

## **Roles for Take-Home Exams from the Perspective of Engineering Students and Instructors**

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## **Introduction**

This is a complete paper that explores the purposes of take-home exams from the perspective of both undergraduate engineering students and university instructors. Traditional methods of testing such as in-class exams are widely used for grading and assessment. Sometimes take-home exams are used in place of such in-person exams, however. These can simply be identical to the in-class exam, using time outside of the established class time to complete. There may be accommodations made to allow for open-book, open-note test taking that is spread out over a longer amount of time. This paper explores the perceptions of students and instructors of such assessment formats. Assessments such as take-home tests and open-note tests have been understudied in engineering education. This paper aims to address this gap by interviewing undergraduate engineering students and instructors to better understand and characterize perceived reasons to use newer testing methods or adhere to traditional structures for exams.

This paper identifies motivations and social drives to switch and barriers to doing so via exploring the perceptions of students and instructors on alternative testing methods. The research team used qualitative semi-structured interviews with students and instructors to uncover important benefits or disadvantages as seen by the key stakeholders. Additionally, this builds upon prior research identifying the pros and cons of this new approach to testing.

Primary points, both positive and negative, are presented that were brought up in the interviews. An analysis of differences among experienced instructors and students (those that have been in university longer than 2 years) versus new students/professors is done. Findings revealed that the primary reasons not to switch are an increased possibility of dishonest practices (exasperated by online learning due to COVID), and a possibility of students studying less for take home exams than traditional exams. Commonly cited reasons to switch included increased flexibility, decreased stress for students, and an environment more accurate to common work settings.

## **Motivation and Context**

This issue was important to the primary author as a student. While research exists on the purposes of take-home tests, there is limited work considering the views of the test's biggest stakeholders: students and instructors. A take home exam or take-home test is an exam, whether written, online, or other, that students can take home to complete on their own time schedule; this exam could be open or closed with a limited or unlimited maximum time. The goal of this paper is to start to remedy that by interviewing students and instructors within the STEM field in university. This issue is close to the authors' heart as many traditional testing methods can be very difficult to make fair to those with issues such as ADA accommodations, testing anxiety, or simply a busy schedule. Additionally, with COVID-19 necessitating more flexibility, take home and online tests are becoming increasingly popular. The rise of online instruction modalities also adds additional merit to the research on this issue as more and more tests appear to be leaving the classroom in favor of 'do it at home' tests. By researching further into the field of alternative

testing we can normalize and identify different methods' usefulness in different situations to make tests easier for all students.

In our local context, what a take-home test or open-note test allowed for seemed to be consistent: unencumbered by time or a limit of class resources. The range of courses employing this in our study were from an introductory mechanical engineering course that had regular problem sets and the take-home test was revisiting that technical content material again. Specific questions to be expected were about calculating vectors and vector addition, static forces and equilibrium, and rudimentary fluids and material stress and strain calculations. Each problem was closed-ended with a certain procedure to follow and a right answer to be calculated. Sometimes technology such as the online learning management system was used to distribute and collect exams. The same strategy used in the individual course was usually the same manner used for exams.

## Literature Review

Past research on this subject has primarily focused on the effectiveness of testing methods instead of the stakeholder's views on methods. Some of the known advantages and disadvantages are listed below, in Figure 1, from views brought up by the participants as well as specific points outlined in congruent research papers [1, 2].

**Table 1: Summary of Advantages and Disadvantages**

<i>Advantages</i>	<i>Disadvantages</i>
Reduce student anxiety	Harder to prevent unethical behavior
Address higher levels of Bloom's Taxonomy	Time consuming to create and grade
More flexible for students	Students study less for tests
Harder questions can be asked	

Another major area of research relating to this paper is the comparative results of take-home tests vs traditional testing styles. It was found that students who took take home tests scored significantly higher than those in the classroom testing environment [3].

Additional findings suggest that students are far more worried about closed book, in class tests than take home tests with  $\frac{3}{4}$  of exam participants reporting greater anxiety surrounding closed book testing. Cheating was found to not significantly increase between the in-class exams and take-home tests with 3 suspected instances of cheating (in class exams) vs 2 in take home tests out of a sample size of 64 students [3].

## Research Methods

A primary group of questions was generated to get a general overview of the participants' views, with a few more specific questions to get at participants' views on tests in general. The primary group of questions asked was modified to fit each sample group (Instructor and Student) as by nature these two groups occupy opposite but complementary sides of a testing environment. Additionally, support staff was interviewed to get an outside perspective on how different testing methods may affect students with ADA accommodations. Using the qualitative data collected

emergent thematic analysis [4] was conducted to better understand the data as well as to compare it with data collected by other studies.

Interviews were conducted in late 2021, students had ample experience with online testing through online classes during the prior COVID lockdown. This heavily influenced the student’s views on this type of test, as they were used to online testing through learning management software (LMS). As part of the interview, I neglected to specify the type of take-home tests in order to prevent biasing and to help understand what they expected a take home test to entail.

*Interview Protocols*

Questions were derived from primary concerns and benefits raised in congruent research papers [1]. The concerns were not asked directly. Instead, open-ended questions such as “*What are some advantages or disadvantages of take-home tests,*” were used to find the participant’s own ideas which could then be expanded upon. This ensured that known benefits/issues may be addressed by the participants in a more natural way without interference from the interviewer. The data will be analyzed in three different groups with care given to recombine the data and to compare and contrast the groups. The questions asked are below in Table 2, divided up into define affinity groups. The additional staff interviewed did not use set questions instead the interviewer allowed them to voice their own concerns and benefits. This was necessary as their specialty created a very specific knowledge set not applicable to the interview questions asked of the other groups.

**Table 2: Interview Questions**

Instructor Questions	Student Questions
<ul style="list-style-type: none"> <li>▪ How long have you been a professor?</li> <li>▪ What subject do you teach?</li> <li>▪ Do you have a positive or negative opinion of take-home tests and why?</li> <li>▪ What are some advantages or disadvantages of take-home tests?</li> <li>▪ How do you think take home exams might affect student learning?</li> <li>▪ How do you think using more take home exams might affect student academic honesty?</li> <li>▪ Do you think take home tests should be used more or less in university academics?</li> <li>▪ What do you focus on when designing a test?</li> <li>▪ How do you think homework questions should compare to test questions?</li> </ul>	<ul style="list-style-type: none"> <li>▪ How long have you been a university student?</li> <li>▪ What is your major?</li> <li>▪ What do you think makes a ‘good test’?</li> <li>▪ Do you have a positive or negative opinion of take-home tests and why?</li> <li>▪ How do you think take home exams might affect your learning?</li> <li>▪ What are some advantages or disadvantages of take-home tests?</li> </ul>

*Participants*

Three student, 3 faculty participants, and a staff member were selected by access and availability. All interviewees were instructors and students from within STEM fields with an emphasis on mechanical engineering to have a sample for comparison. For the purposes of our qualitative and exploratory research project, the numbers of participants were deemed sufficient. (Discussions of the appropriateness of small numbers of participants is covered by others in the

field such as Pawley & Slayton [5, 6]. The instructor and students interviewed are listed below in Table 3, indicated with a numeric identifier for anonymity.

**Table 3: Study Participants**

Participant	Field/Major	Year in University (teaching/learning)
Instructor 1	Mathematics	17
Instructor 2	Mechanical Engineering	8
Instructor 3	Mechanical Engineering	6
Student 1	Mechanical Engineering	Sophomore
Student 2	Mechanical Engineering	Sophomore
Student 3	Mechanical & Electrical Engineering	Junior
Support staff 1	Student Engagement	4
Support staff 2	Student Success	13

## Results and Discussion

The instructor group showed a varied but overall positive opinion of take-home tests with an emphasis placed on specific situations where it may be appropriate or not to administer this testing method. The student group expressed both a liking for the less stressful testing environment and fear of academic dishonesty. Additionally, support personnel such as ADA accommodators and tutoring staff were interviewed and brought up important issues and advantages of take-home tests.

### *Instructor Role*

One major advantage identified by the instructors is the ability to ask more interesting questions:

*“it allows us to be more flexible and ask questions that are perhaps a little bit more reflective of real engineering questions that students might encounter.”* (Instructor 3)

The allowance of more time on a test can be important as students are allowed to answer more complex questions that may be more representative of real-life problems. Additionally, it allows instructors to address higher levels of Bloom’s taxonomy, testing application and understanding of content instead of just memory. One main downside of this is that it requires more complex questions to be written as it is significantly easier for students to look up answers or use other forms of academic dishonesty.

The three instructors interviewed all agreed that in take home tests the enforcement of anti-cheating policies proved to be quite a challenge one instructor described it by saying,

*“I feel like the people that are probably not going to do anything unsavory in an in-class setting are probably going to be the same ones that are going to honor whatever expectations you put on them.”* (Instructor 1)

Additionally, an instructor explained that while preventing cheating is possible it takes exponentially more time to the point where it is no longer worth it to prevent cheating. And agreed that you cannot force a student to learn; some will follow the given rules while others will

try not to (regardless of obstacles). Cheating was brought up as a major issue in other relevant research papers however instructors interviewed seemed to believe that this was avoidable given the question type or inevitable regardless of the testing method. One method of solving this problem might be to write questions that address higher levels of Bloom's Taxonomy [7] such as understand, apply, analyze, or higher. By forcing students to show their thought processes it becomes more difficult to find answers, however, this does require significantly more time commitment in creating the test questions.

One important point brought up in the interviews was the application and appropriate setting for take home tests. They can be used as an important tool to help promote and test higher level thinking such as might be required in higher level classes or in tests where there is no specific correct answer. In class exams may be used more effectively for testing written knowledge or for simple learned facts while application of skills may be more complicated to prove lending themselves better to a take home environment.

*“[In in class exams] I think it's important to force students to recall stuff that we would consider sort of foundational, factual, basic knowledge Speaker. But if we're talking about, say in the mathematics world, an upper level 400 level advanced calculus class... I think it's important to give people enough time to sort of think about it.”* (Instructor 1)

The importance of time is an important advantage of take-home tests as they allow the instructor a greater ability to write complex questions knowing the student will have a chance to complete these.

The instructors also commented on how giving take home increases the accessibility for the students

*“Having a take home test and it being open book, open note over some amount of time also allows it to be a more accessible thing for everybody in the class.”* (Instructor 2)

By giving all students take home tests by default one no longer must as worry about accommodating specific students. One example of this is the most common ADA accommodation for students is extra time on tests this becomes null if there is no time limit for all students.

One additional consideration of take-home tests is the increased time commitment required. Due to the differences in course structuring for this type of test instructors would be forced to reevaluate their course plan to make it work. Instructor 1 emphasized that the primary reason preventing wider adoption (for their own classes) is a huge time commitment to restructuring the class to accommodate for the new testing type. Due to the large amount of work in switching a course over to this style Instructors are hesitant to put in that time commitment when standard testing procedures are not creating perceived problems.

### *Student Role*

Out of the three student interviews, there were varied opinions on how much take home tests were liked. One student really liked them, one disliked them, and the third student was indifferent seeing both advantages and disadvantages.

The primary concern brought up by the students was the ability for academic dishonesty on unmonitored tests:

*“you can be completely honest and not cheat at all [on tests]. And then someone else would cheat and get a better score.”* (Student 2)

This student felt that a significant number of students used an unmonitored take home setting to cheat by looking up answers creating a disadvantage for students who tried to be more honest:

*“Well, if it's not being monitored at all, that is a huge motivator. Because morals kind of go out the window when your grade is at stake.”* (Student 2)

Many of the problems brought up by students are consistent with online multiple-choice quizzes and tests. Many of these problems can be solved through a change in question type as expressed by the instructors. However, until that change can be actualized the students make a very valid point that in many settings closed note unmonitored quizzes are prone to attracting academic dishonesty.

One major advantage expressed by students is that in take home tests the testing environment is much more comfortable eliminating stress allowing them to do better due to the more comfortable setting students are able to perform better additionally taking the test in the same environment that was studied in allows for better recall. One student reflected this:

*“it's lowered pressure... typically, they give more time in take home tests for you to really think about the problem”* (Student 1)

One of the students discussed that they tend to underprepare for take home tests studying less with the expectation that it will be easier than an in-class exam:

*“Sometimes I under prepare for take home tests because a lot of times they're easier. Again, it depends on the teacher and the class because sometimes they make the take home tests harder than they should be, because the [they] assume the students are just going to cheat.”* (Student 3)

### *Support Personnel Role*

The support personnel gave a very different view focusing on accessibility and ADA accommodations. The ability for students to choose the time is invaluable for students who take medication as they may be feeling at their best during certain times of the day, or they may be required to take the medication at dedicated times. Additionally, for students who have ADHD,

the reduced distractions of staying at home can be helpful. One downside of it is the instructor isn't present to answer questions that the student has or to help deal with technical problems. Many of the primary concerns brought up by students and professors have a few possible solutions. There are also a few issues that are specific to different types of take-home tests. Most of the student's concerns on take home tests can be traced back to online testing. One example of this is worries about technical issues that were brought up by student 3. Technology in testing has some added benefits as well including the ability to get instantly graded tests. Solutions include having on paper tests or allowing students to submit in class time. The primary concern for both instructors and students however is academic dishonesty. Possible solutions include giving in class tests and allowing corrections to be done at home after. This would help to show the student's recall ability during class while still allowing for harder questions that can be solved during the correction. Additionally, allowing notes (open note tests) can help to prevent students from cheating as they are then allowed to use all the notes needed. Other possible solutions include recording the test/requiring video.

### **Conclusions and Implications**

This paper helps to fill a gap in studies on take home tests by interviewing students and instructors in a university academic setting. The interviews helped to solidify problems and advantages that were brought up in similar research works as well as reveal new problems specific to these stakeholders. The student's primary worry with take home tests was cheating specifically with online and multiple-choice tests. The student's attitude toward take home tests seemed to revolve around tests that are closed note and consist of one correct answer. One major benefit that was brought up was the increased comfort of taking the test from home and the reduced stress. Professors seemed to be on a very similar page however they were much more open to different types of testing with free response questions and open notes. However, this suggests more experience with the different types instead of more openness. The professors also expressed that a big benefit of take-home tests is the ability to ask more complicated questions. Finally, the support staff agreed that take home tests are overall beneficial with a few key points being lower stress, more time options, and the inability to talk to professors during the test. Using the methods studied and the students' and instructors' recommendations we can make testing easier and fairer for all students.

Further work may be necessary to expand upon this and more accurately gauge what aspects of take-home tests create the biggest difference. Additionally, this paper did not differentiate between types of take-home tests grouping online/paper, open book/closed book, timed/untimed, ext. into a single group. Further research would help to differentiate these aspects of testing to narrow down points of interest for both instructors and students.

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