In-course Learning Intervention for Physiological Psychology- Spring 2022: Practice Brief

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INTRODUCTION

Research based at Virginia State University[1] reveals a relationship between academic skill attainment, self-confidence and self-agency. Additional findings[2] [3] suggest that a student's experience of stress and overwhelm may curtail feelings of confidence and therefore hinder the sense of ownership of one's learning. These findings are not unique to VSU[4]. However, we posit that due to COVID, there is an even greater tendency for students to circumvent the more rigorous demands of the Study Cycle, which is described by Sandra McGuire in her book, *Teach Yourself How to Learn*[5], focusing instead on task completion. While the latter method was seemingly effective during remote learning, the transition back to the post-COVID classroom could prove problematic for both students and instructors if the former is not utilized. However, the study cycle may need to be taught first.

Over the last 15 years, I have identified two distinct groups of students in my VSU courses. Initially I believed that the consistent bimodal grade distribution observed in Psych 412: Physiological Psychology represented students who differed in their abilities to understand or willingness to engage the topic of Neuroscience. I surmised that this was due to many factors including the time lapse between their previous biology course; the attitudes toward science; and possibly “senior-itis” (most students delay this required course until their final semester). After the in-course research conducted this semester, I now believe that these two groups are not easily or accurately distinguishable by grade attainment but rather, they are distinct in terms of their use of

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[1] Culpepper, S.A. (November, 2020) Understanding the link between Personal Factors that Influence Academic Behaviors (PIAB) and first-semester grades of HBCU entering students, HBCU STEM-Undergraduate Success Research Center Presentation, Annual Conference, Atlanta, GA.

[2] Tope-Banjoko, T., Davis, V., Morrison, K., John Fife, S., Hill, O.W. and Talley, C.P. (2020**).** Academic Resilience in College Students: Relationship between Coping and GPA, *Anatolian Journal of Education*, 5(2), 109-120. https://doi.org/10.29333/aje.2020.529a

[3] Kendall Brooks, L. D., & Talley, C. (2020, December 11). Examining Academic Coping Strategies Among Black American Students in Terms of Math Resilience https://doi.org/10.31234/osf.io/ebqc5

[4] Talsma, Kate, Kimberley Norris, and Benjamin Schüz. “First-Year Students’ Academic Self-Efficacy Calibration: Differences by Task Type, Domain Specificity, Student Achievement Level, and Over Time.” *Student Success Journal*. Volume 11 (2) 2020. https://doi.org/10.5204/ssj.1677

[5] McGuire, S. Y. (2018). *Teach yourself how to learn: Strategies you can use to ace any course at any level*. Stylus Publishing, LLC. Pg 35. Figure 4.6

effective learning behaviors, such as the Study Cycle. By embedding teaching strategies within the course, the number of students who would not have likely obtained a final grade of C was reduced by 50%.

This outcome was also the result of grading concessions that were necessary to incentivize student behavior change. For instance, I provided a make-up opportunity for students who had not passed the midterm exam. I also provided opportunity for students to opt-out of the final exam. I had not employed either of these grading options previously. However, as research director of the HBCU STEM Undergraduate Success Research Center, my work includes examining the efficacy of STEM intervention programs. Therefore, I was keenly aware of the "heavy lift" of getting students, particularly seniors in college, to change well-rehearsed academic behaviors.

During the spring 2022 semester, I reconfigured Psych 412 in order to examine the use of metacognitive strategies as outlined in Appendix A of *Teach Yourself How to Learn*[6]*.* In her book, Dr. McGuire reports on the effectiveness of deploying strategies in STEM courses by 1) introducing them to Bloom's technology 2) allowing them to examine their own learning strategies in light of the different levels proposed by Bloom and 3) encouraging adoption of study practices that are more aligned with the learning level of the material (ie memorization vs analysis). Based on this book, a 3-part intervention strategy was created for the entirety of the course. The interventions were adopted from a list of 35 study techniques from McGuire's book (see Appendix A).

THE PLAN

The reflex loop of the patellar tendon (with demonstration of a tap below the knee) was used to introduce the multiple levels of analysi that are the focus of the course. The observed knee jerk, sensation of the tap and the involuntary movement of the leg, the brain centers for sensation and movement and the neural connections at the cellular level are all areas of focus. By the end of the course, assessment items required evaluating the material from the perspective of multiple and overlapping systems and when there is damage, disease or injury to a part of the system. The final culminating class project invited student's creativity in encapsulating all of the material into one presentation.

With the inclusion of the intervention, changes and adaptations to the course forced the emphasis to shift from what was written in the syllabus to what was needed to help students learn. This shift was not reported on the syllabus as a change. However, the change to the course goals was significant. The biggest shift was the admitting to

[6] Ibid Pg105 Appendix A,

myself that the official course goals might not be met…and to accept that reality. This change usurped 25 years of well-rehearsed teaching practices.

By focusing on meta-cognitive strategies with the goal of eliciting behavior change in the students, I was being required to make fundamental changes in my teaching. By insisting that the changes be measured by the quality of graded assignments, I had to choose between prioritizing the current course goals or implementation of the strategies. Due to the challenges of teaching remotely I had already reworked my course delivery. Now I had to do it again because I not only had to create means of assessing students on their knowledge of the material but now how they were studying (or not studying) the material.

From the Syllabus PROGRAM LEVEL STUDENT LEARNING OBJECTIVES (PLSOL)

Upon successful completion of the course, a student will be able to

- Identify structure and function of major brain areas and important neural networks associated with behavior. (PLSOL 1)
- Describe neuronal and brain function in terms of cell biology (PLSOL 1)
- Describe and illustrate the electrical and biochemical basis of neural signaling from the cellular to system level. (PLSOL 1)
- Using an ecological perspective, explain the etymology and symptomology of a psychological disorder or behavior (neural pathology); from a multi-level analysis (biochemical, cellular, anatomical system, cognitive, behavioral). (PLSOL 3 & 4)

SETTING UP

Psych 412- Spr 22 consisted of seniors majoring in Psychology (n=20). Half of the class expected to graduate at the end of the semester (n=11). The course was taught remotely. Even though the University was open and courses were offered in-person, I had been granted an exception due to family circumstances. The course was divided into 5 topical sections plus the course introduction. The topical sections built upon each other with increasing complexity. The pre-midterm topics were course introduction, neuroanatomy, and synaptic transmission. The pre-final topics were psychopharmacology, sensory systems, and brain pathology

As stated in the syllabus (see Appendix A), the grading for the course was 60/40. The midterm and cumulative final exam made up 40% of the course grade. The other 60% of the final course grade came from all other assignments. These included the following:

- In-class assignments (Announced or unannounced quizzes that were delivered on Bb. These ranged from 10-25 points and would be provided only once during the class session. The content assessed was limited to a single topic)

- Minor quizzes (Announced quizzes that were delivered via Bb and were placed on the calendar. The content covered 2-3 topics. The minor quizzes were given at the beginning of a class period and then reviewed during that class period. They were from 25-50 points)
- Major quizzes (A Major quiz was given before the midterm and final exams and served as a preview. The Major quiz often contained more short answer and essay questions than the mid-term or final exams. Students earned 50-100 points)
- Group Project-Individual Portion (The topic of synaptic transmission is the foundational knowledge for the entire course. Students are required to record themselves "teaching" synaptic transmission. Several assignments build up to this assignment which was worth 150 points.
- Group Project-Joint (Student were to have used the best of the group projects to produce a joint group project. The expectation was that each student would contribute to the Joint Group Project after having their graded individual portions returned. This assignment was also worth 150 points.
- Cornell Templates*. To be described below (30-100 points)

A total of 1245 points were possible for the Spr 22 semester. This represented all of the assignments were posted on Bb. The student's grade was thus calculated as follows:

- Student total Bb points/1245 possible points) *.60 + (midterm and final exam percent average) *.40 = Final course grade.

A running total of the Bb grade was always available to students via Bb Grade page. Students needed to be reminded that an A on the Bb portion still meant a D in the course if they failed the exams. Therefore, study for the exams was constantly reiterated.

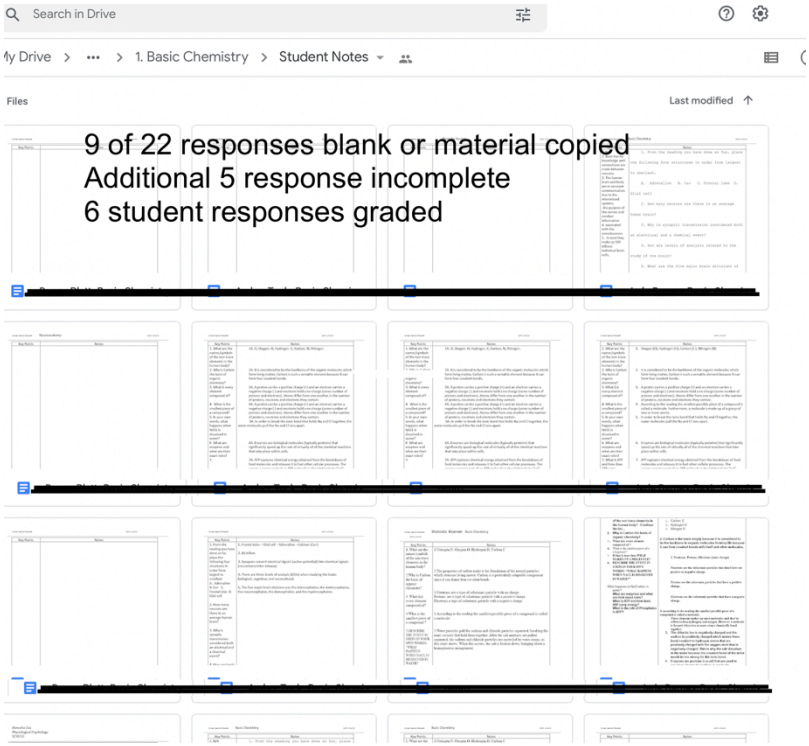
IMPLEMENTATION: EXAMPLE ONE

The January Bb Assignments focused on encouraging **reading of the assigned reading material.** The goal was to have students read the text and then take notes using the Cornell Note Taking Method, as suggested in McGuire's book. One lecture period was devoted to explaining the Cornell Method, providing a template on Google docs and explaining and demonstrating how to access the google file..

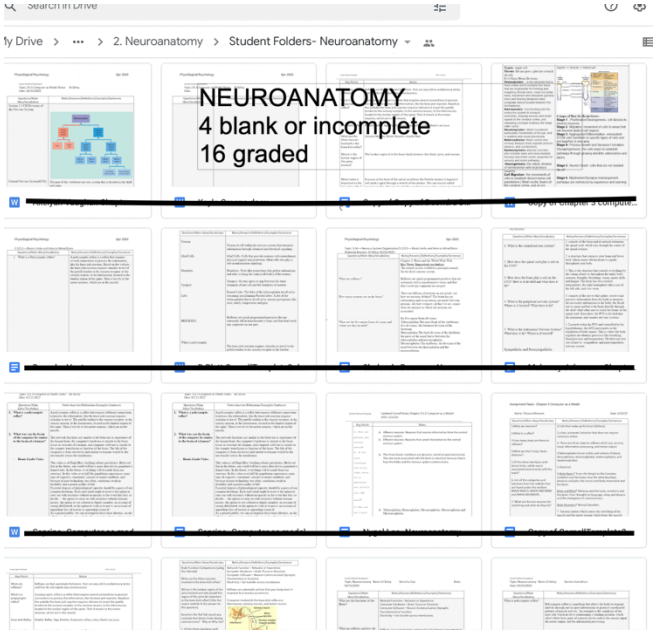
I only graded those papers that were complete. For the first assignment for January 26, 2022, the topic was Basic Chemistry. The majority of the students in the class had no grade recorded. During the post-assignment discussion, it was clear that several students had not engaged the reading because they thought it would be too hard. *The title of "Basic Chemistry" had discouraged them from even attempting the assignment.*. Following the discussion, time was devoted to reading the review of Basic Chemistry

one paragraph at a time while the student re-interpreted the text in their own words an recorded this information on the Cornell Templates. After several paragraphs, the class felt ready to move on.

Google Folder- Basic Chemisrtry



The next assignment was reading material on Neuroanatomy and for that assignment the majority of the responses were graded.



The use of Cornell Templates continued to increase. However, when asked short answer questions on a weekly in-class assignments most students did NOT respond to a question from the same material captured by the Cornell Method. *In other words, while the students did complete the assignments, most did not use the assignment as a study aid but as an independent assignment.*

IMPLEMENTATION: EXAMPLE TWO

Making a connection between content topics is essential in most courses, but crucial for studying STEM courses where concepts systematically build upon one another. My experience with this course taught me that for many students this concept is difficult to grasp. Just as time was spent reading the material together in order to utilize the Cornell Temaplate, additional training was needed to move from memorization to analysis. Therefore, as the course progressed, class activities were designed to encourage **thinking about how concepts interconnect**. The first attempt at this was having students examine test questions and how the questions differed according to Bloom's Taxonomy. For this work, I created the reverse quiz. The reverse quiz required students to students to produce their own questions at different levels of Bloom. The topic was Psychopharmacology. Before giving the Reverse Quiz I provided examples of different types of questions and also asked students how they would study to answer the questions if they were to be on the Final Exam. Students were then asked to create their own questions.

The Reverse Quiz Instructions
Please upload three potential Final Exam Questions that correspond with the levels of Bloom's Taxonomy and are based on your reading of the Psychopharmacology chapter.

- Level 1. Provide a question that tests knowledge and comprehension. This question can focus on vocabulary or definitions of what the terms mean and requires memorization of the material.
- Level 2. Provide a question that tests application and analysis. This question should require a deeper understanding of vocabulary terms and focus on how the terms are related to a process or concept described by the reading.
- Level 3. Provide a question that tests synthesis and evaluation. Ask for an example, not given by the reading, that require an understanding of the processes and how the processes may be related to each other OR ask to relate the topics in a way that shows understanding of the "big picture using examples or analogies.

Student #1 Reverse Quiz Answers
1. What is the difference between Antagonist and Agonist
2. Since pharmacokinetics refers to how the body handles the drug, what does the acronym ADME stand for and what purpose does it serve when considering psychoactive drugs
3. Which process involves the breakdown of psychoactive drugs and enzymes

Student #2 Reverse Quiz Answers
Level 1: What is a side effect?
Level 2: Inhalation and IV are the two fastest ways to administer drugs. Why is someone at a greater risk for addiction when taking drugs through rapid routes of administration?
Level 3: Explain why it would be beneficial for individuals to receive genetic screening before starting pharmacology treatment for conditions like depression.

It was this one assignment that demonstrated the bimodal distribution most starkly. Students who answered the assignment like Student #1 were also more likely to be low performing students in the course. In the example, Student #1 continue use Level one- memorization of definitions, Antagonist, Agonist, ADME- Administration, Distribution, Metabolism and Excretion and the definition of metabolism. This was in stark contrast to he responses from student #2 and other high performing students,

Unfortunately by this point in the semester (April 10) there was little I could do to help the lower performing students. A last ditch effort was to provide a survey to see if they were using other study strategies that could help. This low performing student group

scored no differently on a survey of their use of metacognitive strategies than the high performing students.

CONCLUSION

While students acknowledged the usefulness of metacognitive strategies most students were only compelled to adopt new behaviors after the midterm exam (M= 57%) when less than half (n=9) of the students had a course grade above 70%. At that point, proof of utilizing the study methods themselves were made into graded assignments and quiz grades improved for most but not all students. Despite the fact that lower performing students reported via survey that they engaged in the recommended behaviors, these students consistently failed to follow-through and turn in the assignments.

During the final weeks of the semester, students passing the course with a C or above were allowed to opt out of the final exam. All six of the remaining students consistently had two things in common. They all had poor scores on the Reverse Quiz Assignment. They demonstrated a higher number of missing assignments throughout the course. Finally, these students had missed either the midterm exam or the open-book retake of the midterm exam, which had been averaged together for the actual Midterm grade.

A week before the end of the semester, each of the failing students were contacted privately. Three of the students reported dire consequences (death of close family members during the semester, childcare issues, illness). The other three students were overwhelmed with other time commitments (carrying 21 credit hours, working a full time job and full time school in order to graduate).

These findings suggest that introducing metacognitive strategies early in the course and reinforcing the recommended behaviors after a major assessment may be, as Dr. McGuire writes in her books, effective in altering student behavior. However, the findings also show that the reasons for non-adoption of effective strategies may be varied and not just due to low student motivation. Stressful external factors, including over-extension with time obligations are common in the post-Covid era.

Additionally, while I can say that my efforts to alter performance for some students were successful, the techniques did not reach all students. Nor was I able to teach the course with the appropriate level of rigor while at the same time adopting these techniques. I must conclude that like most academic interventions, student motivation is tied to relationships within the learning context. Learning does not take place in a vacuum and the high stress situation that was Covid and is Post-Covid makes it clear that attention must be given to motivational and affective factors

I believe that this experience demonstrates the need for emphasis on academic skills but also on self-confidence that comes with repeated success. We know from the literature that self-efficacy comes as a result of increased self-confidence. However, the self-agency, the ability to take responsibility for one's own learning may require all of these: skill, confidence, and efficacy. These affective factors cannot be self-generated. They are produced and nurtured in the context of relationships. Additional research is needed on how to best incorporate effective learning strategies into content delivery while taking the needs of the students into account.

I believe that this most important and essential component of becoming educated is the willingness to engage in introspection and self-analysis; to question the way we are doing things when the desired result is not forthcoming; to learn *how* to learn. These are metacognitive activities, and they are useful skills for anyone who wants to continue to learn new things. These deeply personal cognitive actions can be modeled and demonstrated but in order to do that, I found that I had to be willing to learn to teach differently. I had to be flexible and to adapt. I had to confront the fact that my old way of teaching was not effective. In essence, I had to use the metacognitive skills myself before incorporating them into my course.

I have heard from several students that they appreciated my efforts. Their comments suggest that the lessons learned from learning to read and rephrase using the Cornel Note Taking Method may be of more importance to them in the long run than knowing about voltage-gated ion channels. Knowing this makes me feel a little better.

APPENDIX A: COURSE SYLLABUS for Physiological Psychology, Spring 2022

APPENDIX B: USE OF METACOGNITIVE STRATEGIES IN PHYSIOLOGICAL PSYCHOLOGY- Initial Game Plan

1. Infusion of McGuire Metacognitive Strategies into STEM Course
    a. Description of Course and expected difficulty as reported by previous students
    b. Presentation of Hybrid Flipped Classroom (Scherer, S., Talley, C. P., & Fife, J. E. (2017). How personal factors influence academic behavior and GPA in African American STEM students. *SAGE Open,* 7(2), doi 10.1177/2158244017704686. (http://dx.doi.org/10.1177%2F2158244017704686)
    c. Adaptation of (#) *Appendix A from McGuire's book*

i. **Infusion into the teaching (My Teaching Mantras)**
    1. #1 Strive for higher levels of Bloom's Taxonomy
    2. #16 Adopt a Growth Mindset about intelligence
    3. #17 Monitor *my* student-talk and Stay Positive
    4. #18 Attribute results to my actions (or inactions) and not student ability
    5. #21 Use Blackboard Calendar

ii. **Infusion into graded assignments.** (My "Lecture Last" Strategy)
    1. Setting the Stage: Reduction of content and Increase number of assignments
    2. #3 Preview Lecture of the readings without giving full Lecture
    3. #10 Review previous session
    4. #7 Assign the reading in small bits
    5. #5 Require Paraphrased Information from Reading: (Graded Cornell Template for every reading assignment and place on Bb.
    6. Lecture on assigned Information
    7. #9 Require Class notes from the Lecture now be added to the Reading Cornell Template
    8. #12 & #13 Preparing students to teach the material to other students and studying with a group**(Synaptic Transmission Group Project)**