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Habits and beliefs that guide self-regulated learning: Do they vary with mindset?

Veronica X. Yan*, Khanh-Phuong Thai, Robert A. Bjork

University of California, Los Angeles, United States

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ABSTRACT

Prior research by Kornell and Bjork (2007) and Hartwig and Dunlosky (2012) has demonstrated that college students tend to employ study strategies that are far from optimal. We examined whether individuals in the broader—and typically older—population might hold different beliefs about how best to study and learn, given their more extensive experience outside of formal coursework and deadlines. Via a web-based survey, however, we found striking similarities: Learners' study decisions tend to be driven by deadlines, and the benefits of activities such as self-testing and reviewing studied materials are mostly unappreciated. We also found evidence, however, that one's mindset with respect to intelligence is related to one's habits and beliefs: Individuals who believe that intelligence can be increased through effort were more likely to value the pedagogical benefits of self-testing, to restudy, and to be intrinsically motivated to learn, compared to individuals who believe that intelligence is fixed.

With the world's knowledge at our fingertips, there are increasing opportunities to learn on our own, not only during the years of formal education, but also across our lifespan as our careers, hobbies, and interests change. The rapid pace of technological change has also made such self-directed learning necessary: the ability to effectively self-regulate one's learning—monitoring one's own learning and implementing beneficial study strategies—is, arguably, more important than ever before.

Decades of research have revealed the efficacy of various study strategies (see Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013, for a review of effective—and less effective—study techniques). Bjork (1994) coined the term, "desirable difficulties," to refer to the set of study conditions or study strategies that appear to slow down the acquisition of to-be-learned materials and make the learning process seem more effortful, but then enhance long-term retention and transfer, presumably because contending with those difficulties engages processes that support learning and retention. Examples of desirable difficulties include generating information or testing oneself (instead of reading or re-reading information—a relatively passive activity), spacing out repeated study opportunities (instead of cramming), and varying conditions of practice (rather than keeping those conditions constant and predictable).

Many recent findings, however—both survey-based and experimental—have revealed that learners continue to study in non-optimal ways. Learners do not appear, for example, to understand two of the most robust effects from the cognitive psychology literature—namely, the testing effect (that practicing retrieval leads to better long-term retention, compared even to re-reading; e.g., Roediger & Karpicke, 2006a) and the spacing effect (that spacing repeated study sessions leads to better long-term retention than does massing repetitions; e.g., Cepeda, Pashler, Vul, Wixted, & Rohrer, 2006; Dempster, 1988). A survey of 472 undergraduate students by Kornell and Bjork (2007)—which was replicated by Hartwig and Dunlosky (2012)—showed that students underappreciate the learning benefits of testing. Similarly, Karpicke, Butler, and Roediger (2009) surveyed students' study strategies and found that re-reading was by far the most popular study strategy and that self-testing tended to be used only to assess whether some level of learning had been achieved, not to enhance subsequent recall.

Even when students have some appreciation of effective strategies they often do not implement those strategies. Susser and McCabe (2013), for example, showed that even though students reported understanding the benefits of spaced learning over massed learning, they often do not space their study sessions on a given topic, particularly if their upcoming test is going to have a multiple-choice format, or if they think the material is relatively easy, or if they are simply too busy. In fact, Kornell and Bjork's (2007) survey showed that students' study decisions tended to be driven by impending deadlines, rather than by learning goals,

* Corresponding author at: 1285 Franz Hall, Department of Psychology, University of California, Los Angeles, CA 90095, United States. Tel.: +1 310 954 6650.
E-mail address: veronicayan@ucla.edu (V.X. Yan).

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and that students tended not to return to material they considered (rightly or wrongly) learned, or return to material after a course has ended. Hartwig and Dunlosky (2012) administered this same survey to a second sample of undergraduate students at a different university and found strikingly similar results. Furthermore, they demonstrated that students' learning habits do matter: Students with lower grade-point averages (GPAs) were more driven by deadlines and reported less self-testing than did students with higher GPAs.

Previous studies have focused on college students, but given that self-regulated learning is important across the lifespan, and that the online learning population, versus the college population, is so much more heterogeneous on every dimension, it is important to examine how a more diverse population manages its own learning. With additional life experiences, and without the worry of maintaining a GPA, are people in the broader population more strategic self-regulators of learning? To explore this issue, we recruited participants via Amazon Mechanical Turk (MTurk)—a web-based platform that has been proven useful for recruiting and paying a diverse population to perform experimental tasks (Berinsky, Huber, & Lenz, 2012). We asked the participants the same questions used by Kornell and Bjork (2007), plus additional questions that examined specific study strategies and motivations for learning.

One specific question motivating the present research is whether there are general beliefs about one's self related to study decisions. One potential candidate is an individual's theory of intelligence (Dweck, 1999)—that is, whether they are "fixed" (also referred to as "entity") theorists, who believe that intelligence is innate and cannot be changed, or "growth" (or, "incremental") theorists who believe that intelligence can be increased through effort. In both correlational and experimental research, one's theory of intelligence has been shown to impact not just academic achievement (e.g., Blackwell, Trzesniewski, & Dweck, 2007; Mangels, Butterfield, Lamb, Good, & Dweck, 2006; Mueller & Dweck, 1998), but also motivation and use of learning strategies. Growth theorists are more likely than fixed theorists to hold mastery, rather than performance, learning goals (Blackwell et al., 2007; Dupeyrat & Mariné, 2005), are more likely to change learning strategies and persist in the face of difficulty, and use deeper processing strategies during learning (Grant & Dweck, 2003; Ommundsen, 2003). Conversely, fixed theorists tend to believe that ability itself is sufficient for learning, and effort merely reflects a lack of ability (Blackwell et al., 2007; Dweck & Master, 2008).

Consistent with the notion that growth theorists are more likely to interpret effort in a productive way, prior research (Miele & Molden, 2010; Miele, Son, & Metcalfe, 2013) found that fixed theorists interpreted effortful encoding as a sign that they had reached their limits of learning (thus, giving lower judgments of learning or comprehension to items that were dis-fluent), whereas growth theorists were more likely to interpret effort as greater engagement with learning. Most of the research exploring strategy use and preferences by fixed versus growth theorists has not, however, focused on the specific learning techniques that Dunlosky et al. (2013) deemed most effective (e.g., spacing, rather than massing, repeated study sessions, and testing, rather than recopying or restudying, to-be-learned information). Rather, many used survey items where effort could be engaged in both efficient and less efficient ways, such as "when I decide to study, I set aside a specific length of time and stick to it" (from the Learning and Study Strategies Inventory, Weinstein, Schulte, & Palmer, 1987) or "when I study for a test, I practice saying the important facts over and over to myself" (from the Motivated Strategies for Learning Questionnaire, Pintrich & DeGroot, 1990). Understanding how attitudes toward—and adoption of—effective but effortful strategies such as spacing and testing is related to a learner's theory of intelligence was one goal of the present research. To the extent that learners fail to appreciate the benefits of effective study techniques because these techniques make learning feel less fluent and more difficult (e.g., Alter & Oppenheimer, 2009; Benjamin, Bjork, & Schwartz, 1998; Schwarz et al., 1991), are growth theorists less likely to fall prey to metacognitive illusions and possess the insight to appreciate the benefits of desirable difficulties?

1. Method

1.1. Participants

Four hundred and fifty participants (197 males, 250 females, three undisclosed) from the United States were paid $0.50 for completing the survey. Participants' ages ranged from 18 to 74, with a mean age of 34.23, standard deviation of 12.10, and median age of 31. 24.44% of the respondents were between the ages of 18–24; 48.43% were aged 25–40; 26.01% were aged 41–65; and only 1.12% were 65 years or older.

1.2. Materials

1.2.1. Survey on learning and memory

The questionnaire consisted of 13 questions on a single webpage: the seven original questions from Kornell and Bjork's (2007) study, follow-up questions aimed at clarifying the responses to those seven questions, and a few questions probing the respondent's motivations to learn, both for work and for school. The survey also included three questions to assess participants' intrinsic theory of intelligence (from Chiu, Hong, & Dweck, 1997). Appendix A contains the instructions and questions asked. The sequence of questions was the same for all participants.

1.2.2. Demographics questionnaire

Following the survey questions, participants provided their age, gender, highest level of education, profession, level of English fluency, and how often they find themselves in charge of their own learning.

1.3. Procedure

MTurk workers could preview the survey before they decided to participate. They were instructed to read all the responses for a given question carefully before selecting their answer. When questions referred to classroom learning and the participants were not currently in school or college, they were instructed to think back to how they studied (or would study) in school. Participants completed the survey at their own pace (average completion time, 10 min).

2. Results and discussion

2.1. Statistical analysis strategy

All statistical analyses were conducted using $\alpha = .05$. For each question, we first described the pattern of responses by a categorical theory of intelligence variable (fixed vs. growth). Our regression analyses, however, treated theory of intelligence as a continuous variable, using each participant's averaged responses to the three theory-of-intelligence questions.

Each question was analyzed using a stepwise backward binomial or multinomial logistic regression, entering theory of intelligence (continuous between 1 and 6), education (no bachelor's degree, bachelor's degree, graduate degree) and student status (student, non-student) as predictor variables, with an entry probability of .05 and elimination probability of .10. For the education