

# CRAMMING: A BARRIER TO STUDENT SUCCESS, A WAY TO BEAT THE SYSTEM OR AN EFFECTIVE LEARNING STRATEGY?

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This research used college students' study diaries to examine both the effect of cramming on grades and the characteristics of students who cram. Cramming has received very little study, and none of the existing literature measures its actual effect on grades. Despite this lack of empirical evidence, most discussions of cramming describe it as an ineffective and undesirable learning strategy most common among students in dull courses with multiple choice exams that call for little individual thought, creativity and understanding of general principles. Our research suggests that cramming is an effective approach, it is most widespread in courses using take-home essay examinations and major research papers, and it provides students who use it successfully with several benefits.

Twenty-five years ago, R. Sommer (1968) noted that cramming is "as widely condemned by educators as it is widely used by students." More recently, W. G. Sommer (1990) noted that "...this method of working—procrastination and cramming—is so utterly common and yet universally repudiated." Furthermore, both have noted that despite the central place of cramming in many college students' experience, it has remained virtually unexamined. Despite R. Sommer's pioneering efforts, our knowledge of cramming has not advanced appreciably during the past quarter of a century.

R. Sommer conducted a half-dozen interview and observational studies of college students (1968). His research generated a clear definition of cramming as the term is used by college students—a period of

neglect of study followed by a concentrated burst of studying immediately before an exam (R. Sommer, 1968). Sommer (1968) also was able to generate several hypotheses about the conditions that lead to cramming, and while his only measure of success was his students' reports, he questioned the generally held belief among educators that cramming is ineffective and undesirable. Surprisingly, despite R. Sommer's provocative findings, what little literature concerning cramming has emerged since Sommer's work still often perpetuates the largely unsubstantiated claims that cramming is ineffective, hinders learning, and when it does work, it is just another way students manage to beat the system by earning good grades without learning (e.g., Annis, 1983; 1986; Shaughnessy, 1990; W. G. Sommer, 1990).

As R. Sommer (1968) noted, most of the advice against cramming ignores the large number of empirical investigations supporting the utility of recency in learning in favor of the literature concerning the superiority of spaced over massed practice (e.g., Annis

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1983; 1986). All this advice also ignores the evidence that even very successful students routinely cram (R. Sommer, 1968; W. G. Sommer, 1990). If cramming is common among successful students, then it is possible that such behavior may have considerable adaptive value. Both R. Sommer (1968) and W. G. Sommer (1990) indicate that cramming can have benefits for students—it can free up time for other activities (including studying for other courses); it can help relieve the monotony and boredom of studying by concentrating the activity in as short a period as possible; it can help students catch-up when they have fallen behind; it can help students study difficult material or complete difficult assignments by allowing them to devote large blocks of concentrated work to only one subject; and it can even allow students to rebel from the enforced discipline and control by their teachers by allowing them to go “on strike” for weeks at a time and still get good grades (W. G. Sommer, 1990).

The debate concerning the efficacy of cramming has, to date, suffered from a lack of any attempt to actually compare the grades of crammers to those of non-crammers. Michaels and Miethe (1989) did compare self-reported crammers to self-reported non-crammers in regard to how well their grades correlated with the amount of time they studied. They found that there was a weak correlation (.23) between the amount of time non-crammers reported studying and their grades, but there was no such correlation among the crammers. However, they did not compare the grades of the two groups of students. As earlier noted, those who advise against cramming do so largely on the basis of their interpretation of the findings of learning experiments concerning memorization that compare massed learning with spaced learning. R. Sommer (1968) and W. G. Sommer (1990) based their support for the efficacy

of cramming largely on findings that even very successful students cram. Little progress can be made in understanding cramming until we learn how cramming actually influences students' grades.

Given the lack of research about the efficacy of cramming, our primary goal has been to compare the study habits and outcomes of college crammers to the study behavior of those who do not cram. In addition, we have also tried to test existing hypotheses about cramming suggested by R. Sommer (1968)—the only hypotheses we could locate in the published literature.

#### The Study Diary Technique

Most investigations of students' study habits have relied on students' estimates of the time they typically spend studying, and usually these estimates are made at the end of the semester (Hill, 1990; Lineweber & Vacha, 1985; Michaels & Miethe, 1989; Neopolitan, 1982; Schuman, Walsh, Olson & Etheridge, 1985). However, we wanted to use a method that was less subject to error than students' global estimates. As a consequence, we chose an alternative approach—the use of study diaries (Sommer and Sommer, 1986).

*Advantages of study diaries.* Study diaries have several advantages over more traditional surveys. First, they are much less subject to memory errors because the activity is recorded immediately after it occurs, or within a relatively short time after its occurrence. Furthermore, diaries allow the activity to be broken down into specific categories, such as time spent reviewing notes, reading the text and working on assignments. This specificity helps reduce errors by defining more precisely what the student should consider studying. Also, recording specific types of study activity in a diary reduces the likelihood that students will fail to report studying that occurs during other activities (Sommer and Sommer,

1986). Finally, diaries provide a more complete picture of students' study activity because they allow us to examine how study fluctuates from day to day and week to week, and they allow us to examine differences among students in regard to when they study, how long they study during a given study session, how they distribute their study sessions over the semester, etc.

*Disadvantages of study diaries.* While the study diary can eliminate many sources of error produced by reliance on students' estimates of their typical study times, it is not without difficulties. Keeping meticulous diaries can be reactive because the very act of recording an activity can change its frequency (McLaughlin, 1976). However, for the purposes of this study, the danger of increasing total study time may not be critical. Our primary concern is how students distribute their studying over the course of a semester, and comparing students who differ in that regard. Changing the amount of time students study should have little effect on the way they distribute that study time over the semester. Furthermore, since students have many demands on their time, we suspect that simply increasing their awareness of their study activity without simultaneously reducing other demands will have little impact.

A more important problem is that this method significantly increases mortality and reduces the size of the sample. Keeping a diary is time consuming, and the rewards for it are meager (we offered students a very small increase in the points they earned for the course, 1-2%, and the satisfaction of participating in a research project). Furthermore, students' diaries cannot be used unless they cover the entire semester. Failure to complete a diary for even one of the 16 weeks in the semester makes a student's diary unusable. As a result, the number of students who successfully complete a diary for an entire semester is relatively small, and

it is possible that these conscientious students may not be representative of the entire student population. In addition, the difficulty of maintaining a diary may influence its accuracy. Students must keep track of their activities and report them in a timely manner if the data are to be reliable. This source of inaccuracy in reporting was reduced somewhat by collecting diaries each week. While these weaknesses should not be ignored, the available alternatives (direct observation and student estimates) appear to be subject to even greater inaccuracies (Sommer and Sommer, 1986).

### Research Design

Students in 15 lower and upper division Psychology and Sociology courses at Gonzaga University, a small private liberal arts university in Spokane, Washington, were asked to volunteer to keep a detailed diary of their studying for the course, and all students in these courses were asked to complete a questionnaire on study habits during the last week of the course. Of the 529 students in the classes, 239 agreed to keep a study diary, but only 166 completed the diary for each week of the course. Seventy students were in sociology courses and 96 were in psychology courses. Students were assured that their instructor would not see their diaries until after their grades had been assigned, and they were asked to sign their diary with a code name known only to student assistants.

The diary consisted of a one page survey for each week of the course, with space to indicate the begin-time and end-time for up to four sessions per day spent engaging in each of 5 specific study activities (reading the text, reviewing class notes and the text, working on short term assignments, working on long term assignments such as term papers, and "other study activities"). The participants were asked to complete the survey after each study session, and the

surveys were collected at the end of each week.

Each week the participants were issued a blank survey for the following week, and they were asked to return the completed survey, identified only by their code name, when they picked up a blank for the next week. Also, participants were given a book of surveys for each week of the semester, and they were asked to enter their study times in the book and keep it as a "back-up" in case they forgot to turn their survey in. Three student assistants had access to the key identifying students' code names, and they contacted students who did not turn in a survey and requested the relevant page from their "back-up book."

All students in these classes were asked to complete a survey during the final week of the class. Students participating in the diary study identified their end-of-semester survey with their code names. The instructor did not administer the survey, and the students were assured that their instructor would not see the surveys until after their final grades had been sent to the registrar. This survey included questions about the students' interest in the course; the grade they expected, a series of questions concerning their study habits; and various background factors, such as their GPA, their class, and their major. Additional items asked them to rate the class in terms of its relative difficulty, its personal and career relevance, and the amount of time they spent studying for it compared to other classes.

#### *A Four-Fold Classification of Study Patterns*

An important contribution of R. Sommer's (1968) work was the development of an empirically derived definition of cramming. Sommer's interviews of students indicated that it involves two different dimensions—the timing and the quantity of study.

##### *Measuring the timing and quantity of*

*effort.* Sommer (1968) found that cramming involves both intensive, sustained study just before an examination or assignment, and it also involves periods of procrastination or neglect of study. Accordingly, we needed a measure that would allow us to determine both the amount of time students studied and the way they distributed their study over the semester. The diary allowed us to achieve these goals because students provided us with a continuous record of their daily and weekly study activities throughout the semester. The data also allowed us to measure the number and timing of study sessions.

*Operationalization of cramming.* We operationalized cramming to reflect the two dimensions—intensive study and periods of neglect—that R. Sommer identified from his interviews of college students. According to this definition, students are not crammers unless they engage in relatively large bursts of study and they also neglect to study periodically. Accordingly, we used two dimensions—amount of "bursting" and amount of "neglecting"—to classify students. First we divided students into two groups depending on how they distributed their study activity over the semester (neglecting). Neglecting was defined as failure to study during three or more weeks (the median was two weeks) over the semester. Measuring the second dimension of cramming and assigning students to groups was more complex. The second dimension of cramming—"bursting"—involves engaging in intensive study in a short period of time before an exam or assignment is due. After ascertaining that none of the courses involved included more than five major assignments or tests (a major assignment or test contributes over 10% to the final grade), we defined bursting by first identifying the five weeks students studied the most, and then comparing the average amount of study during those five weeks to the average amount of study during the

remaining weeks. Bursting was defined as devoting more than five extra hours per week (the median) to study during each of the five weeks of most intensive study, as compared to the average amount of time devoted to study during the remaining weeks in the semester.

This approach produced a four-fold classification scheme depending on whether students were "neglecting" or "bursting." We labeled these types of study patterns "ideal" (does not neglect or burst); "confident" (neglects, and does not burst); "zealous" (does not neglect, but does burst); and "crammer" (neglects and bursts). It was the presence of the "confident" pattern involving relatively little study before exams and a failure to study at other times that forced us to use this rather cumbersome approach to identifying cramming. If we had used the more intuitive approach of giving each student a cramming "score" by calculating the percentage of their total studying done in their best five weeks, many of these confident students who, relative to other students, neither exerted themselves during test weeks nor studied much during other weeks would have been defined as crammers. However, it is clear from the literature that both students and observers consider study to be cramming only if it involves very large amounts of study (Shaughnessy, 1990; R. Sommer, 1968; W. G. Sommer, 1990). Table 1 identifies each of these study patterns and describes some of the characteristics of those who use them.

*Additional variables.* The grade in the course was recorded from the instructors' grade books, and it was recorded on a four point scale (A = 4.0, A- = 3.7, B+ = 3.3, C = 2.0, D = 1.0, F = 0.0, etc.). Most of the other variables, including background and control variables such as the students interest in the course, number of classes missed, grade point average, year in school, and the like were measured with items from

the end-of-semester survey administered to all students in the classes. Interest was measured with a single item rating "interest in subject matter of the course" on a seven point scale ranging from low (1) to high (7).

Each course was also categorized in terms of the types of assignments used to evaluate students (those in which over 75% of the grade was based on performance on objective examinations done in class and those in which over 40% of the of the grade was based on performance on assignments and papers done outside class). This approach allowed us to measure how students allocated their study time for courses emphasizing the two kinds of assignments and tests, and it also allowed us to compare the effectiveness of various kinds of study in the two types of courses.

### Hypotheses

As earlier indicated, our primary goal was to test the hypothesis that cramming is an ineffective study strategy. However, R. Sommer's (1968) work suggested several other hypotheses for investigation. First, Sommer found that the students he interviewed believed that cramming was a particularly good strategy for certain kinds of courses. Most reported that cramming was most effective for classes that involved extensive use of multiple choice exams and tested memorization, and was least helpful where individual thought, creativity and understanding of general principles was called for. Sommer also found that students reported being especially likely to cram if their interest in the course was very low or if it was very high. These findings yield the following hypotheses:

1. Students who cram will receive lower grades than those who do not.
2. Students with very high interest or very low interest will be more likely to cram than students with moderate interest in the course.

3. Students will be more likely to cram for classes involving objective and/or multiple choice tests than for classes requiring take-home essay exams and writing projects.

### Findings

Examination of Table 1 shows there is no support for the hypothesis that students who cram do less well than those who do not. Crammers' grades were slightly higher than all but the zealous students who studied large amounts just before the test and during the other weeks as well, but the differences were not very large or statistically significant,  $F(3,157) = .37, p = .777$ . Crammers' rate of return (grade in course divided by the number of hours spent studying) is lower than either the rate of return of ideal or confident students (but it is higher than the rate of return for zealous students),  $F(3,157)$

$= 50.67, p < .001$ . This difference suggests that cramming may be less efficient than evenly spaced study, but crammers compensate for that lack of efficiency by studying extra hours. Perhaps the price for taking an average of almost six weeks off from studying for a course is the need for additional total study hours, and these extra hours must be crammed into a short period of time. However, the amount of the extra study is not great. Crammers average 65.7 hours per semester, whereas ideal students study 53.5 hours. Apparently, an extra 12 hours per semester compensates for the lower efficiency of cramming. Many students may consider this extra time a small price to pay for the convenience of six weeks uninterrupted by study for a particular course.

Furthermore, as Table 1 shows, in many ways crammers are indistinguishable from

Table 1  
Mean Scores by Type of Study Pattern

	Type of Study Pattern			
	Ideal (n=39)	Confident (n=43)	Zealous (n=45)	Crammer (n=39)
Grade in Course	3.1	3.1	3.2	3.2
GPA	3.0	3.3	3.2	3.2
Hours Studied	53.5	27.8	97.9	65.2
Study Sessions	55.6	22.9	66.1	41.2
Weeks Without Study	.8	6.8	1.0	5.7
Cuts Reported	2.4	2.8	2.1	3.1
Mean Interest <sup>a</sup>	4.9	4.9	5.9	5.1
Rate of Return <sup>b</sup>	5.8	11.3	3.3	4.9
Hours Report Sleeping				
In Test Week	41.9	40.5	36.9	41.1
In Non-Test Week	46.6	42.7	43.3	46.1

<sup>a</sup> Item was "interest in subject matter of course," rated on a seven point scale ranging from low (1) to high (7).

<sup>b</sup> The rate of return was calculated by dividing the grade in the course by the hours spent studying, and multiplying by 100.

most other students. They do report fewer study sessions than all but the confident students, but that difference is not surprising because they do most of their studying in a short period of time,  $F(3,162) = 44.68$ ,  $p < .001$ . They also average the most cuts, but again, the difference is very small and is not statistically significant,  $F(3,162) = 1.78$ ,  $p = .153$ . In fact, the group of students that seem to stand out the most are those we have labeled "zealous." These students exceed the median in terms of number of hours studied before the exam, but they are below the median in regard to the number of weeks in which they do not study. These students report spending far more hours studying than the rest,  $F(3,162) = 49.84$ ,  $p < .001$ . They also average the most study sessions, the fewest cuts, and the highest interest score,  $F(3,157) = 4.49$ ,  $p = .005$ . Interestingly, despite these very large differences, zealous students' average grade exceeds the rest by only about a tenth of a grade point. Finally, despite concerns that cramming may negatively impact students' health by reducing their amount of sleep (W. G. Sommer, 1990), Table 1 demonstrates that crammers do not report substantially more loss of sleep during test weeks than students who use other study patterns.

We do not know why the zealous students work so hard for so little in return. It is possible that they study more than they need to achieve the grades they desire simply because they are interested in the material—even material unlikely to appear on exams. Alternatively, they may be exhibiting the "labor in vain effect" found in some experimental studies of self-paced learning (Nelson and Leonesio, 1988). Apparently, subjects asked to study until they achieve mastery often reach a point of diminishing returns before they achieve complete mastery, but they continue to study with no real benefit. When asked to study until they believe they know all of the material without

regard to the amount of time devoted to study, subjects will devote up to twice as much time studying as those asked to study only the minimum amount of time needed to learn the material. But, the extra study time yields only marginal gains that are not even statistically significant (Nelson and Leonesio, 1988; Zimmerman, 1975). As Nelson and Leonesio (1988) indicate, this phenomenon has not been explained, and the conditions that produce it have not been identified. Of course, it is also possible that these zealous students simply need greater effort to learn the material.

Table 2 examines the distribution of the four types of study patterns with regard to the type of testing method used, the class standing of the students (freshman/sophomore vs. junior/senior), and students' interest in the subject matter of the course. As Table 2 indicates, our data do not support the hypothesis that students are more likely to cram if evaluation is primarily based on performance on multiple choice tests or other examinations calling for memorization. In fact, students in classes in which at least 40% of the grade was based on performance on papers or "take-home" examinations were more likely to cram. Perhaps, as W. G. Sommer (1990) has noted, students, like many professionals in fields such as publishing, advertising, law, journalism, architecture, medicine and the performing arts, find that they do best on major projects if they complete them in long sessions just before the due date.

We also examined the relative frequency of cramming by class standing (year in college). As Table 2 shows, cramming is more frequent among experienced students (juniors and seniors) than among less experienced students. Among freshmen and sophomores, cramming is the least common study strategy used, and the ideal pattern of evenly spaced study sessions is the most favored approach. Only about one of eight

Table 2  
Type of Study Pattern by Method of Assessment and Year in College

	Type of Study Pattern			
	Ideal (n=39)	Confident (n=43)	Zealous (n=45)	Crammer (n=39)
Assessment Method				
Objective Exams <sup>a</sup>	33.3%	33.3%	18.1%	15.2%
Papers <sup>b</sup>	6.6%	42.6%	13.1%	37.7%
Class Standing				
Freshman/Sophomore	32.9%	28.2%	25.9%	12.9%
Senior/Junior	12.9%	24.2%	27.4%	35.5%
Interest in Class <sup>c</sup>				
Low Interest	18.9%	17.5%	7.0%	15.8%
High Interest	45.9%	37.5%	67.4%	50.0%

- <sup>a</sup> At least 80% of grade was based on in-class "multiple choice" "true-false", or "fill in the blank" exam questions.
- <sup>b</sup> At least 40% of grade was based on take-home essay exams and/or papers completed out of class.
- <sup>c</sup> Item was "interest in subject matter of course," rated on a seven point scale ranging from low (1 - 3) to high (6 - 7).

are crammers, and about a third are "ideal" students. The few crammers have an average grade of 3.2, while all freshman and sophomores average a grade of 3.1. More experienced students are much more likely to cram, with over a third falling into the cramming category. Furthermore, it appears that many abandon the ideal pattern of study—only one of eight juniors and seniors fall into the ideal student category. Judging from our results, it appears that most inexperienced college students heed the advice of the "experts" and avoid cramming. However, by the time they are juniors and seniors, many appear to have discovered that cramming is an effective approach.

The findings reported in Table 2 also fail to support the hypothesis that crammers are likely to have very high or very low interest

in the course. The percentage of crammers reporting low interest differed little from the percentage of low interest students among ideal and confident students. Furthermore, the percentage of crammers who reported high interest was similar to the percentage of high interest ideal students and fell between the percentage of high interest confident students and high interest zealous students. The confident students were most likely to report low interest and zealous students were the most likely to report high interest. None of these differences in interest in the class were statistically significant,  $\chi^2(4, N = 158) = 8.63, p = .20$ .

### Discussion

Certain limitations must be kept in mind when analyzing our findings. Because our



measure of study time placed a large burden on our students, our sample is very small and many students dropped out of the project. Furthermore, all our subjects were drawn from sociology and psychology classes from a small private liberal arts college in the Pacific Northwest. Accordingly, our findings may not generalize to all students or to other colleges and disciplines. However, our students do not appear to be markedly different from students from other colleges in regard to how much time they report studying. Our students studied an average of 3.6 hours per week for the course. If we assume they typically take five courses and our courses required a typical amount of study, then they study about 22 hours per week if they study six days a week. This rate of study is similar to what other researchers have found in very different settings. Shuman et al. (1985) found that the arts and sciences students they studied at the University of Michigan reported averaging about three and a half hours of study per day (with a range of from 3.2 hours for humanities majors to 3.6 hours for natural science majors) or about 24 hours per week. Michaels and Mieth (1989) report that the students they studied at Virginia Polytechnic Institute and State University reported studying a little less—an average of 17 hours per week.

On the other hand, we believe our measure of study time is much more accurate than the estimates used in most research on college students, and it allowed us to accurately assess the study strategies of the students. In addition, our approach allowed us to develop an objective and consistent measure of cramming.

Our findings clearly show that the commonly held view that cramming is an ineffective strategy should be reexamined. Crammers' grades in the course are as good as or better than students who use other strategies, and the longer students are in

college, the more likely they will cram. Crammers' grade point averages are also relatively high, and they put in a substantial amount of study time. In fact, crammers appear to study more hours than most students, perhaps because they must make up for the inefficiency of massed study with more total hours. While crammers study more than most students, their study strategy also gives them a great deal of uninterrupted time to devote to other activities—perhaps to other courses or to extracurricular activities. Furthermore, cramming does not appear to be an adaptation to poor teaching or to over-reliance on multiple choice testing. Crammers are as interested in their courses as other students, and cramming is most widespread in courses that require extensive work outside class. Good students cram, and cramming appears to be most common among experienced students taking courses requiring a great deal of writing. These findings suggest that many of us need to reexamine the advice we are giving our students and advisees. Burdening students with needless guilt and anxiety about their "lax" study habits appears to be unjustified. Perhaps the best advice we can give our students is to experiment until they find the study strategy that works best for them.

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