Identifying Factors which Critically Affect Students' Failure in Blended Courses

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Abstract. Our modern era has brought about radical changes in the way courses are delivered. To meet the new challenges, a new course type has emerged, the blended course in the context of which online teaching and conventional instruction are efficiently mixed. This paper demonstrates a way to identify factors affecting students' critical performance in blended courses through the development of a potent risk model. The risk model is demonstrated in the context of two specific blended courses, sharing the same learning design.

Keywords: risk model; risk factors; students' achievement; engagement; blended courses.

1 Introduction

Blended learning (BL), also known and as hybrid learning, is a way of teaching that combines traditional face to face classroom methods (with technology mediated) and on-line educational material. This allows students to have access to teaching material, even after the lesson is finished and provides them with a more personalized learning environment. Blended learning differs from other on-line methods in the aspect of counting on "face to face" teaching methods as well (Friesen, 2012). It also provides a shift from traditional teaching to a more interactive one, where teachers act more as guides and supervisors, establishing a more personal relation with their students, than simply act as the ones who deliver knowledge to a large audience.

It could be argued that there are many blended learning models available which can be adopted by schools and institutions. This can depend on, content, scale, technology, learning spaces, students' age, etc. (PERC, 2014).

Comes to no surprise that education has been transformed the recent decades by the rapid spread of technology (Drosos et al., 2016; Skordoulis et al., 2014; Skordoulis et al., 2016; Drosos et al., 2015). Higher institutions, as the leading force in delivering

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educational innovations, are trying to adopt to modern society's educational needs (Skordoulis et al., 2015; Ntanos et al., 2020; Skordoulis et al., 2020). Therefore, Blended Learning can be used in a wide range of academic disciplines through a variety of pedagogical approaches and models.

In terms of the students' attitude towards blended courses, one study (Wu & Liu, 2013) has indicated that in general, students show positive attitude towards blended courses and that factors affiliated with learning climate; perceived enjoyment; perceived usefulness; system functionality; social interaction; content feature and performance expectation are also significantly related to students' satisfaction in blended courses (Skordoulis et al., 2014; Skordoulis et al., 2015; Zapantis et al., 2017). Another study (Wang, 2018) has proved that a lot of students who attend blended courses not only show positive attitude towards these courses but they also achieve better results in the context of their performance in comparison to students enrolled in conventional courses. That finding is also in line with the studies (Akbarov et al., 2018; Bakeer, 2018; Maccoun, 2016; Vernadakis et al., 2012; Alsalhi et al., 2019; Saritepeci & Cakir, 2015) which have pointed out that blended learning has positive impact on students' performance.

In the context of students' performance in blended courses, one study (Ismail et al., 2018) has considered the following four main categories as especially important and significant factors that have great effect on academic performance:

- the use of technology;
- the interaction processes;
- the characteristics of the students;
- the characteristics of the class.

Another study (Ramirez et al., 2018) has attempted to describe the relationships concerning motivations; emotions, cognitive; meta-cognitive and learning strategies and their impact on learning performance in blended courses. Their results suggested that negative emotions play a meaningful role between expectancy (a component of motivation) and learning strategies and that the expectancy component of motivation positively influences meta-cognitive strategies.

The issue of students' performance in blended courses has also been addressed in another work (Wenchieh & Lan-Yin, 2010). This study has clarified that students' performance in blended courses is affected by the success of two systems, the technical system and the social system. In a more elaborate detail, the technical system is reflected on the role of e-learning and the social system is reflected on the motivation and learning climate.

In parallel manner, another research (Owson et al., 2013) proved that high achievers in a blended course were students who had fully participated into online activities. Another work (Filippidi et al., 2010) focuses on the Moodle usage practices and their impact on students' performance in the context of a specific blended course proving that the Moodle system usage has accounted for the 20.2 % of variance in the students' final grade. It is also important to refer to another study (Keskin & Yurdugul, 2019) which has indicated that students' achievement in blended courses bears on their self-efficacy and e-learning motivation highlighting the important role of e-learning part.

It is also vital to refer to a study (Volchok, 2018) which made use of a binary logistics regression analysis to predict students' performance in two blended business

courses. The binary logistics' regression outcome on a data set including social; individual and academic factors indicated that students' self-regulation; skills and learning presence in the community are strong predictors of students' final achievement. Needless to say that the academic factors were reflected by students' engagement data including attendance; credit assignments; first quiz grades and semester grades.

In the area of students at risk, there are a lot of researches (Macfadyen & Dawson, 2010; Anagnostopoulos et al., 2020; Marks, 2000; Newmann et al., 1992; Willms, 2003; Fredericks et al., 2004; Zhang et al., 2004; Appleton et al., 2008) which have stress on engagement data as strong predictors of students' critical performance.

2 Research methodology

In the risk factors' identification process, appropriate data are analyzed in terms of a statistic method or a machine learning technique (Marks, 2000; Georgakopoulos et al., 2018; Georgakopoulos et al., 2020) in order to come up with the risk model which identifies the risk factors (Vose, 2008).

The risk model development process is demonstrated for two courses having the same instructional design. The number of students who participated in the first course was 144; whereas the corresponding number in terms of the second course was 150. The instructional design was exported to Moodle LMS. Students were deemed to pass the course if they achieved a final grade greater or equal to 5.

We modeled a binomial variable student risk describing students who were about to face the risk of failing the course (Macfadyen & Dawson, 2010; Anagnostopoulos et al., 2020). The state "0" was modeled to indicate students who were not about to face the risk of failing the course; whereas the state "1" was modeled to indicate students at risk. In parallel manner a set of variables was modeled, describing the students' interaction with the course activities. These variables are listed below:

- Number of Slides completed ("0": not completed, "1": completed);
- Number of Self-assessment quizzes completed ("0": not completed, "1":
- completed);
- Number of Exercises done/completed;
- Number of videos watched/completed;
- Forum used ("0": not used, "1": used);
- Total absences (skipping class);
- Test grade (before the final exams);

After the final exams, the below variables along with the student risk variable were deployed in terms of a binary logistics regression analysis (Volchok, 2018; Macfadyen & Dawson, 2010).

3 Results

3.1 Binary Logistics Analysis Outcome (Course 1)

The significant risk factors, which have significant contribution to the reduction of the risk probability are those factors, the significance value of which is equal or less than 0.05. Thereby, according to the Sig. column on table 1, these factors are the Test Grade and the Total Absences.

Table 1. Coefficients (Regression Model-Course 1).

	B	S.E.	Wald	Sig.	Exp (B)
Test grade	-0.654	0.123	28.232	0.000	0.520
Total absences	0.463	0.149	9.646	0.002	1.589
Constant	-0.198	0.809	0.060	0.807	0.821

3.2 Binary Logistics Analysis Outcome (Course 2)

According to the Sig. column on table 2, the significant factor is the Number of Slides completed.

Table 2. Coefficients (Regression Model-Course 2).

	B	S.E.	Wald	Sig.	Exp (B)
Number of slides	-0.654	0.123	28.232	0.000	0.520
Constant	-0.198	0.809	0.060	0.807	0.821

4 Conclusions

The results have proved that there is not a specific factor that always has contribution to risk occurrence in the blended courses. The risk factors vary among courses. Shedding more light on these cases we can deduct that factors related to a conventional way of course delivery (lectures attended) and factors which are affiliated with a modern way of course delivery (slides completed mounted on Moodle LMS and online test grade) appear to be significant in the reduction of the probability of risk occurrence.

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