaching is limited to independent working or working in a small group on a task designed by the teacher. Flipped classroom is a blended learning strategy that reverses the traditional educational arrangement by delivering instructional content, often online, outside of the classroom and moves activities, including those that may have traditionally been considered homework, into the classroom. Various studies support and recommend flipped model of teaching at graduate and undergraduate level but very less have analyzed the impact of flipped classroom on academic performance and especially knowledge creation at post graduate level. In this paper author is analyzing the performance and knowledge creation of master's level students using statistical data mining and opinion mining techniques in a flipped classroom model.

BACKGROUND

Numerous studies have been conducted on various facets of Flipped Classrooms focusing on the increased levels of active learning, student's participation and collaboration among the students in the flipped class and effect on coping with absence from the class. None of the studies has compared the level of knowledge creation in flipped classroom. This study uses educational data mining methods and quasi experimental methods to compare the academic performance of the students at master's level and secondly the comparison of knowledge creation in flipped classroom with normal teaching setting.

Flipped Classroom

The idea of reverse classroom or Flipped teaching was conceived by pair of high school teachers, Jon Bergmann and Aaron Sams from Colorado in 1990's. They began recording their lectures for students who have missed their classes. The strategy was first employed to facilitate the students who missed their lecture but later it turned into the concept of authentic learning model (Maureen et. al., 2000).

In 1993, Allison King coined the phrase "From sage on the stage" to "Guide on the side" in her article discussing flipped instruction. In this article king focused on the importance of the use of class time for the construction of meaning rather than information transmission. King directly does not illustrate the concept of flipping the classroom but his work is often cited as an impetus for an inversion to allow for the educational space for active learning (King, 1993).

Perhaps most recognizable contributor to flipped classroom is Salman Khan, graduate from MIT and MBA from Harvard. He took a job as a financial analyst. In 2004, Khan began recording videos at the request of a younger cousin he was tutoring because she felt that recorded lessons would let her skip segments she had mastered and replay parts that were troubling her (Sarah, 2011). Salman Khan founded Khan Academy based on this model. For some, Khan Academy has become synonymous with the flipped classroom; however, these videos are only one form of the flipped classroom strategy (Thompson, 2011).

Talley and Scherer (2013) studied the effect of flipped classroom instruction in a Physiological Psychology course with psychology students. Comparing student's performance between the flipped classroom semester and the previous year's performance, along with learning techniques, self-explanation and practice testing increased the final course grade over previous semesters. Also, researchers found a significantly higher performance level for students taking the flipped classroom. The researchers also reported an overall positive attitude of students (Talley & Scherer, 2013).

Students' achievement and attitude were also examined in a flipped college-level information systems spreadsheet course. The study provided convincing evidence of the effectiveness of the flipped approach over both the regular and simulation-based. Authors used pretest posttest quasi-experimental mixed methods design to determine differences in student achievement associated with the instructional approach being used. In addition, the scalability of each approach was evaluated along with students' perceptions of these approaches to determine the affect each intervention might have on a student's motivation to learn. The conclusion of the study stated that a technology enhanced flipped classroom was more effective and scalable in facilitating learning in comparison to traditional learning classrooms and simulation based training classrooms. Students were more motivated since flipped model allowed greater differentiation of instruction (Davies et. al. 2013).

Harvard University and MIT announced the launch of edX, an open online learning platform in spring 2012. edX allowed anyone with internet connection to register and complete the online courses. A quasi

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