Journal of Applied Research in Memory and Cognition xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

Journal of Applied Research in Memory and Cognition

journal homepage: www.elsevier.com/locate/jarmac

What Learning Strategies Do Academic Support Centers Recommend to Undergraduates?

Jennifer A. McCabe*

Goucher College, United States

This survey study examined the learning strategy recommendations and endorsements made by heads of academic support centers at 77 institutions of higher education. Participants answered open-ended and forced-choice items regarding various strategies. Several evidence-based strategies were endorsed and frequently recommended (e.g., self-testing, discussing course materials, answering questions, teaching materials to others, spacing study sessions), but some (e.g., multi-modal coding, interleaving topics) had lower endorsement. In a second section, participants' predictions of learning scenario outcomes indicated strong endorsement for self-generating, moderate for testing and dual-coding, and low for spacing and interleaving. The results present mixed evidence for the endorsement of strategies most likely to support student success, highlighting an opportunity to improve the communication between researchers and those on the front lines of student academic support.

General Audience Summary

An online survey focusing on learning strategies was administered to academic support center (ASC) heads at 77 institutions of higher education. The results were generally encouraging —for one, there was support for several strategies having strong evidence for durable learning (e.g., self-testing, discussing course materials, answering questions, teaching materials to others, spacing study sessions). Also, none of the strategies research has shown to be less successful (e.g., re-reading, cramming, highlighting) were strongly recommended. Yet some evidence-supported strategies were not endorsed (e.g., multi-modal studying, mixing topics). When asked to predict the learning outcomes of educational situations, participants were most accurate in understanding the benefit of generating one's own study materials (versus being provided with materials), moderately accurate for testing (versus restudying) and dual-coding using visual and auditory modalities (versus single-coding, or learning solely through visual materials), and inaccurate for spacing/interleaving of study materials (versus massing/blocking). Overall, there was mixed evidence for endorsement of evidence-supported study strategies in academic support centers. Given these centers are on the front lines of student academic support, it is important to support initiatives to help improve students' knowledge about how learning works, and to teach them ways to engage with course material to maximize learning and therefore improve academic outcomes.

Keywords: Learning strategies, Study skills, Undergraduates, Academic support centers

This survey study examined learning strategy recommendations provided to undergraduates by academic support centers (ASCs) at colleges and universities, and the extent to which these are consistent with evidence from applied memory research. ASCs provide students with various services and resources to support learning and achievement in college courses. If we presume that ASCs are reaching and impacting a substantial number of students (at my institution, the majority of students use these

Author Note

The author gratefully acknowledges Sarah Lummis, Samuel Kane-Gerard, and Scotty Lind for assistance with survey implementation and data analyses.* Correspondence concerning this article should be addressed to Jennifer A. McCabe, Center for Psychology, Goucher College, 1021 Dulaney Valley Road, Baltimore, MD 21204, United States. Contact: jennifer.mccabe@goucher.edu

Please cite this article in press as: McCabe, J.A. What Learning Strategies Do Academic Support Centers Recommend to Undergraduates? *Journal of Applied Research in Memory and Cognition* (2017), https://doi.org/10.1016/j.jarmac.2017.10.002

services on a regular basis), it is important to understand the quality of support provided.

Prior research on ASCs has focused mainly on tutoring and supplemental instruction programs, suggesting positive outcomes in terms of course grades and graduation rates (e.g., Cohen, Kulik, & Kulik, 1982; Cooper, 2010; Hendriksen, Yang, Love, & Hall, 2005; Maxwell, 1990; Reinheimer & McKenzie, 2011), and in relation to historically underserved and at-risk students (e.g., Rheinheimer, Grace-Odeleye, Francois, & Kusorgbor, 2010). Taking a broader approach to services, research suggests connections between level of ASC use with GPA , graduation rate, and academic skills (Grillo & Leist , 2013; Perin , 2004).

Learning Strategies

Extensive laboratory and applied research has established several strategies that enhance long-term retention (for reviews, see Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013; Hattie, 2009; McCabe, Redick, & Engle, 2016; Roediger & Pyc, 2012). Two such strategies with the strongest and most consistent evidence in their favor are *distributed (spaced) practice* and *practice testing*.

The principle of distributed practice (i.e., *spacing*), suggests better memory for material studied in shorter segments with breaks in between, compared to the same amount of time spent studying in one longer session (e.g., Kornell & Bjork, 2007; Rohrer & Pashler, 2007; for a meta-analysis, see Cepeda, Pashler, Vul, Wixted, & Rohrer, 2006, for classroom evidence, see Bloom & Shuell, 1981). A related concept is *interleaving*, or switching amongst topics in a single session (e.g., Kornell & Bjork, 2008; for classroom evidence, see Rohrer, Dedrick, & Burgess, 2014); by implementing interleaving, one is also achieving spacing, but the converse is not necessarily true. Though slightly different ideas, spacing and interleaving are often discussed together.

Practice testing (i.e., *retrieval practice*) improves memory for material compared to the same time spent re-reading the material (e.g., Roediger & Karpicke, 2006; for a meta-analysis, see Rowland, 2014; for classroom evidence, see Butler & Roediger, 2007; McDermott, Agarwal, D'Antonio, Roediger, & McDaniel, 2014). A related strategy is *generating*, the idea that creating one's own study materials is superior to being provided with materials (e.g., DeWinstanley & Bjork, 2004; Slamecka & Graf, 1978; for classroom evidence, see McCabe, 2015a).

Several effective strategies utilize *elaboration*, encouraging meaningful connections between to-be-learned material and other information (e.g., prior knowledge, real-world examples, multi-modal representations), or supporting the explanation and organization of ideas. Elaboration activities include *elaborative interrogation* (e.g., Smith, Holliday, & Austin, 2010), *self-explanation* (e.g., Wong, Lawson, & Keeves, 2002), and *concrete examples* (e.g., Rawson, Thomas, & Jacoby, 2015). Using *imagery* supports elaboration by encouraging multimodal coding (Paivio's dual-coding theory; Paivio, 1986; Paivio, Smythe, & Yuille, 1968). Elaboration can also be achieved using *mnemonics* (e.g., keyword method, Carney & Levin, 2008; for classroom evidence regarding method of loci, see McCabe, 2015b), which provide an organizational scheme for meaningfully connecting disparate items (Bellezza, 1996).

The learning strategies discussed above can be grouped under the umbrella of *desirable difficulties* (Bjork, 1994) —learning conditions or intentional strategies that feel initially difficult in that they slow down learning and even cause errors, but in the long term result in superior memory (see Yan, Clark, & Bjork, 2017, for an updated review). These can be contrasted with more shallow or "surface " learning strategies, including re-reading and highlighting (Dunlosky et al., 2013).

Metacognitive Awareness and Use of Learning Strategies

Laboratory research has shown a lack of awareness for the effectiveness of desirably difficult strategies when predicting the personal memory benefits of testing (e.g., Roediger & Karpicke, 2006), interleaving (e.g., Kornell & Bjork, 2008), and spacing (Zeichmeister & Shaughnessy, 1980), even after participants experienced a memory benefit from these conditions. Real-time strategy choices also reflect a metacognitive disconnect —for example, participants choose blocking over interleaving (Tauber, Dunlosky, Rawson, Wahlheim, & Jacoby, 2013; Yan, Soderstrom, Seneviratna, Bjork, & Bjork, 2017), and short over long spacing intervals (Cohen, Yan, Halamish, & Bjork, 2013). Thus, the most effective learning strategies may not be intuitively rated or even experienced as such. Instead, less-desirably difficult strategies (e.g., re-reading, massing) may encourage a metacognitive illusion of learning, based on short-term feelings of fluency.

Research is more mixed with regard to the level at which undergraduates report knowing about and using evidence-supported strategies. McCabe (2011) asked undergraduates to predict the outcome of learning scenarios, each describing an educational situation and two contrasting strategies. The four scenario strategies relevant to the current study were *spacing/interleaving*, *testing*, *dual-coding*, and *generating*. Results indicated relatively low awareness of memory benefits from all strategies, though there was higher accuracy in predicting the benefit of generating. Recently, Morehead, Rhodes, and DeLozier (2016) replicated and extended this work, comparing student and instructor ratings of three original scenarios, plus one representing a more common form of spacing (massed study two days prior to an exam versus spaced study two weeks prior). Both groups showed low endorsement of interleaving (consistent with results from McCabe's (2011) spacing/interleaving scenario), and very strong endorsement of the newly developed spacing scenario. There was also strong endorsement of generation, and higher endorsement of testing as compared to McCabe. Instructors were more accurate than students in predicting the outcomes of generation and testing.

In survey studies about strategy use, students frequently reported using testing (Bartoszewski & Gurung, 2015; Blasiman, Dunlosky, & Rawson, 2017; Hartwig & Dunlosky, 2012; Morehead et al., 2016), but also less effective strategies such as underlining or highlighting, re-reading, and "cramming" (Hartwig & Dunlosky , 2012). Blasiman et al. (2017) showed

Please cite this article in press as: McCabe, J.A. What Learning Strategies Do Academic Support Centers Recommend to Undergraduates? *Journal of Applied Research in Memory and Cognition* (2017), https://doi.org/10.1016/j.jarmac.2017.10.002