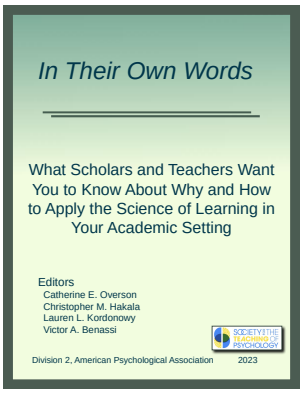

Considerations for Academic Support Centers Regarding Learning Strategy Recommendations

Jennifer A. McCabe
Goucher College

Academic support centers (ASCs), embedded within many institutions of higher education, typically serve as both the front line of help for students struggling with course demands and for the larger student body in support of academic success. Under a variety of names, ASCs offer many services, including workshops, videos, peer tutoring, and individual appointments with staff members. ASCs can take both *proactive* (e.g., skills training or study tips for all students) and *reactive* (e.g., targeting support to students experiencing academic difficulties, connecting them with specific resources) approaches. Thus, the responsibilities of ASCs are complex and multi-faceted, requiring skilled and knowledgeable practitioners to deliver effective services.

What Memory Researchers Know About Learning

In view of the placement of ASCs in higher education and given that students are frequently directed (or self-direct) to their services, it is essential that they offer evidence-based advice on how to learn. Memory and education researchers have accumulated decades of research to support several major categories of learning strategies that have been consistently demonstrated as effective in the laboratory and in the classroom. Yet, at least historically, there has often been a disconnect between this research and ASCs.

Part of the disconnect is that some of the strategies that are most effective for durable learning tend to be unintuitive or counterintuitive. Also problematic is that some popular strategies, such as re-reading, underlining, and highlighting, are less beneficial for learning (for a review, see Dunlosky et al., 2013; Roediger & Pyc, 2012). Cognitive psychologists, and memory researchers specifically, endorse a number of strategies that can be grouped into three categories: *spacing*, *elaboration*, and *testing*. These can be remembered using the mnemonic “SET” or the phrase “SET for success” (McCabe et al., 2021).

The strategy of *spacing* is based on the well-established principle that, given the same amount of study time, memory is improved if the learner processes the material in shorter sessions with breaks in between (what researchers refer to as *distributed practice*), compared to one long study session (commonly called *cramming*, and what researchers call *massed practice*) (e.g., Rohrer & Pashler, 2008, cf. Rohrer & Hartwig, this volume). Although spacing in this form is a relatively intuitive strategy, a survey study I conducted suggests that students’ reports of ideal or intended spacing of their study time are more distributed than their actual study schedule (Susser & McCabe, 2013). In other words, students seem to understand that spacing is better for learning, and they want to use it, but they run out of time and end up cramming. I imagine this story is quite familiar to ASC staff and others reading this chapter. This highlights the critical importance of teaching students time management skills, such that they have a schedule that will allow for spaced or distributed learning.

A special case of spacing is *interleaving*, or mixing up the order of topics being studied into small chunks instead of blocking out extended time for one topic before moving on to the next (e.g., Kornell & Bjork, 2008; Kang, this volume; Rohrer & Hartwig, this volume). This strategy is counterintuitive, and research suggests that many students and instructors are unaware of the benefits of interleaving. Indeed, many believe the opposite to be true – that a large block of study time focused on one topic is better than using that same block of time to study various topics, switching back and forth (McCabe, 2011; Morehead et al., 2016). Blocking can play a role, however, in the overall scheme of mastering course content. When a student is just beginning to learn new material, initial blocking of study before moving to distributed, interleaved study may produce better learning (Kang, this volume).

Elaboration is an umbrella term for several strategies that can boost learning through meaning-based connections with to-be-learned material. Specific examples of elaboration include the use of concrete or real-world examples, self-explanation, asking and answering "why" and "how" questions, visual imagery (pictures, charts, graphs), and mnemonic devices that provide an organizational scheme for otherwise hard-to-organize information. Common examples of mnemonics include ROY G BIV, Please Excuse My Dear Aunt Sally, and the alphabet song. More elaborate tools like the keyword method and the memory palace (or method of loci) have been shown to support learning as well (for reviews, see Belleza, 1996; McCabe et al., 2013). Several elaborative techniques that use visual imagery (such as imagining a hippo walking through a college campus and thinking, "I'll definitely remember that!" to learn that the hippocampus is involved in long-term memory formation) are effective due to *dual-coding*, which creates multiple codes (or pathways) in varying modalities to improve the chance that the memory can be retrieved later (Paivio et al., 1968).

The learning strategy with the most robust body of evidence is *testing*, or *retrieval practice*. Given the same amount of time to study material, it is far better to spend that time retrieving the recently learned information from long-term memory (e.g., a quiz) than it is to spend the time re-reading the material (e.g., Roediger & Karpicke, 2006; Yang et al., this volume). Retrieving information from memory is more effortful, which makes learning more durable, because retrieval strengthens the pathways to access the information in the future. As a side benefit, testing is also a metacognitive tool in that it can provide learners with feedback on how much they have learned and areas in need of continued study. Testing is an example of the broader memory principle of *generation*. When learners create or effortfully initiate processes to study to-be-learned materials (e.g., make a study guide, teach another person from memory), learning will tend to be more durable (Slamecka & Graf, 1978). You may notice that some examples of generation tap both *testing* and *elaborative* processes, which further supports the power of generation as a learning tool.

The "SET" strategies are examples of *desirable difficulties* (Bjork, 1994; Bjork & Bjork, this volume), in that they are more effortful and challenging (and can take more time and lead to errors) in the short term, but they lead to far more durable learning in the long term. Unfortunately, there is a metacognitive disconnect because students show poor understanding of interleaving and testing (McCabe, 2011), even though they have better knowledge of spacing and generation. Although instructors are generally more knowledgeable of these learning strategies, there is still room for improvement (Morehead et al., 2016). Thus, two challenges emerge: 1. educating students on the value of these strategies and 2. motivating them to actually implement the strategies in their studying. The former is happening more and more in higher education (including at ASCs), but the latter is quite difficult. (Refer to chapters in Part 4 of this volume for detailed consideration of this issue.)

To take one example of classroom research to address these questions, my colleagues and I recently conducted an intervention study in an introductory psychology laboratory course in which students received training on the "SET" strategies. Findings revealed that after training, students' demonstrated

an increased knowledge of the strategies and modestly increased self-reported use of elaboration and testing by the end of the course (McCabe et al., 2021). Not surprisingly, the big picture from this and other research suggests that even when knowledge about effective strategies improves, students would often prefer to fall back on strategies that feel familiar, easier, or make the material feel more fluent more quickly. It is therefore critical for students to know that, although strategies such as re-reading and highlighting can give the illusion of learning, their actual learning is likely of a shallow nature, and therefore not likely to last. Equally important is to emphasize to students the value of understanding how memory works (e.g., basic cognitive processes involved in effective encoding, storage, and retrieval), both in academic settings and for lifelong learning.

What Academic Support Centers Know (and Share) About Learning

To better understand whether ASC staff are aware of the utility of the evidence-based strategies described above, and to what extent they recommend these strategies to the students they serve, I conducted a survey study of heads of ASCs from higher education institutions across the U.S. (McCabe, 2018). Of the 400 ASC heads invited, 77 completed the survey. Participants responded to open-ended and closed-ended questions about the learning strategies they endorse and recommend to students.

When asked in a free-response question about the top three learning strategies ASC heads recommend, by far the most reported strategy was "time management" (58%). Focusing on the evidence-based strategies discussed above, 23% commented on spacing, and only 10% reported that they recommended organizational outlines, asking and answering questions, flashcards, multiple modes of studying, and mnemonics.

In the next part of the survey, the ASC heads rated (on a 5-point scale) how much they believe 36 specific strategies to be effective and how often they recommend these strategies to the students they serve. As effectiveness and recommendation ratings were strongly correlated, I will focus on summarizing recommendation ratings for the evidence-based ("SET") strategies (see Table 1, organized in columns by scale intervals from "never" to "always").

Table 1

Recommendation Frequency Ratings for Learning Strategies Relevant to Evidence-Based and Non-Evidence-Based Principles

Never – Rarely Recommend	Rarely – Sometimes Recommend	Sometimes – Often Recommend	Often – Always Recommend
Write notes verbatim from course materials (1.81)	*Plan for longer study sessions focused on one subject* (2.41)	***Incorporate a variety of modalities (e.g., visual, auditory*** **(3.97)**	***Discuss course materials with another person*** **(4.34)**
	Focus on one type of course material for an extended time (*M* = 2.22)	***Use pictures/diagrams*** **(3.97)**	***Answer questions about the material*** **(4.31)**
		Teach material to a real or imagined other **(3.96)**	***Self-test*** **(4.27)**
		Use mnemonics (memory aides such as acronym, keyword, or song) **(3.60)**	***Plan for shorter study sessions with breaks in between*** **(4.16)**
		Study in a way that is consistent with the	

	student's learning style (e.g., visual auditory) (3.55) *Review highlighted or underlined passages from text or notes* (3.55) ***Use flashcards*** **(3.53)** ***Highlight or underline important parts of text or notes*** **(3.49)** ***Study the same course material in at least two sessions*** **(3.44)** ***Mix up the order of related materials that are studied during a single session*** **(3.34)**	***Use concrete real-life examples*** **(4.13)** ***Create study materials*** **(4.12)** ***Use outlines or other organizational materials*** **(4.04)**

Note. Strategies are listed in descending order by mean in each scale-interval column. Means in parentheses represent the 1-5 scale (1 = *never*, 2 = *rarely*, 3 = *sometimes,* 4 = *often*, 5 = *always*) for recommendation frequency. Regular font indicates strategies not empirically supported or otherwise counter to evidence-based strategies, whereas **bold font** indicates evidence-based strategies. Adapted from "What learning strategies do academic support centers recommend to undergraduates?" by J. A. McCabe, 2018, *Journal of Applied Research in Memory and Cognition, 7,* p. 146 (https://doi.org/10.1016/j.jarmac.2017.10.002)

Summary Discussion of ASC Head Ratings in Table 1

Spacing-related strategies

ASC heads reported more frequently recommending *plan for shorter study sessions with breaks in between* than *study the same course material in at least two sessions*. Therefore, the former may be a more obvious or intuitive spacing strategy, even though the memory benefit from spaced, or distributed, practice comes from the latter iteration. More important, and encouragingly, the ratings for *plan for longer study sessions focused on one subject* were far lower than the two spacing items above. ASC heads demonstrated moderate endorsement of interleaving strategies. First, there were higher ratings for *mix up the order of related materials that are studied during a single session* compared to *focus on one type of course material for an extended time*. Thus, the overall picture is quite positive with regard to ASC heads recommending spacing strategies to students.

Elaboration

Several relevant strategies were frequently recommended to students; in descending order of ratings: *discuss course materials with another person*, *answer questions about the material*, *use concrete real-life examples*, *create study materials*, *use pictures/diagrams*, *teach material to a real or imagined other* (Fiorella, this volume), and *use mnemonics*. A takeaway from these results is that, although there is some variation in frequency of recommendation, many elaborative strategies grounded in meaning-based connections are recommended by ASCs.

Testing strategies

ASC heads heavily recommended the most obvious item, *self-test*. Another item, *use flashcards*, was less frequently endorsed. Flashcards, when used correctly to encourage effortful retrieval from long-term memory, can be an excellent way to implement the testing principle (cf. Dunlosky et al., this volume). However, flashcards used more casually, such as skimming or checking the answer without memory retrieval, would not incur the benefits of testing. Therefore, it is not fully clear how to interpret the lower mean for this item. The important takeaway for ASC staff is to teach students to use flashcards in a way that requires retrieval from long-term memory, such that this strategy will strengthen memory for the material; they should also convey to students that any type of self-test can give metacognitive feedback about their current state of learning. This double-benefit for learning is part of what makes testing, or retrieval practice, so powerful. It is also worth noting that the highly-rated item discussed above for elaboration, *answer questions about the material*, could also be relevant to testing principles if the learner were to try to answer the questions from memory without referring to the material.

This optimistic picture of endorsement and recommendation for some of the core evidence-based learning strategies was further bolstered by the fact that none of the more shallow strategies (that would NOT be endorsed by memory researchers as a means to deep and durable learning) had particularly high ratings: *highlight or underline important parts of text or notes*, *re-read course materials for review*, *write notes verbatim from course materials*. It is important to point out that, although several of these strategies were not very often recommended, they were reported at similar levels to some evidence-based strategies; specifically, *review highlighted or underlined passages from text or notes* was equivalent or numerically higher than several effective strategies (Table 1). In summary, and as discussed at more detail in my article (McCabe, 2018), there is much to commend with regard to evidence-based practices at ASCs, but there is also room for improvement on some important fronts.

The Pervasive Myth of Learning Styles

The idea of learning styles is that individuals may report that they have a specific modality or means through which they learn best and, by extension, that they should learn better when the manner of presentation matches their learning style. There are many variations on learning styles, and several ways to group them, although perhaps the most common is to divide students into those who self-identify as 'visual learners,' 'auditory learners,' and 'kinesthetic learners.'

Although researchers have failed to find evidence in support of the benefits of matching individual learning styles to the mode of to-be-learned material presentation (Pashler et al., 2009; Kirshner, 2017; Willingham et al., 2015), 9% of the ASC heads in my study (McCabe, 2018) reported that they recommend that students know and apply learning styles as a top recommendation; this was mentioned far more often than several evidence-based strategies described above. In the closed-ended ratings section, the results were more encouraging, in that the strategy to *study in a way that is consistent with the students' learning style (e.g., visual, auditory)* was less frequently recommended than what could be considered the alternative, *incorporate a variety of modalities (e.g., visual, auditory)*. Yet the learning styles strategy was rated fairly strongly given the lack of empirical evidence; learning styles received an equivalent or higher frequency rating than evidence-based strategies such as *use flashcards* and *mix up the order of related materials that are studied during a single session*.

It turns out that the learning styles idea is one of the most pervasive myths in education, with one study reporting that 58% of students believed they have a specific learning style, and that 91% of university instructors endorsed the idea (Morehead et al., 2016). Clearly there is a need to better communicate that the notion of learning styles does not exist, at least not in a way that matters for actual learning. A recently released "viral video" communicates that learning styles are a myth in an easily digestible,

accurate, and entertaining way. Several other videos by leaders in memory and education research help to combat the learning styles myth – one featuring Dr. Daniel Willingham, who is also interviewed in the video, and another featuring Dr. Robert Bjork. Two TED Talks can be useful to help educate ourselves, faculty, and our students – "Learning Styles and the Importance of Critical Self-Reflection" featuring Dr. Tesia Marshik, and "Misconceptions of Learning Styles" featuring Dr. Anita Acai.

One method of making the myth-busting information about learning styles more palatable to students (the idea is often reinforced in K-12 schooling, and to which students may staunchly cling to this part of their identity) is to emphasize that although they may certainly have learning *preference*s, these do not guarantee better learning. Indeed, the best advice is to "go wide" and incorporate as many modalities as appropriate (Brown et al., 2014), considering the nature of to-be-learned material with the goal of choosing a modality that makes sense (e.g., auditory mode for a music class, visual mode for an art class). Ideally, higher education stakeholders – from ASCs to instructors to other student-facing staff – can develop a consistent, fact-based framework to counteract misconceptions about learning styles.

Learning Strategy Information on Academic Support Center (ASC) Web Sites

As a new initiative for this chapter, I worked with two research assistants to locate the ASC websites of the original 400 higher education institutions contacted for the original survey study (McCabe, 2018). After omitting three institutions that had either closed or did not have available websites, we assessed each site using a qualitative coding scheme to determine the presence of information about general learning support, specific evidence-based learning strategies ("SET"), language indicating to users that they derived recommendations from cognitive science or memory research, and endorsement of learning styles. The goal was to take a snapshot of the outward-facing web presence from these centers with regard to evidence-based practices.

As displayed in Table 2, two categories of general learning support came up most frequently – learning strategies/study skills and time management. Neither of these is particularly surprising given the survey results discussed above (McCabe, 2018). Around half of the ASC sites claimed to support students in test taking (often including management of test anxiety), note taking, and reading. Fewer sites described goal setting, organization, or support specific to online learning. With regard to the last category, it is notable that even 29.7% of ASC sites provided such advice, given that almost certainly this percentage would have been quite small prior to the COVID-19 pandemic. This suggests that many ASCs gathered and organized this specific content rather quickly in light of the emergency shift to distance learning in March 2020. Other topics that were not part of our coding scheme, but we noticed arising multiple times, included motivation, study environment, control of distractions, group work, writing, and wellness/self-care. We only noted seven instances of use of "metacognition" (1.7%), an important but relatively technical term referring to the ways in which learners understand their own learning and make strategic decisions to improve.

Table 2

Academic Support Center (ASC) Web Site Content Analysis Results

Content	Percentage
General Learning Support Categories	
Learning Strategies/Study Skills	74.6%
Time Management	67.8%
Test Taking	52.9%
Note Taking	49.1%
Reading	44.6%
Goal Setting	32.5%
Organization	31.5%
Online/Distance Learning	29.7%
Specific "SET" Learning Strategy Categories	
At least one:	27.7%
Elaboration	22.7%
Testing	20.7%
Spacing	17.4%
Learning styles	9.6%

Note. Percentages computed out of 397 websites and listed in descending order by sub-category.

Turning to the "SET" strategies, 27.7% of ASC sites included at least one specific evidence-based recommendation from the domains discussed above. Strategies relating to the principles of spacing, elaboration, and testing were presented at around the same rate, although elaboration (e.g., outlines, mnemonics, asking questions, making connections) was highest, and spacing (e.g., short study sessions with breaks, distribute studying over many days) was lowest. Additional analyses revealed that only 11.6% included recommendations related to all three "SET" strategies. We also coded for language along the lines of the recommendations being "evidence-based" or "based on cognitive science research" or "based on what scientists know about memory," and only 13.4% met this criterion.

What about learning styles? Keeping in mind that 9% of ASC heads listed learning styles as a top-three recommended strategy in my survey study (McCabe, 2018), it is interesting that learning styles were mentioned on ASC web sites at almost exactly that same rate (9.6%). The good news is that recommendations based on learning styles were found at a far lower rate compared to evidence-based strategies. The not-so-encouraging news is that nearly one out of ten institutions we assessed still endorse this concept; based on the presence of learning style inventories on many of these sites, presumably they recommend that students find out their learning style and then adjust their study strategies to match their style. A few interchanged the language of learning "styles" vs. "preferences," but, in my opinion, this still indicates to students that the discovery of their unique way of learning is important in their study choices and, ultimately, to their academic outcomes. As discussed above, there is a lack of evidence supporting learning styles (e.g., Pashler et al., 2009), so it is important for ASCs to examine their sites for learning styles language and, ideally, replace it with recommendations supported by empirical research.

Our approach to this website analysis was certainly coarse and cannot capture the entire nuanced picture of what is happening at ASCs. Many ASCs may be recommending strategies not described on their websites, and some of the sites appeared to have not been recently updated. We also found a few institutions where content was password-protected, restricted to members of the institution. Nonetheless, these data suggest some interesting patterns of overlap (and non-overlap) when it comes to the types of supports and strategies offered to students.

Based on these analyses, I believe that ASCs could more consistently embrace the disbursement of evidence-based learning recommendations on their public sites. This can be a component of what I referred to earlier as a proactive approach to student support – promoting information relevant to student success early and often to the entire community.

Academic Support Centers as Learning Strategy Ambassadors

ASCs are critical in bridging the gap between theory, evidence, and practice – that is, they are uniquely situated to interpret and translate what memory research has demonstrated into education and, on behalf of the common goal of everyone in higher education, to support students in maximizing learning and academic achievement. After all, use of ASC services has been associated with GPA, graduation rate, and academic skills (Grillo & Leist, 2013; Perin, 2004), and ASCs may be particularly supportive of historically underserved and less-prepared students (Rheinheimer et al., 2010). In addition, combining the use of a variety of strategies that work together in a manner that can potentially boost long-term retention takes both knowledge and planning. Given that not all 'desirably difficult' strategies are particularly intuitive or well-known to students and instructors alike (e.g., McCabe, 2011; Morehead et al., 2016), ASCs have an even broader role in conveying the importance of understanding human learning and memory as a basis for applying effective strategies.

That being said, not every strategy will benefit every student in every situation. Further, there are certainly some known and as-yet-unknown boundary conditions for each strategy (e.g., some may be better suited to specific course structures or topics). This is an important area of continued research. To give two examples, one study demonstrated that undergraduates with ADHD showed an equivalent testing effect (improved memory with increased retrieval from long-term memory) as those without ADHD (Knouse et al., 2016), and another suggested that students with lower working memory had an even larger testing effect benefit than those with higher working memory (Agarwal et al., 2017).

Is it true that where students have the "will" (in this case, possessing knowledge of the best study strategies for each circumstance), they also have the "way"? Research and anecdotal experience suggest not. Students may need support in finding the "way." Some may not even really know what this thing called "studying" is supposed to be. Ideally, ASCs can help students develop a 'cognitive toolbox' (Benassi, et al., 2014; Dunlosky, 2013) of effective techniques that can be strategically applied during study sessions scheduled throughout the week. The ASC heads' popular recommendation to focus on time management skills (McCabe, 2018) aligns very well with the evidence-based strategies discussed above. For example, spaced studying cannot happen without effective time management to allow for shorter bouts of focused learning with breaks in between. Targeted support of time management skills, therefore, will continue to play an appropriately central role in ASC interventions. All these supports will ideally combine to improve students' *self-regulated learning*, so that they can function (and are motivated to do so) in learning environments without ready assistance. Chapters in Part 4 of this volume address this issue in depth.

The call to ASCs to ensure that they possess the most up to date information regarding strategies that research has shown that do (and do not) promote learning is essential. Using their student interaction skills to both convey the information *and* convince students to change behaviors that do not promote

learning is key. Counteracting prevalent myths and misconceptions (e.g., learning styles, the value of re-reading and underlining/highlighting) will likely need repeated and consistent messaging. Just as it is said "it takes a village to raise a child," I would say it takes a campus to empower a student with the best tools for lifelong learning. ASCs can help advocate for institution-wide investment in the endorsement and integration of effective strategies. Staff at ASCs also know the unique character and values of their institution, along with the specific needs of the student population, so they are in a position to craft messaging and interventions most likely to be positively received by and helpful to the students they serve.

If you are reading this as an ASC staff member and you are unsure how to proceed with growing your understanding of learning and memory research relevant to academic success, you have already found one resource (this and other chapters in this e-book) to get started. I also recommend seeking out high-quality media in which research is translated into everyday recommendations and actions, including websites (e.g., *The Learning Scientists*; *Lasting Learning*; *Retrieval Practice*), books (e.g., *Make It Stick* by Brown et al., 2014; *How We Learn* by Carey, 2014; *Powerful Teaching* by Agarwal & Bain, 2019; *Small Teaching* by Lang, 2016), and other resources such as those mentioned above. And please consider reaching out to your local cognitive psychologist, and more broadly, to the faculty in your psychology and education departments, and staff in your teaching and learning centers. Speaking personally, it is one of my favorite things to talk with people about how to communicate learning strategies research effectively to students. Ideally, these conversations could even grow into a space for collaborative research, such as designing and evaluating outcomes of innovative ASC initiatives. These are the types of connections that will solidify the bridge from research to evidence-based practice.

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