Recommending Self-Regulated Learning Strategies Does Not Improve Performance in a MOOC

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ABSTRACT

Many committed learners struggle to achieve their goal of completing a Massive Open Online Course (MOOC). This work investigates self-regulated learning (SRL) in MOOCs and tests if encouraging the use of SRL strategies can improve course performance. We asked a group of 17 highly successful learners about their own strategies for how to succeed in a MOOC. Their responses were coded based on a SRL framework and synthesized into seven recommendations. In a randomized experiment, we evaluated the effect of providing those recommendations to learners in the same course ($N = 653$). Although most learners rated the study tips as *very helpful*, the intervention did not improve course persistence or achievement. Results suggest that a single SRL prompt at the beginning of the course provides insufficient support. Instead, embedding technological aids that adaptively support SRL throughout the course could better support learners in MOOCs.

Author Keywords

Massive Open Online Course; Self-Regulated Learning.

ACM Classification Keywords

K.3.1. COMPUTERS AND EDUCATION: Computer uses in Education.

INTRODUCTION

A primary goal of MOOCs is to provide people with an opportunity to learn. Over 25 million people worldwide have enrolled in MOOCs between 2012 and 2015 [16]. Although only a small number of those who start go on to complete the entire course, many online learners selectively engage with parts of the content [3,5,7]. This variation in behavior can be attributed in part to differences in motivation [8,15]. In fact, only around half of the survey respondents in a typical MOOC report an intention to complete the course to earn a certificate [8]. However, that leaves hundreds of thousands of committed learners who want to complete the course, but do not succeed. The main obstacle, according to recent surveys, is that learners do not

have enough time to spend on the course [5,6]. While time is a finite resource, there are more and less effective strategies for time management, and more broadly, strategies for how to succeed in completing an online course. *What are effective strategies to complete a MOOC and how can online learners be empowered to apply those strategies?*

Self-regulated learning (SRL) strategies have been studied for decades in traditional classroom settings. Though definitions vary, SRL can be understood as the ability to control, manage, and plan learning actions and behavioral processes that increase goal attainment [12,17]. SRL skills improve as a person develops and keeps learning in pursuit of better academic outcomes. Students who apply SRL strategies are more successful in problem solving, and have higher academic achievement, intrinsic motivation, and task interests [12]. In addition, there is growing evidence for the role of SRL strategies in student achievement in online learning environments [4,10]. Multiple studies have shown that helping students apply metacognitive and resource management strategies is related to higher self-regulation and academic achievement in online environments [1,2,9,13].

In the context of MOOCs, as in other online learning environments, engaging in SRL is especially important because learners need to autonomously and actively engage in the learning process. This involves independently setting learning goals, identifying effective ways to learn, and monitoring one's progress toward those goals. How to support SRL in MOOCs to promote course achievement is an open research question. We investigated this question in two consecutive studies. We first surveyed course completers about SRL strategies that they employed. Then, we evaluated the effect of suggesting these SRL strategies to learners in the same course.

RELATED WORK

The present research builds on Pintrich's model of SRL [11], one of the most established models in the literature. It provides a framework for categorizing the various strategies MOOC learners might engage in to self-regulate. Pintrich identified three categories of SRL strategies that students should apply to regulate their own learning. First, *cognitive strategies*, which refer to strategies that students utilize in the acquisition, storage, and retrieval of information (e.g.,

rehearsal, critical thinking). Second, *metacognitive strategies*, which refer to strategies utilized by learners for monitoring and reflecting on their learning process to accomplish a goal (e.g., goal setting and planning). And third, *resource management strategies*, which refer to strategies that students use to manage the learning environment and the resources provided (e.g., time management, help seeking).

Prior work has investigated applications of SRL strategies in online learning environments. Broadbent and Poon [4] found higher academic outcomes in online higher education settings among those who applied time management, metacognition, and effort regulation strategies. Moreover, research on MOOCs suggests that time management, planning, and self-monitoring skills are critical to succeed in these courses, but many learners struggle to engage in relevant self-regulation activities [8,15]. The absence of external pressure to make progress and clear social norms around completing these courses means that learners need to be highly self-directed to succeed. Littlejohn et al. [10] interviewed MOOC learners who were either high or low in self-regulation and identified behavioral differences between the two groups in terms of SRL sub-processes, including motivations and goal setting. In the current research, we asked successful learners about their own strategies to better understand SRL in MOOCs.

A relatively small amount of guidance could go a long way in supporting online learners. Self-regulation can be trained by helping learners apply SRL strategies, for instance, by providing additional scaffolding in the learning environment [17]. Several studies provide evidence that prompting SRL strategies can increase achievement [1,2,9,13]. For instance, prompting students either by suggesting metacognitive activities (e.g., thinking aloud about one's decisions) [2] or by asking them to explain their actions in pop-up windows [9] promoted self-regulation and raised performance. Thus, prior work in online environments suggests that prompting learners with SRL strategies can improve their performance.

STRATEGIES OF THE MOST SUCCESSFUL
First, we focus our attention on learners who are not only committed but also successful in the course. Specifically, we investigate the following research question:

RQ1. What SRL strategies do successful learners who earn a certificate use in a (self-paced) MOOC?

Methods
The course was offered by Pontificia Universidad Católica de Chile. In addition to Coursera's certificate, Chilean nationals could earn a certification recognized by the Chilean government by passing an in-person exam at the university. Participants were 17 learners who completed the course and took the official exam. The course was a self-paced MOOC on a topic in Education that comprised 54 lectures and 11 graded assessments. Out of 17 participants

(11 women), eight were aged between 25 and 34, six between 35 and 49, and three 50 or older. All held a degree in education or related field and were full-time employed in a school or other educational institution.

After sitting the official exam, participants completed a paper-based survey about their metacognitive and resource management SRL strategies. They indicated which activities related to time management, self-study, and help-seeking strategies they used during the course on an established list of activities (IQ Learn [14], a measure of individual learning skills in online environments). Participants also wrote recommendations for other learners to help them succeed in the course. Following a qualitative approach, the 35 collected recommendations were coded independently by two researchers based on Pintrich's metacognitive and resource management categories [11]. The researchers then discussed their coding and reached agreement. Table 1 shows how many recommendations were provided in each category and an example of a relevant recommendation.

Results and Discussion
The most commonly reported SRL strategies were reserving time in the week for studying (time management), adapting one's own study habits to match the requirements of the course (effort regulation), and working without the help from others (reversed help-seeking). Most of the recommendations from learners were related to time management (10 out of 35) and effort regulation (8 out of 35), as shown in Table 1. These findings provide a set of seven strategies that a group of successful learners considers to be effective in MOOCs. In particular, time management and effort regulation stood out as the most important strategies to succeed. This is consistent with prior work on SRL in online learning [4]. Surprisingly, most learners did not engage in help seeking. This could present a critical shortcoming, as prior work identified peer support as a key predictor of course success [3,8].

Table 1. Frequency and exemplary recommendation for different strategies from successful MOOC learners.

SRL Strategy	#	Example Recommendation
Metacognitive strategies		
Self-monitoring	4	Preparing summaries and mind maps about what the instructor explained helped me a lot.
Self-evaluation	4	I used what I learned in the course back in school, so that I could internalize what I learned.
Goal setting/planning	2	The most important thing is to have clear objectives and be organized to accomplish them.
Resource management strategies		
Time management	10	Taking the course was complex because I have other daily duties and occupations. What helped me is to devote a specific time of the day to work on the course.
Effort regulation	8	The day I started a chapter, I would also finish it.
Help seeking	4	It was a great help and motivation to take the course with friends.
Study environment	3	Find some quiet time at home and be concentrated on the computer.
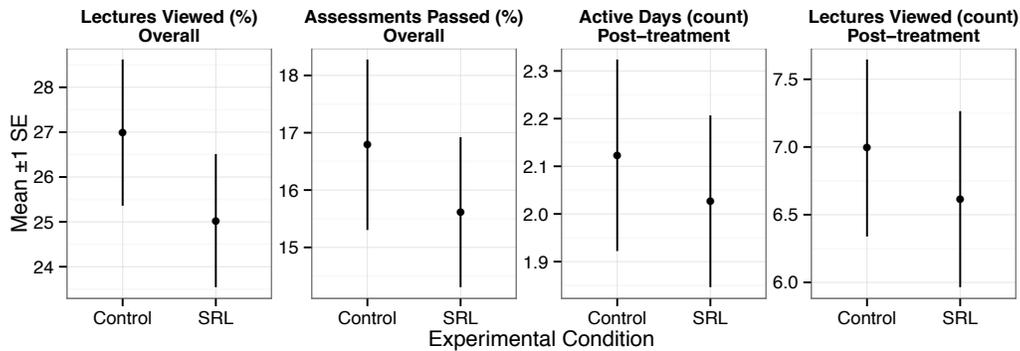
Figure 1. Course outcome measures examined as a function of experimental condition ($N = 569$).

STUDY TIPS EXPERIMENT

In this experiment, we leverage the SRL strategies that we had collected from successful learners in the form of study tips. Some learners were randomly assigned to receive study tips, while others completed a control activity. We assessed subsequent persistence and achievement outcomes to test the following hypothesis:

H1. Prompting learners with SRL strategies improves persistence and achievement in a (self-paced) MOOC.

Methods

Participants. The experiment was conducted several weeks later in the same MOOC as the previous study. The experiment was embedded for 15 days in the course survey that was announced multiple times via email. Of the 820 survey responses, 741 reached the stage in the survey at which they were randomly assigned to conditions, and 653 unique participants who were not cross-exposed were retained in the final sample: 322 control and 331 SRL. The average age was 40 ($SD = 10$), 61% women, 89% with a bachelor's or higher degree. Most participants were located in Mexico (31%), Chile (21%), and Colombia (11%).

Procedure. In the course survey, learners were randomly assigned to either a SRL condition or a control condition. In the SRL condition, participants were presented with seven recommended SRL strategies based on the findings above. They were told that "[w]e have interviewed people who have successfully completed the course to find out how they did it. The following strategies stood out as the most effective." Each strategy consisted of a brief label (review your goals constantly; take notes and summarize the course content to better understand it; apply what you learn; plan ahead; set yourself realistic goals; find fellow students; choose a good study environment) and a quotation from Table 1. Participants rated how helpful they thought the strategies will be for them (from 1 to 5) and wrote a brief message addressed to new learners about the strategies to internalize them. In the control condition, participants were shown the official course description and course topics. Participants rated how useful they thought the course will be for their career (from 1 to 5) and wrote a short message

addressed to the course designers about the topics they found the most and the least interesting and why.

Measures. Behavioral data collected by the platform was available from months before the start of the experiment until 25 days after the start of the experiment. The main outcome measures were the percentage of lectures that learners' watched (i.e., persistence) and the percentage of assessments that learners' completed with a passing grade (i.e., achievement). Similar outcome measures were used in prior research with MOOCs [6,8]. Two additional behavioral outcomes were how many days learners were active in the course after taking the survey (post-treatment), and how many unique lectures they watched post-treatment. Corresponding pre-treatment measures served as covariates in the analysis. Participants also reported their gender, education level, course intentions, and prior experience with the topic.

Results and Discussion

Most learners who participated in the experiment had only recently started the course: 90% had been active for less than 2 weeks. However, 13% of survey respondents had already watched over 90% of lectures. They were excluded from further analysis, as the SRL strategies were intended to help learners at an earlier stage. Results were qualitatively equivalent when using an earlier cutoff. Moreover, random assignment was successful in providing two groups balanced in pre-treatment self-report measures ($ps > .35$) and behavioral measures ($ps > .48$). The control task provided a similar experience as in the SRL condition: Study tips were most commonly rated as *very helpful* ($M = 3.87$, $SD = 0.88$) in the SRL condition and course topics were rated as *very useful* ($M = 4.20$, $SD = 0.78$) in the control condition. In both conditions, around 72% of participants wrote a message (typed > 20 characters).

With a sample size of 569, we have 85% statistical power to detect an effect size of just a quarter standard deviation. However, no significant benefit from providing SRL study tips over the control task was found for several course outcomes. The overall percentage of viewed lectures and passed assessments was similar in both conditions, and

number of active days and viewed lectures following the intervention was almost identical (see Figure 1). Covariate-adjusted OLS regression analyses with robust standard errors confirm this null result (qualitatively equivalent results with non-linear model). The coefficient on the condition indicator variable was small and non-significant in regressions for persistence and achievement ($ps > .56$).

CONCLUSION

The findings suggest that merely telling MOOC learners about ways to engage in self-regulated learning does not lead to improvements in course persistence or achievement, despite our efforts to select especially relevant strategies and communicating them with authentic quotations. The prompt might have been too brief and insufficiently integrated with the rest of the course to scaffold the application of the strategies. Alternatively, the SRL tips may have encouraged beneficial self-regulation behaviors that were not captured in the data. An experimental design that encourages adoption of quantifiable SRL strategies could address this shortcoming. Future work should focus on approaches to support SRL that are embedded in the course and adaptive to the learners' skills and motivations [10], such as activities to scaffold time management and metacognitive self-regulation strategies. Moreover, moving toward explanatory models for SRL interventions, a deeper understanding of learners' SRL profiles can support more targeted approaches to scaffolding the learning experience.

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