Journal of the Scholarship of Teaching and Learning, Vol. 10, No. 1, January 2010, pp. 28 - 35.

Focusing on how students study

Regan A. R. Gurung[1], Janet Weidert[2], and Amanda Jeske[3]

Abstract: What is the best advice to give students regarding how to study? We provide preliminary results on the utility of a 35-item Study Behaviors Checklist that is adaptable for any course. We assessed 125 introductory psychology students' use of different study techniques and correlated their responses with their exam scores. Attendance, study guide use, using practice exams, and using class material to explain problems were positively correlated with exam scores. Some often recommended techniques (e.g., highlighting material) were negatively correlated with exam scores. We present study guidelines for students and key areas for future research on this topic.

Keywords: study techniques, strategies, student success, study skills.

"Read your textbook and assignments before coming to class. Take good notes. Test yourself often".--- These are some of the many study techniques recommended to students by instructors and even some textbooks to do well in a course and there are also a number of student study guides (e.g., Fry, 2004; Tamblin and Ward, 2006). A large body of research has attempted to identify the techniques that are optimal (e.g., Gurung, 2005; Hattie, Biggs, and Purdie, 1996; Kobayashi, 2006; Metcalfe, 2009; Robbins, Lauver, Le, Davis, and Langley, 2004; Wingate, 2006; Worrell et al., 2010; see Gurung and Schwartz, 2009 and Hattie, 2009 for extensive reviews and summaries). Unfortunately, given the breath of past research and the ambiguity of findings (i.e., what is found to work in one study often does not seem to work in another), it is difficult for instructors to find the best empirically supported advice to give students regarding how to study. In this article we provide instructors with preliminary results using a short measure of study behavior that is adaptable for any course. Our primary research question was, "What study behaviors are associated with higher grades on exams?"

Measures of study behaviors, also called study skills, strategies, or techniques can serve as diagnostic tools to help instructors identify students in need of additional help, as well as providing students with a better awareness of their strengths and weaknesses and, correspondingly, ways to optimize their learning. Study behaviors can be broadly defined as behaviors serving to acquire, organize, synthesize, evaluate, remember, and use information (Crede, and Kuncel, 2008; Gettinger and Seibert, 2002). Such behaviors include time management; goal setting; selecting what to study, how, and where; taking good notes; reading; and self-testing. Researchers have divided the many specific study behaviors into main four categories: repetition-based (e.g., flashcards), cognitive-based (e.g., studying with a friend), procedural (e.g., time management), and metacognitive (e.g., taking quizzes to test self-knowledge; for more details see Gettinger and Seibert, 2002; Tamblin and Ward, 2006). Metacognitive techniques were shown to be some of the strongest predictors of exam scores

[1] Department of Human Development and Psychology, 2420 Nicolet Drive, MAC C309, University of Wisconsin, Green Bay, Green Bay, WI 54311, gurungr@uwgb.edu
[2] Department of Industrial/Organizational Psychology, Colorado State University, Fort Collins, CO 80523-1876
[3] Department of Counseling Psychology, University of Minnesota-Twin Cities, Minneapolis, MN 55455

(Hattie, 2009). This study builds on this literature and assesses techniques from each of these categories.

Given the obvious link between studying and learning (as established by high exam scores and course grades), a large 'self-help' market caters to students looking for tips. The style and empirical basis of the available material varies greatly. Many of the guides include discussions of topics such multiple intelligences, learning styles, and time management, while providing step-by-step strategies on how to read better, take good notes, and remember and test better. Whereas some guides include some empirical evidence to support recommendations (e.g., Pauk and Owens, 2007; Tamblin and Ward, 2006), most do not. For example, Newport (2007) features tips based on interviews with students who achieved high grades in college and list anecdotes of what the high scoring students did (e.g., minimize the time spent on assignments while still learning exactly what is needed, p. 83). Many guides are targeted at the high school or first year college student (Fry, 2004) and many of the prescriptions are not necessarily derived from or aligned with the empirical literature on study techniques reviewed above.

In contrast to non-empirical 'self-help' style student guides to studying, a wealth of empirical research suggests that good study behaviors predict academic success (Crede, and Kuncel, 2008; Hattie, 2009; Prevatt, Petscher, Proctor, Hurst, and Adams, 2006). But what exactly are 'good study behaviors'? Early attempts to assess 'good' study behaviors go back to Wrenn's (1933) Study-Habits Inventory, the Student Skills Inventory (Locke, 1940), and the Survey of Study Habits and Attitudes (Brown and Holtzman, 1955). More recently, researchers have commonly used the Learning and Study Strategies Inventory (LASSI, Weinstein and Palmer, 2002) or created their own scales (Carrell and Menzel, 1997; Gurung, 2005). Unfortunately, many of these scales are long, extremely general, and furthermore do not afford clear prescriptions on how to advise students to study although they do provide links between studying and exam scores. Similarly, while clearly establishing the link between study behaviors and performance, large meta-analytical studies (Crede and Kuncel, 2008; Hattie, 2009) do not provide specific prescriptions of how exactly students should study.

We build on previous work to provide a more fine-tuned view of what students do to study by assessing different behaviors in a shorter format than existing scales. Furthermore, we directly tie study behaviors to exam scores to test the utility of many commonly suggested study tips such as looking over notes immediately after a lecture. Consistent with recent research, we hypothesized that metacognitive behaviors (e.g., self-testing) would predict higher exam scores.

I. Method.

A. Participants.

One hundred and twenty students (41% women and 19% men; 40% did not report sex) from a midsized Midwestern university in one section of an introductory psychology class participated in this study (participation was voluntary, class enrollment = 126). The mean age was 19.60 (*SD* = 2.80). The majority of the students were freshmen (46%); the rest were sophomores (16%), juniors (7%), and seniors (6%) or did not report their year in school (25%). The mean ACT score was 22.16 (range: 17 to 30) and mean cumulative GPA was 2.83 (range 0.98 to 4.00). We obtained student permission to access university records for ACT and GPA data.

B. Materials.

We created a 35-item Study Behavior Checklist (SBC, see Table 1) based on previous research (Gurung, 2005; Weinstein and Palmer, 2002) and student interviews. The items assessed students' *organizational behaviors* (e.g., writing down when exams, assignments, and quizzes are due; setting up a study schedule), *application behaviors* (e.g., creating questions about the material), *elaboration behaviors* (e.g., paraphrasing the material, explaining it to another person), *metacognitive behaviors* (e.g., using practice exams to study), and *resource use behaviors* (e.g., asking a fellow classmate to explain the material) on a scale ranging from 1 (*Not at all like me*) to 5 (*Exactly like me*).

C. Procedure.

After completing the final class exam consisting of 60 multiple choice questions, participants picked one of two extra credit opportunities (for five bonus percentage points on the exam) in accordance with approved Institutional Review Board (IRB) protocol. Students were able to complete the 35-item study behavior checklist or read an article about student study behaviors and complete short answer questions about the article. We informed students that participation was voluntary, the information obtained would be strictly confidential, and responses to the questions would not adversely affect their class grades or exam scores.

II. Results.

The mean scores on each of the items of the SBC appear in Table 1. The scale showed high reliability (Cronbach's alpha = 0.89). Attending class, organizing notes, writing down relevant figure/table/chart numbers, and knowing when assignments were due were the most highly cited behaviors. Using the book Web site for practice quizzes and asking for additional study materials were the least cited behaviors. There were no significant differences between men and women in scale responses.

We correlated student responses to the SBC with scores on students' final exam. The more students attended class, $r(114) = 0.23$, $p < 0.05$; answered all questions on the study guide, $r(114) = 0.23$, $p < 0.05$; used practice exams to study, $r(114) = 0.24$, $p < 0.05$; and were able to explain problems using the material, $r(114) = 0.28$, $p < 0.01$; the higher were their exam scores. A number of behaviors were associated with lower scores. The more students reported looking over notes after class, $r(114) = -0.20$, $p < 0.05$; highlighting important information to review later, $r(114) = -0.21$, $p < 0.05$; asking friends/classmates to explain material they did not understand, $r(114) = -0.23$, $p < 0.01$; asking the TA or professor for additional study materials, $r(114) = -0.26$, $p < 0.05$; and reviewing the chapter after lecture, $r(114) = -0.26$, $p < 0.05$; the *lower* were their exam scores. Student report of study hours did not relate to exam scores.

Our hypothesis that the metacognitive items (20 and 21) would be the most powerful predictors of exam score was borne out by the positive correlations between these items and exam score. To further test whether these two items held together well and were unique from the other items, we computed a principal components factor analysis and used a varimax rotation. Ten factors (Eignevalues > 1.0) explained 67% of the variance. Looking at the rotated factor

matrix showed that the two explicitly metacognition items loaded highly on a single factor with weights of 0.70 and 0.75 respectively.

Table 1. Means and Standard Deviations for the Study Behavior Checklist items and Correlations with Exam Score.

Item	*M*	*SD*	*r*
1. I attended every class.	4.46	0.76	0.24*
2. My notes were organized well.	4.27	0.88	0.15
3. I wrote down in my notes figures/tables/charts/sections that were mentioned in lecture.	4.22	0.98	0.12
4. After class, I looked over my notes to check for and fill in missing information.	2.48	1.02	-0.21*
5. I read the difficult material slowly.	3.51	1.08	-0.07
6. I highlighted the most important information in each chapter to review later.	3.04	1.29	-0.23*
7. I took notes on what I was reading.	2.66	1.31	-0.15
8. I created and answered questions about the material while I was reading in my head.	2.35	1.14	-0.02
9. I created and answered questions about the material while I was reading in my notes.	2.57	1.19	0.00
10. I related what I was reading to lecture materials and discussion.	3.64	0.97	0.05
11. I reviewed the chapter after the lecture on that topic.	2.60	1.05	-0.27**
12. I read and evaluated the figures and tables in the book.	3.35	0.99	0.11
13. I evaluated the pictures/photos in the book.	3.17	0.90	0.00
14. I read and evaluated the Personal Application Sections in the book.	2.39	1.17	0.16
15. I knew when the exams, quizzes, assignments were due and noted them in my planner, calendar, PDA, etc.	4.14	1.15	-0.03
16. I actively modified my studying because this exam used a Multiple Choice format.	2.75	1.19	-0.18
17. I reviewed the material to decide how many hours I needed to study.	2.66	1.06	-0.08
18. I set up a study schedule that allowed me enough time to complete all that is due in my different classes.	2.97	1.19	-0.01
19. I crammed before this exam.	2.54	1.15	0.15
20. I answered every question on the study guide.	3.66	1.38	0.22*
21. I used practice exams to study.	3.84	1.36	0.24*
22. I briefly reviewed all the chapters covered before I studied.	3.43	1.11	-0.01
23. I divided material into smaller, manageable, and logical sections (e.g. I used an outline).	2.78	1.32	0.00
24. I varied my studying behaviors by switching between reading, rehearsing, solving problems, writing, etc.	2.84	1.31	0.04
25. I went to the book website for practice quizzes.	2.14	1.35	-0.11
26. I took the online quizzes without any notes.	3.41	1.32	0.07
27. When I got an answer wrong on a quiz, I went back to the related material to better study it.	3.47	1.20	0.06
28. I paraphrased what I was learning and explained it to someone else.	2.85	1.17	0.13
29. I generated my own examples about the material.	2.97	1.11	0.08
30. I was able to explain a problem or phenomenon using the material.	3.42	0.95	0.27**
31. I asked (by email, a phone call, visit, etc.) a classmate/ friend to explain material I did not understand.	2.95	1.34	-0.22*

32. I asked (by email, a phone call, visit, etc) the professor/TAs to explain material I did not understand.	2.40	1.26	-0.09
33. I explained confusing concepts to classmates.	2.76	1.26	-0.02
34. I was able to answer questions my classmates asked.	3.29	1.01	0.12
35. I asked the professor or TAs for additional study materials.	1.61	0.82	-0.26**

Note: * $p < 0.05$; ** $p < 0.01$

Is it possible that study behavior varies by student ability (i.e., GPA)? To test this idea we used a median split to divide the sample into students with high ability (cumulative GPAs > 2.90) and those with low ability (GPAs < 2.90). We then computed similar correlations to those discussed earlier comparing self-reported study behavior and exam score. There were differences in patterns of correlations between the two groups. For high ability students, only one SBC item was significantly (though still negatively) correlated with exam score. Students who highlighted important information to review later did worse on the exam $r(34) = -0.38$, $p < 0.05$. For low ability students, a number of SBC items were negatively correlated such as looking over notes after class to fill in missing information $r(28) = -0.48$, $p < 0.05$; reading difficult material slowly, $r(28) = -0.44$, $p < 0.05$; highlighting important information to review later, $r(28) = -.041$, $p < 0.05$; evaluating pictures in the book, $r(28) = -0.41$, $p < 0.05$; actively modifying studying, $r(28) = -0.47$, $p < 0.05$; reviewing material to decide on study hours needed, $r(28) = -0.41$, $p < 0.05$, setting up a study schedule, $r(28) = -0.38$, $p < 0.05$, and asking the professor or TAs for additional study materials, $r(28) = -0.35$, $p < 0.05$. As can be seen, the sample size for each subsequent analysis was much smaller due in large part to the fact that GPA information for 33 students was not available (students did not give permission for their records to be accessed).

III. Discussion.

These results present many challenges for pedagogical research attempting to identify optimal study skills. Whereas we found support for our hypothesis regarding the utility of metacognitive strategies such as self-testing, few behaviors significantly related with exam scores, and some often recommended strategies turned out to correlate negatively with exam scores.

The results of this study, although troubling, are consistent with the literature that suggests there are no strategies that work all of the time, for all students, in all classes (e.g., Gurung, 2003; Hadwin and Winne, 1996; Hattie et al., 1996). Additionally, given the results of this study are based on one sample and are self-report, it may be premature to over emphasize the magnitude and directions of the relationships. The key may be that the SBC identifies some of the most commonly suggested study behaviors based on a wide literature. It is possible that introductory psychology multiple choice exams require only basic study behaviors as seen in the demonstrated utility of behaviors such as self-reported use of the study guide and practice exams.

The higher negative correlations between self-report study behavior and exam scores for students with lower GPAs suggest that some behaviors such as highlighting important information served as “dangerous detours” to learning (Gurung, 2004, p. 164) involving more study time at the expense of other techniques and efficiency. The negatively correlated items could represent behaviors used by academically weaker students. Whereas the academically stronger students may not take time on behaviors such as going over chapters right after a lecture in lieu of doing so right before an exam, the weaker students may go over the chapters at both times.

The preliminary findings on the SBC provide important recommendations for both how instructors advise students and for future research on study techniques. Instructors need to be cognizant of how much of the advice they give to students is empirically proven to work in an actual classroom as compared to a controlled cognitive psychology laboratory study where many studies of learning are done. What may work well in the lab may not transfer well to a classroom (Daniel and Poole, 2009). Part of the problem may relate to what exactly students are doing. Studying with a friend was negatively correlated to exam scores in our study. Perhaps students need to be trained in the best way to study with a friend. Instructors can model how students should make up examples with the material and quiz each other. For some students 'studying with a friend' may mean sitting on a couch reading notes and chatting with the television on. Whereas you can control and monitor what a student is doing in a laboratory experiment on studying, a simple questionnaire measure may not accurately tap into what students do as they study in college. This notwithstanding, the SBC takes the first large step towards specifying study behaviors and may provide teachers with a useful format for guiding student learning. Asking students to complete the SBC (or even some items from the SBC) after the first exam in any class taught may provide instructors with a starting point to discussing study behaviors with students. Instructors can correlate the behaviors with exam scores and identify what behaviors are associated with better scores. Sharing the results with the students can help the students modify their study behavior. Taking some class time to discuss the variety of study techniques as outlined in the SBC, *and then detailing what exactly is involved in each method*, may also be critical to helping students do better. In class discussion can provide a key venue to expand on some suggestions, such as providing specifics on how 'studying with a friend' can be optimal. Students can also get a sense of what they are not doing and be alerted to possible problems in their existing ways of studying (Entwistle, 2009).

We hope the SBC can form the basis for additional explorations of what works best, for whom, and when. Whereas the items can remind students of the different ways they can study, serving as a helpful guide, scholars of teaching and learning need to fine tune prescriptions for studying going beyond global recommendations such as 'read the book' to ways to read to achieve the best outcomes. Instructors can advise students to study using the different methods listed in the SBC, but much more focused empirical research is needed to pinpoint which specific behaviors encompassed by each item are the most conducive to learning. Results such as those found in this study compel a closer look at the recommendations instructors make to their students, highlight some critical techniques, and also help set a research agenda for a focus on the best ways to help students learn.

References

Brown, W. F., and Holtzman, W. H. (1955). A study-attitudes questionnaire for predicting academic success. *Journal of Educational Psychology, 46,* 75-84.

Carrell, L. J., and Menzel, K. E. (1997). The impact of preparation and motivation on learning performance. *Communication Education, 46,* 262-272.

Crede, M., and Kuncel, N. R. (2008). Study habits, skills, and attitudes: The third pillar supporting collegiate academic performance. *Perspectives on Psychological Science, 3,* 425-454.

Daniel, D. B., and Poole, D. A. (2009). Learning for life: An ecological approach to pedagogical research. *Perspectives on Psychological Science, 4,* 91-96.

Entwistle, N. (2009). *Teaching for understanding at university: Deep approaches and distinctive ways of thinking.* London, UK: Palgrave Macmillan.

Fry, R. (2004). *How to study* (6e)*.* Clifton Park, NY: Thompson Delmar Learning.

Gettinger, M., and Seibert, J. K. (2002). Contributions of study skills to academic competence. *School Psychology Review, 31*, 350-365.

Gurung, R. A. R. (2003). Pedagogical aids and student performance. *Teaching of Psychology, 30,* 92-96.

Gurung, R. A. R. (2004). Pedagogical aids: Learning enhancers or dangerous detours? *Teaching of Psychology, 31,* 164-166.

Gurung, R. A. R. (2005). How do students really study (and does it matter)? *Teaching of Psychology, 32*, 367-372.

Gurung, R. A. R., and Schwartz, B. M. (2009). *Optimizing teaching and learning:* Pedagogical research in practice. Malden, MA: Blackwell.

Hadwin, A. F., and Winne, P. H. (1996). Study strategies have meager support: A review with recommendations for implementation. *The Journal of Higher Education, 67*, 692-715.

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement.* London, U.K.: Routledge.

Hattie, J., Biggs, J., and Purdie, N. (1996). Effect of learning skills interventions on student learning: A meta-analysis. *Review of Educational Research, 66,* 99-136.

Kobayashi, K. (2006). Combined effects of note-taking/-reviewing on learning and the enhancement through interventions: A meta-analytic review. *Educational Psychology, 26,* 459-477.

Locke, N. M. (1940). The Student Skills Inventory: A study habits test. *Journal of Applied Psychology, 24,* 493-504.

Metcalfe, J. (2009). Metacognitive judgments and control of study. *Current Directions in Psychological Science, 18(3),* 159-163.

Newport, C. (2007). How to become a straight-A student: The unconventional strategies real college students use to score high while studying less. New York: Broadway Books.

Pauk, W., and Owens, R. J. Q. (2007). *How to study in college (9e).* San Francisco: Wadsworth.

Prevatt, F., Petscher, Y., Proctor, B. E., Hurst, A., and Adams, K. (2006). The revised Learning and Study Strategies Inventory: An evaluation of competing models. *Educational and Psychological Measurement, 66,* 448-458.

Robbins, S. B., Lauver, K., Le, H., Davis, D., and Langley, R. (2004). Do psychological and study skill factors predict college outcomes? A meta-analysis. *Psychological Bulletin, 130,* 261-288.

Tamblin, L., and Ward, P. (2006). *The smart study guide: Psychological techniques for student success.* Malden, MA: Blackwell.

Weinstein, C. E., and Palmer, D. R. (2002). *Learning and Study Strategies Inventory (LASSI): User's manual* (2nd ed.). Clearwater, FL: H & H Publishing.

Wingate, U. (2006). Doing away with 'study skills.' *Teaching in Higher Education, 11,* 457-469.

Worrell, F. C., Casad, B. J., Daniel, D. B., McDaniel, M., Messer, W. S., Miller, H. L. et al. (in press). Promising principles for translating psychological science into teaching and learning. In D. F. Halpern (Ed.) *Undergraduate education in psychology: A blueprint for the future of the discipline*. Washington, D.C.: American Psychological Association.

Wrenn, C. G. (1933). *Study-habits inventory*. Oxford, England: Stanford University Press.