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TWELVE TIPS

Twelve tips on guiding preparation for both high-stakes exams and long-term learning

Aubrie Swan Sein, Shubha Dathatri and Todd A. Bates

Columbia Vagelos College of Physicians and Surgeons, Columbia University, New York, NY, USA

ABSTRACT

High-stakes exams including admissions, licensing, and maintenance of certification examinations are commonplace in health professions education. Although exam scores and performance can often serve gate-keeping purposes, the broader goal of health professions education is to foster deep, self-directed, meaningful, motivated learning. Establishing strong support structures that emphasize deep learning and understanding rather than exam scores can be beneficial to preparing learners who have the knowledge base to be excellent practitioners. This article offers guidance that can be used by academic support centres, medical educators, learning specialists, and faculty advisors, or even test-takers, to help learners to balance score achievement and knowledge development, while simultaneously cultivating more efficient and motivated studying and increasingly self-regulated learning. This series of tips details considerations for building academic success supports, fostering a growth mindset, planning efficient and effective studying efforts, utilizing test-enhanced learning strategies, exam-taking skills practice, and other support structures that can help strengthen learning experiences overall.

KEYWORDS

Evidence-based learning practices; exam preparation; test-enhanced learning; self-directed learning; learner support

Introduction

High stakes examinations such as admissions, licensing, or maintenance of certification exams are ubiquitous in health professions education and practice. The intended purpose of these exams is usually to ensure that future or current practitioners have a minimum or adequate score for admission into or practice within the profession. Because testing can drive learning, test creation and design committees have been thoughtful about assessing information that is important for people to know and demonstrate, and that is important for patient care (e.g. Schwartzstein et al. 2013).

At the same time, high-stakes exams can cause a lot of anxiety and stress for learners. Despite many efforts to promote fairer assessment, factors such as structural racism disproportionately impact testing and admissions through inequitably-distributed preparation (Lucey and Saguil 2020) and access to studying and learning resources and test preparation advice (Girotti et al. 2020). Learning support structures can be built and learning specialists or trained medical educators can be utilized to assist students through preventive, early identification, and/or remediation measures (Swan Sein, Daniel, et al. 2020). Thoughtful assessment *for* and *as* learning within medical school assessment systems can also help facilitate student learning (Swan Sein, Rashid et al. 2020). Directing learners to recognize opportunities to use exam preparation to build and apply more clinically-minded strategies, even when the content of the exam may not focus on clinical reasoning or diagnosis, might better prepare them to learn from their patients and to apply similar strategies later on.

The purpose of these tips is to provide guidance on how schools and programs can help learners prepare for knowledge learning and high stakes medical style exams that can be shared with any learner along the health professions education continuum (admissions, predoctoral, and postdoctoral/residency). To generate and support the tips that are provided, a literature review was conducted to gather and translate evidence about learning strategies and exam preparation.

Tip 1

Set up advising for 'academic success' and for promoting evidence-based messages about learning and studying

Targeted approaches that work toward increased learning efficiency and effectiveness can benefit all learners, not just those who are struggling. Intentionally orienting and framing advising toward academic success and achievement can signal to all learners that the assistance is geared toward helping them work efficiently and effectively.

Effective learners engage in self-regulated learning such that they plan, monitor, and target learning by identifying knowledge gaps, adopting appropriate study strategies to address gaps, applying prior knowledge to learning, and managing time appropriately (Cleary et al. 2013; Cutrer et al. 2017). Academic success centres can champion and circulate such evidence-based studying and learning advice, and can help reframe studying for long-term learning, not just for exam performance (Kalet and Chou 2014; Kalet et al. 2016).

Learning specialists or trained medical educators can meet with class leaders or representatives for a learning

CONTACT Aubrie Swan Sein sea2134@cumc.columbia.edu Center for Education Research and Evaluation, Columbia Vagelos College of Physicians and Surgeons, Columbia University, New York, NY, USA

skills consultation to help demonstrate available services such as how to tailor a learning success plan. Beyond providing class leaders or representatives with individualised guidance about navigating resources and applying evidence-based learning strategies, taking this approach can destigmatise meeting with learning specialists or faculty providing academic support, and to help class leaders circulate well-researched and curriculum-specific advice to peers.

Tip 2

Help learners to have a growth learning mindset that prioritises clinical reasoning over memorising details

To promote a growth mindset (Dweck 2006), faculty guidance can help learners adopt strategies focused on learning for the sake of deepening learning and consolidating foundational information (Bierer et al. 2018). A master adaptive learner-oriented approach (Cutrer et al. 2017) will support students towards becoming informed and effective clinicians, rather than toward trying primarily to achieve high exam scores. Learning through cramming (last-minute, short-term attempts to 'cram' enough memorisable information to pass a test), and binging and purging (taking in large amounts of information at a surface level during a short period of time just prior to an assessment and then forgetting it after the test) strategies are associated with poorer performance, fail to lead to long-term retention of information, and are strategies characteristic of more novice medical learners (Bickerdike et al. 2016). To help avoid these effortful, yet low-return strategies, learners can be directed to identify and prioritize learning information that relates the most common or most clinically relevant information, by developing and utilising the building blocks of differential diagnosis illness scripts and clinical reasoning (Rencic 2011; Hennrikus et al. 2018). Working through and securing foundational concepts and then returning to concepts to add successive layers of detail can be more effective and clinically important than attempting to give equal priority in addressing all possible details that could arise on an exam.

Learners should be advised not to focus on comparisons to other learners' achievement or learning strategies. Using another student's plan or schedule may not be appropriate as each student has individual strengths and weaknesses. Because individual learners start at a different baseline levels, the most effective approaches to improving scores often vary depending on the baseline level. Benchmarking with others can result in learners using more resources or doing more work but may not lead to meaningful learning gains (Bates and Bratkovich 2020).

Tip 3

Assist learners to apply for necessary testing accommodations as early as possible

Helping learners with learning disabilities to identify or reveal disabilities and discuss the way that might impact test taking as early as day one can help ensure they get needed testing accommodations for high-stakes exams (Jain 2016). Some testing agencies have numerous requirements for test-takers to be granted accommodations for learning disabilities and it often can take many months to make accommodation decisions or to review accommodation appeals. Testing accommodations can also be made for learners with medical issues, such as pregnancy, postpartum pumping, and diabetes management. Learners should be encouraged to work with offices of disability services or similar such resources to take necessary steps to obtain appropriate accommodations (e.g. neuropsychological testing, working with clinicians for documentation of disabilities, submitting full applications for testing accommodations for learning disabilities, etc.) (Meeks et al. 2018).

Tip 4

Support learners to create a healthy and sustainable studying and test preparation plan

Schools or programs can coordinate studying supports from a variety of offices including learning success centres and wellness centres. Learners preparing for a high-stakes exam should be advised to consider and plan a study schedule that includes time for exercise, days off, breaks, and planned limited study hours in order to avoid burnout and to maximize outcomes (Shreffler et al. 2020). Learners who are studying full time during a dedicated studying period can be coached to take at least the equivalent of one day off per week, or two half days, to build in the spaced, intentional rest and personal time that support their learning. If a studier starts feeling burned out, taking a couple of days off can lead to better focus once studying begins again. Learners should take breaks from studying to exercise, eat well, and do other activities that balance the day and sustain them through the study process (Shreffler et al. 2020).

Learners can also be advised to interact and cultivate a sense of community with others who are studying to avoid feelings of isolation (Shreffler et al. 2020). Organizing a small group of people to engage in 'parallel studying' (i.e. studying in the same space or location but not studying 'together'), can motivate learners to focus and encourage one another to study for a specified amount of time. Wellness offices can offer positive breaks from studying and can work with learners on strategies to alleviate feelings of stress or anxiety.

Tip 5

Help learners to strategically select and learn how to use resources to guide studying and learning

There are myriad exam preparation learning resources available to students through schools or commercial ventures. In considering resource options, learners can benefit from primary learning resources, such as textbooks or course materials, overview resources like review books or video overviews of individual topics, and question bank resources featuring practice questions and explanations. Some review resources are designed to effectively fill concept gaps, others to remind learners of content they once knew but have now forgotten, and still others to help

learners with a strongly established fund of knowledge to remember less foundational details.

Advice can also be provided to learners to keep them from using learning resources counterproductively. For example, cramming, as opposed to studying more consistently and deeply, leads to poorer academic performance and does not promote knowledge retention (Bickerdike et al. 2016). Some learners might want to read review books cover-to-cover before beginning to do practice questions and other learners rely heavily on flashcard resources to help them to remember facts and details over time. There are risks in using book, video, or flashcard resources that tend to be overly focused details and facts at the expense of or prior to establishing conceptual understanding of information and practicing clinical reasoning techniques. As such, learners should be encouraged to avoid using memorization tools as their primary learning resource.

Tip 6

Teach learners how to practice recalling and summarising what has been learned on the topic

Retrieval practice is a powerful tool, yet studies have shown that learners do not necessarily practice retrieval on their own, so this must be coached (Karpicke et al. 2009). Retrieving information from memory over time activates development of knowledge in part by helping learners to develop an 'organization retrieval structure' through which they can practice how to remember information based on particular memory cues, and the more a learner practices recalling information from memory, the greater the chance that information will be committed to long-term memory. (Karpicke and Blunt 2011).

Studiers can engage in a wide range of activities that rely on doing from memory: make review sheets, re-create tables of information on areas of weakness, answer how/why questions, write out what was learned about a certain topic into a blank computer document, and explain new understandings to another person. Specific types of questions that promote elaboration, including generation and explanation questions, enhance understanding and long-term retention (van der Vleuten and Driessen 2014). Questions that ask learners to answer *why, how,* and *what-if* tend to promote deeper levels of comprehension and learning (Craig et al. 2006).

Tip 7

Support learners to utilise test-enhanced learning practices and measure learning progress

Test-enhanced learning (TEL) has been well-established to be a high-quality learning strategy (Larsen et al. 2008; Roediger et al. 2011; Green et al. 2018). Learners can be advised to take a baseline practice assessment before beginning to study and additional practice assessments along the way to monitor progress and potential to achieve the goal score. This process can resemble how testing might be done in a clinical setting where a baseline is established, an intervention is implemented (in this case studying), and then subsequent reassessments are used to evaluate and monitor the effectiveness of the intervention and progression toward 'healthy' values (i.e. a goal score). Using some practice exams to measure progress from a baseline level is important as well; learners should at least take a baseline, midpoint, and pre-exam practice exam to ensure that learning gains and scores are in line with studying and exam goals.

Using practice questions from question banks can help learners to become aware of gaps in understanding based on areas of weaker scoring. An iterative cycle of previewing content, using questions diagnostically to identify weaknesses, rehearsing information necessary to correctly answer questions from memory, answering more questions, and then cumulatively reviewing should be considered (Szpunar et al. 2007; Swan Sein, Cuffney, et al. 2020, see for an illustration of the test-enhanced learning cycle).

Further TEL-based recommendations include avoiding using 'tutor mode' options on question banks. When learners are able to easily look at what the correct answer is, they tend to spend less time and effort on understanding the nature of the question and on assessing what they know and do not know. Making use of small chunks of questions, such as ten at a time, can drive iterative learning.

Cumulative review that incorporates previous incorrect questions to demonstrate the learner's ability to attain and retain points over time is also important. In order to build cumulative review into the learning process, studiers can complete around 80% of questions in each topic in a question bank before moving on while saving the remaining 20% for cumulative review of all previously covered topics. Encouraging learners to progress through the question bank to review content and to ensure that previously missed questions are now questions they can answer correctly can be helpful.

Tip 8

Encourage learners to embrace learning from errors through metacognitive processes

Simply answering practice questions as a learning strategy is insufficient: questions should be used to determine what needs to be learned, to what level those things must be learned, and then the learning must be rehearsed – otherwise, the hard work of gaining new understandings or relearning content is largely wasted. A review of research on learning from errors concluded that making errors can help students to learn because '*errors enhance later memory for and generation of the correct responses, facilitate active learning, [and] stimulate the learner to direct attention appropriately*' (Metcalfe 2017, p. 20).

While preparing for the multiple-choice sections common to admissions, licensure, and medical speciality training exams, once learners have completed a block of practice questions, they should focus on questions they answered incorrectly or were unsure about and try to generate what the right answer is. Before looking at a question explanation, learners should attempt to explain why the right answer is correct, so they can uncover errors in knowledge and reasoning. Learners can then review the explanations to dispel misconceptions.

Learners can engage in a metacognitive process through which they plan how to learn in response to errors and misconceptions (see Andrews et al. 2018 for a practical clinical question review form resource). Learners can track their errors using an error analysis table or spreadsheet that allows them to keep record of what questions they missed and why. Monitoring patterns of incorrect answers to questions from problem sets or practice exams and noting whether an error centred on understanding, recall, application, and/or test-taking can help inform subsequent action and future studying, while providing a way to check whether progress has been made in addressing those concerns over time. For example, with errors in understanding, learners can consult a video, textbook, consultation with a more knowledgeable other, or any available source that will explain the content. Since errors in understanding point to an opportunity for conceptual learning, pairing a resource that explains the content in ways that build understanding can be helpful. For recall errors, studiers can utilise spaced repetition and practice remembering information from memory. For errors with reasoning or application, learners can complete more practice questions and explain why the right answer is right (or why the wrong answer is wrong). For test-taking errors, working with a learning specialist or faculty member to identify and address patterns of errors that emerge can be helpful.

Parsing these similar types of errors is crucial because each type of error could, on the surface, feel like something the learner 'didn't know.' By tracking errors and applying corresponding strategies in this way, learners can leverage metacognition to tailor their learning approach as granularly as on a question-by-question basis rather than having to rely on a one-size-fits-all approach to addressing these different needs.

Tip 9

Counsel learners to prioritise learning from questions over time rather than doing simulated exams close to the test date

A key to test preparation is a strong fund of knowledge that learners have practiced accessing and applying to the answering of questions and the solving of problems, such as through retrieval practice exercises (Karpicke and Roediger 2008) and test-enhanced learning (Green et al. 2018). Learners should focus on learning from questions and generally avoid repeatedly simulating the exam throughout their study period. Working through cumulative question sets throughout the study period to assess what has been studied and continue to iteratively identify errors and build recall in anticipation of a later assessment is a good use of study time (Szpunar et al. 2007).

While learning from errors is vital (Metcalfe 2017), using a large portion of a question bank under test conditions can increase overall stress by placing studiers in 'test mode' for longer periods, and does not lead to productive learning and understanding in learners who are still strengthening their conceptual understandings. Learners should generally wait until the later part of a testing period to work on doing random, timed questions in a fashion that simulates the testing experience, and that helps them to gain some level of comfort with not knowing what each question will be about. They can also finally 'cram' and review notes or flashcards on 'high yield' information in order to feel prepared for the test.

Tip 10

Help learners to practice common test-taking tips

Engaging in deliberate practice (Ericsson 2004), such as practicing test-taking techniques during the studying period and building personal evidence for which strategies are most effective, will help prepare students for test day. For example, when question passages are long, test-takers can try and practice reading the last sentence of the passage (such as, 'what is the next step in the management plan') first to understand what the question is asking, and then glancing at the answer choices to preview the content of the question before reading the full prompt. This anchoring process (Bransford et al. 2000) might help a student to understand the context of a question before reading through a long case stem, and might help them to understand what the question is asking more efficiently.

Test-takers should revisit questions they are unsure about, but should avoid spending excessive time on a single question and should make an educated guess and then mark the question as one to return to if there are a few minutes left at the end (Ouyang et al. 2019). When test-takers narrow answers down to two or three choices but cannot determine which answer is correct, they can be encouraged to 'go with their gut,' with the most plausible choice. If they still are stuck between a few answers, test-takers can be coached to always choose the first remaining answer choice, for example, so they can more quickly move on to other questions. Some test-takers might want to change an answer choice because they think a question is too easy, so other practical advice can be to not change answers unless there is certainty about the new response.

Tip 11

Assist learners to practice strategies to mitigate exam anxiety and maximise test day performance

Test-takers may experience varying degrees of anxiety on exam day, which is common and can be productive. However, some test-takers can experience panic and anxiety that distract from their concentration and exam performance. Advisors or learning specialists can help students practice applying several carefully selected strategies to work through anxiety on test day rather than enacting a less-helpful and poorly rehearsed 'menu of strategies' that might not always result in benefit (Encandela et al. 2014). For example, test-takers who tend to speed through questions and then need to reread them multiple times can be coached to read questions 'out loud in their head' to help focus attention on the test information. Test-takers can be reminded that 'slow is smooth; smooth is fast'— it is often more useful and faster to read a question once carefully and smoothly, than to frantically read the same question two or three times.

Learners might also consider visiting the testing site ahead of time to practice commuting and to be familiar

with what to expect there on test day. They can also think through details including what their test break plans are and what test day meals should be. We recommend that test-takers not change caffeine use until after the exam. Test-takers should familiarize themselves with specific testing policies, and what they should do if they are very ill on test day or need to leave during an exam. Lastly, test-takers should plan to take the day before the exam off from heavy studying so they can relax and be rested for the exam itself.

Tip 12

Promote learner post-exam reflection and continued learning

Tests and exams will continue to happen in school and for maintenance of certification, so having a smart approach to learning and studying is an important skill to cultivate. A lot can be learned from taking exams, as well. Some exam reports come with score breakdowns by topic areas, and this can drive future study to fill in knowledge gaps, particularly because such gaps can result in errors that impact future learning or patient care. Learners should avoid 'purging' their knowledge or skills learned for one exam because this material may appear on future exams (Haist et al. 2017) and, more importantly, because this could be important knowledge for clinical practice.

In the case where learners experience repeat failures despite coaching and support in each of the tips presented, 'compassionate off-ramps' (Bellini et al. 2019) from school or alternative options for career next steps can be facilitated.

Discussion

Schools or programs should be intentional in creating systems to support learners to be prepared for examinations for medical licensure or specialty training, such that the exams are an accurate reflection of their ability (Swan Sein, Daniel, et al. 2020). Situating exam preparation as foundational learning and patient care preparation can help learners prepare well and for the right reasons. Learners preparing for an exam should be encouraged to acquire and utilise information as they would in the real world, to make studying and preparing for examinations for medical licensure or specialty training or admissions exams as useful as possible for practice.

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Notes on contributors

Aubrie Swan Sein, PhD, EdM, is Director of the Center for Education Research and Evaluation and Assistant Professor of Education Assessment in Pediatrics and Dental Medicine at Columbia Vagelos College of Physicians and Surgeons, New York, New York.

Shubha Dathatri, PhD, EdM, is Education, Assessment, and Evaluation Specialist and Assistant Professor of Education in Surgery at Columbia Vagelos College of Physicians and Surgeons, New York, New York.

Todd A. Bates, PhD, MSEd, MA is Education and Learning Specialist and Assistant Professor of Education in Medicine at Columbia Vagelos College of Physicians and Surgeons, New York, New York.

ORCID

Aubrie Swan Sein http://orcid.org/0000-0002-3139-4626
Shubha Dathatri http://orcid.org/0000-0002-1263-6925
Todd A. Bates http://orcid.org/0000-0003-0450-9341

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