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Student Preferences and Performance: A Comparison of Open-Book, Closed Book, and Cheat Sheet Exam Types

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Abstract

What type of examination do students prefer the most? Is the preference for exam type related to performance on the exam? The differences in student preferences and performance between open-book, cheat sheet and closed-book exams were examined in two different types of psychology courses. A total of 297 students enrolled in 8 sections of Introductory Psychology and 99 students enrolled in 4 sections of Statistics participated in this study. Students were given either open-book, cheat sheet or closed-book exams and completed a preference questionnaire. The questionnaire asked participants which type of test (open-book, cheat sheet or closed-book) they predict they would do best on, which type of test they would spend the most time studying for and which type of test they preferred to take, as well as how much time they had spent studying for that test. Students in both types of classes predicted that they would do better on open-book or cheat sheet exams compared to closed-book exams. Scores on closed book exams were lower than on the other two exam types, but scores did not differ between open-book and cheat-sheet exams. Comparisons of the actual exam scores of those who predicted they would do best on open-book exams and those that predicted they would perform best on cheat sheet exams found no difference between the two groups of students on scores on the two types of exams. Students believed they would study most for closed-book exams compared to the other exam types, but there were no differences in reported study time between exam types. Finally, students were asked which of the 3 exam types they would prefer to take. Students in both classes preferred open-book and cheat sheet exams over closed book tests. A comparison of the exam scores of those that preferred open-book exams to those who preferred cheat sheets revealed no difference between the two groups of students on exam scores. These results suggest that although students have preferences for particular types of exams, these preferences are largely unrelated to how students actually do on exams or how much they prepare for exams.

Keywords: Exams, Anxiety, Test-Types

1. Introduction

The goal for teachers is to help their students to learn and retain the material covered and at the same time enjoy the process of learning. One way to check for how well students have learned is by giving exams. There are many who consider the traditional closed-book and notes time-limited exam as the best measure of student learning, while others argue for alternatives, such as cheat sheet or open-book tests. While closed-book exams are probably the most common type of exam in psychology courses, alternative exam types, such as cheat sheets (or crib notes) where the student can prepare notes to use on the exam ahead of time, and open-book exams where the student can use all their material during the test, are increasingly accepted. Students themselves prefer alternative forms of testing – for example, Williams and Wong found that students prefer open-book exams compared to closed-book tests[1]. Students believed that being able to use notes, cheat sheets and texts during an exam would improve grades.

Is this expectation justified? The purpose of this project was to examine the effectiveness of various exam types - open-book; closed-book and cheat sheet.

Eilertsen and Valdermo argue that open-book exams encourage greater engagement and improve understanding of course material[2]. Feller has further suggested that open-book exams are superior to closed-book exams as they are more realistic – similar to problem solving situations students are likely to face outside of academia[3]. And of course, students prefer open-book to closed-book exams and find them less stressful[4]. As Kalish points out however, open-book tests may encourage less studying[5].

The evidence for the benefits of open-book tests is mixed. Kalish found that grades did not improve in open-book tests compared to closed-book exams, but other researchers have found higher grades on open-book tests, although the improvement is more modest than might be expected[6]. Those higher grades do not necessarily mean better learning of the material. In observing students taking open-book examinations, Boniface found that weaker students relied more on their notes and texts than academically stronger students, and students that used their notes most ended up doing more poorly on the exam, suggesting that open-book exams may actually lead to lower scores[7]. Moore and Jensen found that while exam scores in an Introductory Biology class were higher on open-book tests, the open-book format also encouraged lower attendance and less effort (fewer extra credit assignments and lower attendance at review sessions) and lower retention of information over the long term[8]. Heijne-Penninga, Kuks, Hofman and Cohen-Schotanus found that in medical students, closed-book exams actually encouraged more in-depth engagement with the course material[9].

An alternative to either closed-book or open-book exams are cheat sheet exams, where the student is given the opportunity to prepare a sheet of notes ahead of time to use on the exam. Erbe has argued that the preparation of cheat sheets improve and deepen learning by helping students organize their study time[10]. Some authors find an improvement in performance when students use cheat-sheets[11], while others find no effect[12]. Dickson and Bauer argue that cheat sheets are more of a crutch than an aid in preparing for an exam and found that students who prepared cheat sheets for an exam showed no improvement in learning on a pretest without their cheat sheets[13].

Some of the discrepancy in findings about the effectiveness of various exam types may be due to differences between classes and disciplines. While some of the research reviewed above focused on psychology courses [5, 13] others used students in science and mathematics classes [14, 8] and teacher education classes [11]. Some of the classes were lower division, others upper division. It is likely that different types of courses demand different styles of studying and test for different types of material. In some courses - an introductory course for example - studying for an exam involves reviewing facts. For other classes, such as mathematics or statistics, the student may need to practice using formulas and calculations. To our knowledge, there have been no attempts to directly compare open-book, cheat sheet and closed-book exams in lower and upper division Psychology courses.

The present study measured the effectiveness of different exam types (open-book, closed-book and cheat sheet) in two different types of classes, an Introductory Psychology class typically taken by freshmen, and a Statistics course typically taken by juniors. Students in the Introductory class were given open-book exams, cheat sheet exams and closed-book exams. As students at our institution are not required to memorize statistical formulas in their Statistics class, closed-book exams were not practical in that course, instead only open-book and cheat sheet exams were compared. The effectiveness of exams was measured by comparing exam scores and asking students about their preferences. We hypothesized that exam scores would be highest when taking open-book and cheat sheet exams.

2. Method

2.1 Participants:

A total of 396 undergraduate students enrolled at a small liberal arts University participated in this study. There were 297 (64 male, 233 female) students enrolled in 8 different sections of Introductory Psychology, and 99 (12 male, 87 female) participants enrolled in 4 sections of Statistics. This project was approved by the university's Institutional Review Board for the Protection of Human Subjects.

2.2 Materials:

In all sections of both Introductory Psychology and Statistics, students completed a 3 item Exam Preference Questionnaire, which asked participants which type of test (open-book, cheat sheet or closed-book) they predict they would do best on, which type of test they would spend the most time studying for and which type of test they preferred to take.

On cheat sheet exams in both Introductory Psychology and Statistics participants were instructed to prepare a double-sided 8 ½ X 11 sheet of paper on which they could write as much information as they wanted to use on the exam. These cheat sheets were collected and scored by an independent scorer on a 10 point scale for organization and richness of detail.

2.3 Procedure:

In Introductory Psychology, all sections were taught by the same instructor, and had the same texts and assignments, and during a given term, identical exams (non-cumulative, 50 multiple choice questions on each exam) were given to all sections. The sections of Introductory Psychology were taught over 4 terms (3 sections the first term, 2 sections the next two terms and one section the fourth term).

In Statistics, all sections were taught by the same instructor, and the sections had the same textbook, homework assignments, and exams. There were 2 sections taught each term for 2 terms. There were two exams, and the exams were a combination of short answer and story problems.

2.3.1. exam performance

Student performance on closed-book exams was compared to performance on cheat sheet and open-book tests in 3 sections of Introductory Psychology, all taught the same term. In the three sections, the three exams were counterbalanced among the 3 sections and the 3 exam types (open-book, cheat sheet and closed-book), so that each exam was given in all three formats (to different sections).

In the remaining 5 sections of Introductory Psychology, the first two exams were either open-book or cheat sheet (counterbalanced across sections in 4 sections, and open-book first and cheat sheet second in the final section).

In Statistics, the two exams were counterbalanced among the 4 sections and 2 exam types (open-book and cheat sheet).

2.3.2. student preferences

After the first exam in each section of class (both in Introductory Psychology and Statistics) students completed the Exam Preference Questionnaire, and also reported the number of hours they had spent studying for that exam.

3. Results

3.1 Exam Scores

Table 1 shows exam scores for both classes. In Introductory Psychology, an ANOVA found differences between scores on the three different types of exams ($F(2, 130)= 7.74$, $p < 0.05$). Paired-samples t tests found that closed-book exams resulted in lower scores than either open-book exams ($t(68) = 4.00$, $p < 0.05$) or cheat sheet exams ($t(67) = 2.43$, $p < 0.05$), and cheat sheet exams resulted in lower scores than open-book exams ($t(286) = 3.45$, $p < 0.05$). In Statistics, the difference in exam scores between open-book and cheat sheet exams was not significant ($t(98)= 1.98$, $p > 0.05$) .

Table 1 *Exam and Quiz Scores*

		Open-Book	Cheat Sheet	Closed-Book
Introductory psychology	Exam Scores	80.11 (10.92) N = 287	77.85 (12.14) N = 287	72.52 (11.81) N = 69
Statistics	Exam Scores	80.73 (13.05) N = 99	77.48 (14.89) N = 99	

Note. Values are Means (and standard deviations in parentheses) for the different types of exams calculated across all sections. For exam scores, N reflects the number of students in all thesections of the two classes that took the exams

Figure 1 shows the overall correlations between exam types. Pearson correlations revealed that scores on different types of exams were positively correlated in both classes. In Introductory Psychology, there was a positive correlation between scores on open-book and cheat sheet exams ($r(285) = 0.54$, $p < 0$ .05), between open-book and closed-book ($r(67) = 0.66$, $p < 0.05$) and between cheat sheet and closed-book scores ($r(66) = 0.67$, $p < 0.05$). In Statistics, there was a positive correlation between scores on open-book and cheat sheet exams ($r(97) = 0.32$, $p < 0.05$). Students who did well on one type of exam did well on the other types.

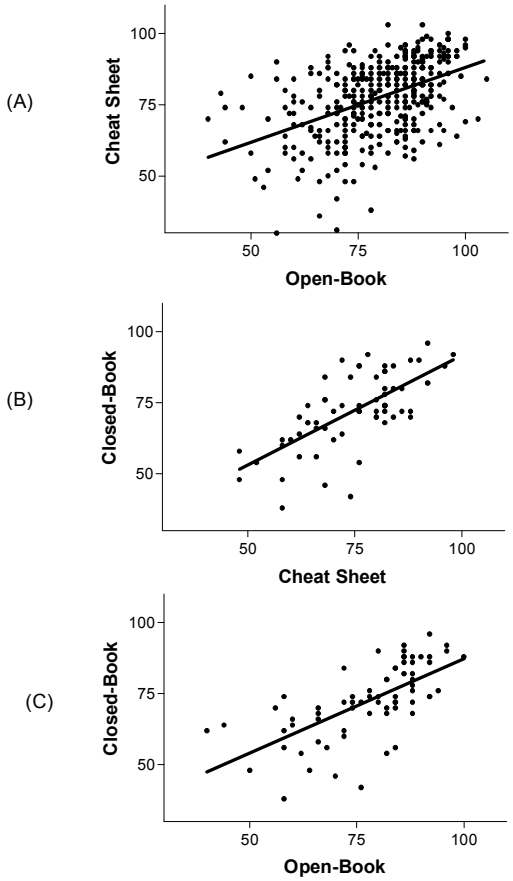

Figure 1. Correlations between different exam types across all sections and both courses. A) Scores on open-book and cheat sheet exams (N = 396); B) Scores on closed-book and cheat sheet exams (N = 67); C) Scores on closed-book and open-book exams (N = 69).

3.2 Student Preferences

Table 2 summarizes the results of the student preferences questionnaire. As can be seen, students in both classes predicted that they would do better on open-book or cheat sheet exams compared to closed-book exams ($\chi 2(3) = 238.67$, $p < 0.05$). Comparisons of the actual exam scores of those who predicted they would do best on open-book exams (N = 192) and those that predicted they would perform best on cheat sheet exams (N = 136) were made. Those who predicted that they would do best on open-book exams scored an average of 79.3% (SD = 15.0) on open book exams and 77.0% on cheat sheet exams (SD = 16.3), those who predicted they would do best on cheat sheet exams scored an average of 80.2% (SD = 12.0) on open-book exams and 76.6% (SD = 13.3) on cheat sheet exams. An independent samples *t* test found no difference between the two groups of students on scores on the two types of exams.

Table 2 Student Preference Questionnaire (Percent's)

		Introductory psychology	Stats	Overall
Predicted Best	Closed Book	6.3%	2.4%	5.4%
	Open-Book	53.0%	47.1%	51.6%
	Cheat Sheet	33.8%	48.2%	37.1%
	No Preference	7.0%	2.4%	5.9%
Study Time	Closed-Book	76.0%	65.9%	73.7%
	Open-Book	5.6%	4.7%	5.4%
	Cheat Sheet	6.6%	9.4%	7.3%
	No Preference	11.8%	20.0%	13.7%
Preferred Exam	Closed-Book	7.3%	2.4%	6.2%
	Open-Book	51.7%	41.7%	49.5%
	Cheat Sheet	35.0%	54.8%	39.5%
	No Preference	5.9%	1.2%	4.9%

Note. Values are % of participants reporting a preference for that exam type. Students were asked before the first exam to 1) predict which exam type they would do best on, 2) which exam type they think they would study most for, and 3) which exam type they preferred. N=372 total (287 participants in Introductory psychology and 85 in Statistics).

Students believed they would study most for closed-book exams ($\chi 2(3) = 475.38$, $p < 0.05$). Students were asked on the first exam to report how much time they had actually spent studying for that test. For Introductory Psychology, the average reported study times for open-book exams was 3.97 hours (SD = 4.42, N = 160), for cheat sheet exams study time was 4.04 hours (SD = 3.65, N = 103), and for closed-book exams reported study times were 3.32 hours (SD = 3.32, N = 23). Independent-samples *t* tests found no differences between exam types in reported study time. In Statistics, students reported spending and average of 2.60 hours (SD = 1.66, N = 36) studying for the open-book exam and 3.77 hours (SD = 6.86, N = 49) studying for the cheat sheet test. This difference was also not significant.

Finally, students were asked which of the 3 exam types they would prefer to take. As can be seen in table 2, students in both classes preferred open-book and cheat sheet exams over closed book tests ($\chi 2(3) = 231.71$, $p < 0.05$). To see if preferences were related to exam performance, we compared the exam scores of those that preferred open-book exams (N = 183) to those who preferred cheat sheets (N = 144). Those who stated a preference for open-book exams scored an average of 78.6% (SD = 14.4) on open-book tests, and 76.0% (SD = 16.3) on cheat sheet tests. Those that preferred cheat sheet exams scored an average of 80.7% (SD = 13.4) on open book tests and 77.5% (SD = 13.2) on cheat sheet exams. An independent samples *t* test revealed no difference between the two groups of students on exam scores.

4. Discussion

Our hypothesis that exam scores would be higher on open-book and cheat sheet exams compared to closed-book exams was supported by the results of this study.

Scores among exam types were positively correlated –students who do well on one exam type tend to do well on the others. While open-book exams resulted in the highest scores and both open-book and cheat sheet exams resulted in a small improvement in exam scores compared to closed-book exams in Introductory Psychology classes, the difference was quite modest given students perceptions of what exams they would prefer and which exams they would do best on. In fact, students overestimated the advantage they would have on open book and cheat sheet exams - those that predicted they would do better on one type of exam or the other or who had a preference for one type of exam over the other actually did the same on both types of tests. To our surprise, cheat sheet exams scores were not significantly higher than open-book exam scores in Statistics courses, although the difference approached significance and was in the same direction as in Introductory Psychology. Our results are in agreement with those of other researchers who have failed to find improved learning with alternative exam types [5, 12, 16]. It would be interesting, in future studies, to include other alternative exam types such as take home exams and cooperative exams. It may be that there are some types of exams, not examined here, which do result in superior learning and retention. In addition, future research could look at the effects of various test preparation methods, such as study guides and review sessions, on exam performance and anxiety.

The relative lack of effectiveness of cheat sheets compared to open-book exams in Statistics compared to Introductory Psychology may be explained in terms of the differences in course content and the material covered in exams. In introductory level classes, students are tested on facts which the student may not have included on their cheat sheet, and their performance may therefore be improved on open-book exams. In Statistics, it is likely that the material included on a typical, well constructed cheat sheet would be the same material the student would look up in the text book (e.g. formulas), and therefore there is little improvement when students are allowed their texts. This may also explain why the quality of the cheat sheet was positively correlated with grades in Statistics but not in introductory classes.

However, given the preference students have for alternatives to closed-book exams and the strong correlation between scores on different exam types, we argue that open-book and cheat sheet exams are superior to the traditional closed-book test in a variety of psychology courses – all three types of exams are equally effective as teaching tools, are equally able to distinguish stronger from weaker students, and result in equal levels of studying and retention.

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