

# **A thematic analysis of students' perspectives and opinions on the construction of exam support sheets**

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## **Abstract**

With large amounts of content and material taught by university professors and instructors, students face difficulty in trying to memorize course content in order to perform well on exams. To resolve this issue, professors often allow students to create and use support sheets, also known as cheat sheets or crib sheets, which contain useful information to aid them during an exam. This eases the burden of rote memorization and might reduce student stress or anxiety during the exam.

The creation of the support sheet lies in the hands of the student, and each student can include any information they deem useful. Numerous studies have already considered the content of the support sheets and how they correlate to exam or course performance. In this investigation, we instead consider the student perspective on creating their support sheets. The data collected comprised of five question surveys from over 200 participants in an undergraduate mechanics of materials course. For this study, a subset of 30 participant responses are used for preliminary analysis, using content analysis of the student responses. The survey questions addressed student experiences in both creating and using support sheets for their exams. The results of this study found that a majority of students perceive equations and rules, conventions, and procedures to be most beneficial to include on their support sheets; students find that creating a support sheet aids in organizing and summarizing course content while also increasing content retention. Furthermore, students reported that using a support sheet helped to avoid rote memorization and to alleviate stress during the exam.

This paper will give some insight into student sentiments on the construction and benefits of using student-created support sheets during exams and in preparation for exams. These results may interest instructors and students alike. The results may provide valuable feedback to students who can learn from the perceived usefulness, mistakes, and shortcomings of the studied student populations' support sheets.

## **1 Introduction**

Over the years, many researchers have investigated the benefits of allowing students to use support sheets during an exam. Research has indicated that support sheet organization and content correlates with exam performance, (Danielian and Buswell<sup>1</sup>, Dickson and Miller<sup>2</sup>, Smith and Lester<sup>8</sup>) and points to a reduction in anxiety during an exam for students using a support sheet (Drake et al.<sup>4</sup>, Erbe<sup>5</sup>). Investigations done where courses were quantitative in nature, such as engineering, statistics, or computer science, have shown that student performance is correlated with support sheet content (Danielian and Buswell<sup>1</sup>). The work presented in this paper analyzes the student perspective of support sheets rather than the support sheets themselves. Using survey responses of students who have created support sheets for course exams, we aim to understand

how that experience has shaped how they create and use support sheets. In addition, the results also show for some students test anxiety is reduced and there is an increase in confidence during an exam.

## 1.1 Literature Review

Much research has been conducted on the benefits of allowing students to use support sheets during an exam. The research on support sheets can be parsed into three categories: (1) Students performance on an exam while using a support sheet (Dickson and Miller<sup>2</sup>, Dickson and Bauer<sup>3</sup>, Hindman<sup>7</sup>), (2) The psychological effects of having a support sheet (Erbe<sup>5</sup>, Drake et al.<sup>4</sup>), and (3) The content of the support sheet and its effect on exam performance (Raadt<sup>9</sup>, Danielian and Buswell<sup>1</sup>, Smith and Lester<sup>8</sup>, Visco et al.<sup>11</sup>).

On the effects of student performance while using a support sheet, Dickson and Miller<sup>2</sup> investigated the use of support sheets in an undergraduate psychology course. They did not find any evidence showing that student created support sheets improve exam performance. In a later study, Dickson and Bauer<sup>3</sup> instead tried to determine if the process of creating a support sheet aided in exam preparation. They found that student created support sheets increased exam performance yet did not encourage deeper learning or understanding. In a similar investigation and setting, Hindman<sup>7</sup> found that support sheets allow students to avoid rote memorization, but support sheets were not as helpful in conceptual understanding. In fact, students' exam performance was no different when students had a support sheet available as compared when students did not.

In contrast to the work conducted by the aforementioned researchers, Erbe<sup>5</sup> found evidence which suggests that student created support sheets can reduce test anxiety while increasing learning. It was also noted that students invested significant time in constructing the support sheets, and the act of writing and organizing course content adequately prepared students for exams. Drake et al.<sup>4</sup> found that students' anxiety was reduced during exams if a support sheet was allowed. In addition, they noted that students' support sheets were detailed and diverse in content. Similar to these results, Visco et al.<sup>11</sup> found that there can be a variety in the content and quality of the support sheet. Moreover, they found that the quality of the support sheet does not necessarily imply better exam performance. From a quantitative approach, Raadt<sup>9</sup> found that certain features of support sheets were found to be related to exam performance, for example, students who recorded abstract concepts in their support sheets had better performance as compared to students who only wrote out worked out examples. A similar result was found by Danielian and Buswell<sup>1</sup>, yet instead, this study found that support sheets were predominantly comprised of equations and rules/procedures, with a smaller number of abstract concepts recorded. Moreover, they also found that students who included annotations (e.g. variable names, comments, or reminders) performed better than students who did not include any annotations. Finally, Song and Thuente<sup>10</sup> created a rating system accounting for density, organization, readability, number of formulas, and number of examples. The results of the study found that there was a positive correlation between high-quality support sheets and exam performance.

Some of the investigations above also asked students to participate in a survey at the end of the course. Two studies (Dickson and Bauer<sup>3</sup>, Smith and Lester<sup>8</sup>) probed students' perceptions of

support sheets on how helpful the support sheets were during the exam and whether using one reduced test anxiety. Visco et al.<sup>11</sup> interviewed students and asked about the construction process of creating a support sheet, how much support sheets helped during the exam, and if making a support sheet helped prepare for the exam. Student perceptions were that the support sheet did aid in exam preparation, yet the authors state that this was not indicated by the exam scores. Furthermore, the number of students in this study was low (10), and thus drawing conclusions from the results may warrant caution. A more extensive study by Smith and Lester<sup>8</sup> analyzed 34 support sheets for an engineering economics course and adopted the rating system for support sheets first proposed by Songe and Thuente. In addition, the study asked 15 survey questions attempting to gain insight into how they prepared for the exam using the support sheet, the perceived benefits to using a support sheet during an exam, and if using a support sheet maintains academic integrity. Some key results of the study were that there was a weak, but positive correlation between high-quality support sheets and exam performance, most students incorporated using a support sheet in their exam preparation, most students felt less stressed using a support sheet during the exam, and there was no discernable difference in academic integrity in using a support sheet or not.

Much of the previous research in the setting of a problem-solving courses has focused on what content students have included on their support sheets, and whether a high-quality support sheet will correlate with exam or course performance. A single recent study (Smith and Lester<sup>8</sup>) incorporated the student perspective, but with the goal of assessing student preparations (which includes creating a support sheet) for the exams, whether using a support sheet can reduce test-taking anxiety, and if academic integrity is compromised by not using a support sheet. The aim of this study is to instead investigate student sentiments of the what content should be included, how using the support sheet has aided exam preparation or course content retention, allowed avoiding rote memorization, and if using a support sheet may reduce test-taking anxiety.

## **2 Methodology**

To better understand student responses on the impact of using support sheets during an exam, a content analysis of the survey data was done in order to answer the research questions presented next.

### **2.1 Research Questions**

Previous researchers studying the content of support sheets for problem-solving courses have shown that support sheets comprised of abstract concepts as opposed to formulaic procedures are correlated to increased exam performance. Due to each course having a unique setting, this may not be a general conclusion. In fact, student perceptions of what they deem useful can be wildly different than what researchers or instructors encourage. For this study, we present the following research questions attempting to better understand the student perspective about support sheet creation and use, and any benefits that may arise:

1. What features or content did students find most beneficial to include on support sheets?
2. To what extent did students feel that the process of creating support sheets helped in exam or course preparation?

3. To what extent did students report the support sheet reducing their test-taking anxiety?

## **2.2 Student Survey Questions**

Prior to the final exam being administered, students were asked to participate in a survey to collect data about their experience creating and using support sheets. Survey questions 1 and 2 addressed the content of the support sheet as it relates to what students consider useful or not. Survey questions 3 and 4 attempted to capture what the experience of creating a support sheet was for the student, and how it influenced the creation process of future support sheets. Survey question 5 was an open-ended question where students responded with any comments that the previous four questions did not address. The survey questions are presented in full below.

1. On the past two exams, did you have information on your Support Sheet that you didn't use at all? What was it?
2. On the past two exams, was there information you wished you had included on your Support Sheet but didn't have? What was it?
3. How have the experiences of the past two exams influenced the making of your Final Exam Support Sheet? (Be as detailed as possible)
4. What have you learned from preparing your support sheet that you want to remember for the future?
5. Anything else you would like to share about the Support Sheets?

## **2.3 Setting**

The data collected for this research was obtained from a class of 227 students in an undergraduate mechanics of materials course at the University of California, Irvine. Prior to data collection, there were two exams focusing on the first and second third of the course content. Students completed the survey questions described above prior to a cumulative final exam. For each exam, students were allowed to create a support sheet which could include any information they may find useful. There were two requirements, namely, students could use a double-sided 8.5"x11" sheet of paper and the information was to be hand-written. The instructor imposed the one-page requirement to have students actively process the information they are recording while also prioritizing content to include in the support sheet. The handwritten requirement was imposed so that each student had to create their own support sheet.

## **2.4 Method of Analysis**

From the 227 survey responses gathered, 30 were randomly selected for preliminary analysis, which is comparable to the number of surveys considered by Smith and Lester<sup>8</sup>. Analyzing the student survey responses was done by first deidentifying the data and assigning a number to each student. Two researchers coded the survey responses individually and then met to code to agreement, using the coding framework shown in Table 1 below. The codebook included content and layout features and benefits of support sheets. Research procedures were approved by the institution's IRB office.

## 2.5 Coding Framework

In order to categorize the different themes and features of the survey responses, a subset of five responses were first examined. A pre-existing codebook from a previous study (Danielian and Buswell<sup>1</sup>) was used and then modified to account for the new themes or features encountered. The final codebook is shown in Table 1.

Main codes	Subcodes	Descriptions
Content Features	Problem examples	Worked out examples of specific problems.
	Abstract Representations	Concepts, diagrams or drawings which represent general topics as opposed to specific examples.
	Rules, Conventions, and Procedures	Included definitions/rules of concepts, conventions used in the course, and step-by-step procedures to solve certain types of problems.
	Equations	Equations which may be used to solve problems.
	Reminders	Comments to prompt use of a certain equation, concept, etc.
	Annotations	Comments or explanations of the content in the support sheet.
	Miscellaneous content	Any feature not falling into the above, e.g., definitions, unit conversions, etc.
Layout Features	Space management	Support sheet organization improvement.
Benefits of using support sheet	Learning content benefit	Summarizes course content, aids in content retention, aids in course organization.
	Psychological benefit	Alleviates anxiety and/or avoids rote memorization.

Table 1: Codebook used for content analysis of student survey responses.

It is worth noting that the coding framework presented in Table 1 attempts to encompass what may be recorded on a support sheet independent of the content of the exams. In other words, the coding scheme is broad so that the proceeding research questions can be meaningfully answered, without addressing specific content (e.g. stress formulas for tension, definition for moment of inertia, etc.) on the support sheets. This categorization is similar to previous studies which analyzed support sheet content and compared it to exam performance (Danielian and Buswell<sup>1</sup>, Smith and Lester<sup>8</sup>, Raadt<sup>9</sup>, Song and Thuente<sup>10</sup>). In addition, previous studies implementing surveys (Erbe<sup>5</sup>, Smith and Lester<sup>8</sup>, Visco et al.<sup>11</sup>) did not consider student sentiments on the content of the support sheets, instead focusing mainly on the learning content or psychological benefits. Therefore, one contribution of this preliminary study is to address what type of content

students found more beneficial. As the remaining survey responses are analyzed, the codebook presented in Table 1 may be modified to address additional aspects mentioned by the students.

## **2.6 Limitations**

In this preliminary exploratory study, we acknowledge that several limitations impact the findings of our work. First, as has been mentioned, at this stage in the research, we have examined only a subset of our total dataset. As we describe in the future work section, this work will inform further analyses.

## **3 Results**

In the preliminary analysis presented in this paper, 30 student survey responses were analyzed and a total of seven content features, one layout feature, and two benefits were identified in the survey results. The results presented in this paper categorizes the data gathered based on Coding Framework presented in Section 2.3. In addition, the conclusions drawn are based from this preliminary analysis, and as such may not reflect complete student sentiments of support sheets. Future work will incorporate all 227 survey responses to address this limitation.

In the remaining sections we address the three research questions. Section 3.1 describes the content features that students mentioned. In Section 3.2, we present the survey results of the course related benefits students mentioned. Finally, in Section 3.3, we show the survey responses that address the psychological benefits of using a support sheet during an exam.

### **3.1 Identified features (RQ 1: What features or content did students find most beneficial on a support sheet?)**

If we consider survey question 1 in Section 1.3 (On the past two exams, did you have information on your Support Sheet that you didn't use at all? What was it?), 73% answered yes, that is, three-quarter of students mentioned including information on their support sheets that was not necessary to completing the exam. Conversely, 27% of students felt they had the necessary amount of information to complete the exam. Figure 1 shows what content students described not needing and indicates that from the 73% of students who had excessive information, a third had more equations than necessary, and 23.8% mentioned miscellaneous content, such as definitions or unit conversions. Furthermore, both having rules, conventions, and procedures and problem examples on their support sheets were identified in 14% of the total responses. Finally, with abstract concepts and annotations falling into 10% and 5%, respectively. An interesting observation is no student mentioned having too many reminders, which anecdotally makes sense, since reminders are generally included to not forget pertinent information.

Survey question 2 (On the past two exams, was there information you wished you had included on your Support Sheet but didn't have? What was it?) addresses what content students wished they had included on their previous exam support sheets. From the survey results, 60% of the students responded with no, meaning they had all the necessary information to complete the exam. This result is relatively consistent with the results from survey question 1, where 27% of students said they did not have excessive information. The remaining 40% of the students

answered yes, which means slightly less than half the students did not feel they had an adequate support sheet during the exam.

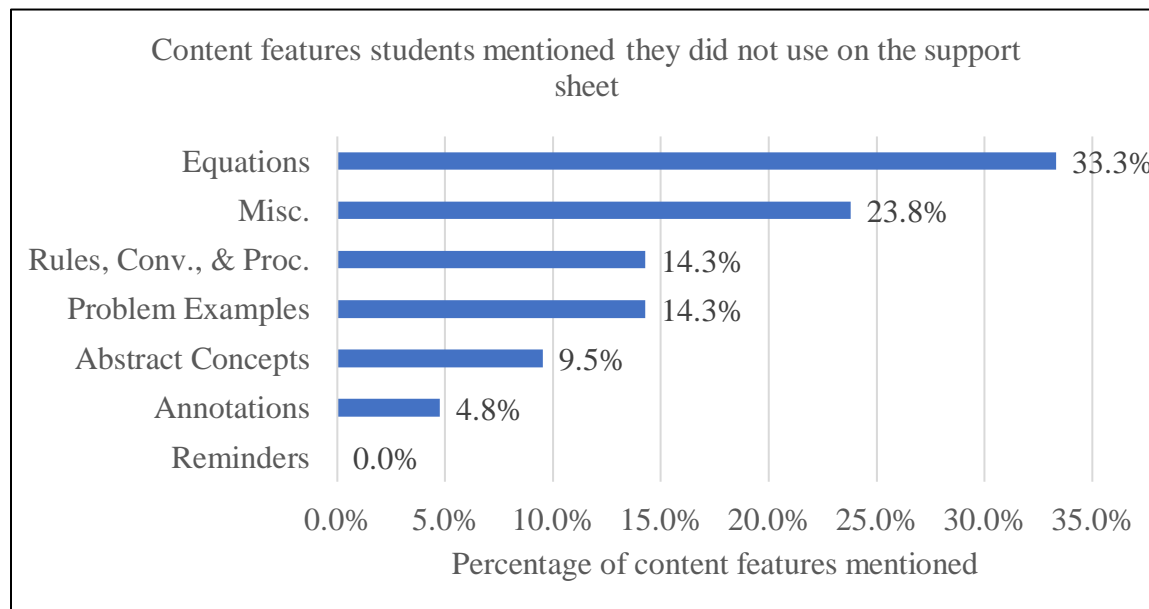


Figure 1: Percentage of content features students mentioned they did not use on their support sheet.

From those that answered yes (as in, yes, there was information they wished they had included but didn't), Figure 2 indicates that 26.7% of responses mentioned not including enough rules, conventions, and procedures, problem examples, or miscellaneous content. Equations was at 13.3%, and 6.7% of responses mentioned not requiring reminders, which is also consistent with the results in Figure 1, that is, students used reminders during the test, and moreover wish they had included more to aid them during the exam. Finally, we see that both abstract concepts and annotations were at 0%, meaning that students felt they had the necessary number of abstract concepts and annotations on their support sheet to complete the exam.

Survey question 3 (How have the experiences of the past two exams influenced the making of your Final Exam Support Sheet?) asked about what was learned from creating support sheets and applying that knowledge to the creation of the support sheet for the final exam. Student responses comprised of stating which content or layout features they would want to include or consider in the final exam support sheet. The results of the survey responses are summarized as percentage of total responses and are shown in Figure 3. From Figure 3, we see that 33.3% of the responses mentioned including equations in the support sheet for the final exam. Next, 31% of the students mentioned that they would improve space management, that is, make sure the support sheet is properly organized to their preference. As for the other content features, 14.3% of responses mentioned including rules, conventions, and procedures, with the remaining content

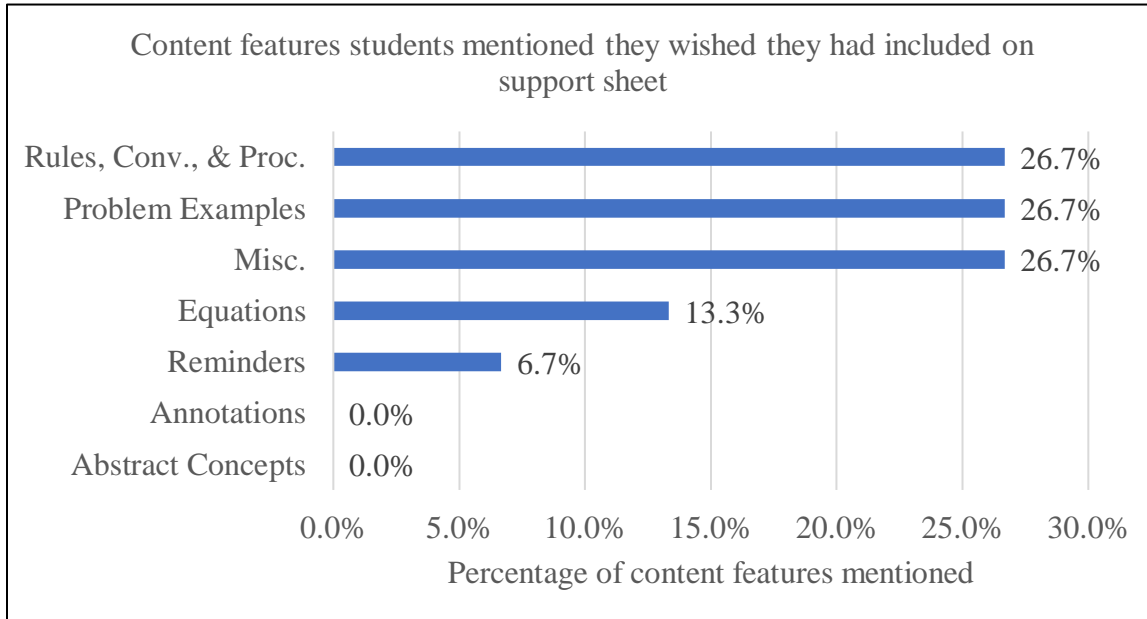


Figure 2: Percentage of content features students wished they had included on their support sheet.

features all falling below 5% of total responses. Furthermore, we see that 31% of the responses mentioned that creating the final exam support sheet in an organized fashion is beneficial. It is worth noting that from a student perspective, all the content features outlined in Table 1 are necessary for the final exam support sheet and the support sheet should also be well organized. This intuitively was expected, as the final exam was cumulative, and thus requiring a wide range of topic selections with a well-organized support sheet.

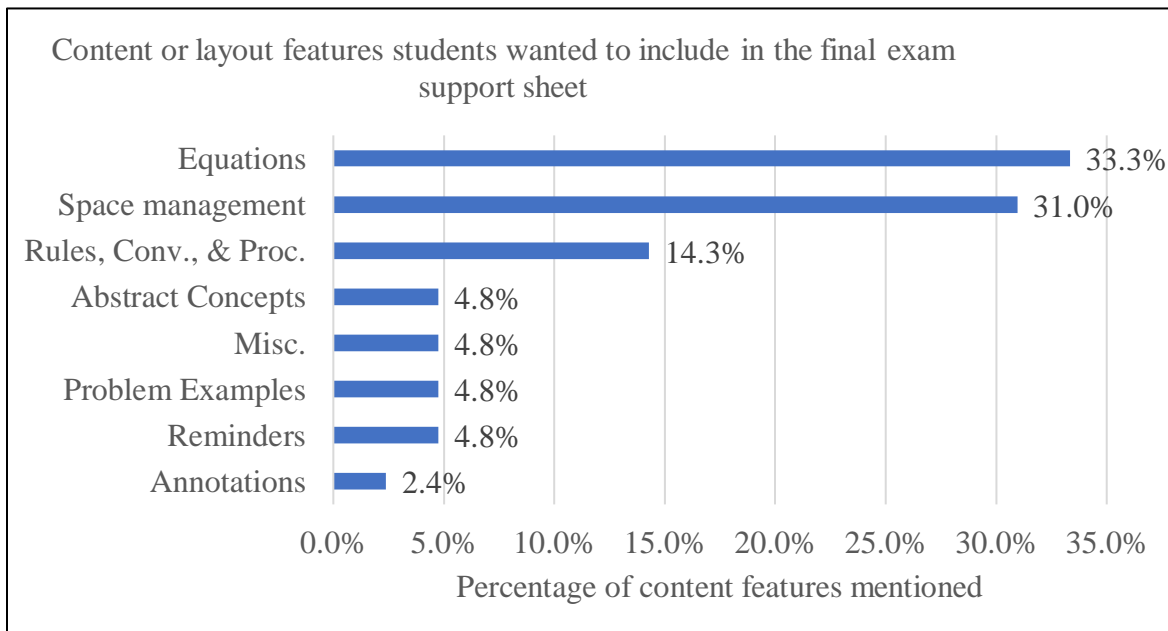


Figure 3: Percentage of content or layout features mentioned in student survey responses.



### 3.2 Exam Preparation (RQ 2: Did the process of creating support sheets help in exam or course preparation?)

Survey question 4 (What have you learned from preparing your support sheet that you want to remember for the future?) addresses the student experience of creating support sheets for exams, and survey question 5 (Anything else you would like to share about the Support Sheets?) was a free response section, where students could optionally comment about anything related to support sheets that was not addressed by the previous questions. From analyzing 30 surveys, two major features were identified, namely, “Learning Content Benefit” and “Psychological Benefit”. Under the former, three distinct benefits students mentioned were that the support sheet aids in summarizing course content, content retention, and organizing course content. The percentages of learning content benefits mentioned are shown in Figure 5. It is worth noting that these responses arose organically (especially from response 5), as opposed to probing the student directly about the learning and psychological benefits of using support sheets.

In Figure 5, we see that 52.2% of the learning content benefits mentioned were that students perceive using a support sheet as an aid to summarize course content. Also, 28.3% mention that creating a support sheet aids in content retention, and finally 19.6% mention that the creating process helps organize course content.

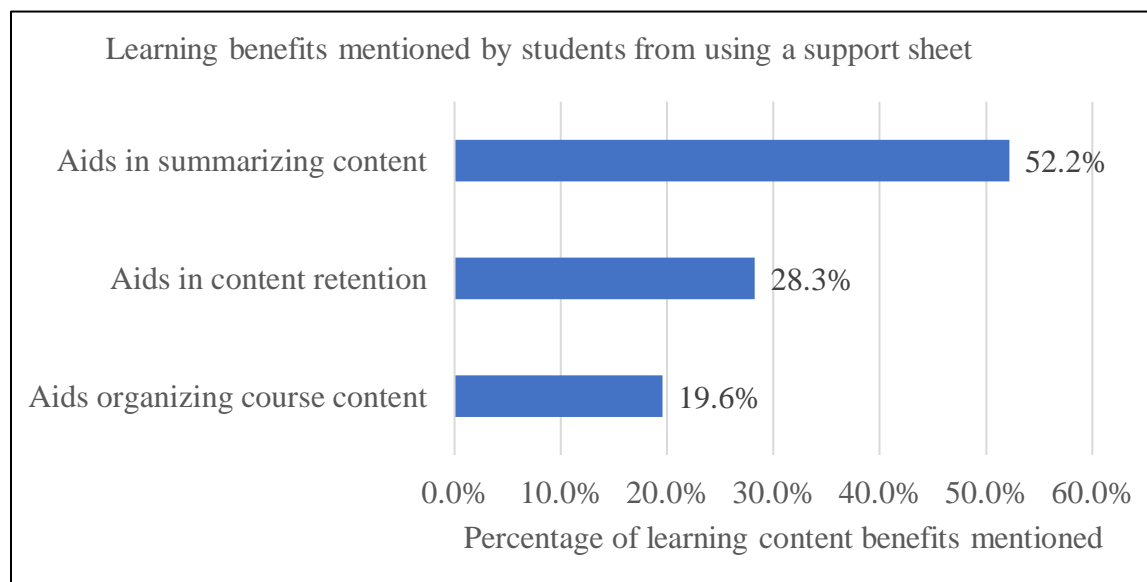


Figure 5: Percentage of learning content benefits mentioned in student survey results.

### 3.3 Psychological Effects (RQ 3: Did support sheets lower test anxiety and/or increase test taking confidence?)

The responses coded and analyzed from survey questions 4 and 5 also mentioned psychological benefits of using a support sheet during an exam, such as helping to avoid rote memorization and alleviate test-taking anxiety. As mentioned above, the psychological benefits largely came up as unsolicited benefits as the survey question did not directly ask about psychological benefits. Figure 6 displays the percentage of psychological benefits mentioned. From this we see that

three-quarters of the responses mention that using a support sheet helps to avoid rote memorization, which is as expected. In addition, Figure 6 also shows that 25% of the responses also mention that using a support sheet during an exam alleviates test-taking stress/anxiety.

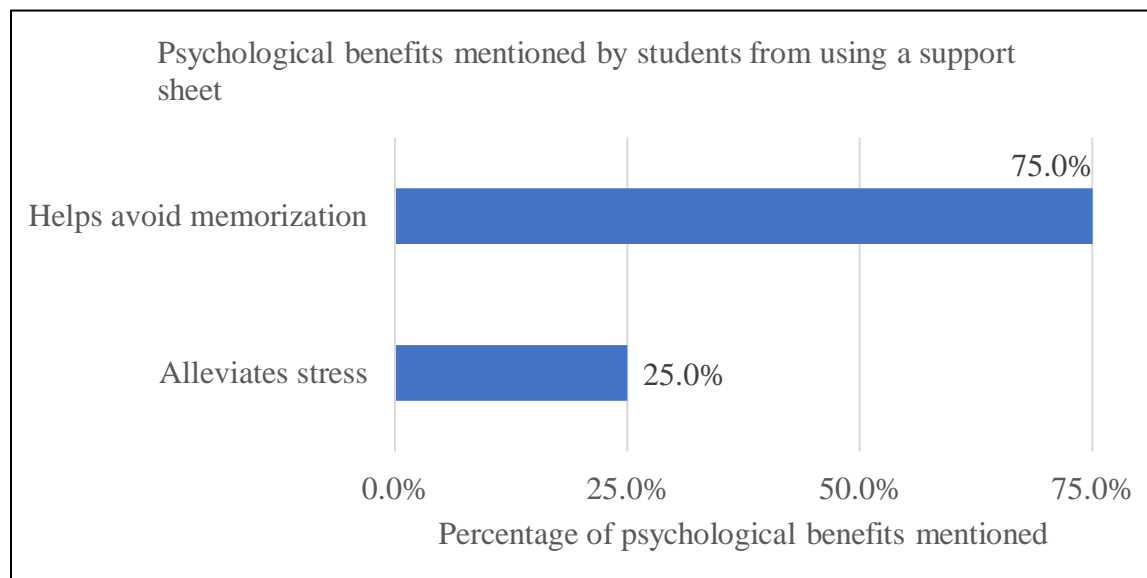


Figure 6: Percentage of psychological benefits mentioned in student survey results.

#### 4 Discussion

This study found a variety of features students perceived to be beneficial to include on a support sheet. It also investigated what students perceived not to be important to include on a support sheet. From this analysis, most students reported that including a refined list of equations were most beneficial (see Figure 3), along with rules, conventions, and procedures (RQ1). In addition, students who commented on the creation of the final exam support sheet noted that it should be properly organized. Moreover, it was found that many students felt that both creating and using support sheets aided in summarizing course content, aided in course content retention, and helped organize course content (RQ2). Furthermore, many students mentioned that using a support sheet helped to avoid memorization, and some found it to relieve stress during the exam (RQ3).

Although researchers have studied how content of support sheet correlates to exam or course performance (Smith and Lester<sup>8</sup>, Raadt<sup>9</sup>, Song and Thuente<sup>10</sup>), there have not been investigations into what students perceive to be the most important content, and how students perceive a support sheet should be created. Yet, there are some similarities from previous studies. In particular, the data from this study is taken from the same course found in Danielian and Buswell<sup>1</sup>, which showed that many students included a high number of equations accompanied with rules, conventions, and procedures. Moreover, the previous study showed that better organized support sheets had a weak, but positive correlation to exam performance. A similar result was also found in Smith and Lester<sup>8</sup>. In addition, it was found that one of the greatest benefits of using a support sheet was to summarize course content and aided in content retention (see Figure 5). This can imply that the process of creating a support sheet leads to students

retaining course content, ultimately using the support sheet as a formula bank. It is this phenomenon which merits further study, especially as it relates to other engineering courses having a similar setting as in this study.

The results in this paper are similar to those found in Smith and Lester<sup>8</sup> where the majority of the students mentioned incorporating creating the support sheet in their exam preparation. Furthermore, students from this study also mentioned that creating and using a support sheet helped organize the course content, which was also found in the study by Smith and Lester. It is worth noting that the previous investigation by Dickson and Bauer<sup>3</sup> which found that students creating support sheets does not imply they internalize course content runs contrary to what was found here, where 28.3% of responses mentioned that creating a support sheet aids in content retention. In addition, 52.2% of responses mentioned that support sheets aided in summarizing course content. Although this result does not directly indicate that support sheets enhance learning, it is the opinion of the authors that summarizing course content is beneficial in exam preparation and can lead to a better understanding of course content. For example, students mentioned that creating the support sheets aided them in studying for the course, and only used the support sheet during the exam to reference equations, whereby they had already internalized the course content necessary to solve the exam problems.

The findings of this study also align with Hindman<sup>6</sup> where 75% of responses mentioned support sheets are used to avoid rote memorization, while 25% of the of the responses also mentioned using a support sheet alleviates stress. Although the latter result was not found in most responses, due to the detrimental effects of test-anxiety on exam performance (Hembree<sup>6</sup>), the use of support sheets aids those students most at-risk. This result is also much like ones found in the works of Drake et al.<sup>4</sup>, Erbe<sup>5</sup>, Smith and Lester<sup>8</sup>, and Raadt<sup>9</sup>. From the work here, and done elsewhere, it can clearly be concluded that support sheets allow students to avoid rote memorization while simultaneously reducing stress. It is the opinion of the authors that this combination of features go hand-in-hand as large amounts of content to memorize can be a daunting tasking for instructor and student alike. Also, we feel as though students using support sheets is a net-positive, since at the very least it helps reduce unneeded memorization, and for some students it alleviates test-induced anxiety. While, many instructors may not allow support sheets, they may still provide necessary equations, which also allows for students to avoid memorization. However, if the instructor provides the equations, students are not forced to consider which equations they might need on the exam. In addition, we believe that if support sheets were not to be used, it may cause negative effects to performance, especially for students who may experience stress during an exam. We believe that the creation of support sheets prompts students to determine what content and equations are important in the course, which likely leads to increased learning.

## **5 Conclusion**

This study posed the following research questions:

1. What features or content did students find most beneficial to include on support sheets?
2. To what extent did students feel that the process of creating support sheets helped in exam or course preparation?

### 3. To what extent did students report the support sheet reducing their test-taking anxiety?

After collecting, coding, and analyzing responses of 30 students in an undergraduate mechanics of materials course, we were able to understand the unique benefits and opinions students had about support sheets. This investigation helped highlight that quality and quantity matters in the construction of a support sheet. From the data provided above, students indicated that including equations was the most beneficial and was closely followed by good space management. Furthermore, numerous students claimed that these support sheets helped them in preparing for the exam, and did not help as much during the exam, except as a quick way to reference important notes. In addition, more than half the students mentioned that support sheets assisted in summarizing course content. This study found that a majority of students used the sheet to help in avoid rote memorization, where students depended on the sheet to act as an information-carrier. Moreover, we found that that avoiding memorization helped in alleviate stress during the exam.

## 6 Future work

The next steps in our investigation are to combine the survey results with the support sheet content data done in a previous study (Danielian and Buswell<sup>1</sup>). Doing so will allow us to determine if student perceptions of support sheet content correlate with exam and course performance. Moreover, we will also incorporate demographic data to see if certain groups (e.g. underrepresented students) benefit from creating support sheets in different ways. The end goal is to comprise all 227 students support sheet content analysis with their corresponding survey responses to capture the entire student population in the course. Doing so will give statistically significant results and build upon the preliminary analyses done so far.

## 7 References

- 1 Danielian, S. A., & Buswell, N. T. (2019, April), *Do support sheets actually support students? A content analysis of student support sheets for exams* Paper presented at 2019 Pacific Southwest Section Meeting, California State University, Los Angeles , California. <https://peer.asee.org/31824>
- 2 Dickson, K. L., & Miller, M. D. (2005). Authorized crib cards do not improve exam performance. *Teaching of Psychology*, **32**(4):230–232.
- 3 Dickson, K. L., & Bauer, J.J. (2008): Do Students Learn Course Material During Crib Sheet Construction? *Teaching of Psychology*, **35**(2):117-120.
- 4 Drake, V. K., Freed, P., & Hunter, J. M. (1998). Crib sheets or security blankets? *Issues in Mental Health Nursing*, **19**, 291–300.
- 5 Erbe, B. (2007): Reducing Text Anxiety while Increasing Learning - The Cheat Sheet. *College Teaching*, **55**(3):96 - 98.
- 6 Hembree, R. (1988). Correlates, Causes, Effects, and Treatment of Test Anxiety. *Review of Educational Research*, **58**(1), 47–77. <https://doi.org/10.3102/00346543058001047>
- 7 Hindman, C. D. (1980). Crib notes in the classroom: Cheaters never win. *Teaching of Psychology*, **7**, 166–168.
- 8 Smith, R., Lester, H. (2019). Instructor and Student Perceptions of the Authorized Self-Prepared Reference Sheet for Examinations. Proceeding of 2019 ASEE Annual Conference & Exposition. Washington DC: American Society for Engineering Education

- 9 Raadt, M. de (2012): Student Created Cheat-Sheets in Examinations: Impact on Student Outcomes, *Proceedings of the Fourteenth Australasian Computing Education Conference*, p. 71-76, January 31-February 03, 2012, Melbourne, Australia.
- 10 Song, Y. and Thunte, D. (2015), "A quantitative case study in engineering of the efficacy of quality cheat-sheets," in IEEE Frontiers in Education Conference (FIE), 2015, pp. 1-7.
- 11 Visco, D., Swaminathan, S., Zagumny, L., & Anthony, H. (2007): Interpreting Student-Constructed Study Guides. *Proceedings of the 114th Annual ASEE Conference & Exposition*, Honolulu, Hawaii, USA, June 24 - 27, 2007. 1 - 9.