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Matt Farrell

Fanshawe College, mfarrell@fanshawec.ca

Shannon Maheu

Fanshawe College of Applied Arts and Technology, smaheu@fanshawec.ca

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How Did You Study For the Test? Measuring the Impact of an Online Study Skills Module

Matt Farrell¹ Shannon Maheu²

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Abstract

The rationale for this project is rooted in the importance of students engaging in effective study habits in preparation for exams at the collegiate level. Many investigations into study habits rely on student self reporting. In this project we use online student activity data to supplement survey responses and attempt to determine whether an online study skills module a) impacted exam performance and b) changed student study habits. Students in online and blended courses were provided with an online study skills module that recommended effective study strategies. We examined clickstream data to identify the students who accessed the study skills module and then compared exam scores between those students who accessed the module and those that did not. Students were also asked to complete an anonymous survey to ask about their studying practices, including their experience with the study skills module. Findings suggest that the availability of an online study resource did not affect student study habits or exam grades.

¹ Professor of Interdisciplinary Studies, School of Language and Liberal Studies, Fanshawe College, 1001 Fanshawe College Blvd, London, ON. mfarrell@fanshawec.ca

² Professor of Psychology, School of Language and Liberal Studies, Fanshawe College, 1001 Fanshawe College Blvd, London, ON. smaheu@fanshawec.ca

Introduction

This project investigated whether an online study skills module provided to students in advance of a midterm exam would have any impact on grades. Effective study habits are essential for student success at the post secondary level, however many students self report the use of ineffective study strategies. Despite the evidence of effective study strategies, and the institutional supports available, many students continue to choose study strategies that do not improve memory or learning, such as simply highlighting or re-reading notes.

We sought to ascertain whether students might respond to a constructive intervention designed to inform students about effective study habits, and to observe any impact on exam grades for those students making use of the recommended strategies. We used learning analytics to track interaction with the study skills module, including the number of times a student accessed the material and the duration of the interactions. We compared those data with midterm grades to identify any relationship that suggested an effect on exam performance. Lastly, we administered a post exam survey to determine whether the study skills module prompted any students to modify their study habits.

This paper will proceed as follows: we will discuss the rationale for our project before describing the specific intervention offered to students. We will then recount the data gathered and offer an analysis of the results.

Rationale

Effective study skills are strong predictors of student success in individual courses and overall GPA (Credé & Kuncel, 2008). Moreover, large bodies of cognitive and educational research consistently outline the importance of specific study strategies including, practice testing, distributed practice and elaborative practice as effective study strategies for students (Dunlosky, Rawson, Marsh, Nathan, Willingham, 2013; Roediger & Pyc, 2012). Evidence also suggests the

quality of study has more of an impact on GPA than mere quantity of study time (Plant et al. 2005).

To promote quality study habits, postsecondary institutions offer a range of supports to assist students with the development of effective study skills, via both documentation and in-person supports through student success centers and peer tutors. Despite the supports available, and the seeming consensus around effective study techniques, students continue to report use of ineffective study strategies.

While many studies in this domain use student surveys to gain insight into the preferred study habits of students, learning analytics may provide an additional metric to supplement student self-reporting. Learning analytics refers to “the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs” (Siemens & Long, 2011). Learning analytics allows educators to monitor student activity in a virtual learning environment. This electronic activity log can provide “actionable intelligence” for informing the design of learning activities (Campbell, Peter, & Oblinger, 2007). This engagement with online course material - for instance, page hits - are a good indicator of student effort (Whitmer, 2013), and have been found to be positively correlated with exam performance (Andergassen, Mödritscher, & Neumann, 2014). For this study, we tracked students interaction with the course learning management system (LMS) to compliment the survey data and to provide insight into the utility of a specific study aid.

Methodology

We use an observational study to assess the impact of a study skills intervention on students in elective courses at a community college. Students were enrolled in five online and blended courses that were selected based on instructor participation in this study. The courses were breadth electives in the social sciences (n=351)

Description of the Intervention

An online study skills guide was created for students as an HTML page, and was uploaded as a content module to the respective course LMS. Identical versions of the module were provided to students across five online and blended sections. The study skills module consisted of two study skills guides:

1. What to Study Guide - this document outlined the details and specific content of the mid-term test (i.e. review sheet)
2. How to Study Guide - this document outlined rationale for having a study plan as well as offered elaborative practice study strategies, using examples and video instruction.

Our analysis was restricted to the *How to Study Guide*. Students were made aware of the module through an announcement widget on the course home page, as well as an email. The text of the announcement was identical across all course sections.

Data Gathering

Student activity data was downloaded from the LMS after all students had completed the exam.

Table 1 describes the variables used in the analysis.

Table 1: Table of LMS Variables Extracted

Variable	Description
Visits	Number of visits to the study skills module
Avg. Time	Average time spent per visit
Total Time	Cumulative time spent on all visits
Grade	Percentage grade on midterm exam

Students were also asked to complete a post-exam survey to solicit feedback about their choice of study habits based on questions used by Sebesta and Bray Speth (2017). The full survey instrument is provided in the Appendix.

The data gathered from the LMS and survey responses were used to answer the following questions:

- A. Did students who accessed the study skills module score higher on the midterm exam?
- B. Did the number of visits or time spent have an impact on exam scores?
- C. Did students use the strategies prescribed in the study skills module?
- D. Were students likely to change their study strategies for future tests?

Results

351 user records were downloaded from the LMS across five course sections. Records contained trace data for page hits, total time spent, and average time spent. These records were paired with midterm exam grades from the LMS gradebook.

A. Did student's who viewed the study skills module score higher on the midterm exam?

Student data was filtered to create two groups: students who accessed the study skills module (complete) and those who did not (incomplete). Descriptive statistics revealed that students who completed the study skills module did not perform significantly better on the midterm exam (Table 2).

Table 2: Descriptive Statistics: Completion vs. Non Completion

<i>Incomplete</i>		<i>Complete</i>		<i>Two-Sample t-Test</i>	
Mean	0.6936311	Mean	0.712793201	Hypothesized Mean Diff	0
Standard Error	0.0107066	Standard Error	0.00968377	df	309
Median	0.7	Median	0.7167	t Stat	-1.32735002
Mode	0.7	Mode	0.75	P(T<=t) one-tail	0.09268639
Standard Deviation	0.125318	Standard Deviation	0.137291136	t Critical one-tail	1.649799826
Sample Variance	0.0157046	Sample Variance	0.018848856	P(T<=t) two-tail	0.185372781
Kurtosis	-0.12715	Kurtosis	-0.117088993	t Critical two-tail	1.967670885
Skewness	-0.077907	Skewness	-0.425697873		
Range	0.6166667	Range	0.6964		
Minimum	0.3833333	Minimum	0.3036		
Maximum	1	Maximum	1		
Sum	95.027467	Sum	143.2714333		
Count	137	Count	201		
Confidence Level(95.0%)	0.021173	Confidence Level(95.0%)	0.01909539		

The mean exam score for students who accessed the study skills module was 71%, compared to 69% for those who did not. The difference was not significant at the p=.005 confidence level.

B. Did the number of visits or time spent have an impact on exam scores?

Number of Visits

A one-way analysis of variance (ANOVA) test revealed no significant difference in exam score based on the number of visits (Table 3). The average exam score for students who visited the mould once was 71%, which was the same average score produced by students who registered two visits. Interestingly students who visited a third time earned a lower average score.

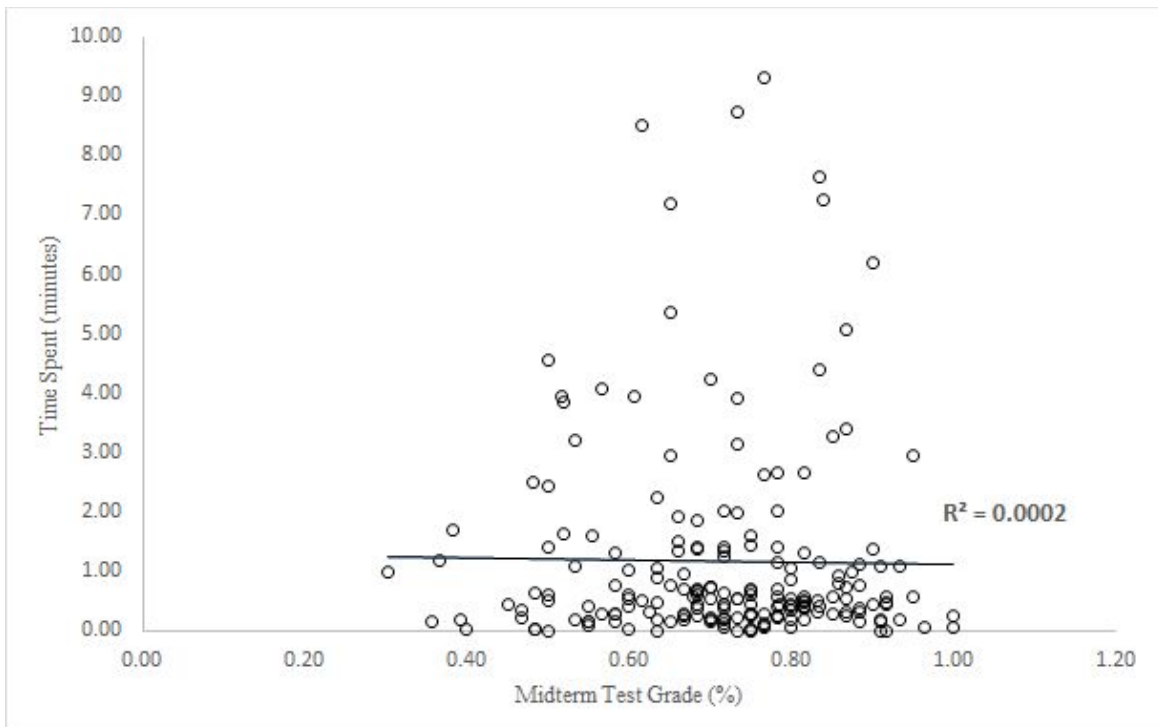
Table 3: Average Grade by Number of Visit

Summary				
Groups	Count	Sum	Average	Variance
1 Visit	153	109.1392667	0.71332854	0.018543581
2 Visits	189	135.6309333	0.717623986	0.01815738
3 Visits	9	5.915533333	0.657281481	0.016073007

Time Spent

19 records contained an error message indicating that a time report was not available. Those records were excluded from time comparisons for a total of 332. Figure 1 shows a scatterplot of the results.

Figure 1: Scatterplot: Time Spent vs. Grade

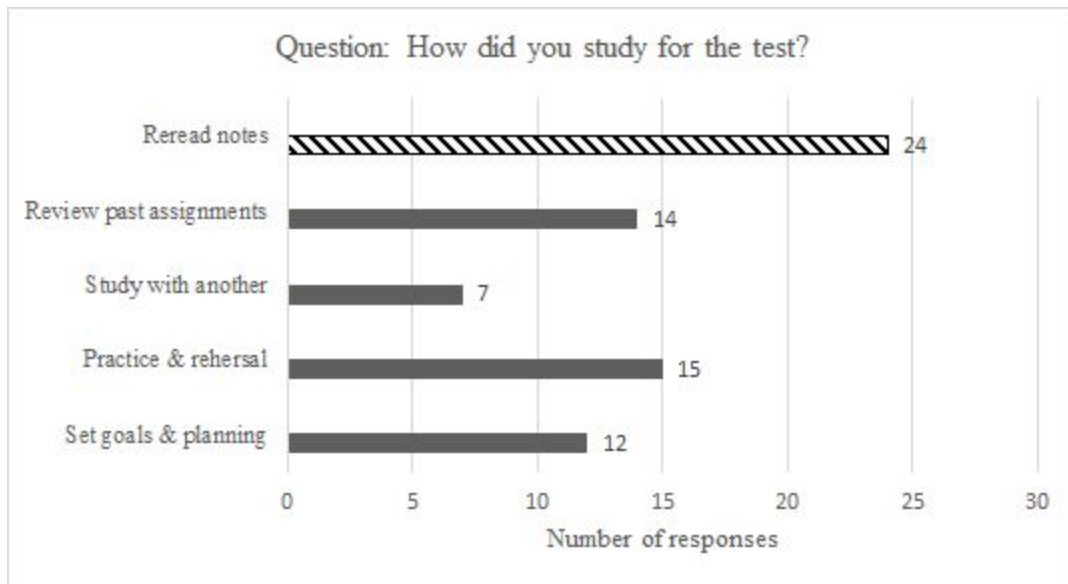


There was no significant relationship between the two variables ($R^2 = 0.0002$). The amount of time spent viewing the study skills module had no relationship with exam grades.

C. Did students use the strategies prescribed in the study skills module?

The post exam survey elicited 27 responses from students. Students were asked to indicate the strategy they used in preparation for the midterm exam (Figure 2). The range of choices included strategies that were explicitly recommended by the study skills module along with one option that was specifically discouraged by the study skills module (rereading notes). Almost all students indicated using the discouraged strategy of rereading their notes (n=24).

Figure 2: Self-Reported Study Strategies.



While several students did report using the recommended strategies, the fact that the dominant study strategy chosen was the one explicitly discouraged calls into question the efficacy of the study skills module.

D. Were students likely to change their study strategies for future tests?

When asked if students would consider adjusting their study strategies for a future test, only 9 of 27 students indicated they would maybe or definitely try something different on a future test

when asked a bipolar likert scale question. By contrast 18 students planned on ‘doing the same thing’ in preparation for future tests. When the question responses were offered as a unipolar question, 21 students were very or somewhat likely to study the same way. The existence of a study skills module did not seem to prompt students to adopt different study habits.

Discussion

This project seems to suggest that the use of an online study skills module had no impact on exam scores. Additionally, students did not appear to use the strategies recommended by the module, nor did they indicate a desire to adjust future study habits based on the information provided, prompting us to conclude that the study skills module did not succeed in its intended purpose of encouraging students to adopt more effective study habits.

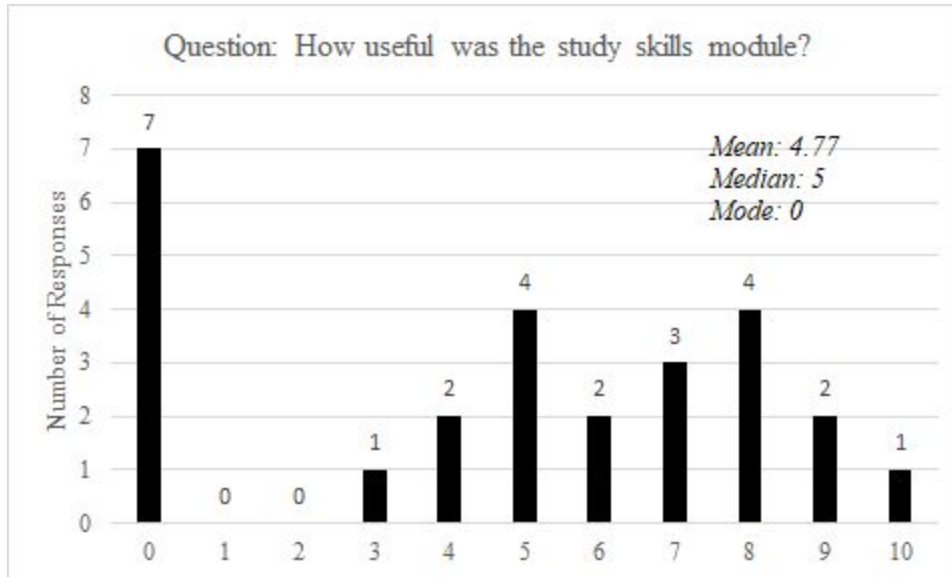
There are several limitations to this project that may help explain the results. First, the use of student activity log data - mouse clicks - is a crude proxy for engagement. For example, a student may click on a page, then proceed to a different activity for the next 15 minutes. The LMS will record an active session of 15 minutes. In the absence of additional technology, there is no method to determine actual engagement with the material. In attempting to measure student engagement with the study skills module, we may not be capturing an accurate representation of students’ interactions.

Additionally, there is scepticism whether a period of intense studying prior to an exam is an effective strategy. Research suggests frequent burst of activity aren’t as effective as sustained effort spread throughout the term. (Mödrischer, Neumann, & Andergassen, 2013). By providing strategies to aid cramming, we did not address the preferred method of success, which is to encourage more consistent effort through the full 14 week term.³ Providing opportunities in class for formative learning and elaborative practice throughout the term may help develop student learning and study skills.

³ The authors acknowledge the challenge of student motivation in online courses - especially for students enrolled in a non-core elective.

Finally, it is possible that the study skills module itself was insufficient. This seems to be supported by student responses to a thermometer scale question asking students to rate the usefulness of the module. Students were asked to assess the study skills module on a scale from 0 - not at all useful, to 10 - extremely useful. Responses, shown in Figure 3, were not encouraging.

Figure 3: Usefulness of Study Skills Module



While these findings may seem discouraging, they are not out of step with previous efforts in this domain. As Nonis and Hudson (2010) note, academic performance is driven by the interaction of different factors, including ability, study time, and study techniques. Interestingly they find counterintuitive, and sometimes negative, relationships between supposedly optimal study habits and exam performance. Observations are also complicated by factors like the quality of study notes. Further exploration of study habits and student perceptions may offer important understandings of where students are at in terms of current study habits.

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Study Habits Survey

You are being invited to participate in a study looking at the effectiveness of different course components, and the prevalence of select study habits. It will also ask questions about the “How to Study” guide that was provided by your instructor for your recent midterm test. Approximately 200 students have been invited to complete this survey across several online and blended course sections. The survey consists of 8 multiple choice questions and should take less than five minutes to complete.



1. How did you study for the recent midterm test?

For each of the following descriptions, indicate which strategies you used when studying for the midterm test. Check yes if you used the strategy described, check no if you did not.

Check all that apply.

	Yes	No
I set goals and a timeline for studying the material and I plan how to meet those goals on time (e.g., plan to review a chapter a day in the week before a test).	<input type="checkbox"/>	<input type="checkbox"/>
I practiced or rehearsed important facts in order to memorize them (for example, using flashcards).	<input type="checkbox"/>	<input type="checkbox"/>
I reread my notes.	<input type="checkbox"/>	<input type="checkbox"/>
I studied with another person (friend, classmate, roommate, etc)	<input type="checkbox"/>	<input type="checkbox"/>
I reviewed my previous assignments and quizzes critically (meaning, in an effort to understand the correct answer and/or explanation).	<input type="checkbox"/>	<input type="checkbox"/>

2. If the study strategy you used is not listed above, please describe it in the box below.

3. Would you say you are likely to study this way again on a future test, or are you likely to try something different?

Mark only one oval.

- Definitely try something different
- Maybe try something different
- Don't know
- Maybe do the same thing
- Definitely do the same thing

4. Did you read the "How to Study" guide that the instructor posted on the Content page on FOL.

Mark only one oval.

- Yes
- No
- Don't recall
- Prefer not to answer

Study Skills Module

This section will ask you some additional questions about the "How to Study" guide that was provided by the instructor.

5. How useful was the "How to Study" guide?

On the scale below, indicate how useful you found the information. (10 indicates you found the information very useful, whereas 0 indicates you did not find the information useful)

Mark only one oval.

0	1	2	3	4	5	6	7	8	9	10
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. Did you employ any of the techniques suggested in the "How to Study" guide?

Mark only one oval.

- Yes Skip to question 7.
- No Skip to question 8.

Study Skills Module (continued)

7. Please describe which techniques you used from the "How to Study" guide.

Performance Appraisal

This section will ask you to reflect on your midterm performance.

8. What was your grade on the midterm test?

Mark only one oval.

- Below 49%
- 50-59%
- 60-69%
- 70-79%
- 80-89%
- 90% or higher

9. **How satisfied or dissatisfied are you with your midterm test grade?**

Mark only one oval.

- Very Satisfied
- Satisfied
- Neither satisfied nor dissatisfied
- Dissatisfied
- Very Dissatisfied
- Don't know / Prefer not to answer

10. **Based on your responses above, are you likely to study the same way again on future tests?**

Mark only one oval.

- Very likely
- Somewhat likely
- Not very likely
- Not at all likely
- Don't know