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# Frequent deadlines: Evaluating the effect of learner control on healthcare executives' performance in online learning

Lawrence V. Fulton [a], Lana V. Ivanitskaya [b], Nathaniel D. Bastian [c,*], Dmitry A. Erofeev [d], Francis A. Mendez [b]

[a] Texas State University, Department of Computer Information Systems & Quantitative Methods, San Marcos, TX 78666, USA
[b] Central Michigan University, Department of Health Administration, Mount Pleasant, MI 48859, USA
[c] University of Maryland University College, Department of Mathematics, Adelphi, MD 20783, USA
[d] Central Michigan University, Department of Business Administration, Mount Pleasant, MI 48859, USA

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ABSTRACT

In a three-group, gender-matched, preexisting knowledge-controlled, randomized experiment, we evaluated the effect of learner control over study pace on healthcare executives' performance in an online statistics course. Overall, frequent deadlines enhanced distribution of practice and improved learning. Students with less control over pace (in groups with weekly deadlines) spaced their study episodes to a greater extent than their peers with more control over pace (in groups with monthly and end-of-course deadlines). Online learning experience and technology self-efficacy did not explain practice distribution effects. Student perceptions of control over how, when and in which order they learn did not differ significantly across experimental groups. However, perceived control and spaced practice were positively and significantly related to performance on tests of short delayed retention and near transfer. In addition, perceived control and spaced practice predicted performance on a test of delayed retention and far transfer. Locus of control did not explain differences in performance.

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## 1. Introduction

### 1.1. Background

Many course instructors can attest to their students' dislike of frequent, instructor-set deadlines. In designing their courses, instructors must define deadline frequency, spacing and penalties for not meeting the deadlines. Once made, these decisions are often modified mid-course under pressure from learners who insist on relaxing deadlines and softening penalties. In this experimental study, we examine how middle-aged adult healthcare managers and executives distribute (or space) their practice of statistics when they are provided with different work completion deadlines. We use random assignment of learners to weekly, monthly and end-of-course deadlines. The students are enrolled in a computer-assisted (CA) distance learning course to develop their data analysis competencies. Because learner control over pace and sequence is one of the most salient features of a CA distance learning environment, there is a great need to understand how instructor-set deadlines impact distance learners.

In educational contexts, planning fallacy refers to learners' propensity to underestimate how much time it would take to complete a learning task (Sanna & Schwarz, 2004; Schwarz, Sanna, Skurnik, & Yoon, 2007). Learners may not pay enough attention to potential obstacles and disregard scenarios that deviate from the best case. They may also overestimate how much control they have personally over when their work is completed (Newby-Clark, Ross, Buehler, Koehler, & Griffin, 2000). Multiple and frequent deadlines may improve learner awareness of planning fallacies and facilitate corrective self-regulatory actions.

Defined as "an active, constructive process in which learners plan, monitor, and control their own learning process" (Kostons, van Gog, & Paas, 2012, p. 121), self-regulated learning can be beneficial for motivating learners but it does not guarantee better outcomes, especially for novice learners (e.g., Moos & Azevedo, 2008a, 2008b; Scheiter & Gerjets, 2007; Schnackenberg & Sullivan, 2000; Steinberg, 1989). Older individuals and full-time managers are likely to be more skilled in managing deadlines than college-age students due to their greater life experience; however, their learning patterns may still be affected by course

* Corresponding author. 94-277 Makapipipi St Apt 121, Mililani, HI 96789, USA. Tel.: +1 (570) 809 3619.
*E-mail address:* nathaniel.bastian@fulbrightmail.org (N.D. Bastian).

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deadlines. In a study by Ariely and Wertenbroch (2002), adult learners enrolled in an executive education program had self-regulation problems while setting and meeting deadlines. Specifically, the working professionals set overly aggressive deadlines and did not space them enough for optimal performance. As frequent and evenly spaced cues to action, instructor-set deadlines may assist learners in overcoming their self-regulation failures.

Self-determination theory (SDT) draws distinction between *autonomous regulation* that is integrated with one's self (e.g., action stems from one's interests or perceived importance) and *controlled regulation* in response to demands, pressures, coercions or seductions. It is unclear if instructor-set deadlines, especially frequent deadlines with penalties for late submissions, support learner autonomy (Deci & Ryan, 2006). On the one hand, deadlines can be viewed as controlling (rather than autonomy supporting) events because they impose rigorous standards for when, how often and how much the learners must study. Amabile, DeJong, and Lepper (1976) support this position by demonstrating decreases in intrinsic motivation for an interesting activity with an imposed deadline. On the other hand, the theory predicts wide variations in learners' phenomenological experiences with deadlines. Learner A may feel pressured or coerced ("My instructor will fail me if I don't meet a deadline"). Other learners may internalize external standards through introjections (Learner B: "I'll feel bad if I don't meet a deadline") or identification (Learner C: "I want deadlines because I work best under pressure"). Learner D may view deadlines as an opportunity ("Learning is fun; I can explore some topics deeper if I study ahead of the recommended deadlines"). These divergent appraisals of deadlines reflect different degrees of autonomy (Ryan & Connell, 1989) and range from mostly controlled regulation by learner A to mostly autonomous regulation by learner D. According to SDT, autonomous regulation can energize learning, create a state of subjective vitality and lead to persistence. In contrast, controlled regulation leads to an inner conflict which depletes inner resources and energy (Deci & Ryan, 2006). In sum, SDT predicts that frequent deadlines may impact learners in different ways—some may be energized and others may give up—a fact that motivated the design of the present study.

The purpose of this study was to test the effects of differential learner control over pace on learners' perceptions of control, distribution of practice, time on task and performance. Deadline frequency represents an objective measure of external control over pace but it is unclear how it translates into learners' subjective experiences of control. Will learners experience less or more control in groups with relaxed deadlines?

In addition, we examine the effects of learner characteristics. Three characteristics are potential confounders: Experience with online courses, technology self-efficacy and prior knowledge. The forth characteristic is locus of control, a trait that is linked to self-regulation. In organizational settings, external locus of control has a significant negative relationship with autonomy and a positive relationship with work anxiety (e.g., Spector & O'Connell, 1994). The need to adhere to imposed deadlines may increase anxiety and discourage planning to achieve the desired outcomes by learners with external locus. Externals tend to have control orientation (Rotter, 1966), which is linked to distress and guilt emotions (Ryan, Connell, & Deci, 1985) and poor test performance by undergraduate students who learned conceptual material (Deci & Ryan, 1985). In a meta-analytic path analysis by Colquitt, LePine, and Noe (2000), the locus-performance relationship is in the opposite direction—externals have better declarative knowledge and higher transfer, a surprising finding that was not fully explained. Externals may use negative copying strategies such as denial or blaming others (Ryan & Connell, 1989). They may also feel a greater need for self-control through "rigid, self-punitive methods" (Deci & Ryan, 1987, p. 1035), such as anxiety avoidance or guilt, that lead to depletion of inner resources and low persistence (Deci & Ryan, 2006; Moller, Deci, & Ryan, 2006). In contrast, learners with internal locus of control (internals) are expected to initiate behaviors that lead to desired outcomes (Deci & Ryan, 1987). Noe (1986) proposed that internals expect that their learning efforts will result in both mastery and rewards, which affects their motivation. confirmed that motivation to learn was strongly related to locus of control and internals were more motivated than externals. To control their environment, internals engage in exploratory behaviors, for example, assess their skill gaps, goals and plans, as demonstrated by Noe and Schmitt (1986). Such self-assessment may lead to actions aimed at avoiding planning fallacies. It may also facilitate integration of instructor-set deadlines into personal learning goals, for example, when deadlines are framed as opportunities to succeed by better regulating (e.g., pacing) one's own learning over time. Specific hypotheses and their justification are presented below.

### 1.2. Hypothesis testing

*Hypothesis 1*: In groups with frequent deadlines, learners with less control over pace will space their study episodes to a greater extent than their peers with relaxed deadlines and more control over pace.

Hypothesis 1 was informed by Ariely and Wertenbroch (2002) studies. Ninety-nine professionals enrolled in two sections of an executive education course are willing to set their own deadlines that involve considerable commitment and cost. Because students improperly time their self-set deadlines, grades are higher in a course section where students adhere to instructor-set deadlines. In a related study of 60 student hires doing a proofreading task, Ariely and Wertenbroch (2002) show that performance is best in a group with evenly spaced deadlines that are externally imposed, followed by a group with self-set deadlines and by the end-deadline group that performed the worst. Additional evidence in support for external regulation comes from a study conducted by Azevedo, Moos, Greene, Winters, and Cromley (2008). They used think-aloud protocols to understand why externally-facilitated learning is superior to self-regulated learning, as demonstrated by pre- and post-test shifts in adolescents' mental models of the circulatory system, blood and heart. Their analysis showed that self-regulated learners used ineffective strategies and engaged in fewer monitoring activities than learners guided by human tutors.

In this study, we investigate the development of data analysis competencies in complex learning tasks. They are complex due to the high number of choices and high uncertainty in statistical data analysis. For example, many learners of statistics have trouble matching a problem to a correct data analysis procedure. Because the majority of evidence supports the distribution of practice effect, we also predict it in Hypothesis 2.

*Hypothesis 2*: Higher degrees of practice distribution will lead to better performance not only on a test of shortly delayed retention and near transfer (H2a) but also on a test of delayed retention and far transfer (H2b). This relationship will hold when learners' psychological characteristics and prior knowledge are held constant.

Massed practice has no separation of study episodes, whereas spaced or distributed practice separates study episodes by some amount of time. The term "distribution of practice effect" is used to explain the advantage of spaced practice over massed practice. Researchers studied this effect for over 100 years across a wide range of tasks most of which involved psychomotor or verbal learning. Learners prefer massing to spacing (Kornell & Bjork, 2008) even after receiving feedback that shows how their performance is hindered by massed practice. Analogous to the distribution of practice effect, a spacing effect is well documented by advertising