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Research

A snapshot of student study strategies across a professional pharmacy curriculum: Are students using evidence-based practice?

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Abstract

Introduction: In order for students to focus on deep learning and develop higher order skills, faculty need to improve the delivery of the educational experience, and students need better study skills.
Methods: This study surveyed student pharmacists across all four curricular years at a single institution about study strategies.
Results: Overall, 55% of students completed the survey. Nearly all the respondents (91%) re-read their notes, textbook, or re-watched videos with no significant differences between years. There were significant negative linear trends between cohorts with students completing practice problems ($p < 0.0005$), using flashcards ($p < 0.0001$), using retrieval strategies ($p < 0.005$), and thinking of real life examples ($p < 0.02$); in all cases a higher frequency was found with lower-level students (i.e., students in their first year or P1) and lower frequency with upper-level students (i.e., P4). Regardless of cohort, 52% of the students would re-study material rather than practicing recall without the possibility of re-study. Students reported studying in a variety of environments. While quiet areas were ranked first, a large frequency of students report studying while texting or checking emails (48%). Approximately half (52%) of the respondents participated in their own professional development regarding study skills, and these students reported less use of re-reading compared with their counterparts (88% vs. 95%, $p < 0.05$).
Conclusion: Students used re-reading as a main study strategy despite evidence that it is relatively ineffective. Students who seek resources to improve their study skills tend to use more retrieval practices than students who do not.

Keywords: Study skills; Student development; Practice; Study environment

Introduction

Deep learning (i.e., ability to extract meaning and not simply memorize) and higher order skills (e.g., critical thinking) are a focus of health science education, but changes to the delivery of educational experiences (e.g., design of courses and curriculum) are required to provide opportunities for students to develop these skills and for instructors to facilitate the process. This requires that students become more effective learners so they can go beyond memorizing facts for short-term recall examinations. Therefore, effective study strategies may be as important as how faculty deliver course work.

In a summary of learning strategies, Dunlosky et al.[1] outlined that retrieving information (i.e., repeated testing, known as the testing effect) was a high-utility strategy. This means there was sufficient evidence to show it was a highly effective practice.[1] The authors also found that more common study strategies of highlighting, summarizing, and re-reading were low-utility strategies; that is they were not effective or as effective as other strategies. Students may select study strategies for various reasons including time allocation, learning goals, advice from instructors or peers, or

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previous experience with the strategy. Within health science education, students must select the best strategies for long-term gains since curricula are road maps for learning as opposed to a collection of siloed courses. As such, information across courses needs to be retained and built upon to increase student success in patient care settings.

Repeated testing has demonstrated enhanced long-term retention compared with spending an equivalent amount of time repeatedly studying. The testing effect can increase learning by reinforcing retrieval pathways and by providing feedback to guide further study.[2,3] Research on learning has found that repeated reading is often an ineffective study strategy.[4,5] Conversely, repeated retrieval practice produces better long-term retention than re-reading.[6–8] However, students appear to lack metacognitive awareness of the testing effect.[2,9] Therefore, students may not practice retrieval methods in real-world educational settings and instead spend time re-reading material, re-watching videos, or re-reading notes.

Research in study skills has also shown that study environments can influence learning and that studying with competing cognitive processes (i.e., multi-tasking) can impede the rate of learning and overall retention of material.[10,11] Anecdotally, we may see students studying while in coffee shops, on the bus, while responding to social media, or engaging in other distracting activities. While society may condone these practices, attention is necessary for learning. Multi-tasking or task switching could be detrimental.[10–12]

One might assume that student learning strategies will improve as students progress through their education, especially as they enter professional or graduate programs. To date, there are few studies examining how learning strategies progress over time or across a curriculum. Research has indicated the most effective learning strategies are not being practiced in both undergraduate populations and within pharmacy professional programs.[2,13] The objective of this study was to examine the prevalence of retrieval practice relative to other study strategies implemented in students' real-world study behaviors. In addition, the study investigated whether these practices change over time as a function of experience within a professional program. The latter objective can help determine if interventions (e.g., workshops) are needed to enhance students' learning strategies. This can have direct implications for student success within a professional curriculum because student learning, especially long-term retention, can be enhanced with better strategies.[13] This could ultimately impact patient care as better learning strategies may improve ability to retain information and may better prepare students for experiential education as well as their future careers.

Methods

We surveyed 645 student pharmacists at the University of North Carolina at Chapel Hill about strategies they use to study. Participants included first (P1) through fourth year (P4) student pharmacists. The survey instrument was adopted from previously published work by Karpicke et al.[2] Some additions were made based on a review of effective study strategies.[1] The survey was administered online through Qualtrics (Qualtrics, Provo, UT) (http://www.qualtrics.com/university/researchsuite/research-resources/other-resources/cite-or-reference-qualtrics/) in the four weeks before the fall semester; the survey was administered during this time to capture learning habits of the incoming students' (P1) study strategies before exposure to the professional pharmacy curriculum. All students enrolled within the curriculum received an email explaining the study and that completion of the survey would serve as consent.

Data were summarized using descriptive statistics. When appropriate, the Chi-Squared and a Cochran-Armitage test for trend was used to assess trends (P1 through P4) in categorical data across cohorts of students (JMP, SAS Institute, Cary, NC). Significance was set at $p < 0.05$. The study was approved by the University's Institutional Review Board.

Results

Overall, 495 students opened the survey (77%), 394 agreed to participate (61%), and 354 completed (55%) the survey. Of the individuals who completed the survey, 28% were first year students (P1, $n = 99$), 34% second year students (P2, $n = 122$), 20% third year students (P3, $n = 70$), and 18% were fourth year students (P4; $n = 63$). Consistent with the overall student body, 79% of the participants had a previous degree. Overall, 54% of participants self-reported a grade point average above 3.5 (out of 4.0), 37% between 3.0 and 3.49, and 9% reported a grade point average below a 3.0. There was no statistical difference in the grade distributions between participants and the overall student body ($p = 0.25$).

On average, students reported using eight study strategies, and there were no differences between cohorts

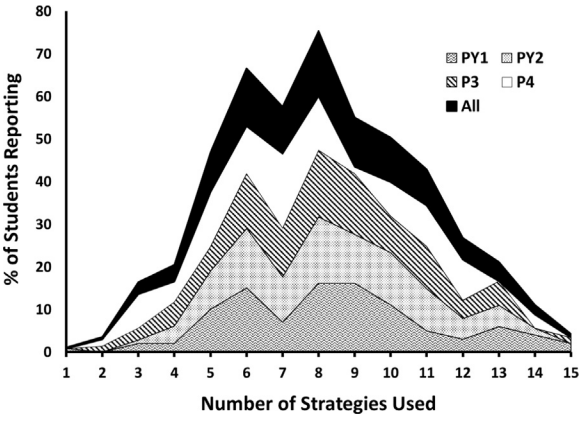

Fig. Number of learning strategies marked. P1 = first year student pharmacist; P2 = second year student pharmacist; P3 = third year student pharmacist; P4 = fourth year student pharmacist; All = all students.