EXPLORING THE RELATIONSHIP BETWEEN THE TIME OF COMPLETING ONLINE QUIZZES AND STUDENTS’ PERFORMANCE IN ACADEMIC WRITING

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Abstract

Students’ online behaviour in two academic writing subjects was examined to determine if there is a relationship between first attempt at topic quizzes and academic performance. Of the 3078 students who completed the two subjects in the 2015/16 academic year, over half of the enrolled students completed Quizzes 1, 2 and 3 in the first two weeks following release. However, it took four weeks to achieve a completion rate above 50% for other quizzes. At the end of semester, a sudden jump was observed and by week 13, the completion rate for Quizzes 1 to 9 reached as high as 90% while it hovered around 70% for Quizzes 10 to 13. Students were classified into three groups based on their final subject grade: “at-risk” students, typical students and high performing students. Membership of these categories was used as the outcome variable in decision tree analysis. The tree where three variables (week of first attempt of Quiz 1, 3 and 5) were entered to predict the students’ grade membership identified that the week of first attempt for Quizzes 1, 3 and 5 were significant predictors and the likelihood of being an at-risk student was higher if Quiz 1 or 3 (together with Quiz 5) was completed late. These results have implications for monitoring future students’ learning progress by observing quiz attempt behavior and following up students who do not complete the quizzes or complete them late. The results can also inform setting of deadlines to better align monitoring and intervention. This study has shown that simple indicators like time of quiz completion can predict academic performance as measured by students’ grades in the subject. For this subject, time of quiz completion appears to be an indicator that teachers can monitor to help improve outcomes for students.

Keywords: learning analytics, online learning, learning management system, academic writing.

1 INTRODUCTION

Blended learning has been widely adopted in higher education. Learning Management Systems (LMSs) such as Blackboard and Moodle have been used to create a learning environment where students can easily perform different kinds of learning-related activities, such as downloading notes, accessing grades, completing tests or quizzes and participating in online discussions at any time and any where. LMSs also capture and store the activity of students and accumulate a large amount of valuable information for analysing students’ learning behaviour such as how many messages are read or posted or what content pages are viewed and when. These actions representing students’ behaviour and engagement online can be used to better understand what learners are doing and how this impacts on their learning. Teachers can make use of these statistics to monitor students’ learning progress, identify and help at-risk students and predict student performance.

Many studies examining students’ LMS usage patterns in relationship to their final grade, have found that a range of student online behaviours predict final grade in a subject. For example, overall usage of the LMS resources, such as total number of hits recorded and log-in frequency [1, 2, 3] are related to final grade in a subject. Specific actions such as the number of times a student accessed content such as the course main page or files [4, 5], discussion forums [6, 7, 8], quizzes’ mark [8], quizzes’ attempts [5] and hits in assessment area [9] are also predictive of final grade.

All of these findings show that there is a relationship between the students’ activity in the LMS and the learning outcomes which are measured by final subject grades. Many studies have successfully developed practical and useful models for identifying at-risk students who finally performed poorly in the courses. This previous research has shown that analyzing usage data stored in the LMS can help teachers to take timely and evidenced-based actions to support those at-risk students.
2 RESEARCH QUESTIONS

While many researchers have found that frequency behaviours in the LMS (such as clicks, course access, content access, files downloaded, page access) or interactive behaviours (e.g., number of discussion posts, frequency of viewing posts) are correlated with final grades, few studies discuss whether there was a relationship between the time of completing online quizzes in the LMS courses and students' performance. Therefore, we examined the time pattern of students' first attempt at online quizzes to see whether there is a relationship between this and students' performance. To do this we used decision tree analysis with the chi-squared automatic interaction detector (CHAID) algorithm.

3 ABOUT THE ACADEMIC WRITING SUBJECTS

Our study looked at the LMS courses of two English for Academic Purposes (EAP) courses in 2015-16 academic year, focusing on different referencing styles: one course on APA / Harvard and the other one on IEEE / Vancouver. The LMS course design or structure and the skills taught in these two subjects were basically the same except the referencing styles taught were different due to the study field of the students (e.g. social science or engineering). The subjects were blended, with a face-to-face meeting each week and online LMS course for releasing announcements, downloading notes, reading materials for assignments, participating in discussion forum voluntarily and completing online quizzes. There were more than 150 LMS courses in these two subjects with around 20 students per LMS course and a total of approximately 3000 students. Nearly all of the students took these subjects in order to fulfil a graduation requirement. Students came from a range of disciplines including Business, Accountancy, Applied Mathematics, Rehabilitation, Nursing, Engineering, Design, etc. and usually took the subjects in their first year. The subjects lasted for one semester (13 weeks).

In these subjects, students were expected to complete two written and one oral assessment across the semester with the final grade based on their performance on these three assignments. Each topic in the LMS had a quiz which was a knowledge, understanding or application check for the topic. There were thirteen quizzes in total for the whole semester. Completing these online quizzes was compulsory, with a minimum requirement of 50% correct for the overall score. If students got less than 50% of the total score, their final subject grade would be downgraded. Quizzes 1 to 9 were released one by one each week starting from week 1 while Quizzes 10 to 13 were released together in week 10 and the closing day for all quizzes was the end of the semester. Students could have multiple attempts in order to get higher marks for meeting the 50% total marks requirement and could review the marks and correct answers for the quizzes after completing a quiz once.

4 RESULTS

The analysis approach used in this study was to first plot the cumulative percentage distribution of students' first quiz attempts across the semester. This provided a visualisation of completion patterns for the quizzes. Next in preparation for decision tree analysis, students were classified into one of three groups based on their final grade in the subject. These classifications were then used in decision tree analysis to examine the relationship between final grade and quiz completion.

4.1 Subject performance

In 2015-16, a total of 3078 students completed the two target subjects and received a final subject grade. Under the university grading system, grades are alphabetical with A+ considered the highest, followed by A, B+, B, C+, C, D+, and D considered as passing grade while the lowest F is a fail. Students were allocated into three categories based on their final subject grade: at-risk students (final grade = C/ D+/D/F), typical students (final grade =B/C+) and high performing students (final grade =A+/A/B+) as shown in Table 1.
Table 1. Percentage grade distribution.

<table>
<thead>
<tr>
<th>Student Classification</th>
<th>Final Grade</th>
<th>Count</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>High performing</td>
<td>A+/A/B+</td>
<td>116</td>
<td>3.8</td>
</tr>
<tr>
<td>Typical</td>
<td>B/C+</td>
<td>2308</td>
<td>75.0</td>
</tr>
<tr>
<td>At-risk</td>
<td>C/D+/D/F</td>
<td>654</td>
<td>21.2</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>3078</td>
<td>100</td>
</tr>
</tbody>
</table>

4.2 Time of first attempt for quizzes

There were thirteen online quizzes available for each of the LMS courses for the two subjects. Each quiz had its respective release date, with around one new quiz released per week. However, all quizzes had the same the closing date at the end of semester. The quizzes were designed to help keep track of students’ learning progression and could be used by students for revision. They could complete the quizzes whenever they liked during the semester. The only two requirements were that they had to complete quizzes in all each of the four modules and achieve above 50% of the total marks available for the quizzes. Therefore, the time students first completed the online quizzes varied. Fig 1 and 2 show the percentage of students who had completed the online quizzes for the first time by academic weeks in semesters 1 and 2 respectively.

Fig 1 shows that students were relatively more enthusiastic in completing the earlier quizzes as more than 50% of students completed Quizzes 1, 2 and 3 in a two week period. Then, the pace of quiz completion slowed. However, at the end of semester (week 12 and week 13), a sudden jump for the completion of quizzes was observed. By week 13, completion rate for quizzes 1 to 9 reached as high as 90% while it hovered around 70% for quizzes 10 to 13, which were released as a bundle towards the end of the semester (week 10). The situation in semester 2 is shown in Fig 2. In semester 2, students did not seem as motivated to do the quizzes as it took more than 5 weeks to see quiz completion rates reach above 50%. The slower pace may relate to the Chinese Lunar New Year (CNY) break (which is around 10 days) in the second semester during which students could plan time for learning and revision. Similar to semester 1, however, there was a jump at the end of the semester (week 12 and week 13) but the completion rate for Quiz 7 to 13 was lower than that in semester 1.

Figure 1. Percentage of students completing online quizzes for the first time by academic week (Semester 1).
4.3 Identifying “at-risk” students

Decision tree analysis, a data mining technique that can predict group membership [10], was used to identify students classified as at-risk based on their final grade in the subjects. The effectiveness of this technique was examined by retro-fitting a decision tree model to the full dataset of LMS activity at end of the semester. In this analysis, the CHAID algorithm in SPSS was used for classification based on chi-square tests. The outcome variable was membership of the three final subject grade groups: at-risk students (Final grade = C/ D+/D+/F), typical students (final grade =B/C+) and high performing students (final grade =A+/A/B+). The first assessment was due in these subjects in Week 6 or 7. Therefore only time of first attempt of quizzes released before the first assessment (Quizzes 1 to 5) was examined in this analysis.

Fig 3 shows the tree where three variables (week of first attempt of Quiz 1, 3 and 5) were entered to predict the students' grade category membership. This tree showed that while week of first attempt for Quiz 1, 3 and 5 were significant predictors, Quiz 5 had the biggest influence. Fig 3 illustrates that the likelihood of being an at-risk student was higher if Quiz 1 or 3 (together with Quiz 5) was completed late rather than early. Therefore, if students completed quizzes late or did not do the quizzes, they were more likely to be the at-risk students.

5 DISCUSSION

This study examined the time pattern of students’ first attempt at online quizzes and explored the relationship between this and their performance in two academic writing subjects. Results showed that very few students did the quizzes immediately after they were released and the time between quiz release and completion became longer towards the end the semesters. Students’ procrastination was even more obvious and prevalent towards the end of semester 2. Such behaviour is not unexpected amongst students because it had no consequence on their grade as long as they reached the 50% cut-off by the end of the semester. The decision tree showed that the week of students’ first attempt at quizzes predicts their performance in these subjects. Students who completed the quizzes late in the semester for the first time were more likely to have relatively lower final grades than those students who completed the quizzes early in the semester. This shows that the decision tree was effective in identifying at-risk students from data on their quiz attempt behaviours.
These results have implications for teachers in monitoring future students’ learning progress by observing their quiz attempt behavior and giving additional attention to students who do not complete quizzes in a timely manner. For example, instructors could make use of these findings to develop a notification system to monitor students’ learning progress based on quiz completion. They could choose a reference time-point for reporting students who had not completed the quizzes, such as one or two weeks before the first assessment task is due. Instructors could remind the students to do the quizzes by sending emails or messages to them in order to keep them on track. In order to improve the prediction accuracy, other variables could be further examined, such as quizz marks or other behaviours of students within the LMS.

The results also suggest that there is a need to review and re-design quiz deadlines for these subjects to better align with monitoring and intervention to improve student learning. Assigning earlier deadlines for quizzes may be useful for instructors to support at-risk students. To better assess for learning, instructors should also highlight the importance of completing quizzes earlier. The next step in our research is to explore other variables for analysis and the possibility of development of different models for notifying instructors about at-risk students. Furthermore, our future work will examine whether these findings can be applied to the students in the next cohort and ultimately, see how these online behaviours could help students to achieve the learning outcomes of the subjects.

REFERENCES


