

Do exam wrappers help students achieve better study habits in introductory biology?

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Abstract

Students in first-year biology courses tend to resort to high school study habits that are ineffective for college-level learning. When exams are returned with poor scores, students pay close attention to their score but often fail to connect their own study habits with the score received. Without time to reflect on their study habits after each exam, students tend to repeat their study strategies with dismal results. To encourage students to reflect on their study strategies, we used exam wrappers after the first and third exams in a large introductory biology course. Students completed exam wrappers after receiving both their graded exams and access to the answer key (receiving 5 homework points for the completion of each wrapper). Analysis of data over a 3-year period shows that exam wrappers lead at least some students to identify new (better) strategies for college science courses. However, 50% of students did not take their own advice in preparing for exam 3. Students who did take their own advice (37%) scored significantly better than their peers on exam 3. Overall, exam wrappers do not appear to be the wonderful answer to student preparation touted by promoters. There is some usefulness for a small segment of students, but certainly not the majority. In fact, there appears to be less usefulness to students than even our preliminary study of 10 years ago.

Background

Making the leap into college-level science classes is difficult for many students. First year students may come from high school without having mastered appropriate study skills. Skills needed for self-regulated learning are often lacking. Even when these skills are present, self-assessment is difficult, and needs to be guided.

Since the late 1990s educational psychologists have tried to find ways to stimulate meta-cognitive reflection in first-year students. A National Research Council report in 2001 emphasized the concern that poor problem solvers often continue to use a strategy even after it has failed, and noted that people in all fields generally continue to use a familiar strategy that works moderately well (or even poorly) rather than switch to a new strategy that would work better. The concept of exam analysis as a means to help students learn to do this appeared by 2005, and was in practice soon thereafter. By 2010, armed with new research on how learning works (see for instance Ambrose *et al*), more faculty were trying this approach, and in 2013 the term "exam wrapper" was coined by M. Lovett at Carnegie-Mellon University.

"Exam wrappers" guide students through the process of analyzing their learning habits by focusing on three key areas:

1) **How did I prepare for the exam?** Students are asked to reflect on whether or not they read the book, attended review sessions, used note cards or outlining, reviewed videos and laboratory materials, and whether they studied with a partner or a group.

2) **What errors did I make on the exam?** Students reflect on whether careless mistakes were the major problem; whether they had trouble remembering basic concepts or applying them; whether they changed their mind and erased first answers; whether incorrect multiple-choice questions were eliminated?

3) **How should I study for the next exam?** Here students reflect on behavioral changes for the future, based on knowledge of what went wrong in the current exam, and submit two concrete, specific changes in classroom or study behavior that they intend to implement.

Methods

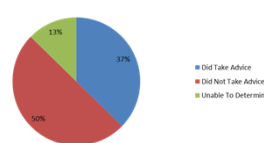
An exam wrapper was developed that followed the general criteria outlined in the background section. The wrapper was specific for the freshman biology course, a majors' course that included significant numbers of non-science majors as well. The exam wrapper was administered in the fall 2018, following both exam 1 (approx. week 4) and exam 3 (approx. week 12). During 2018 n = 136 for exam 1 and n = 118 for exam 3. In 2019 the same study was conducted with n = 128 for exam 1 and 112 for exam 3.

Exam wrappers were completed during lab as exams were returned. Students received 5 points of homework credit for completing and returning the exam wrapper assignment during lab.

Results

Goals set after exam 1 were compared to behaviors reported after exam 3. Fifty percent of students that completed both exam wrappers (n = 118) failed to take their own advice when preparing for future exams (fig. 1).

Do Students Take Their Own EW Advice?



Students Who Did Improve Their Grade Above a D/F

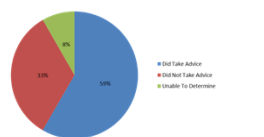
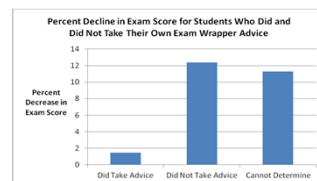


Fig. 2 – Of the 52 students receiving a D or F at week four, 12 improved their final course grade. Most (58%) took their own advice in doing so.



The data analyzed clearly indicates that students who create goals and follow through on them have a much increased likelihood of passing the course with a grade of C or better (fig. 2-4).

Results - continued

Analysis of individual behaviors listed on the exam wrappers indicated a general trend toward more study time after exam 1 (fig. 5), and a general trend toward more time spent reviewing class notes (fig. 6).

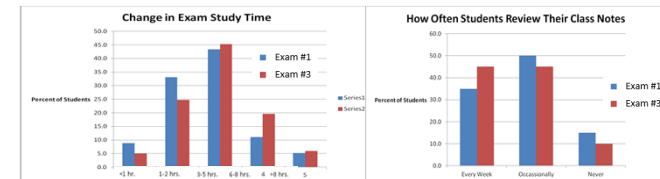


Fig. 5 – Self-reported study time for exams 1 and 3.

Fig. 6 – Self-reported frequency of class note reviews for exams 1 and 3.

Conclusions

Exam wrappers lead at least some students to identify new (better) strategies for college science courses. However, 50% of students did NOT take their own advice in preparing for exam 3. Students who DID take their own advice (37%) scored significantly better than their peers on exam 3.

Exam wrappers do not appear to be the wonderful answer to student preparation touted by promoters. There is some usefulness for a small segment of students, but certainly not the majority. In fact, exam wrappers have not changed overall D/F ratios for Biology 151, which average 30%.

We will continue this study for one additional year to see if the observed trends continue to hold.

References

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