Pedagogy
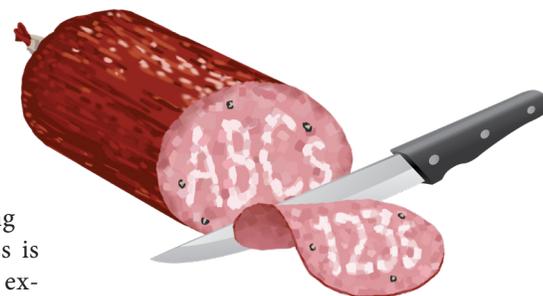
Evidence-based Approach to Effective Studying

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The issue

If you are like me, much of your time is spent ensuring that the classroom learning experience you provide for your students is stimulating, interactive and impactful. But how invested are we in ensuring that what students do outside of class is productive? Based on my anecdotal experience and several studies[1,2,3] looking at study strategies employed by students, the answer to this question is not nearly enough! Much like professional athletes or musicians, our students are asked to perform at a high level, mastering advanced, information dense subjects; yet unlike these specialists who have spent years honing the skills of their craft, very few students have had any formal training in the basic skills necessary to learn successfully.

Why does it matter

We often evaluate students' formative or summative assessments with grades, written, or verbal feedback. But what type of feedback do we give them to help improve the efficacy of their preparation for these assessments? If we do give them feedback about how to improve the learning process, is it evidenced-based and directed at improving metacognition, or do we simply tell them they need to study harder or join a study group in order to improve their learning? I would contend that we could do more to help students evaluate their approach to learning outside of class and examination performance.
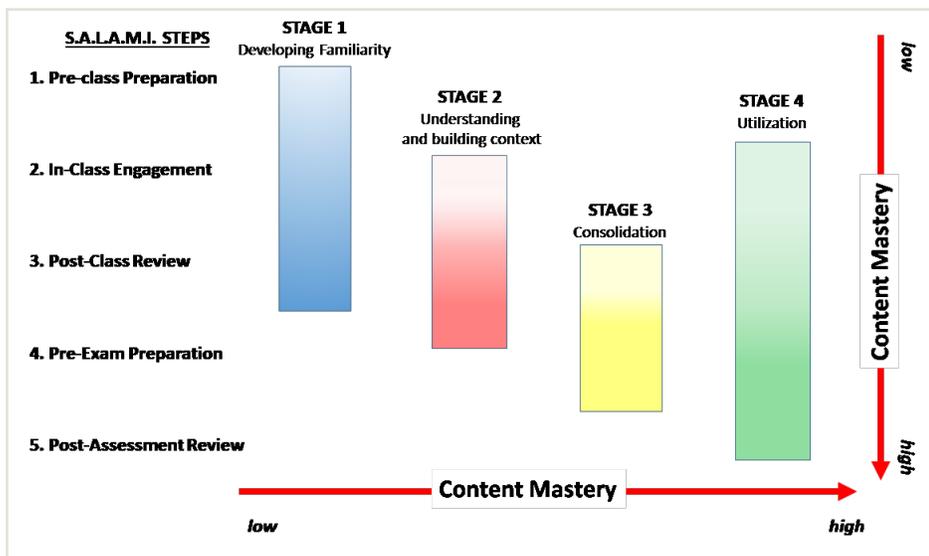
Faculty solution

Several years ago, I began to seriously think about and research this issue in hopes of developing an evidence-based process that would be easy for students to learn and implement. Out of this work I developed a strategy focused on the development of metacognition—thinking about how one learns. I based it on extensively studied, high impact learning techniques to include: distributed learning, self-testing, interleaving and application practice.[4] I call this strategy the S.A.L.A.M.I. method. This method is named after a metaphor used by one of my graduate school professors. He argued that learning is like eating a salami. If you eat the salami one slice at a time, rather than trying to eat the whole salami in one setting, the salami is more likely to stay with you.

S.A.L.A.M.I. is a "backronym" for **S**ystematic **A**pproach to **L**earning **A**nd **M**etacognitive **I**mprovement. The method is structured around typical, daily learning experiences that I refer to as the five S.A.L.A.M.I. steps:
   1. Pre-class preparation
   2. In-class engagement
   3. Post-class review
   4. Pre-exam preparation
   5. Post-assessment review

Each of the five steps correspond to different "stages" or components of learning (see figure on next page). Specific tools and techniques designed to enhance metacognition and learning are employed during each step. Two tools I have found to be particularly useful are a **pre-exam checklist** and an **exam wrapper**. The pre-exam checklist guides students through a series of reflective questions to help them think about the effectiveness of their daily study habits as they prepare for upcoming assessments.

S.A.L.A.M.I. STEPS

1. Pre-class Preparation
2. In-Class Engagement
3. Post-Class Review
4. Pre-Exam Preparation
5. Post-Assessment Review

STAGE 1 — Developing Familiarity
STAGE 2 — Understanding and building context
STAGE 3 — Consolidation
STAGE 4 — Utilization

Content Mastery (low → high)

The exam wrapper contains several statements describing possible reasons for missing an exam question. The student analyzes each missed question and matches one or more of the statements on the wrapper to each one in an attempt to identify the various factors that he/she is struggling with.

Results

Some of the most common issues that I diagnose involve illusions of learning.[5] Students who suffer from the 'illusion of knowledge' often mistake their understanding of a topic for mastery. These students anticipate getting a high grade on an assessment but end up frustrated and confused when receiving a much lower grade than expected. Information from the S.A.L.A.M.I. exam wrapper can help them realize that although they may have understood the concept being taught, they could not effectively recall important facts and apply them.

Students who suffer from the 'illusion of productivity' often spend extensive time preparing for an exam, however, the techniques they use are extremely passive. Commonly used passive study strategies include: highlighting, recopying and re-reading notes, or listening to audio/video recordings of lectures. The pre-exam checklist can help students identify the learning strategies they are using and reflect on their effectiveness.

I use the S.A.L.A.M.I. method in Principles of Receptor and Dose Response Theory, an extremely information dense course that runs 2 hours per day, 5 days a week. At the beginning of each class, 10 to 15 minutes is taken to discuss various aspects of the method. Students learn about illusions of learning, the benefits of distributed learning vs. mass practice and how to implement retrieval practice in their study through the use of common, in-class active learning strategies. Prior to the first exam, all students complete the pre-exam checklist in order to evaluate the effectiveness of their learning. They are also asked to predict what they will earn on the exam. During the exam return, all students complete the exam wrapper to analyze their performance and determine changes that need to be made to their preparation. Both the exam wrapper and pre-exam checklist have been very useful in helping to further "diagnose" learning issues and suggest recommendations for how students can change their learning strategies.

Other thoughts

Rather than relying on anecdotal advice from classmates or old habits that are no longer working, students should seek help early on and consistently practice efficient study strategies as outlined in the S.A.L.A.M.I. method. If used consistently over time, these tools can help students successfully make sustainable, data driven changes in their approach to learning. They should also remember that digesting information (e.g. a S.A.L.A.M.I.) in small doses is always more effective at 'keeping the information down' so that it may be consistently applied later on.

Additional resources

1. Kornell, N., Bjork, R. The promise and perils of self-regulated study. *Psychon Bull Rev*. 2007;14 (2): 219-224.
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3. Persky, A.M., Hudson, S. L. A snapshot of student study strategies across a professional pharmacy curriculum: Are students using evidence-based practice? Curr Pharm Teach Learn. 2016; 8: 141-147.
4. Dunlosky, J., Rawson, K.A., Marsh, E.J., Nathan, M.J., Willingham, D.T. Improving Students' Learning With Effective Learning Techniques: Promising Directions From Cognitive and Educational Psychology. Psychol Sci Publ Int. 2013; 14 (1): 4-58. https://journals.sagepub.com/doi/full/10.1177/1529100612453266
5. Koriat, A., & Bjork, R. A. Illusions of competence during study can be remedied by manipulations that enhance learners' sensitivity to retrieval conditions at test. Memory & Cognition. 2006; 34: 959-972.

Author's background

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