

HYPERAUTOMATION TO INCREASE EFFECTIVENESS OF STUDENT ONLINE LEARNING BEHAVIOR

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Abstract. Vietnamese higher education has been dealing with increasing student enrollment and that will likely continue for some time. Employers are reporting not being satisfied with the quality of workers they are getting from the pool of university graduates and want employees to be more autonomous. Likewise, students also need to learn how to study more independently outside of the classroom. To help students develop the skills they need, higher education institutions should put the burden of learning onto the student rather than on the already overloaded teaching staff. Social modeling, from social cognitive theory, can be combined with technology to change student learning-related behavior as this randomized control trial with 309 undergraduate students shows. The behaviors which were under study included student interactions with the university's learning management system (LMS). Comparing the interactions with the LMS between the treatment and control groups shows a weekly report can be successful in motivating students to change their behavior. With the recent worldwide requirement of remote learning due to the Covid-19 pandemic, students will naturally interact with the LMS more than before. This will provide additional data to the system allowing clearer identification of the behaviors that lead to top-performing students.

Keywords: *Learning analytics, social modeling, learning management system, global south, digital university, learning analytics dashboard.*

1. Introduction

While the Vietnamese Ministry of Education and Training (MOET) continually aims to massively increase higher education enrollments (Trines, 2017), there is a challenge of getting so many students, including many who are the first in their family to attend higher education, to change their learning behavior (Fishman et al., 2017). While countless studies have been done with interventions to change students' learning-related behavior, most of these require the lecturer to change, often to teach even more. This may be putting too much of a burden on an already burdened teaching staff.

2. Background

Lecturers in Vietnamese higher education institutions (HEIs) have a heavy teaching load partially because teachers are expected to cover all course material during class time (Hayden, 2005). Academic salaries in Vietnam are already too low to attract higher quality educators (Hayden & Thiep, 2015). In fact, those with a university degree working outside the education sector earn more than those working at HEIs (The World Bank, 2008). Therefore, if we want to improve the quality of education, putting more burden on the teachers seems counterproductive. However, more must be done if student outcomes are to be improved, which is necessary to meet the demands of employers in Vietnam.

Vietnamese companies have been decrying the quality of workers available to them (Bo Xuan Hiep, 2018; Saigon Times, 2017) for many years. Vietnamese employers want and expect university graduates to

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be autonomous (The World Bank, 2008). Therefore, it is reasonable that we put more of the responsibility for learning onto the learner, rather than onto the already overburdened teachers. If large gains are to be made in student learning then we must target changing student behavior, not just in the classroom but their learning-related behavior outside of the classroom environment. This means that students will need to change away from learning only during class time and toward doing work both inside and outside of class for their own benefit and development.

Student behavior has been shown to be positive correlated to student learning for many decades, including by Bloom (1974). Indeed, any teacher in higher education knows that how much a student does outside of class is a key determiner of how much a student will learn. It is not just about time but also doing the right things (working smarter not harder). Classifying these learning-related behaviors has become a major course of research (Entwistle, 2018).

One challenge is that students do not know what they need to do to perform well in HEIs and, as mentioned above, it is unreasonable to expect teachers to teach everything that students need to know. This lack of understanding is even more true of students who are the first in their family to attend university (Fishman et al., 2017). There are students who are well prepared for higher education. These students tend to get the best grades because they have built the best study habits. Therefore, if there was a way to get all students to replicate the behavior of the best students, then it is reasonable that all students would improve, if not to the level of the best students, at least they would be closer than they are currently.

Social Learning Theory says that through observation, new behaviors can be learned (Edinyang, 2016). This idea was originally developed by Bandura (1977b) and later developed into Social Cognitive Theory. However, the basic tenet that learning can take place by observing others, that is through “vicarious experience,” remains (Bandura, 1977a). Social Modeling (Bandura, 2006) is the name given to this process whereby one person models a desired behavior and another person, by observing that behavior, will reproduce that behavior themselves. Just as social modeling is a way of indicating to others what should be done, Contrast Modeling (Bandura, 2019) involves giving an example of what not to do.

Bandura’s early work involved children learning physical behavior from watching adults. Specifically, his most famous experiment involved watching how children would behave toward a doll after watching adults either be kind or aggressive towards that doll. While there are those who question the study, it is generally accepted that Bandura’s concept of observational learning is, indeed, one of the ways humans learn.

Student learning-related behavior is key to their performance. It is generally understood that if students “do the right things” then they will perform well, not just while at university but also in the job market. This concept underpins the majority of research into student-focused educational interventions. For example, it is widely accepted that taking notes during a lecture leads to greater learning than not taking notes. Therefore, taking notes is behavior that leads to greater learning. How can social modeling, and perhaps contrast modeling, be used to help students to improve their learning-related behavior?

One of the foundational tools of the Digital University (see Webster & Andre, 2021) is the Learning Management System (LMS). The LMS is a specialized web-based software that helps manage the online interaction between teachers and students. For example, lecturers often post their lecture slides on the LMS so students can download and review them prior to the lecture, even if just to check for new vocabulary. Likewise, an LMS will include discussion forums where students can ask questions. While the teacher or tutor can answer the questions posted, the social aspect of these discussion forums can be configured to allow students to also answer the questions, with the lecturer making sure everything is correct. Educators can also add reading materials such as journal articles or links to useful websites or videos that students should review. While there are many more features of an LMS, the key is that it is a core technology of the Digital University (Harvey, 2020) and online and blended learning depend on it. As an initial experiment, student use of the LMS will be targeted.

Students must learn to become self-directed as agents of their own learning (Bandura, 2006). An agent here is someone who, by their own actions, can cause a desired effect to come about (Bandura, 2018). Agency is a critical component of social cognitive theory (Bandura, 2019) and contains four components of intentionality, forethought, self-regulation, and self-reflection (Bandura, 2018). The following are examples of how this experiment will address each of these components.

Intentionality: The desire is for students to have the goal of higher grades by seeing their behavior and performance compared to that of their classmates, thus seeing the possibility that they can improve (aiming for a higher goal).

Forethought: To achieve the desired goal of higher academic performance, the intent is for the student to make clear plans to change their behavior by following the model of the top performing students.

Self-regulation: In order to complete their plan, the desire is for them to self-regulate to ensure the needed steps are taken to change their actual behavior targeting higher usage of the LMS (presuming they see the top-performing students using the LMS at a higher rate).

Self-reflection: Students will be able to evaluate their performance (grades) and behavior (LMS usage) against the data which is reported weekly.

In short, this experiment used social modeling to help students to see how they can change their behavior, measured by usage of the LMS, as a means of improving their performance. Since social modeling has been used to promote wide-scale changes in personal conduct (Bandura, 2006, p. 11), it is reasonable to believe it can be used in the field of education to motivate students to change their behavior toward learning. The one doing the modeling, however, is being dynamically determined and is their peer rather than a teacher.

In social modeling, credibility and motivation are important (Bandura, 1977a). The modeled behavior must something that is believable by the students, something the students believe they themselves are capable of replicating, and will help them to achieve their actual goals. As students generally care about grades, if for nothing more than passing, this is how we will determine the social modeling groups.

The purpose of this study is to see if hyperautomation (the performance of tasks by a computer that were never done by a human) can be used to change student learning-related behavior without requiring any additional effort from the teacher. If technology can be used to fully execute this process, then as enrollments increase, there will be no need to burden already overloaded teachers with additional responsibilities.

Given the recent requirement for remote learning, due to the Covid-19 pandemic, this kind of hyperautomation may be even more important as students are more likely to depend heavily on the university's LMS when they cannot see the teacher in person.

3. Methods

3.1. Participants

This mixed-methods research included 309 students studying two first year undergraduate business management courses. All students studying these two courses were included and randomly assigned into treatment and control groups. All students were between 18 and 21 years old and most had spent their previous year studying English intensively as the program is an English-language program taught in a large Vietnamese public university.

3.2. Procedure

Students were notified at the start of the term that an experiment would be done. They were told they would be divided into treatment and control groups randomly and were informed about the importance of these boundaries.

During the fourth week of the term, questionnaires were sent and students were allowed two weeks to complete them.

At the end of the sixth week, treatment group members began receiving a weekly email which contained a link to a web-based report (a learning analytics dashboard). The report was divided into sections with each section targeting different student behaviors, mostly with the LMS. Figure 1 is an example of the first section. Note the reference to “Moodle” is a reference to the LMS.

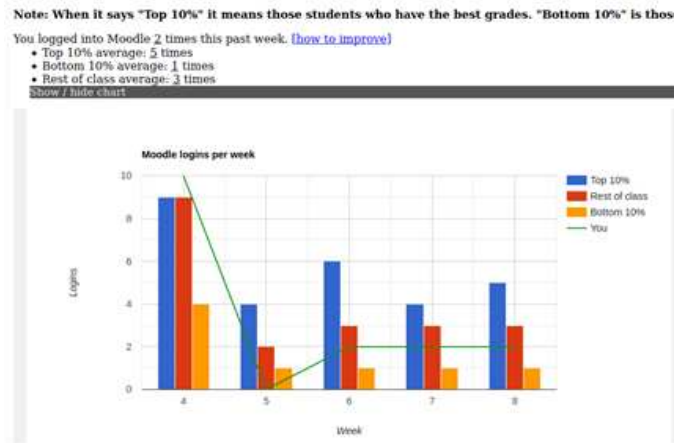


Figure 1. Report section 1

3.3. Analysis

As the reports began mid-term, the second half LMS usage was compared (using an independent samples t-test) to usage during the first half of the term to see if there were any statistically significant differences between the treatment and control groups.

Analysis here focuses on the following five categories of usage of the LMS: 1) how many times the student logged into the LMS, 2) how many online quizzes the student attempted, 3) how many of the URL links on the LMS were accessed by the student, 4) how many files on the LMS (posted by the lecturer) were downloaded by the student, and 5) all of these numbers combined to represent total LMS usage by the student.

4. Findings

The following chart shows that each of the five categories of LMS usage were higher for the treatment group than for the control group. For example, we can see that files were downloaded 5.04% more often by the treatment group. URLs were opened 40.57% more often.

Using a t-test to compare usage between the two groups in the first half and second half of the semester, shows only overall LMS usage, URL clicks, and LMS logins were statistically significant at the $p = .05$ level.

5. Discussion

This experiment provides evidence that students can be nudged (Thaler & Sunstein, 2009) into changing their behavior. Key to this nudging was using social modeling by showing what the top performing students' behavior includes. Also important was the contrast modeling showing what the bottom performing students' behavior includes.

Students can see the relationship between different categories of behavior (for example, exploring more URLs) and academic performance. Learners do not need to be trained in the proper use of statistics to see that there is an important relationship, especially when they can see the trend over time (see Figure 1).

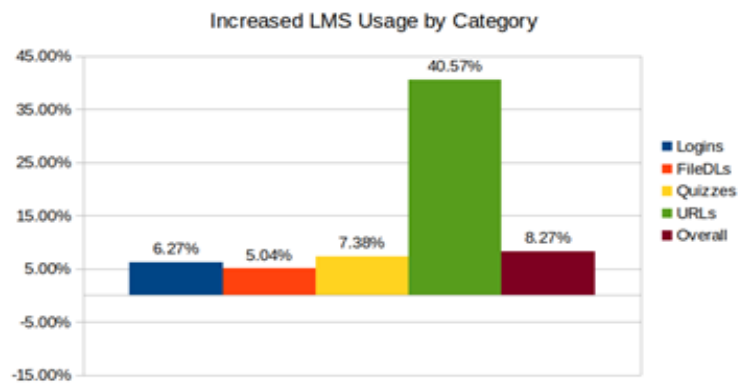


Figure 2. Treatment group LMS usage vs control group

Table 1. Comparing Means

Measure	Control		Treatment		T-test signif.	Effect size Cohen's d
	Mean	SD	Mean	SD		
LMS usage	-36.18	39.31	-23.82	38.94	.01	.36
URL clicks	-3.14	12.31	0.38	12.85	.02	.28
File downloads	-21.26	25.86	-16.63	23.01	.10	.19
Quiz attempts	-1.28	1.47	-0.95	1.77	.08	.34
Logins	-10.50	14.09	-6.62	14.09	.02	.27

It was likely important that these reports were weekly. The intention was that this would serve as a constant reminder to act.

Exploring why file downloads and quiz attempts were not impacted strongly enough to show statistical significance, it is important to know that the lecturer depends more on URLs (web-based articles) rather than files for students to download. Additionally, there is only one quiz attempt allowed each week while there are many URLs that the students can investigate. Since files and quizzes were the most restricted in terms of quantity, it is not surprising that these were the least impacted.

6. Conclusions and future directions

Changing student learning-related behavior now appears to be something that can be done through hyperautomation (having computers perform tasks that humans have not done in the past). Through social modeling (showing what students should do) and contrast modeling (showing what they should avoid), this experiment shows how an LMS can be leveraged to nudge students in the desired behavioral direction.

Given the recent requirement for remote learning worldwide, this idea may prove even more important. That is, as students learn solely outside of the classroom they are more likely to depend heavily on the LMS. This additional interaction (with the LMS) provides this kind of a system with even more data, allowing an even better identification of the behaviors students should seek to emulate.

While not all aspects of LMS interaction behavior that were tracked showed statistically significant changes, those changes that were statistically significant are important enough to warrant further investigation.

Now that it has been shown that the possibility exists to change student behavior through hyperautomation, additional investigations should be done. First, this experiment should be replicated in other universities, ideally in other cultures. Second, we need to make sure that this system actually captures all of the important student behavior. If students copy LMS interaction behavior without seeing their grades increase, their behavior will likely revert. This is important because the LMS likely does not capture all of the behavior which leads to top students to their top performance.

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