Distribution Agreement

Ada Weaver March 28 2025

Academic Integrity In Undergraduate Physics: A Department-Level Analysis

by

Ada Weaver

Dr. Erin Bonning
Advisor

Physics

Dr. Erin Bonning
Advisor

Dr. Elizabeth Kim
Committee Member

Dr. Tom Bing
Committee Member

2025

Academic Integrity In Undergraduate Physics: A Department-Level Analysis

by

Ada Weaver

Dr. Erin Bonning
Advisor

An abstract of
a thesis submitted to the Faculty of Emory College of Arts and Sciences
of Emory University in partial fulfillment
of the requirements of the degree of
Bachelor of Science with Honors

Physics

2025

Abstract

Academic Integrity In Undergraduate Physics: A Department-Level Analysis

By Ada Weaver

This study approaches physics education research from the lens of academic integrity by evaluating the integrity culture of undergraduates in the Emory physics department. Because students take such a large number of classes with peers who share their major, departments have a great opportunity through their policies and personalities to shape the integrity of their students. This study ultimately seeks to gain a better understanding of academic integrity in undergraduate physics and provide the Emory physics department with information about its students and suggestions to further their learning in a physics context. Specifically, this study sought to characterize the current state of the integrity culture of the physics department, explain how physics students navigate academic integrity concerns on physics assignments, and determine how academic integrity in physics compares with other STEM departments. This study employed surveys, given to physics majors and non-physics STEM majors, as well as interviews with physics majors to investigate these interests. The surveys were designed, based on methods developed in previous literature, to ask students questions about their own opinions and behaviors regarding academic integrity and the opinions and behaviors of their peers, professors and department. The interviews were designed to tease out what makes physics unique and how students go about solving physics problems, as well as more information about when and why physics students cheat. Finally, based on previous academic integrity and physics education literature and the results of our surveys and interviews, we provided suggestions to the physics department and its professors of policies that they could employ to address academic misconduct in the department, with the ultimate goal of helping physics students become better physicists, better problem-solvers, and ultimately better people. These suggestions focused on realistic, tangible changes professors could make to their syllabi or assignment policies with the goal of incorporating previous physics education research to make recommendations that directly support physics students' learning, where possible.

Academic Integrity In Undergraduate Physics: A Department-Level Analysis

by

Ada Weaver

Dr. Erin Bonning
Advisor

A thesis submitted to the Faculty of Emory College of Arts and Sciences
of Emory University in partial fulfillment
of the requirements of the degree of
Bachelor of Science with Honors

Physics

2025

Acknowledgments

First, I would like to thank Dr. Erin Bonning for advising me on this project, specifically for being an excellent resource and providing valuable feedback about my project ideas and execution. I would also like to thank Dr. Elizabeth Kim for co-advising my project and providing her expertise about designing and executing surveys and interviews and analyzing my data. Finally, I would like to thank Dr. Tom Bing for his role as one of my committee members and for his insight into physics education research, especially his feedback on my literature review and his suggestions for improvement to my data analysis. I am incredibly grateful to have such a caring committee who took time to provide feedback and suggestions.

I am also extremely grateful to Dr. Jason Ciejka, Ms. Blaire Wilson, and Ms. Melissa Shoemake for their dedication to the work of the Honor Council at Emory and their excellent teaching in the Honor Council Practicum course. Additionally, their support of this project was incredibly valuable, as they provided resources, feedback, and ideas throughout the entire process.

Finally, I would like to acknowledge my family for their continued support of me throughout the project. They encouraged me when I was losing my motivation and helped me when I was overwhelmed. I'm extremely grateful to all of them.

Table of Contents

1 Introduction

1.1 Physics Education Research

Physics education research is a broad field that seeks to understand how students learn physics and what can be done by educators to improve learning outcomes for physics students. Specifically, physics education researchers investigate aspects of physics education such as examinations and question format, student's methods for understanding and problem solving physics, and developing instruction methods to best communicate physics. Thus far, there have been very few studies of academic dishonesty in the physics context.

1.2 The Problem of Academic Dishonesty

Academic integrity can be defined as a personal and community commitment to submitting work that represents one's own understanding, crediting others work appropriately, and maintaining honesty, responsibility, and fairness when completing academic work. Academic dishonesty is any action or inaction that compromises that ideal. Academic integrity is the foundation of education: without integrity, grades, research, and awards are meaningless. Yet, McCabe, Butterfield, and Treviño report in their book, *Cheating In College: Why Students Do It ans What Educators Can Do About It*, that many studies have found cheating rates as high as 70-80% [11].

To address this concerning discrepancy, the field of academic integrity research has recently emerged and is a major area of current research. This research addresses questions of what motivates students to cheat, what types of cheating there are, how often students participate, and how educators can effectively convince students to abide by academic integrity standards. In the literature review, we investigate several areas of academic integrity research that are important to this study by reviewing key or characteristic studies and drawing appropriate conclusions.

2 Literature Review

2.1 Founding Research

Academic integrity research as we know it today is relatively new compared to most other fields of academic research. It was kickstarted by a landmark study completed in 1964 by William Bowers, in which over 600 deans, 500 student body presidents, and 5,000 undergraduate students completed physical surveys[3]. These surveys asked about a wide variety of topics relating to academic integrity and students' experiences in college and drew responses from 99 schools in the United States, making this study the first large-scale investigation into undergraduate academic dishonesty.

Bowers was one of the first researchers to apply survey techniques to academic integrity research and pioneered many techniques that are now well-established within the field, and which this study will employ. Specifically, Bowers used several different methods to measure cheating behaviors, namely asking student body presidents, deans, and students about rates of cheating, asking students if they had participated in four categories of cheating, asking students to self-report and describe in detail specific instances of academic dishonesty, asking students if they had engaged in a set of thirteen specific behaviors, and asking students to estimate rates of cheating among their peers.

These methods have continued to be refined throughout the years, and now it is standard to ask students questions about their opinions of and participation in a set of 7-13 specific actions, as this method was found to yield the highest number of cheaters and provides an interesting landscape for investigations into questions about academic dishonesty[11]. For example, one of the major points of discussion for Bowers was that a significantly greater number of students admitted to participating in one or more of the thirteen specific acts that Bowers asked about than admitted to participating in any of the four different categories of academic dishonesty or described specific acts of cheating. To Bowers, this revealed that students, researchers, and administrators often have differing definitions of cheating and different standards for when cheating is acceptable, and asking about a specific set of behaviors best allows researchers to probe into those opinions and obtain valuable results.

In addition to pioneering important methods, Bowers study had several major results. First, Bowers showed that most college students have come into contact with academic dishonesty within the last year, either by observing it in one of their classes or by being approached by another classmate and being asked to participate in an act of academic dishonesty. Additionally, Bowers found that students underestimated the proportion of their peers that engaged in some act of academic dishonesty, and that at least half of students had cheated within the past year. The "typical cheater" in Bowers study was a repeat offender, someone who had cheated a few times in the past year, and cheating behaviors in the first two years of a students college experience strongly shaped their cheating behavior in their last two years.

With regard to students' decisions to cheat, Bowers found that the opportunity to cheat was a significant factor in rates of cheating, as nearly every scenario that offered students a better opportunity to cheat resulted in a higher rate of cheating. Specifically, cheating rates were higher in courses of a larger size, courses which had a large number of tests or quizzes, courses that reuse tests or assignments from previous years or give the same exam to multiple sections of a course at different times, and in courses whose tests contained a higher number of short answer and multiple choice questions. All of these conditions offer students more opportunities to cheat by increasing their anonymity, the amount of work they could possibly choose to cheat on, or their ability to gain access to the answers (or copy from another student). Furthermore, Bowers found that perceived fairness is a significant factor in rates of student cheating, as situations in which students perceived an injustice, like pop quizzes, curved grading systems, or a professor reusing old tests, have significantly higher rates of academic dishonesty.

2.2 Motivations and Justifications for Cheating

In a 1992 study that involved surveying over 6,000 undergraduates to ask about their reasons for cheating, McCabe confirmed five specific "neutralization strategies" that students use to justify their cheating: denial of responsibility, condemnation of condemners, appeal to higher loyalties, denial of victim, and denial of injury[10]. The most prevalent rationalization used was denial of responsibility, in which students justified their cheating because they were in a situation in which cheating was the only way they felt they could succeed. This mostly happened in instances where a student was failing or felt extreme pressure from a situation they could not control, like other students cheating or pressure from parents. The second-most popular method was condemnation of condemners, in which students placed the responsibility for their cheating on their professor, TA, or other authority. This rationalization strategy was typically employed when students felt that their professor or TA was unfair or unprofessional and gave some students preferential treatments for reasons other than their performance in the course. Finally, appeal to higher loyalties was also popular, and consisted of students rationalizing their behavior by invoking a relationship that was more important to them than their relationship with the school's Honor Code or disciplinary system. This applied mostly to students who had been asked to help their friends cheat and felt that it was right to help their friend out or students who felt significant peer pressure about cheating and felt that it was necessary to succeed or to fit in.

This study showed that students rationalize their cheating using any relevant method, but also that there are many circumstances that make it easier for a student to rationalize poor decisions and therefore make it easier for them to act poorly in the first place. This research supports several of Bowers' key findings in his 1964 study, namely that perceived fairness is extremely important to students and that peer attitudes about cheating are a major contributor to student decisions about academic integrity[3]. Perceived fairness as it is described in the Bowers study matches well with the condemnation of condemners category of rationalization. Finally, peer involvement was present in nearly every important category of rationalization, and students consistently justified their cheating based on their peers' attitudes or behaviors.

Additionally, a study completed in 2007 entitled "Applying Ethical Theories: Interpreting and Responding to Student Plagiarism" investigated several other moral strategies that students use to rationalize plagiarism[8]. The ethical frameworks investigated include deontology, utilitarianism, rational self-interest, Machiavellianism, cultural relativism, and situational or contingent ethics. They used the files of past plagiarism cases at a Western university and analyzed the student's explanation or rationale for their behavior in terms of these six ethical theories.

Deontology is a theory that posits that people follow the rules of their society because these rules are based off of individual's rights and right relationship to one another. Because plagiarism is objectively wrong based on societal rules, including the rules of the university, a student who plagiarizes can invoke deontology if they state that they did not realize that their actions constituted plagiarism or if they express true remorse for their actions. Utilitarianism is a theory that states that decisions are ethical when they provide the most amount of good to the greatest number of people. Students who invoke this reasoning strategy are likely to state that their plagiarism helped their grade and didn't hurt anyone else. Rational self-interest is a transactional view of ethics in which the guiding moral compass is wether or not fair trades are being made. In this view, a student might justify their plagiarism by stating that they paid the person who wrote their assignment for them, so both parties gained from the exchange, or that the professor doesn't put much time and effort into teaching the course, so neither should the student put much effort into completing their work, otherwise it would be unfair to the student.

Machiavellianism posits that self-interest is the defining standard by which behavior should be decided. In this view, if plagiarism helps one's educational outcomes, it should be pursued without qualm. When students are caught, they deny responsibility, saying that it was an accident or that the violation was the professor's or another student's fault. However, they do not demonstrate true remorse for their behavior, as the only reason they feel badly about the incident is that they were caught and punished. Cultural relativism acknowledges that morality can be different depending on the relevant culture, and that many cultures have different expectations regarding using other's work. Students who used this reasoning strategy rationalized their decision by pointing to another culture they either had been or were still a part of, which viewed plagiarism differently than the university. Students argued that since plagiarism was accepted in that culture, they thought it would be accepted in college as well and truly did not understand that their actions were wrong. Finally, situational ethics states that there are some situations that justify actions that are typically considered morally wrong, like plagiarism. This might include significant personal circumstances beyond the individual's control, and students often cite such circumstances as reasoning for why they plagiarized. However, these students do not demonstrate true remorse for their behavior.

This study found that the most common theories used by students to justify their behavior were deontology, situational ethics, and Machiavellianism, with the least common being cultural relativism, utilitarian reasoning, and rational self-interest. Importantly, they found that these theories of ethical reasoning fit the justifications students provided. Additionally, this study fits well with McCabe's 1992 results; situational ethics corresponds to McCabe's "denial of responsibility" category of justification, and Machiavellianism to "condemning the condemner" [10].

Finally, these researchers made recommendations for schools based on the reasoning strategies used by students. These recommendations focused on educating students about citation methods and the school's policies about plagiarism, having a consistent structure within the institution that provides impactful consequences to students who are found to be in violation, and educating students who might otherwise be able to honestly employ cultural relativism.

The study emphasized that reusing assignments or exams, inconsistency, leniency, and a lack of clarity about methods used to detect plagiarism would only encourage students to be academically dishonest. With that in mind, it is important to discover within a given degree program how these aspects are played out in the lives of students. Investigating how frequently assignments are reused, how different professors treat cases of academic misconduct differently, including if they ignore cases they think are trivial, and how professors are explaining their policies to students is important. Furthermore, it can allow for recommendations to be made and positive changes to be implemented that significantly change student's behaviors and students' relationships with their professors. Thus, this project sought to investigate these issues in an undergraduate physics context in hopes of being able to provide these insights and recommendations to the department.

2.3 Academic Major-Related Predictors of Academic Dishonesty

One might naturally ask the question "does someone's choice of major affect their academic integrity?" Certainly, a student's choice of major is a defining characteristic of their college experience. They are likely to have friends who are of their same major or who have a major housed in the same department, they are exposed the most consistently and meaningfully to faculty who are part of their department, and they are likely to pursue relationships with those faculty to obtain help in a class, a research position, and a letter of recommendation. Therefore, a student's choice of major is ripe with the ability to affect their academic integrity behaviors.

However, there has been little research that demonstrates a connection between a specific major and student's cheating behaviors; many studies have found that there is no correlation. There are a few exceptions, namely business students and students on a competitive pre-professional track, who tend to cheat more frequently than most other students. An obvious difference between these programs and most other majors is the increased presence of competition and grade pressure, and there is significant research to show that cheating is more prevalent in scenarios where competition for grade pressure is high.

First, a study done by Mary Rigdon and Alexander D'Esterre in 2015 designed a task where participants had to solve a set of math problems in a given amount of time and then report the number that they had solved correctly[14]. They received a monetary prize for each problem solved correctly. There were four conditions: participants' problems were graded by an experimenter, participants graded their own problems, participants graded their own problems and were paired with another participant, and only the participant with the higher score received the monetary prize, and participants graded the problems of the participant they were paired with, and only the participant with the higher score received the monetary prize. Thus, they were testing if participants were more likely to cheat in a competitive environment or in a noncompetitive environment and if they were more likely to cheat by inflating their own score or by deflating the score of their partner.

They found that there was not a significant difference in levels of cheating between competitive scenarios and noncompetitive scenarios. They did find that a significantly lower proportion of individuals are willing to cheat by sabotaging another participant than are willing to cheat by inflating their own score. In an academic setting, this likely means that most individuals who cheat are likely to do so by artificially inflating their own abilities, such as by using unauthorized resources or plagiarizing. However, most people who cheat are unlikely to intentionally sabotage the work of their peers or cheat in a way that they believe negatively affects their peers in a substantial way. Finally, they found that their participants were significantly more likely to cheat when they knew they could get away with it, specifically when they graded their own problems. In the educational realm, this likely means that students are more likely to be academically dishonest when they feel confident that they will not be caught.

Next, a study published in 2009 used an experimental setting to test whether the condition of competition encouraged cheating and how it affected participants true performance[15]. This study had participants complete mazes using a software that allowed them to cheat in each of two environments. First, some participants were put into a noncompetitive environment; the payment they received only depended on their performance. Second, some participants were put into a competitive environment, in which they were competing with five other participants for the payment, which was only received by the participant in each group who received the highest score. Finally, participants were able to cheat in multiple ways.

This study found that both men and women complete more mazes when there is competition, but with some qualifications. Before the individual realized that they could cheat, the competitive condition encouraged better performance on the task; participants completed more mazes than in the noncompetitive condition. However, if an individual knew that they could cheat, they weren't spurred on by competition to work faster and complete more mazes. Additionally, they found that bad players were significantly more likely to cheat when there was competition than when there was no competition, but good players were just as likely to cheat when there was competition as they were when there was no competition, and that good players overall cheated at a lower level than bad players. Finally, they found that the presence of competition increased the number of methods that people used to cheat, especially for bad players.

From this study, we can conclude that a student's natural ability and perception of how well they are performing is likely to impact their decisions relating to academic integrity, especially when they know that they are competing with other students. Students who are performing poorly are more likely to commit acts of academic dishonesty and are more likely to commit multiple types of academic dishonesty. Additionally, this study affirms the idea that competition can increase academic dishonesty, although it can also increase student's performance when they do not feel that they are able to cheat.

These studies are important because the faculty and administrators of a department drive the competition or collaboration culture. Faculty course policies, like disallowing students from collaboration on homework, fitting exam grades to a curve that hurts some student's grades, and having students compete for limited research positions or internships, all encourage students to view their peers as competitors instead of collaborators or neutral third parties. Additionally, cheating increases when students believe that they can cheat, and that they can get away with it. Thus, lenient faculty or inconsistent application of academic integrity policies is likely to increase rates of cheating. All of these policies will affect the undergraduate culture of the department, therefore, departments have an exceptional opportunity to affect their students' integrity choices.

2.4 Environment and Peer Attitudes

Going back to McCabe's 1992 study, one of the most common methods that students use to justify their cheating, appeal to higher loyalties, is directly applicable to the case of collaborative cheating, as students feel more immediate pressure from their peers to go along with collaborative cheating behaviors[10]. The prevalence of this method of rationalization indicates that peer attitudes about cheating, especially collaborative cheating, is likely to have a large affect on student's academic integrity choices in college.

A study completed in 2017 looked at how a student's perceptions of their peers and parent's attitudes, as well as several other personality and achievement-striving habits, were able to predict a student's intentions to cheat[9]. Specifically, they administered a survey to undergraduate students that was designed to test how various factors predicted students' intentions to cheat. First, they investigated how peer attitudes about cheating and parent attitudes about cheating predicted cheating behavior, and found that peer attitudes had a significantly stronger influence on participants intentions to cheat, but that parental attitudes also had a significant influence. They stated that this result was consistent with previous research, which has overwhelmingly shown that peers opinions about cheating are one of the best predictors of students behaviors. Second, they investigated how social pressures, termed "subjective norms" and the perceived ease or difficulty of successfully cheating and getting away with it, termed "perceived behavioral control" predicted intentions to cheat. They found that social pressure to cheat and the perception of cheating being easy both predicted intentions to cheat with significance. Finally, they found that students' overwhelmingly treated take-home assignments with less seriousness when it comes to cheating behaviors; students were much more likely to show intentions to cheat on take-home assignments and to believe that it would be significantly easier to successfully cheat on take-home assignments without getting caught.

The results of this study suggest that peers are one of the greatest predictors of students' academic dishonesty, both through social pressures to cheat and students' perceptions of their peers' attitudes about cheating. Thus, it is important to understand the culture of a department, specifically what students' believe about their peers' cheating behaviors and opinions, if we want to develop an accurate understanding of how frequently cheating takes place and develop effective strategies to deter it. Additionally, perceived ease of cheating was also a major predictor, and this agrees with other research as well[15]. Clearly, departments need consistency in how they handle cases of academic dishonesty and need to have effective mechanisms for catching such behavior. This may mean that faculty administer fewer take-home exams, and only have students complete major assignments and examinations in proctored environments. At the very least, it means that plagiarism software like Turnitin should be utilized whenever possible, and that professors should strive to create assignments that do not easily allow for cheating.

Next, a study completed in 2024 addresses collaborative cheating behaviors, which involve students obtaining help from their peers to cheat[4]. They acknowledge that collaborative cheating can have benefits for students beyond the usual grade boost, such as improvements in one's social circle, like gaining friends or increasing trust between students. Thus, students experience pressure to cheat not only from their goals of obtaining high grades but also from their goals of developing close, positive relationships with their peers. Additionally, this study argues that the culture of a student's peers can put significant pressures on students to cheat, even if they are not initially inclined to do so. The methods included a survey at the beginning of the semester asking students about their social goals and the norms of their peer groups, and a survey at the end of the semester asking students about their cheating behaviors throughout the semester.

This study showed that cheating was correlated with both social norms and social goals, so that participants who had peers who were more approving of cheating and participants who had strong goals to fit in socially or find community were more likely to cheat. Based on these results, which are supported by other literature, a significant influence on a student's decision to cheat is their peers. This is especially true when it comes to collaborative cheating behaviors.

These studies suggest that an important consideration for schools that wish to reduce the frequency of academic dishonesty in their undergraduate programs is the student culture surrounding academic integrity. Specifically, this suggests that department-level interventions may be important, as students will share the largest number of classes and the greatest opportunity for collaborative cheating with peers in their major. Therefore, it may be prudent to investigate the prevalence of collaborative cheating and invest in programs and policy changes that aim to affect student culture at the department level.

2.5 Instructional Methods to Decrease Cheating

Though academic dishonesty is clearly a significant problem within higher education, there are many strategies that instructors can use to reduce its prevalence. These strategies can depend on the culture of the institution and should be implemented gradually and with great care, but are generally very successful at decreasing academic dishonesty.

A review completed in 2013 investigated cheating in the context of online classes, in which students and their instructors do not have significant face-to-face interactions[12]. Though there are significant differences between online and in person courses, this study has relevant information addressing all assignments that are not completed in the physical classroom, even for courses that meet in person. The article identified a variety of methods for the successful detection and mitigation of academic dishonesty.

First, the article acknowledged that a foundation of care for academic integrity is ideal. Thus, the article recommended communicating in some significant manner that the professor cares about academic integrity. This may include having a written statement in the syllabus, the professor discussing academic integrity during the first day of class and before major exams, and having an academic integrity statement on assignments and exams to remind students of its importance. Additionally, students should understand the consequences of academic dishonesty, including the university's standard sanction for a violation. Students should also be able to reflect on why academic integrity is important to their own careers and personal lives. Finally, students should have a robust understanding of what exactly constitutes a violation of academic integrity, which may require some education from their professors. This is especially true for international students who may come from a culture that has different norms and expectations regarding academic integrity.

In addition to providing students with education to build a firm foundation, there are many specific policies that this article recommends to deter cheating during the completion of assignments and exams. First, it recommends providing scaffolding for large assignments, by having students submit parts one at a time so that they are forced to keep up with large assignments over the course of the semester. Additionally, during exams, questions should be randomized if possible, or students sitting next to one another should receive different versions of the exam so that students cannot copy one another's answers. Proctors and cheating detection technology should be used where possible to increase the likelihood that a student will be caught. For assignments that students complete at home, including homework and take-home exams, professors should assume that students will use the course textbook and their own notes and allow for the use of these materials, as well as specify explicitly what other resources (if any) are appropriate. Students should also be expected to submit copies of the resources that they use, such as the page in the course textbook or a picture of their notes. In cases where AI is allowed, students should be required to submit the prompt they used or a screenshot of the help they received. For take-home exams, students should have a limited amount of time to take the exam, as this limits the unauthorized assistance they can receive during their completion of the exam. Finally, in all examinations and assessments, the professor should strive to make the assignment relevant to the students' personal interests so that they have some amount of buy-in to its completion.

In an article published in 2017, Gallant argues that a specific teaching approach, what she calls "the teaching and learning approach," will decrease academic dishonesty[7]. Specifically, she provides many concrete instructional methods that align with the standards of this approach that are shown to foster environments of integrity.

First, Gallant focuses on methods that help faculty to transform the classroom from its historical focus on grades and performance to an environment in which students' goal is content mastery. She argues that assessments should be directly relevant to the content of the course, the students' personal lives, and their professional goals. In essence, students should never feel that they have been given an assignment that has no purpose to them, since when they personally care about their assignments they are significantly more likely to invest their time and energy and avoid academic dishonesty. Additionally, Gallant encourages faculty, to the extent possible, to give students limited control over the grading structure of the course. Although this is not always feasible, she recommends allowing students to have a limited control over how their final grade is determined, such as by setting the proportion of the grade determined by each assignment or being able to choose a certain number of assignments out of a list of options. Finally, she advocates for the use of a flipped classroom model, which allows a greater amount of in-class discussion and problem solving activities, and helps students to take responsibility for their learning.

Next, Gallant argues that clear, excellent, and organized instruction will help to deter students from cheating. Professors who are clear about what constitutes cheating in their course help students to avoid accidental violations. Additionally, professors who are excited about the material, engaged in their lectures, and supportive in office hours consistently motivate their students to care more about their learning, which in turn discourages academic dishonesty. Next, Gallant argues that professors should be organized and prompt, themselves fulfilling the expectations that they have for their students. This means that students' grades should be returned regularly, the course learning site should be well organized, and professors should be on time to their office hours and classes. When professors model these behaviors, the students in turn perceive a fair and respectful classroom, and are more likely to act in a fair and respectful manner. Finally, Gallant argues that learning objectives should be clearly connected to the course assessments so that students understand exactly what they are being tested on and why those assessments have value.

Finally, Gallant argues that when students are caught committing acts of academic dishonesty, education is crucial. These experiences should be reframed for faculty and students so that both parties think of catching academic dishonesty less as a matter of surveillance and punishment and more as a matter of an opportunity to promote maturity, knowledge of community principles, and ethical growth in the student. Specifically, Gallant advocates for an instructional module that is managed by the institution that reported students must complete, or some similar educational program that students go through when they are found responsible for a violation.

2.6 Use of Learning Tools & Problem Solving in Physics

A study published in 2010 developed a method to recognize real-time cheating on online homework assignments in introductory physics classes at MIT and used this method to track cheating over the course of a semester[13]. Specifically, they hypothesized that students who answered each question in less than five minutes were copying the answer, whereas students who took a longer time were likely completing the assignment with their own understanding. This also allowed these researchers to correlate cheating with exam scores later on in the semester, and to see how rates of cheating progressed throughout the semester.

The researchers found several patterns throughout the course of the semester. First, homework copying increased throughout the semester, with very low rates in the first homework and significantly greater rates as the semester went on. Rates of copying tended to jump after midterms, when students presumably felt the most grade pressure. Additionally, they found that students who did not exhibit copying behaviors were significantly more likely to have a large part of their homework assignments finished two days before the homework was due, while those who consistently copied were more likely to have only a very small portion of the assignment done before the night it was due, and were more likely to submit their homework late. Specifically, they found that "Students are more likely to copy a problem if it is more difficult, if it is later in the assignment, if they do it closer to the deadline..., or if the assignment is later in the term," [13].

Additionally, the researchers analyzed how copying correlates with course performance using the main assessments given throughout the course. Specifically, they administered the mechanics baseline test (MBT) at the beginning of the semester, three in-person midterms, and one comprehensive final exam. They found that students who could be classified as "heavy copiers" scored significantly lower on both midterms and the final exam than those who copied very infrequently or not at all, and that the difference between the scores of the two groups progressively increased throughout the semester.

This experiment shows that students who struggle through the material and take the time to do it on their own consistently perform better than those who copy the answer. Though this is not a surprise, it indicates that struggling with homework problems reinforces learning in a manner that substantially improves the student's long-term ability to perform well on assessments and solve physics problems. Finally, the researchers noted that even students who took more than five minutes to complete each question could have cheated. However, the act of trying to work through the problem on their own first and struggling with the material before looking up the answer still seemed to be significantly beneficial to students' long-term understanding of physics.

A literature review completed in 2014 of physics education research describes the current focuses, findings, and implications of physics education research on the topic of problem solving strategies[5]. Though the scope of this review is much greater than just problem solving, it contains detailed information about relevant findings in recent problem solving research. Specifically, it explains what has been found about the differences between beginning students' approaches to physics problems and advanced students or instructors' approaches, discusses how students use solutions manuals and worked examples to solve similar problems, and how instructors can better teach critical problem solving skills in physics.

For studies that compare problem solving strategies between beginners and experts, the review explains that all physics students tend to make an attempt to categorize problems and identify similarities between the given problem and ones they have done before. Beginning students tend to categorize problems based on the physical objects that are part of the question and tend to get stuck while completing a problem in going from step to step. Advanced students tend to categorize problems based on the approach they used to solve the problem and keep track of what they have accomplished as they go through the steps of solving the problem.

When discussing how physics students use solutions to help them understand the answer to a problem or the physics concepts, this review found that having access to answer keys and worked problems can significantly improve a student's understanding of the concepts and performance on exams in certain conditions. First, the students themselves must be focused on understanding the problem; if students are only using an answer key to copy solutions or find a near exact match to the problem that they are attempting so that they can plug in new values to a predetermined formula, their learning suffers. Second, when comparing their wrong answers to an answer key, students struggle to identify exactly why their solution is incorrect unless there is scaffolding in place, such as a detailed rubric that identifies the specific principles or approaches needed to solve the problem. Finally, the article emphasized that having students review detailed solutions, including by correcting their own exams, can significantly improve their learning.

Finally, the article suggests instructional methods to encourage the development of problem solving skills. Specifically, they argue that have a detailed, consistent structure for problem solving that is taught in conjunction with the physics material is extremely beneficial to students ability to approach new problems.

3 Methods

This study was conducted at a Emory University, a small private university in the South known for excellence in research and medicine. Emory has had a student-led Honor Council for over a century, and a small group of students, faculty, and administrators are highly involved in maintaining the Honor Code and resolving cases of academic misconduct. The school Honor Code has some aspects of a more traditional Honor system, like required reporting and a student-led Honor Council, as well as many aspects of a more modern Honor system, like the use of an educational program as a common sanction and proctored exams. The standard sanction for a first violation is failure of the course, a one-year Honor Code probation, and mandatory completion of an Honor Code educational program. These sanctions are overall fairly moderate compared to other schools and are used in an effort to balance an appropriate consequence with education and restoring students to their community. Students are typically only expelled for third violations of the Honor Code, and second violations typically result in a suspension.

The school defines academic dishonesty as falling into several categories: the usual cheating and plagiarism, "Lying and Dishonesty", "Violating Community Standards", "Violating Standards in the Honor Code Process", violating the "Electronic Device Policy", and violating the "Testing Policy". First, cheating is defined as "Seeking, using, giving, or obtaining unauthorized assistance or information in any academic assignment or examination"[2]. Second, plagiarism is defined as "plagiarizing, whether intentionally or unintentionally, in any assignment"[2]. Third, lying and dishonesty includes several different charges: providing false information to obtain an advantage, falsifying citations or quotes, "falsifying, altering, or fabricating academic records, forms, or correspondence," and "seeking to gain or to provide an unfair advantage during course registration"[2]. Fourth, "Violating Community Standards" includes violations like "intentionally sabotaging the work of another student," helping someone else violate the Honor Code or helping a student at another school violate their Honor Code, "disseminating any course materials... without the permission of the instructor," and "seeking to gain or to provide an unfair advantage during course registration"[2]. Fifth, "Violating Standards in the Honor Code Process" includes violations which pertain to Honor Council hearings and confidentiality. For reported students or witnesses, violating the Honor Code includes "intentionally giving false testimony or evidence... or refusing to testify or give evidence," as well as "harassing, threatening, coercing, or bribing witnesses"[2]. Finally, this section includes breaching confidentiality and failing to report a case. Emory maintains a completely confidential Honor Code process, so students' names are not publicized and hearings are completely private. If a witness or another involved student or a member of the Honor Council were to publicize information about a student's violation, that would be considered a violation. Additionally, the Honor Code has a mandatory reporting clause, so students are required to report all cases that they are aware of. If it is found that they were aware of a potential violation and did not report it, they may be found responsible for an Honor Code violation themselves. Finally, the electronic device policy and testing policy describe procedures for maintaining a secure exam environment. Specifically, they disallow the use of any electronic device during exams and quizzes unless the instructor allows them, allow professors to enforce policies during exams like requiring students to hand in their phones or put their bags at the front of the classroom, moving students in the middle of an exam, and requiring that students only use the allotted time to complete their exams.

3.1 Research Questions

This study was interested in investigating the following three research questions:

1. What is the current state of the integrity culture of the physics department?
2. How do physics students navigate academic integrity concerns on physics assignments?
3. How does academic integrity in physics compare with other STEM departments?

Question 1 was developed because the study seeks to create positive change in the physics integrity culture, and an important first step is to understand its current state. This means investigating specific questions, like how often physics students cheat on physics assignments, what the most common forms of cheating are, what physics students themselves believe about academic dishonesty, and what they think their peers and professors believe about the subject. These questions were primarily addressed in the surveys.

For Question 2, we were interested in uncovering how physics students think about academic integrity and how they use academic dishonesty in their work. This means asking students questions about the conditions that would incline a physics student to cheat, how academic dishonesty benefits or hurts their learning, and why they typically cheat. These questions were primarily addressed in the interviews.

Finally, we expect that the physics department at Emory will have a somewhat unique program culture and academic integrity concerns, and Question 3 addresses how those differences actually play out. We wanted to know if physics students have a better or worse understanding of academic dishonesty than their non-physics STEM peers, if physics policies are similar to those of other STEM departments, and how the physics department's integrity culture compares to the overall STEM culture at the institution. These questions were primarily addressed in the surveys, especially the surveys for non-physics STEM majors.

3.2 Thirteen Specific Behaviors

Based on Bowers 1964 study and the standard explained by McCabe, Butterfield, and Treviño we developed a list of thirteen specific behaviors that were applicable to the school's Honor Code, inclusive of all major types of cheating as defined by McCabe, Butterfield, and Treviño and representative of the major types of academic dishonesty that physics students encounter[3][11]. These behaviors are as follows:

1. Getting exam questions or answers ahead of time from someone who has already taken the same exam.
2. Copying from another student on a test or exam, with or without the student's knowledge.
3. Working on the same homework with multiple students when the teacher does not allow it.
4. Turning in an assignment done entirely or in part by another student.
5. Turning in an assignment copied, entirely or in part, directly from another student's work.
6. Using unpermitted notes during an exam.

7. Looking up and copying answers to homework questions from a solutions manual or other online resource when the teacher does not allow it.
8. Looking up and copying answers to homework questions from a solutions manual or other online resource when the teacher does not have an explicit policy about doing so.
9. Using a device with internet capabilities during an exam when the teacher does not allow it.
10. Fabricating or tweaking results in a research project.
11. Lying to a professor to gain more time for a homework assignment or to have an exam moved.
12. Using AI to write code or solve a homework problem when the teacher does not allow it.
13. Entering course materials (notes, lecture materials, homework questions, practice exam questions, etc.) into an AI chatbot or LLM.

In categorizing these behaviors, we can make a distinction between collaborative cheating (items 1, through 5) and independent cheating (items 6, through 13). Additionally, several of these behaviors are relatively new forms of cheating involving artificial intelligence (items 12 and 13) and are far less studied than other forms of cheating which have been around for a long time (items 1 through 11).

We chose these specific behaviors because they are the most relevant to the academic integrity choices that physics majors typically encounter. Using these allowed us to question participants about standard cheating behaviors, even those which they do not personally consider cheating. Additionally, they provide a consistent way to measure various things of interest, including participants perception of behaviors, their perception of their peers attitudes and behaviors, and their participation in those behaviors.

Item 1, "Getting exam questions or answers ahead of time from someone who has already taken the same exam," is something that the average physics major will likely have the opportunity to do several times in the course of their degree. There are few classes large enough that professors hold the same exam at multiple times; however, many students receive exam accommodations that allow them to take all or most of their exams outside of the regularly scheduled time or have occasional extenuating circumstances that require them to take an exam at a time outside of the regularly scheduled time, like a religious, family, athletic commitment. Additionally, this can be done informally, such as by asking a friend who has already taken the exam for help on what topics to study, or more formally, such as by having a friend write down the questions they remember after taking an exam. Additionally, this behavior can include using study websites like Chegg, where students can post copies of previous years' exams. This might be helpful to a student if the professor often reuses their exam questions. We include this behavior because it is always cooperative and indicates how willing students are to share information about their exams to "help each other out". Responses to this question will generally indicate how collaborative or competitive students view their peers in their major.

Item 2, "Copying from another student on a test or exam, with or without the student's knowledge," is an action that every physics major has many opportunities to take, as physics is typically taught in an exam-based learning environment. Additionally, this behavior is complex, as it can be premeditated if students decide to work together before they take the exam, or it can be a spur-of-the-moment decision for a student who finds themselves struggling during the exam. We include this behavior because it is a very common temptation for students and represents a standard cheating behavior.

Item 3, "Working on the same homework with multiple students when the teacher does not allow it," is a behavior that, similar to item 2, is extremely collaborative and indicates students' views about the culture of their major. Though it is not typical for physics faculty to disallow students from collaborating on their homework assignments, there are a select few classes in the major where this is the accepted policy, and students are likely to experience this type of class a few times while they are undergraduates. Additionally, this item indicates how willing students are to defy rules when the faculty has little to no ability to enforce them; faculty cannot control how or where students complete their out-of-class assignments, and students may or may not choose to follow the rules faculty set regarding these assignments.

Item 4, "Turning in an assignment done entirely or in part by another student," is something that every physics major has the opportunity to do many times throughout the completion of their degree. Students are frequently offered the completed work of peers who have already taken the class they are a part of, and many professors re-use assignments, especially laboratory experiments. Similar to items 2 and 3, this behavior indicates how collaborative the physics culture is and, additionally, how much students value the work they are assigned.

Item 5, "Turning in an assignment copied, entirely or in part, directly from another student's work," is another behavior in which nearly every physics major will have the opportunity to participate. This item also indicates the collaboration culture, but is a more blurry line for most students than, for example, copying someone during an exam.

Item 6, "Using unpermitted notes during an exam," describes a serious violation of the Honor Code, since this is generally a premeditated action that involves planning to sneak notes into a test. Additionally, it gives a student a very direct advantage over others that students know is unfair. Finally, this is certainly a behavior which physics students have the opportunity to do many times throughout their degree, as they take many exams.

Item 7, "Looking up and copying answers to homework questions from a solution manual or other online resource when the teacher does not allow it," is a behavior that physics students have extremely frequent opportunities to do, as the majority of physics coursework consists of problem sets for homework and professors very frequently assign problems from textbooks, which have answer keys. Whether students copy the answers in full or use the answer key as a guide to help them get to the answer, these resources are very often explicitly disallowed by professors because they take away the struggle of working through the problem, which is extremely beneficial to student learning[13]. Additionally, in instances where the faculty is clear in their syllabus about the fact that these are not acceptable resources, the student who uses them is knowingly violating their professor's design for the class.

Item 8, "Looking up and copying answers to homework questions from a solutions manual or other online resource when the teacher does not have an explicit policy about doing so," is very similar to item 7, except that many students and faculty would not consider this a violation of the Honor Code, so long as the resource used was cited.

Item 9, "Using a device with internet capabilities during an exam when the teacher does not allow it," is again a behavior which every physics student has had the opportunity to do. However, unlike most of the previous items, this is typically an entirely solo act and may constitute various levels of academic misconduct, depending on the specific circumstances. For example, using a phone during an exam for something unrelated to the exam, like texting a friend who isn't in the class about dinner plans, is a very minor violation because it compromises the integrity of the exam, but doesn't provide an unfair advantage to the student. However, stashing a device in a restroom to access during the exam is an egregious violation, because it is premeditated, compromises the integrity of the exam, and gives the student an unfair advantage.

Item 10, "Fabricating or tweaking results in a research project," is one that every physics student will have the opportunity to do, because lab work is often integrated into physics coursework. However, students will only rarely have the opportunity to participate in this behavior, since lab work is much less common than other assignments, unless the student is part of a lab outside of their courses. We include this item because most physics students at our target school participate in extra-curricular research during their undergrad education, and physics research is a highly regarded aspect of the typical physics student's experience.

Item 11, "Lying to a professor to gain more time for a homework assignment or to have an exam moved," is a behavior that all physics students will have the opportunity to do, as they frequently have assignments and exams. Additionally, this is generally a completely solo act, but one which involves direct interaction with the professor, either via email or in person, which adds an interesting dynamic in that students must directly reach out to their professor with a fake story. No other form of academic misconduct on the list involves direct interaction and communication with a professor.

Item 12, "Using AI to write code or solve a homework problem when the teacher does not allow it," is also a behavior that all physics students have the opportunity to do. Though some physics students may avoid taking a coding class, physics is heavily based on problem sets, and newer versions of ChatGPT and other Generative AI programs are experts at solving undergraduate-level physics problems, making them extremely tempting for homework help. However, many professors explicitly disallow these programs. If a professor does allow them, they typically ask for students to cite their use and explain how they used them.

Item 13, "Entering course materials (notes, lecture materials, homework questions, practice exam questions, etc.) into an AI chatbot or LLM," is something that most students would not immediately think of as academic misconduct. However, given that course materials are the intellectual property of the professor, a student's choice to disseminate them to a third party without obtaining permission from their professor is highly unethical, and falls under the school's Honor Code as academic misconduct. Additionally, many generative AI platforms are introducing "memory" functions, so that information an individual provides to the platform is retained and used to continue to train the AI model. In this way, students who put their professor's materials into generative AI models are allowing those models to retain that information and train on that data, which infringes the intellectual property rights of the faculty. Thus, this is a serious form of academic dishonesty, but something that most students don't bat an eye at.

3.3 Surveys

Two surveys were developed and administered: one for individuals who had significant experience in the physics department and one for individuals who had significant experience with a non-physics STEM department. The surveys were designed to allow the researchers to gain an understanding of several key points of interest. The surveys contained the same basic questions, and the survey for physics students contained additional questions. Surveys were administered using Qualtrics, and screening questions separated physics students from non-physics STEM students. Surveys were sent to physics students using the physics majors and minors email listserv, the university's undergraduate physics club's communications, and was posted by professors in some courses on the course website. Surveys were sent to non-physics STEM students through specific courses, departmental newsletters, and some departments' email listervs. Appendix A contains the survey questions. The surveys were designed with the previous literature in mind. In particular, many of the ideas of the survey were based on the surveys designed by Bowers in 1964, specifically questions about why the student chose their major, how students prepare for exams, questions about the academic integrity culture, and questions about specific instances of academic dishonesty within physics[3].

Physics participants included students who were a physics major or minor, physics and astronomy major, astronomy minor, biophysics major, or engineering sciences major. These programs were selected because all students enrolled in these programs would have significant experience with the department culture, including professor policies, peer attitudes about cheating, and knowledge of student cheating incidents. Additionally, all of these students are required to take a significant number of physics classes, meaning that they have experienced navigating academic integrity concerns on physics assignments and examinations. Non-physics STEM participants included any students whose major, joint major, or minor was part of the math, computer science, chemistry, biology, psychology, environmental science, economics, neuroscience and behavioral biology, or quantitative theory and methods departments. We defined non-physics STEM students based on departmental definitions of their program. For example, economics majors at Emory receive a STEM designation on their diploma, so although economics is not considered a STEM major in the University bylaws, we allowed economics students to complete our survey as non-physics STEM students[6].

First, both surveys ask for background information from each participant. This included information about the length and depth of a student's participation with the department of their major. For physics participants, these questions included asking them to select the types of classes they have taken in the physics department (introductory, intermediate, core, and advanced). For non-physics STEM participants, these questions included questions about a student's year and STEM major/minor. These were asked so that the researchers could categorize and participant's responses. Specifically, a student who has only taken introductory physics classes will have had significantly less experience with the culture of the physics department and less experience on physics assignments that the student who has taken introductory, intermediate, core, and advanced classes, for example. This study was completed in the second academic semester, so beginner students would have completed at least one physics course at Emory by the time they completed the survey. Based on this assumption, we developed four categories for participants.

First, "beginner students" were students who had only taken introductory physics classes or who were non-physics STEM freshmen. These students could only have taken two to three classes in the relevant department, at a maximum.

Second, "intermediate students" were students who had taken introductory and intermediate physics classes, or who were non-physics STEM sophomores. These students have taken 3-6 courses in the relevant department, all of which are lower-level classes (mostly 100 and 200, maybe 300 level). These students are considered to have some significant experience with their peer's attitudes about academic dishonesty, but less experience with the overall department culture, especially professors course policies, as they have experience with only a small number of professors.

Third, "core students" were students who had taken introductory, intermediate, and either core or advanced physics classes, but not both, or who were non-physics STEM juniors. These students have a wide range of experiences in undergraduate courses in their degree and have been taught by many different faculty. They may have significant research experience as well, although we did not ask about research experience specifically.

Finally, "advanced students" were students who had taken introductory, intermediate, core, and advanced physics classes, or who were non-physics STEM seniors. These students have likely developed strong relationships with several faculty in their department, have significant knowledge of the culture of their department, and have a very good understanding of what to expect from the typical course in their department.

This section of the survey was designed in this way because we needed information about how much participants had been involved with their department, but we could not ask specific questions such as "how many years have you been declared as a physics major," "select the classes you have taken in the physics department," or "have you participated in research." The physics department is small enough that the answers to those questions may have allowed individuals to be identified. Since we were planning to ask participants about their personal academic misconduct, we did not want them to feel that their identity could in any way be gleaned from their answers. For the same reason, we did not ask for any demographic information such as race, sex, gender identity, etc.

The surveys then asked a series of questions about why the participant chose their major or minor. These were asked to glean information about a student's "purpose" as they go about the completion of their degree. These questions assessed whether a student was involved in their degree primarily for economic reasons or because they genuinely enjoyed the material they got to learn. STEM degrees, generally, offer students the opportunity to make a high salary after graduation or are direct paths to further education which will achieve the same goal (medical school, graduate school, etc.). They also are degrees which allow students to pursue their passions, like research and teaching.

We were interested in determining, to the extent possible, why the participant had chosen their major because we believe that this affects the department culture and therefore also the student's cheating behaviors. As an example, if a significant proportion of a given department's students chose their major because they believe that it will provide them with a high salary after graduation or is a direct path to further education which will achieve the same goal, these students are more likely to care about their professional relationships with their faculty and their GPA than they are about the process of their learning experience. The department culture, therefore, might be more likely to be formal and competitive, leading to lower rates of collaborative cheating behaviors and higher rates of solo cheating behaviors. Additionally, students might be more willing to report one another for cheating behaviors, because they are concerned with the reputation of their department and want to be seen as respectable and intolerant of unprofessional behavior. Thus, asking about a students reasoning for choosing their major or minor will help us characterize their attitude towards their coursework, which we can correlate with the results of later survey questions.

Next, both surveys ask about how students prepare for exams and the resources they typically use to complete assignments and study. These questions help gauge department culture and identify student's preferred resources. Specifically, this section asks students to identify how often they participate in a set of behaviors when studying. These behaviors include many collaborative behaviors, including forming a study group, studying the notes of another student, and attending office hours. Several of these behaviors also indicate to us how students perceive their peers' study habits. For example, students can select whether they often study more or less than other people taking the same exam, indicating if they feel that they go above and beyond or do less to prepare than their peers. Finally, we wanted to identify what resources physics majors find the most and least helpful, as this knowledge allows faculty in the department to provide more useful study aids in their courses.

The survey for physics students asked several additional questions in an attempt to characterize the "typical" physics class. These were questions asking students to indicate the approximate proportion of their courses which had been conducted according to certain policies, such as allowing the use of a cheat sheet during exams. This section was used to measure student's perceptions of typical physics course policies. Several of these questions were related to exam policies, such as questions about what types of resources were allowed during exams, if exams were take-home or in person, if practice exams or previous years' tests were available, if the professor had a seating chart, and if multiple, similar versions of the same exam were given in different years or within the same year to multiple sections of a course at different times. Several more were related to general course policies, such as the requirement and necessity of textbook reading, the professor's verbal and written statements about the Honor Code, and the support offered by the professor (and Teaching Assistants) in the form of regular office hours.

Next, the surveys investigate perceived peer and faculty attitudes about academic dishonesty by asking all participants to rate how strongly the set of thirteen behaviors are considered academic dishonesty by their peers and how many times in the past year they think their peers have engaged in those behaviors. As explained in section 2.4, a student's perception of their peer's attitudes about academic dishonesty is one of the most influential factors in their own cheating behavior. Thus, we wanted to understand what students believe their peers' attitudes are towards cheating, and how commonplace cheating is among their peers, because this is likely to correlate with their own cheating behavior and is an important aspect of department culture.

The survey for physics students asks several additional, more specific questions about instances of academic dishonesty that students are aware of. This includes asking students to estimate the proportion of people in the physics department who have cheated in the past year, and selecting the types of classes (introductory, intermediate, core, and advanced) in which they have personally witnessed academic dishonesty. Additionally, physics students were asked to provide the type of class and type of cheating for the physics course in which they have personally observed the most cheating, and to estimate the proportion of the class they directly observed cheating, as well as the proportion they thought cheated, even if they did not directly observe the behavior. These questions were asked so the researchers could gain an understanding of physics student's perceptions of cheating in their department; if students believe that everyone else is cheating, they are significantly more likely to cheat themselves[9]. Additionally, we were interested to see if physics students reported that their peers engaged in the same behaviors that they engaged in, or if they believe that their peers engage in significantly different cheating behaviors than they do. Finally, we were interested in trends for which types of courses have the most academic dishonesty that students are aware of, as this is likely to inform how the department chooses to address academic dishonesty in the future and which types of classes need professors to talk in greater detail about their academic integrity policies. Additionally, this information may indicate the department culture. For example, if most cheating occurs in introductory and intermediate classes, but cheating is very rare in core and advanced classes, this may indicate that serious physics students cheat less than students obtaining a minor or taking physics classes to complete requirements in a different degree program, which typically only require introductory physics classes. These students might not take their physics coursework very seriously since it is not part of their primary degree program, and therefore may be more likely to cheat.

Next, all participants were asked to rate their agreement with a set of questions describing how faculty in their department typically deal with cases of academic misconduct. These questions were asked to help determine the nature of student's perceptions of faculty and their course policies. Students are more likely to abide by the Honor Code and course policy when they perceive the faculty and their policies to be fair, so their perceptions of faculty are extremely important[3][10]. Additionally, faculty have a significant amount of power in setting the tone of the course as it relates to academic integrity, and setting the tone of the department as a whole. Their syllabus statements, verbal statements at the beginning of the semester, and reminders during exams and assignments communicate to students the importance of integrity or, alternatively, the professor's lack of care for the Honor Code.

This section also asks students several questions about the department culture, including their perception of the difficulty of their major, whether their peers report each other for Honor Code violations, their peers understanding of the Honor Code, peer opinions about cheating, and why students in their major typically cheat. These questions were asked to provide direct insight into the department culture, including aspects of student opinions about the Honor Code and integrity, the structure and feasibility of their degree program, and the motivations of their peers.

The final section of the surveys asked about the individual participant's attitudes and behaviors regarding academic integrity. Specifically, all participants were asked to rate how strongly they considered the set of thirteen behaviors to be academic dishonesty. This was done so that we could analyze which behaviors students found to be more serious, and which they thought were more trivial. Additionally, we wanted to compare between departments to see if there were any significant differences.

The survey for physics students additionally asked students to indicate how many times in the past year they had engaged in each of these thirteen behaviors. The purpose of this question was to gain an understanding of typical cheating in the physics department, including rates of cheating and type of cheating, and to compare these answers to the previous question about how strongly they considered those behaviors to be cheating. Finally, physics students were asked to indicate how many times they had cheated in the past year as defined by the Honor Code. This is a secondary measure of student cheating, and per the previous literature, we expected that students would indicate a lower proportion of cheating for this question than the results of our question using the thirteen specific behaviors would indicate[3].

3.4 Interviews

In addition to surveys, interviews were conducted with students from the physics department. These interviews allowed a deeper exploration of certain specific questions which could not be obtained from survey responses. Interviews were administered over Zoom with the participant's video off and their name changed to "Anonymous" so that the interviews, to the greatest extent possible, could be anonymous. Additionally, students were not asked any identifying information, nor were they asked about their own personal cheating behaviors. The participant was read a verbal consent form and gave their verbal consent to participate in the interview, and then was asked the interview questions in order. The interviewer typed a paraphrased transcription while the participant answered the questions. The interviewer shared their screen on zoom to show the participant what they were typing at all times, so the participant could identify anything they didn't agree with or ask for a part of their response to be changed or removed. Interviews were sent to physics students using the physics majors and minors email listserv, the university's undergraduate physics club's communications, and was posted by professors in some courses on the course website. Appendix B contains the interview questions. Six interviews were completed with physics students.

First, the interview sought to characterize physics coursework in comparison to other fields, as the students experience it. To do this, the interview asked participants to explain how their physics coursework is different from their non-physics STEM coursework. Additionally, students were asked to explain ways that physics coursework promotes academic integrity or academic dishonesty, and how their physics coursework has affected their problem solving strategies. These questions were asked to develop a deeper understanding of how physics students navigate academic integrity concerns alongside the problem-solving difficulties they encounter in their physics coursework.

Second, the interview sought to investigate how physics majors use academic dishonesty as a problem solving method. To do so, participants were asked about situations where academic dishonesty might benefit a student's learning, and how often physics majors typically pursue those opportunities, as well as the same questions about situations where academic dishonesty hurts a students learning. Additionally, participants were asked about situations that many students would consider to justify academic dishonesty, such as a student enduring personal stress, a student using an unauthorized resource to better their learning, a student who has an extremely unfair professor, and a professor who has an unclear Honor Code policy in their syllabus.

Lastly, the interview was created so that the researchers could better understand the situations that most often prompt physics students to cheat and how physics students approach issues of academic integrity. To do this, the interview asked participants to identify at what point in a story the typical physics major would cheat in a manner that clearly violates the course policy. The story took the participants through many conditions which most physics majors would reasonably encounter at some point during the completion of their degree: being under a time crunch, being surprised by how difficult an assignment is, attending office hours that are unhelpful or in which the professor is rude, being completely unable to answer a question on an assignment from one's own understanding, and experiencing peer pressure to cheat or to stay honest. Finally, participants were asked to identify, when given pairs of circumstances, the situation in which a physics student is more likely to cheat. These circumstances include a coding assignment versus a written problem set, an in-person assignment versus one completed at home, group work versus individual work, an assignment worth very little versus an assignment worth a lot, and an exam for which the student prepared well versus an exam for which they crammed. These questions provided insight into physics students experiences of academic dishonesty and allowed us to probe the rationale for why participants believed that certain methods, justifications, and habits are more common than others.

3.5 Honor Council Data

In an effort to check the data reported by students in their surveys and interviews, we also requested data from the Honor Council. Specifically, we requested, from the last five years, how many Honor Code cases were reported from the physics department, the division of natural sciences, and overall in Emory College of Arts & Sciences, the types of violations reported for those same three divisions, and for cases reported in the physics department, the course level (100, 200, 300, 400) in which the violation occurred. The division of natural sciences included biology, chemistry, environmental science, mathematics, computer science, and neuroscience and behavioral biology based on the Emory College Faculty Bylaws[1]. Since not every instance of cheating is reported to the Honor Council, we expected that the levels of cheating found in these data should be lower than the levels of cheating reported by survey and interview participants.

4 Analysis & Results

4.1 Survey Analysis

Blank responses, responses in which the participant did not consent to participate in the survey, and responses in which the student indicated that they were neither a physics student nor a STEM student were deleted from the final data set. Responses that were partially or fully completed but that had not been submitted by the participant were also not considered. In total, 50 responses were submitted and 37 were included in the final data set. Of those 37 responses, 21 were physics students and 16 were non-physics STEM students. This was a relatively small sample size, especially for STEM students, so we focused on descriptive statistics to analyze the data. Regarding physics students, there were 110 students enrolled in physics degree programs, including physics majors and minors, physics and astronomy majors, astronomy minors, biophysics majors, and engineering sciences majors at the time of this survey, so approximately 19% of physics students were surveyed.

Questions which employed a four-point Likert scale were converted to numerical data with Not important/Never/Not academic dishonesty/None=1, Somewhat/ Sometimes/Trivial academic dishonesty/Several=2, Moderately/Most of the time/ Moderate academic dishonesty/Most=3, and Extremely/Always/Serious academic dishonesty/All=4. Responses marked "Unsure" were deleted so that they did not factor into the data analysis. Questions which employed a five-point Likert scale were converted to numerical data with Strongly disagree=1, Somewhat disagree=2, Neither agree nor disagree=3, Somewhat agree=4, and Strongly agree=5.

4.1.1 Physics: Background Information

Of the 21 physics students surveyed, five were classified as beginner students, three as intermediate students, four as core students, and nine as advanced students. The average physics participant was a core student, or a student who had taken introductory, intermediate, and at least one core or advanced physics class.

We used a four-point Likert scale to measure how important various aspects of a student's degree program were to them. We converted to numerical data with a 4-point scale (not=1, somewhat=2, moderately=3, extremely=4) and then calculated the average score and standard deviation for each question. The results for these questions are summarized in Table 1.

Question	Average	Std Dev
Enjoy & care about classes	3.67	0.48
Aligns with career goals	3.48	0.68
Access to research groups & programs	3.4	0.75
Needed for pre-professional path	3.0	1.03
Will provide economic advantage (high pay, good job)	2.9	0.72
Influence from parents, friends & mentors	1.92	0.28

Table 1: Average score and standard deviation for physics student's responses to questions about how important various factors have been in their decision to major or minor in a physics-related discipline. Questions used a four-point Likert scale and scores have been converted to numerical data with not important=1, somewhat important=2, moderately important=3, extremely important=4

.

These data show that the most important reason that physics students choose to major or minor in a physics discipline is that they enjoy their classes and care about what they are learning. Additionally, students clearly are interested in pursuing careers that require a degree in physics and want access to physics research groups and programs. Clearly the least important reason that physics students choose to major or minor in physics is influence from their parents, friends, or mentors.

4.1.2 Background Information: Comparison

The STEM students who completed the survey included at least one participant from every STEM major offered at Emory except for Human Health (n=0). So, it included students from the mathematics (n=5), computer science (n=1), chemistry (n=5), biology (n=4), quantitative methods (n=4), environmental science (n=3), anthropology (n=1), economics (n=1), and neuroscience and behavioral biology (n=1) departments. Students could select multiple programs if they were enrolled in a joint major or if they had both a major and a minor which were in STEM departments.

Participation spanned nearly every STEM major; however, it was clearly concentrated in the chemistry, mathematics, biology, quantitative methods, and environmental sciences departments. This was expected as these departments are the most similar to physics, and many of the majors in these departments require students to take introductory physics courses, so these students were more likely to have experience in physics and be interested in the project.

Additionally, these students were pretty evenly distributed by class, with four freshmen (beginner students), three sophomores (intermediate students), three juniors (core students), and six seniors (advanced students). The advanced students were from the mathematics, anthropology, quantitative methods, and environmental sciences departments. The core students were from the chemistry, environmental sciences, and biology departments. The intermediate students were from the chemistry and biology departments. The beginner students were from the math, economics, computer science, chemistry, biology, and NBB departments. The average STEM participant was a core student, similar to the physics participants.

With regards to the reasons these students chose their major, we used the same four-point Likert scale and the same questions as with the physics students. The results for these questions for non-physics STEM students are summarized in Table 2.

Question	Average	Std Dev
Access to research groups & programs	3.8	0.6
Aligns with career goals	3.7	0.5
Enjoy & care about classes	3.5	0.6
Needed for pre-professional path	3.5	0.7
Will provide economic advantage (high pay, good job)	3.1	1.0
Influence from parents, friends & mentors	1.9	1.1

Table 2: Average and standard deviation of responses to being asked to rate the importance of various reasons the student chose their major. Questions were originally asked using a four-point Likert scale and then converted to numerical data.

These results are very similar to the results for physics students; STEM students choose their majors and minors because they enjoy their coursework, they aligns with their career goals, and they provide access to resources like research labs and other programs.

4.1.3 Exams and Courses: Physics

Physics students were asked questions that would allow us to characterize the typical physics course and students' expectations for their classes and professors. We used a four-point Likert scale to measure how many of a students' physics courses had employed certain course policies. We converted to numerical data with a four-point scale (none=1, several=2, most=3, all=4) and then calculated the average score and standard deviation for each question. The results are summarized in Table 3.

First, it is somewhat rare that physics professors allow the use of a cheat sheet during exams. Looking at this result more closely, beginner and intermediate students either report that none or all of their classes have allowed a cheat sheet, which makes sense given that these students will only have taken one or two physics courses in their physics career, so they are answering the question with a much smaller sample size. Advanced students, however, consistently responded that several of their physics courses have allowed cheat sheets (Adv M=2.1, SD=0.3). This indicates that cheat sheets are overall uncommon but are allowed in a few select courses. This makes sense, as most physics professors provide their own formula sheet for students during exams.

Participants also reported that it is very rare for a professor to allow them to use their own notes or the course textbook during exams. Specifically, all beginner, intermediate, and core students reported that none of their courses have allowed them to use the textbook or their notes during exams, and only advanced students indicated that this happened in several or most of their classes (Beg, Int, & Cor M=1, SD=0; Adv M=1.8, SD=0.7).

Students consistently agreed that several of their courses assigned essays or lab reports (All M=2.4, SD=0.8), and there were not significant differences between students of different levels. This means that students are not often writing large amounts in their physics classes, but occasionally have a lab report or an essay assigned. This makes sense for physics, which is a largely problem-based discipline, and physics students may be unprepared or lack knowledge about writing and academic integrity concerns, such as plagiarism and proper citation.

Question	Average	Std Dev
Allowed the use of a cheat sheet during exams	1.8	0.8
Allowed the use of the course textbook or other course notes during exams	1.3	0.6
Assigned essays or lab reports as a significant portion of the coursework	2.4	0.8
The professor stated that reading the textbook was required	1.9	0.8
Reading the textbook was necessary to do well in the course	2.8	0.9
A solutions manual existed online for the course textbook, and the professor assigned problems from the textbook for homework	2.3	0.7
Some or all exams were given in a take-home format	1.0	0.2
A practice exam was provided before major exams	2.7	0.9
Previous year's tests are available online, but the professor did not put them there and does not intentionally share them with students	1.1	0.3
During exams, seats were assigned or the professor recorded where every student sat	1.7	0.8
The professor (and/or their TA) offered multiple office hours regularly throughout the week	3.3	0.8
The syllabus contained a clear policy about academic integrity	3.8	0.5
The professor discussed the Honor Code at some point to help explain to students what is appropriate for the class	2.8	1.1
The professor administered the same test to multiple sections of the class at different times	1.5	0.9
The professor used the same or a very similar test as in previous years	1.7	0.9
The professor provided a copy of a past year's exam before major exams	1.8	0.9
The professor closely monitored students while they were taking exams	2.7	0.9
The professor had students orally explain their homework or major assignments, either one-on-one or as a presentation, to ensure they understood what they had submitted	1.5	0.8

Table 3: Physics student's responses to questions about the typical course and professor in the physics department. Questions were originally asked using a four-point Likert scale and then converted to numerical data.

Students across all levels agreed that several of their professors state that reading the textbook is required. Nearly every physics course will involve a textbook of some kind, so it makes sense that students would have a few professors who emphasize this more than others. However, intermediate, core, and advanced students overwhelmingly agree that for most physics courses reading the textbook is necessary to do well in the course (Int, Cor, & Adv M=3.0, SD=0.6). This indicates that students rely on their textbooks for a significant portion of their learning, especially in upper level courses.

There was an interesting split between younger and older physics students when answering the question of how often a professor assigns homework from a textbook that has an answer key that is available to students online. Beginner and intermediate students most often chose "unsure," indicating that they are likely unaware if a solutions manual exists online for their courses. This may mean that they have never intentionally looked for such a resource or have never been offered it by a friend. However, core and advanced students agreed that several to most of their courses assign textbook problems from a textbook that has a solutions manual (Cor & Adv M=2.4, SD=0.7). Students are generally only aware that a solutions manual exists because the professor tells them it does, they search for it themselves, or they have a friend who offers to send it to them to help them out.

Nearly all participants agreed that physics courses do not give take-home exams (All M=1.0, SD=0.2), with only one participant choosing that several of their courses have given take-home exams. This indicates that the vast majority of physics exams are given in person and physics students are likely very familiar with in person exams.

Physics students also overall rated that several to most of their professors provide practice exams before their major exams (All M=2.7, SD=0.9). Additionally, there was a difference between students of different levels; intermediate students indicated that most to all of their professors provide practice exams (Int M=3.7, SD=0.6), but core and advanced students indicated that only several of their professors provide practice exams (Cor & Adv M=2.3, SD=0.5). Thus, providing practice exams may be significantly more common in introductory courses than it is in more advanced courses.

Students of all levels overwhelmingly agreed that it is extremely rare for a physics professor's exam to be found online when the professor didn't publicize it (All M=1.1, SD=0.3). This means that students are not aware of their peers posting exams to websites like Chegg and CourseHero. It is likely that this result is partially due to the fact that the vast majority of physics exams are given in person; students are significantly more likely to upload their exam to a website like Chegg while they are taking it in an attempt to obtain answers, but the in-person format of most physics exams does not allow for this, so students are unlikely to ever put their exams online. This also means that it is unlikely for a student to be able to obtain questions or answers for a physics exam ahead of time by looking up the exam online.

Students also agreed that in several of their physics courses the professor has assigned seats during exams or recorded where each student sat. It seems that there are likely a few professors in the department that use this policy, but that most professors don't assign or record seats.

Students also agreed that in most of their courses their professors and TAs offer multiple office hours regularly throughout the week (All M=3.3, SD=0.8). This belief was the strongest among beginner students (Beg M=3.6, SD=0.9) and weakest among intermediate students (Int M=3, SD=1), showing that introductory physics courses have a great deal of support for students in terms of office hours, but intermediate level classes may shift to having fewer office hour times offered. However, this statement was overall the second most highly agreed with statement, so it is safe to assume that in the vast majority of physics courses students feel that they have ample opportunity to interact with their professor.

The statement that was the most agreed with overall was that physics syllabi contain clear policies about academic integrity (All M=3.8, SD=0.5). Students feel that most to all of their courses contain clear information in the syllabus about academic integrity and how it will apply to the specific course in question. However, students agree much less about whether their professors discuss the Honor Code in class to explain to students what is appropriate for that course (all M=3, SD=1). This disagreement may be because some professors don't discuss it at all, or it may also be because some students might not attend the first lecture of a course for a variety of reasons, and so may miss any discussion that occurs on the first day of class, which is typically when the Honor Code may be mentioned.

Most students indicated that they never have a professor who administers the same test to multiple sections of a course at different times. Doing so provides an opportunity for students to get questions or answers from people who have already taken the exam, so the fact that students perceive that this practice is uncommon indicates that they don't often realize when their friends take the exam at a different time than them.

Students agreed that several of their courses give exams that are the same or very similar to tests given in previous years, but many students across all levels indicated that they were unsure about the answer to this question. Additionally, students responded very similarly to a question asking how many of their professors provided a copy of a past year's exam before major exams, indicating that students are likely mainly aware that their exams are similar to previous year's exams because they have been provided with previous year's exams.

Students indicated that in several to most of their courses, the professor was monitoring students closely during their exams. This indicates that overall students feel that their professors aren't proctoring their exams very closely, but that professors are active during exams.

Finally, students indicated that very few of their professors asked them to orally explain their homework or other major assignments. This indicates that a student could copy a solutions manual on a homework assignment and their professor is unlikely to ever ask them to explain their solution and check that the student understands what they have written.

Next, physics students were asked questions about how they prepare for exams so we could understand the resources students typically use. We used a four-point Likert scale to measure how often students participated in a set of behaviors when preparing for an exam. We converted to numerical data with a four-point scale (never=1, sometimes=2, most of the time=3, always=4). Table 4 shows the results for these questions.

When preparing for an exam, how often do you...	Average	Std Dev
Form a study group with other students	2.2	0.8
Cram last minute	2.3	0.9
Study the notes of another student who is taking the course with you	1.3	0.5
Use copies of tests from previous years to study	2.4	0.9
Study the notes of another student who took the course in a previous semester	1.1	0.4
Study for longer than most other students in the class	2.5	0.9
Study for less time than most other students in the class	1.8	0.8
Feel anxious or nervous during the exam	3.0	0.9
Enjoy taking the exam	2.1	0.4
Attend the office hours of your professor, TA, or LA	2.6	0.8
Use artificial intelligence when studying	1.8	0.7

Table 4: Physics students average and standard deviation in responses to questions about their study habits. Questions were originally asked using a four-point Likert scale and then converted to numerical data.

As can be seen in this table, there are several things that students use very rarely or not at all, notably studying the notes of another student who took the course in a previous semester or who is taking the course concurrently with the student. Artificial intelligence is also never to sometimes used when students are preparing for tests; students focus on other resources like study groups, office hours, and tests from previous years.

An interesting result is that students by and large believe that they study for less time than other students sometimes to never, while they believe that they study for longer than other students sometimes to most of the time. It is possible that the students who took this survey represent a portion of the physics department who do actually work harder than the rest of the students in the department, however, it is more likely that students' perceive that their peers study less than they do falsely. This is especially likely because a student is well aware of all the work they put into their studies, but may not see all the work that their peers put in, so they may be inclined to believe that they work harder than their peers.

Finally, many students reported that they cram last minute and feel anxious or nervous during exams sometimes to most of the time. This indicates that students may frequently sit down to take an exam feeling unprepared and anxious about their performance and that students care about how well they do on their exams. Students reported that they sometimes enjoy taking physics exams with a very low standard deviation compared to the other questions, indicating that students enjoy the challenge of physics, especially when they feel prepared and capable.

We used a four-point Likert scale to measure how important students perceived various resources to be when they studied for exams. We converted to numerical data with a four-point scale (not important=1, somewhat important=2, moderately important=3, extremely important=4). Table 5 shows the results for these questions.

For studying, rate the importance of...	Average	Std Dev
Your notes	3.4	0.7
The textbook	3.2	0.9
Homework assignments	3.6	0.6
Previous years tests	2.7	1.3
Practice exams provided by the instructor	3.7	0.6
Office hours	2.7	1.0
Artificial intelligence	1.5	0.8

Table 5: Physics students average and standard deviation in responses to questions about the resources they typically use to study for major exams. Questions were originally asked using a four-point Likert scale and then converted to numerical data.

Interestingly, physics students rated most available resources as moderately to extremely important to them when studying, with the only resource rated as less than moderately important being artificial intelligence. Practice exams, homework assignments, and their notes were the most important resources to students when they are studying, indicating that students believe that they benefit from attending lectures to take notes and from completing and understanding their homework assignments. Additionally, students rated practice exams provided by their instructor as the most important resource for them when studying for exams, likely because they provide specific information about the format and length of the exam, as well as the type of question and level of difficulty that students can expect. However, as previously discussed, students in upper level courses often are not provided with a practice exam.

4.1.4 Exams and Courses: Comparison

STEM students were also asked questions about how they prepare for exams so we could understand the resources students typically use. We used a four-point Likert scale to measure how often students participated in a set of behaviors when preparing for an exam. We converted to numerical data with a four-point scale (never=1, sometimes=2, most of the time=3, always=4). Table 6 shows the results for these questions.

When preparing for an exam, how often do you...	Average	Std Dev
Form a study group with other students	2.1	0.9
Cram last minute	2.4	0.8
Study the notes of another student who is taking the course with you	1.6	0.7
Use copies of tests from previous years to study	2.6	1.1
Study the notes of another student who took the course in a previous semester	1.3	0.5
Study for longer than most other students in the class	2.1	0.7
Study for less time than most other students in the class	1.8	0.9
Feel anxious or nervous during the exam	3.1	0.9
Enjoy taking the exam	2.1	1.1
Attend the office hours of your professor, TA, or LA	2.8	0.9
Use artificial intelligence when studying	1.9	1.1

Table 6: STEM students average and standard deviation in responses to questions about their study habits. Questions were originally asked using a four-point Likert scale and then converted to numerical data.

Comparing this data to the data from physics participants shows that physics students typically use the same resources for studying as non-physics STEM students, with a few minor differences. First, there were generally higher standard deviations amongst STEM student responses than amongst physics student responses, which was not surprising given that the STEM students will have experienced many different departmental policies and cultures, while physics students are likely to all have a somewhat similar experience.

Additionally, STEM students indicate that they study for longer than other students with a slightly lower frequency than physics students; STEM students report that they sometimes study for longer than other students when preparing for exams, while physics students report that they sometimes to most of the time do this (Physics M=2.5, STEM M=2.1). Additionally, STEM students had a greater variety of responses to the question of how often they enjoy taking exams (Physics SD=0.4, STEM SD=1.1).

We used a four-point Likert scale to measure how important students perceived various resources to be when they studied for exams. We converted to numerical data with a four-point scale (not important=1, somewhat important=2, moderately important=3, extremely important=4). Table 7 shows the results for these questions.

For studying, rate the importance of...	Average	Std Dev
Your notes	3.6	0.6
The textbook	3.0	0.8
Homework assignments	3.6	0.6
Previous years tests	2.7	1.3
Practice exams provided by the instructor	3.8	0.6
Office hours	2.9	1.1
Artificial intelligence	1.8	1.0

Table 7: STEM students average and standard deviation in responses to questions about how they typically prepare for exams. Questions were originally asked using a four-point Likert scale and then converted to numerical data.

The resources used by STEM students were very similar to those used by physics students. The only notable difference was that STEM students reported that artificial intelligence was slightly more important to their studies that physics students reported (STEM M=2, Physics M=1.5).

4.1.5 Department Culture & Policies: Physics

Physics students were asked questions about their perception of the culture of their department as it relates to academic integrity. We used a five-point Likert scale to measure how much students agreed or disagreed with a set of statements. We converted to numerical data with a five-point scale (strongly disagree=1, somewhat disagree=2, neither agree nor disagree=3, somewhat agree=4, strongly agree=5). Table 8 shows the results for these questions.

Rate your agreement with the following statements	Average	Std Dev
1. Different faculty members don't often handle Honor Code violations the same way	3.4	0.8
2. Faculty members do not care about the Honor Code	2.0	1.0
3. Faculty members don't try hard to catch Honor Code violations	3.4	1.1
4. In general, faculty are clear in their syllabi about what they consider cheating	3.8	1.2
5. Physics majors would report their peers if they knew they cheated	1.9	1.1
6. Most physics majors never violate the Honor Code while at Emory	2.5	1.3
7. If physics majors did not cheat, they would fail	1.8	1.1
8. Cheating is necessary to succeed in the physics department	1.9	1.1
9. In general, physics majors strongly disapprove of other students violating the Honor Code	3.3	1.2
10. In general, physics majors have a working knowledge of the Honor Code and how it applies to their coursework	3.8	1.0
11. When physics students cheat, they do it only to obtain a better grade	3.5	1.0
12. When physics students cheat, it is because they care about learning the material	2.6	1.3

Table 8: Physics students average and standard deviation in responses to questions about their perception of their department's policies, their professor's typical behaviors, and other physics students' attitudes about academic integrity. Questions were originally asked using a five-point Likert scale and then converted to numerical data.

These results have very large standard deviations, indicating significantly less agreement among physics students. However, important conclusions can still be drawn from this data. First, students generally have little to say about whether different faculty members handle Honor Code violations the same way. When looking closer at this data, only one participant indicated that they somewhat disagreed with the statement. Ten students answered this question neutrally, saying they didn't feel particularly one way or the other. Seven other students stated that they somewhat agreed with the statement, and one more agreed strongly. Overall, there is a slight agreement with this statement, indicating that physics students believe that faculty are inconsistent with how they handle Honor Code violations.

Additionally, physics students on average disagreed with the statement that faculty members do not care about the Honor Code. For this statement, seven students strongly disagreed, seven somewhat disagreed, three students were neutral, and two students somewhat agreed. Thus, there is clear overall disagreement with the statement, indicating that physics faculty are perceived as caring about the Honor Code. The next statement, that faculty members don't try hard to catch Honor Code violations, was met with an average neutral score; however, the median score for this statement was 4, with nine students indicating that they somewhat agreed with the statement and two indicating that they strongly agreed with it. Thus, students generally perceive that their faculty don't try very hard to catch Honor Code violations but also that faculty don't go out of their way to ignore violations. This gives context to the previous statement, indicating that physics students likely perceive that their professors care about integrity (and as a result, care about the Honor Code), but don't go out of their way to catch violations, so they aren't perceived as extremely punitive and harsh.

Overwhelmingly, physics students believe that their professors are clear in their syllabi about what constitutes cheating. Only three students indicated that they strongly or somewhat disagreed with this statement, while fourteen strongly or somewhat agreed with it. Physics students believe then that they are not lacking in education and understanding of what constitutes academic dishonesty in their courses. Another indicator of this is statement ten, in which most students somewhat agree that they have a working knowledge of the Honor Code and how it applies to their coursework.

Students also agree that physics majors do not report their peers when they know that they have cheated; fifteen students disagreed with statement five, strongly or somewhat. However, they were more evenly split when responding to statement nine, that physics majors disapprove of other students violating the Honor Code. This may indicate that there is some level of disapproval about violating the Honor Code, but this peer pressure is not so strong that students would report their peers if they knew about a cheating incident.

Students overall do not believe that cheating is necessary to pass or succeed in their classes. Statement seven, that if students don't cheat, they will fail, garnered fifteen disagrees, while statement eight, that cheating is necessary to succeed, garnered thirteen. Clearly, students agree that they have the opportunity to both pass their classes and succeed in their endeavors without having to cheat. Additionally, students opinions of those who do cheat in their department were mildly negative, with students on average indicating that they believe that students who cheat do it with the goal of getting ahead and obtaining a better grade.

Finally, there was very little consensus on statement six, that most physics majors never violate the Honor Code while at Emory. This statement had a mean response of neutral, and a median response of somewhat disagree, indicating that on the whole there is mild disagreement with this statement. Thus, physics students seem to be aware that people in their major violate the Honor Code, although they may not be aware of the details of acts of academic dishonesty or very egregious ones.

4.1.6 Department Culture & Policies: Comparison

STEM students were asked questions about their perception of the culture of their department as it relates to academic integrity. We used a five-point Likert scale to measure how much students agreed or disagreed with a set of statements. We converted to numerical data with a five-point scale (strongly disagree=1, somewhat disagree=2, neither agree nor disagree=3, somewhat agree=4, strongly agree=5). Table 9 shows the results for these questions.

STEM students generally strongly agreed with physics students responses to these statements. The main differences in their responses were that STEM students more strongly agreed with statement one, that different faculty members don't often handle Honor Code violations the same way (STEM M=4, Phys M=3.4). Additionally, STEM students disagreed more strongly with statement 12, when students in my major/minor cheat, it is because they care about learning the material.

4.1.7 Peer Attitudes & Behaviors: Physics

Physics students were asked questions about their perception of their peer's attitudes about academic dishonesty. We used a four-point Likert scale to measure how strongly students thought their peers believed the set of thirteen behaviors were academic dishonesty. We converted to numerical data with a four-point scale (not academic dishonesty=1, trivial academic dishonesty=2, moderate academic dishonesty=3, serious academic dishonesty=4). Table 10 shows the results for these questions.

First, there are several behaviors that physics students believe their peers agree are serious academic dishonesty: using unpermitted notes during an exam, using a device with internet capabilities during exam when it isn't allowed, and copying from another student on an exam. Note that these are all behaviors that occur when students are taking an in-person exam, not when they are completing a homework assignment on their own outside of class or completing research. Thus, students believe that their peers take exams

Rate your agreement with the following statements	Average	Std Dev
1. Different faculty members don't often handle Honor Code violations the same way	3.8	1.3
2. Faculty members do not care about the Honor Code	1.7	0.9
3. Faculty members don't try hard to catch Honor Code violations	2.6	1.3
4. In general, faculty are clear in their syllabi about what they consider cheating	3.7	1.1
5. My peers in my STEM major/minor would report their peers if they knew they cheated	2.4	1.2
6. Most of my peers in my STEM major/minor never violate the Honor Code while at Emory	3.1	1.2
7. If my peers in my STEM major/minor did not cheat, they would fail	2.0	1.3
8. Cheating is necessary to succeed in the department of my STEM major/minor	1.8	1.1
9. In general, my peers in my STEM major/minor strongly disapprove of other students violating the Honor Code	3.2	1.0
10. In general, my peers in my STEM major/minor have a working knowledge of the Honor Code and how it applies to their coursework	3.6	1.2
11. When students in my STEM major/minor cheat, they do it only to obtain a better grade	3.6	1.4
12. When students in my STEM major/minor cheat, it is because they care about learning the material	2.4	1.3

Table 9: STEM students average and standard deviation in responses to questions about their perception of their department's policies, their professors' behaviors, and their peers' opinions about academic integrity. Questions were originally asked using a four-point Likert scale and then converted to numerical data.

seriously and feel strongly that compromising the integrity of an exam is serious academic dishonesty. Interestingly, using unpermitted notes garnered complete agreement; every physics student who filled out the survey selected that they believe their peers think that this is serious academic dishonesty. This is generally a premeditated cheating behavior that gives students a strong advantage on exams, which are worth a significant portion of the grade in a class and are high-stress, as physics students previously indicated that they are stressed and anxious during exams most of the time. Thus, it makes sense that students' peers would consider this out of all the behaviors listed serious academic dishonesty, and would generally consider cheating that occurs during an exam to be the most serious.

Next, behaviors that physics students believe their peers think are moderate academic dishonesty include getting exam questions or answers ahead of time, turning in an as-

Behavior	Average	Std Dev
1. Getting exam questions or answers ahead of time from someone who has already taken the same exam.	3.5	0.8
2. Copying from another student on a test or exam, with or without the student's knowledge.	3.8	0.5
3. Working on the same homework with multiple students when the teacher does not allow it.	2.3	0.7
4. Turning in an assignment done entirely or in part by another student.	3.4	0.6
5. Turning in an assignment copied, entirely or in part, directly from another student's work.	3.4	0.6
6. Using unpermitted notes during an exam.	4.0	0.0
7. Looking up and copying answers to homework questions from a solutions manual or other online resource when the professor does not allow it.	2.5	0.8
8. Looking up and copying answers to homework questions from a solutions manual or other online resource when the professor does not have an explicit policy about doing so.	1.9	0.8
9. Using a device with internet capabilities during an exam when the teacher does not allow it.	3.9	0.2
10. Fabricating or tweaking data in a research project.	3.1	0.9
11. Lying to a professor to gain more time for a homework assignment or to have an exam moved.	2.8	0.8
12. Using AI to write code or solve a homework problem when the professor does not allow it.	2.8	0.8
13. Entering course materials (notes, lecture materials, homework questions, practice exam questions, etc.) into an AI chatbot or LLM.	1.7	0.9

Table 10: Physics students average and standard deviation in responses to questions about their perception of their peers beliefs about the set of thirteen academic dishonesty behaviors. Questions were originally asked using a four-point Likert scale and then converted to numerical data.

signment done by another student or copied from another student's work, fabricating or tweaking data in a research project, lying to a professor to gain more time or have an exam moved, and using artificial intelligence when it isn't allowed. These behaviors are almost all premeditated and intentional, but occur outside the exam environment, even if they have to do with exams.

Next, behaviors that physics students believe their peers think are trivial academic dishonesty include working on a homework assignment with multiple people when it isn't allowed, copying answers from an internet resource whether or not the professor explicitly disallows it, and entering course materials into an artificial intelligence chatbot. These are all behaviors which occur outside of the classroom and are most likely to occur when students are completing homework assignments. Additionally, the difference in peer approval of behaviors seven and eight is striking; it indicates that students believe that their peers care about and understand their professors' policies. It is also striking that physics students believe that their peers consider behavior eight, which results in a student submitting work that isn't their own, as only trivial academic dishonesty. Though it is difficult to catch and is generally not collaborative, it is surprising that an action that provides such a clear unfair advantage is believed to be treated as trivial by students' peers.

Collaborative cheating behaviors on this list include behaviors one, two, three, four, and five. Most of these behaviors were rated as moderate to serious academic dishonesty, indicating that physics students believe that their peers know that collaborative cheating is serious. This means that students expect their peers to know that giving someone else answers to an exam or homework problem is wrong, although it says little about how willing students are to help each other out in ways like these. Behavior three is one which students argue in their interviews (spoiler!) immensely benefits their learning, so the belief that peers see this as trivial academic dishonesty may indicate that students believe that their peers are willing to break the rules if it will help them learn.

Behaviors four, five, seven, eight, and twelve are ones which intentionally skirt the learning process which occurs during the completion of homework by providing short cuts and easy methods for avoiding the struggle of learning physics. Physics students seem to believe that their peers make a distinction between taking another person's work and taking solutions off of the internet or from an artificial intelligence program.

Finally, behaviors twelve and thirteen use a relatively new resource, artificial intelligence programs, to help a student solve a problem or study. Students believe that behavior twelve is seen by peers as moderate cheating, but behavior thirteen only as trivial cheating. Thus, students believe that their peers are unaware of the intellectual property issues present in behavior thirteen, or are unaware of them themselves. Additionally, students believe that their peers don't see artificial intelligence as posing significant academic integrity concerns.

4.1.8 Peer Attitudes & Behaviors: Comparison

STEM students were asked questions about their perception of their peer's attitudes about academic dishonesty. We used a four-point Likert scale to measure how strongly students thought their peers believed the set of thirteen behaviors were academic dishonesty. We converted to numerical data with a four-point scale (not academic dishonesty=1, trivial academic dishonesty=2, moderate academic dishonesty=3, serious academic dishonesty=4). Table 11 shows the results for these questions.

Behavior	Average	Std Dev
1. Getting exam questions or answers ahead of time from someone who has already taken the same exam.	3.4	0.7
2. Copying from another student on a test or exam, with or without the student's knowledge.	3.8	0.4
3. Working on the same homework with multiple students when the teacher does not allow it.	2.5	1.1
4. Turning in an assignment done entirely or in part by another student.	3.1	0.9
5. Turning in an assignment copied, entirely or in part, directly from another student's work.	3.1	0.9
6. Using unpermitted notes during an exam.	3.6	0.6
7. Looking up and copying answers to homework questions from a solutions manual or other online resource when the professor does not allow it.	2.6	1.0
8. Looking up and copying answers to homework questions from a solutions manual or other online resource when the professor does not have an explicit policy about doing so.	2.3	1.1
9. Using a device with internet capabilities during an exam when the teacher does not allow it.	3.8	0.4
10. Fabricating or tweaking data in a research project.	2.9	1.0
11. Lying to a professor to gain more time for a homework assignment or to have an exam moved.	2.8	1.0
12. Using AI to write code or solve a homework problem when the professor does not allow it.	2.6	0.9
13. Entering course materials (notes, lecture materials, homework questions, practice exam questions, etc.) into an AI chatbot or LLM.	2.1	1.2

Table 11: STEM students average and standard deviation in responses to questions about their perception of their peers' opinions about the set of thirteen academic dishonesty behaviors. Questions were originally asked using a four-point Likert scale and then converted to numerical data.

Similar to the results for physics students, STEM students believe that their peers consider copying from another student on a test or exam, using unpermitted notes during an exam, and using a device with internet capabilities during an exam to be serious academic dishonesty. However, STEM students rated that their peers would be more disapproving of copying off of someone or using an electronic device than using unpermitted notes.

Next, STEM students believe their peers think that getting exam questions or answers ahead of time, working on a homework with others, turning in an assignment done by or copied from another student, copying answers from a solutions manual, fabricating data in a research project, lying to a professor to gain more time, and using artificial intelligence on homework were all forms of moderate cheating. This is a little different from physics students' answers, in that STEM students believed that their peers consider working on homework with peers when it isn't allowed to be moderate academic dishonesty, but physics students thought that their peers felt that this behavior was trivial academic dishonesty.

Next, behaviors that STEM students believe their peers think are trivial academic dishonesty include copying answers from a solutions manual when there is not an explicit policy outlawing it, and entering course materials into an artificial intelligence chatbot.

Again, behaviors that peers are thought to believe are moderate or serious academic dishonesty tend to be those that occur while exams are being taken, whereas behaviors that peers are thought to believe are more trivial typically involve homework assignments and obtaining assistance or answers from a "non-human" source.

STEM majors believe their peers see all collaborative cheating behaviors as moderate to serious academic dishonesty, but felt that their peers were slightly more tolerating of these behaviors on the whole, indicating that they may be less hesitant to ask a peer to engage in collaborative cheating than a physics student.

Peer behaviors

4.1.9 Personal Attitudes: Physics

Physics students were asked questions about their attitudes about academic dishonesty. We used a four-point Likert scale to measure how strongly students believed the set of thirteen behaviors were academic dishonesty. We converted to numerical data with a four-point scale (not academic dishonesty=1, trivial academic dishonesty=2, moderate academic dishonesty=3, serious academic dishonesty=4). Table 12 shows the results for these questions.

Physics students beliefs were similar to their perception of their peers beliefs, with a few key differences. First, physics students felt that a greater number of behaviors were serious academic dishonesty, adding getting exam questions or answers ahead of time and turning in an assignment done by another student or copied from another student to the list. However, they still rated exam-based cheating behaviors as overall more serious than

Behavior	Average	Std Dev
1. Getting exam questions or answers ahead of time from someone who has already taken the same exam.	3.6	0.7
2. Copying from another student on a test or exam, with or without the student's knowledge.	3.9	0.5
3. Working on the same homework with multiple students when the teacher does not allow it.	2.5	0.8
4. Turning in an assignment done entirely or in part by another student.	3.7	0.6
5. Turning in an assignment copied, entirely or in part, directly from another student's work.	3.3	0.6
6. Using unpermitted notes during an exam.	3.9	0.2
7. Looking up and copying answers to homework questions from a solutions manual or other online resource when the professor does not allow it.	2.9	0.7
8. Looking up and copying answers to homework questions from a solutions manual or other online resource when the professor does not have an explicit policy about doing so.	2.4	0.8
9. Using a device with internet capabilities during an exam when the teacher does not allow it.	3.8	0.5
10. Fabricating or tweaking data in a research project.	3.2	0.9
11. Lying to a professor to gain more time for a homework assignment or to have an exam moved.	2.9	0.8
12. Using AI to write code or solve a homework problem when the professor does not allow it.	3.1	0.8
13. Entering course materials (notes, lecture materials, homework questions, practice exam questions, etc.) into an AI chatbot or LLM.	2.0	1.0

Table 12: Physics students average and standard deviation in responses to questions about their beliefs about the seriousness of the set of thirteen academic dishonesty behaviors. Questions were originally asked using a four-point Likert scale and then converted to numerical data.

cheating that occurs outside of the classroom. Physics students considered most of these behaviors to be more serious cheating than they thought their peers did, indicating that physics students may believe that their peers don't have as strong of morals as they do. However, it is also possible that students were worried about confidentiality concerns when completing the survey, and it they were more comfortable with indicating that their peers believe these actions are less serious than they were with indicating that they themselves believe these actions are less serious.

Another interesting difference was that there was a significantly smaller difference between physics students answers about behaviors seven and eight. Physics students themselves don't seem to distinguish very strongly between copying answers when it is explicitly not allowed and when there is no policy about it, but they believe that this affects their peers' opinions.

Behaviors four and five also provided an interesting difference in that physics students thought that their peers considered these behaviors to be the same in terms of their severity but themselves felt that they were different, rating behavior four as more severe than behavior five. This may indicate that physics students are more comfortable with sharing their work than with doing work for one another or paying someone for their work. Additionally, copying someone else's work does require that a student actually fully write out the answers on their own, whereas submitting work done by someone else does not.

Finally, we calculated the average rating on all questions by beginner, intermediate, core and advanced students. Beginner students rated all behaviors on average as a 3.6, indicating that they believe most of these behaviors are moderate to serious academic dishonesty. Intermediate and advanced students rated all behaviors on average a 3.0, indicating that they believe most of these behaviors are moderate academic dishonesty. Core students rated all behaviors on average a 3.2, indicating that they believe most of these behaviors are moderate academic dishonesty. This indicates that beginner students on average see all thirteen forms of academic dishonesty as more serious than do intermediate, core, and advanced students.

4.1.10 Personal Attitudes: Comparison

STEM students generally agreed well with physics students when indicating their own opinions about the set of thirteen behaviors. The main differences in STEM students responses were that STEM students felt that behaviors three (STEM M=2.9, Physics M=2.5) and five (STEM M=3.6, Physics M=3.3) were slightly more serious on average than physics students did; however, these differences were very small. Table 13 reports the results from these questions.

4.1.11 Incidents of Cheating: Physics

Next, physics students were asked to select the types of courses in which they have observed a peer being academically dishonest at least once. Twelve students reported observing dishonesty in introductory courses, nine reported observing dishonesty in intermediate courses, eight reported dishonesty in core courses, and only four reported dishonesty in advanced courses. An impressive amount of dishonesty was reported in introductory and

Behavior	Average	Std Dev
1. Getting exam questions or answers ahead of time from someone who has already taken the same exam.	3.6	0.7
2. Copying from another student on a test or exam, with or without the student's knowledge.	3.9	0.5
3. Working on the same homework with multiple students when the teacher does not allow it.	2.9	0.8
4. Turning in an assignment done entirely or in part by another student.	3.7	0.5
5. Turning in an assignment copied, entirely or in part, directly from another student's work.	3.6	0.5
6. Using unpermitted notes during an exam.	3.9	0.4
7. Looking up and copying answers to homework questions from a solutions manual or other online resource when the professor does not allow it.	3.1	0.8
8. Looking up and copying answers to homework questions from a solutions manual or other online resource when the professor does not have an explicit policy about doing so.	2.3	1.1
9. Using a device with internet capabilities during an exam when the teacher does not allow it.	3.7	0.6
10. Fabricating or tweaking data in a research project.	3.4	0.7
11. Lying to a professor to gain more time for a homework assignment or to have an exam moved.	2.9	1.0
12. Using AI to write code or solve a homework problem when the professor does not allow it.	3.1	0.8
13. Entering course materials (notes, lecture materials, homework questions, practice exam questions, etc.) into an AI chatbot or LLM.	2.1	1.0

Table 13: STEM students average and standard deviation in responses to questions about their beliefs about the severity of the set of thirteen academic dishonesty behaviors. Questions were originally asked using a four-point Likert scale and then converted to numerical data.

intermediate courses, especially given that such a large proportion of our sample was core and advanced students, who would have taken their introductory and intermediate courses at least one to two years prior. Even these students can still remember a significant number of instances of academic dishonesty in these courses.

Next, students were asked to consider the single course in which they were aware of the greatest amount of academic dishonesty. Nine students reported that this was an introductory course, three reported it was an intermediate course, four reported that it was a core course, and no students reported that it was an advanced course. The types of academic dishonesty reported ranged greatly, and Table 14 shows the number of reports for each of the thirteen types. Note that behaviors four and five were accidentally combined in this question, so they received the same number of reports.

Behavior	Count
1. Getting exam questions or answers ahead of time from someone who has already taken the same exam.	3
2. Copying from another student on a test or exam, with or without the student's knowledge.	1
3. Working on the same homework with multiple students when the teacher does not allow it.	9
4. Turning in an assignment done entirely or in part by another student.	8
5. Turning in an assignment copied, entirely or in part, directly from another student's work.	8
6. Using unpermitted notes during an exam.	2
7. Looking up and copying answers to homework questions from a solutions manual or other online resource when the professor does not allow it.	10
8. Looking up and copying answers to homework questions from a solutions manual or other online resource when the professor does not have an explicit policy about doing so.	9
9. Using a device with internet capabilities during an exam when the teacher does not allow it.	4
10. Fabricating or tweaking data in a research project.	5
11. Lying to a professor to gain more time for a homework assignment or to have an exam moved.	4
12. Using AI to write code or solve a homework problem when the professor does not allow it.	7
13. Entering course materials (notes, lecture materials, homework questions, practice exam questions, etc.) into an AI chatbot or LLM.	6

Table 14: Physics students reported, considering the course in which they had personally observed the most academic dishonesty, what types of academic dishonesty they most often observed. Students could select multiple types of academic dishonesty, so the total count is greater than the number of physics students who participated in the survey.

First, the most heavily reported behavior was behavior seven. Curiously, this was reported more than behavior eight, even though physics students reported that they see behavior eight as less severe academic dishonesty in previous survey questions. In addition, behaviors three, four, and five were the most frequently reported. This aligns with what was suggested in the previous survey questions, as these are behaviors which physics students believe that their peers think are trivial to moderate academic dishonesty. All of these behaviors occur outside of the classroom and most of them involve collaboration with peers. It makes sense that students would be the most familiar with their peers cheating behaviors which are collaborative, because these are the behaviors which they are most likely to see and participate in.

Next, several behaviors were reported by fewer participants: behaviors nine, ten, eleven, twelve, and thirteen. These are individual cheating behaviors, so it makes sense that they would be reported less because students might not be as aware of their occurrence. This may be especially true for question eleven, which is generally something that occurs only between a professor and the student in question. Additionally, except for behavior nine, these are all behaviors which occur outside of the classroom, which again supports the theme in the rest of the interview questions that physics students are more comfortable with academic dishonesty that occurs outside of the classroom. The fact that behavior nine was reported by four students indicates that when a student uses a phone or electronic device in an exam, other students are often aware of its use, which compromises their confidence in the integrity of their exam.

Finally: several behaviors were reported very rarely: behaviors one, two, and six. These are all behaviors which have to do with exams, and two out of three of them occur during exams. This again supports the idea that exam-related cheating behaviors are less common than cheating behaviors that occur outside of the classroom.

We also asked students to report the proportion of the class who they saw participate and the proportion of the class they believe participated in the cheating behaviors that they reported. Students reported actually seeing anywhere from 0-50% of their classmates engage in academic dishonesty, with an average of 12% of the students classmates being observed cheating. Students reported believing that anywhere from 5-100% of their classmates were engaging in academic dishonesty, with students believing that an average of 35% of their classmates were likely cheating. Given that this question was asked about the course with the greatest amount of cheating that each participant has encountered, these estimates are either somewhat low or physics students cheat less than most, as previous literature has found rates of cheating as high as 70-80%[11].

Next, we asked students to estimate how frequently their peers had engaged in the thirteen behaviors in their physics class in the past year. Table 15 reports the resulting data.

Two behaviors were estimated to occur with a median frequency of never, behaviors six and nine. These are both exam-related cheating behaviors which physics students consistently rated as being moderate to severe academic dishonesty, so it makes sense that they do not believe that their peers would participate in these behaviors frequently.

Behavior: Times this year:	0	1-2	3-5	5-10	>10	Median
1. Getting exam questions or answers ahead of time from someone who has already taken the same exam.	6	7	3	3	0	1-2 times
2. Copying from another student on a test or exam, with or without the student's knowledge.	7	7	2	1	2	1-2 times
3. Working on the same homework with multiple students when the teacher does not allow it.	1	3	4	3	8	5-10 times
4. Turning in an assignment done entirely or in part by another student.	9	1	5	3	1	1-2 times
5. Turning in an assignment copied, entirely or in part, directly from another student's work.	5	3	6	3	2	3-5 times
6. Using unpermitted notes during an exam.	11	6	2	0	0	Never
7. Looking up and copying answers to homework questions from a solutions manual or other online resource when the professor does not allow it.	1	2	5	4	7	5-10 times
8. Looking up and copying answers to homework questions from a solutions manual or other online resource when the professor does not have an explicit policy about doing so.	2	1	1	3	12	>10 times
9. Using a device with internet capabilities during an exam when the teacher does not allow it.	10	7	2	0	0	Never
10. Fabricating or tweaking data in a research project.	5	9	4	0	1	1-2 times
11. Lying to a professor to gain more time for a homework assignment or to have an exam moved.	4	6	3	6	0	1-2 times
12. Using AI to write code or solve a homework problem when the professor does not allow it.	3	3	3	2	8	5-10 times
13. Entering course materials (notes, lecture materials, homework questions, practice exam questions, etc.) into an AI chatbot or LLM.	1	2	3	4	9	5-10 times

Table 15: Physics students estimates of how frequently their peers engaged in each of the thirteen academic dishonesty behaviors in the past. Both the number of estimates of each frequency and the median estimate for each question is represented.

Next, many behaviors were estimated to occur with a median frequency of 1-2 times or 3-5 times, namely behaviors one, two, four, five, ten, and eleven. These behaviors are a mixture of exam-related cheating, homework cheating, and lab-related cheating and, except for behavior two, were all rated as moderate to severe cheating, both when physics students were asked their own opinions and their perceptions of their peers opinions.

Finally, several behaviors were estimated to occur with a median frequency of 5-10 times or more than 10 times, namely behaviors three, seven, eight, twelve, and thirteen. These behaviors all were rated as trivial to moderate cheating and involve collaboration with peers, use of outside resources, or artificial intelligence. Interestingly, there is a difference in the median between questions seven and eight, indicating that physics students believe that the presence of a clear policy about copying answers on homework not only affects their peers opinions of these behaviors as shown in Table 10, but also their actions, as they estimate copying answers to be more frequent among their peers when there is not a policy about it.

Physics students were also asked to identify what percentage of their peers had cheated in their physics coursework in the past year. Their estimates ranged from 1% to 100%, with an average value of 37%. This is, again, low compared to other literature. Additionally, this was a right-skewed distribution, as shown in Figure 1. Either physics students are unaware of the extent of their peers' cheating behaviors or physics students at Emory cheat less than most students.

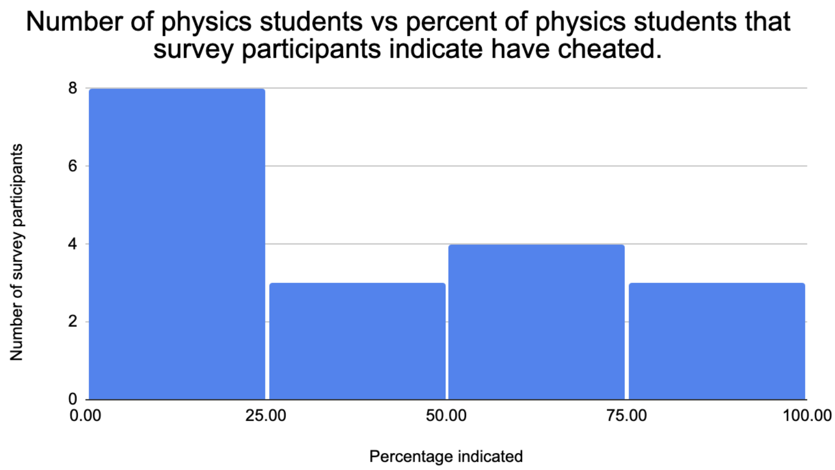

Figure 1: A histogram showing the number of physics survey participants who indicated that a certain percentage of their peers had cheated in the past year.

Next, we asked physics students to report how frequently they had engaged in each of the thirteen behaviors in the past year. Table 16 shows the number of responses in each frequency category for each behavior.

Behavior: Times this year:	0	1-2	3-5	5-10	>10	Median
1. Getting exam questions or answers ahead of time from someone who has already taken the same exam.	16	3	0	0	0	Never
2. Copying from another student on a test or exam, with or without the student's knowledge.	19	0	0	0	0	Never
3. Working on the same homework with multiple students when the teacher does not allow it.	11	2	4	1	1	Never
4. Turning in an assignment done entirely or in part by another student.	16	2	0	1	0	Never
5. Turning in an assignment copied, entirely or in part, directly from another student's work.	13	4	0	2	0	Never
6. Using unpermitted notes during an exam.	18	1	0	0	0	Never
7. Looking up and copying answers to homework questions from a solutions manual or other online resource when the professor does not allow it.	8	8	1	0	2	1-2 times
8. Looking up and copying answers to homework questions from a solutions manual or other online resource when the professor does not have an explicit policy about doing so.	6	5	3	3	2	1-2 times
9. Using a device with internet capabilities during an exam when the teacher does not allow it.	19	0	0	0	0	Never
10. Fabricating or tweaking data in a research project.	17	2	0	0	0	Never
11. Lying to a professor to gain more time for a homework assignment or to have an exam moved.	17	2	0	0	0	Never
12. Using AI to write code or solve a homework problem when the professor does not allow it.	9	6	4	0	0	1-2 times
13. Entering course materials (notes, lecture materials, homework questions, practice exam questions, etc.) into an AI chatbot or LLM.	8	1	6	3	1	3-5 times

Table 16: Physics students reports of how frequently they engaged in each of the thirteen academic dishonesty behaviors in the past. Both the number of estimates of each frequency and the median estimate for each question is represented.

These data agreed with the data about physics students' personal attitudes about these behaviors as well as the data about their perception of their peers' opinions about these behaviors. Specifically, the behaviors which participants rated as the most serious academic dishonesty, behaviors two, six, and nine, were behaviors that were very rare; only one student admitted to using unpermitted notes during an exam one to two times in the past year, and no other student admitted to any of these three behaviors.

Next, there were several behaviors that physics students only reported doing never or once or twice, namely behaviors one, four, ten, and eleven. This again agrees with data about students' opinions about these behaviors and students' beliefs about their peers opinions of these behaviors, as all of these behaviors were rated as moderate to serious academic dishonesty.

There were several behaviors which were reported as occurring with a median of 1-2 times per year, namely behaviors seven, eight, and twelve. These are all behaviors that occur when a student is completing homework outside of the classroom, so they follow the previous pattern of cheating being the most accepted and practiced on homework or other assignments that occur without the professor present.

It is curious that behavior thirteen, entering course materials into an artificial intelligence chatbot or LLM, had the highest median frequency of 3-5 times per year, as students reported that they do not frequently use artificial intelligence when studying or doing homework. However, going back to Table 12, we can see that physics students rated behavior thirteen as not academic dishonesty or trivial academic dishonesty more than any other behavior. Thus, it may be that students are simply more comfortable reporting this behavior on a survey and so were honest about the frequency with which they engage in this behavior, but weren't honest about the other behaviors.

Finally, we found for each student how many times they reported engaging in a behavior never, once or twice, three to five times, five to ten times, and more than ten times. Looking at this data, eight students reported that they engaged in any of these behaviors very few times or never in the past year, four students reported that they engaged in these behaviors more than a few but less than ten times total in the past year, and eight students, about 38% of physics participants, reported that they engaged in these behaviors more than ten times in the past year, classifying them as active cheaters. This aligns well with physics students reports about their peers cheating, which also generated estimates around 40%.

Additionally, we asked physics students to report how many times in the past year they had cheated, plagiarized, or otherwise been academically dishonest as defined by the Honor Code on any assignment or research int eh physics department in the past year. Nine students selected that they had never been academically dishonest, seven that they had once or twice, one that they had three to five times, and two that they had more than ten times. The median response was once or twice. This means that only two physics students who participated in our survey classified themselves as active cheaters, and all others cheat only occasionally, likely when they become very busy or stressed. This was a significantly lower proportion than our previous estimates from other data that students reported, meaning that even if students can remember participating in behaviors that we define as academically dishonest, they may not consider themselves to be cheating, and particularly don't consider themselves to be active cheaters.

4.1.12 Incidents of Cheating: Comparison

Finally, we asked STEM students to estimate how frequently in the past year their peers had engaged in the set of thirteen behaviors. These data are reported in Table 17.

Clearly, STEM students' opinions were not cohesive; however, we were able to calculate the median frequency for each behavior, which gives some better information about students' estimates. The rightmost column provides the median number of times that STEM students estimate that their peers participated in each of the thirteen behaviors in the past year. Some behaviors are estimated to be very frequent, namely behaviors three, seven, eight, twelve, and thirteen. These are all behaviors that occur when a student is completing homework problems, indicating that cheating on homework is perceived in many STEM disciplines to be very common. Additionally, two of these behaviors are related to the use of artificial intelligence, indicating that STEM students are very familiar with artificial intelligence tools and use them frequently to help with their assignments.

Several other behaviors occurred with a slightly lower median frequency of 3-5 times in the past year, including behaviors two, four, five, ten, and eleven. These are a mix of behaviors, some of which occur on exams, and some of which involve assignments or lab work. Finally, a few behaviors were estimated to occur with a median frequency of 1-2 times in the past year, including behaviors one, six, and nine. Similar to previous data, these behaviors all involve cheating on exams, either by copying from someone else nearby, using an electronic device, or bringing an unauthorized cheat sheet.

Behavior: Times last year:	0	1-2	3-5	5-10	>10	Median
1. Getting exam questions or answers ahead of time from someone who has already taken the same exam.	3	4	1	4	1	1-2 times
2. Copying from another student on a test or exam, with or without the student's knowledge.	5	1	3	2	2	3-5 times
3. Working on the same homework with multiple students when the teacher does not allow it.	1	4	0	3	6	5-10 times
4. Turning in an assignment done entirely or in part by another student.	5	1	2	2	3	3-5 times
5. Turning in an assignment copied, entirely or in part, directly from another student's work.	1	4	3	1	4	3-5 times
6. Using unpermitted notes during an exam.	5	3	2	2	1	1-2 times
7. Looking up and copying answers to homework questions from a solutions manual or other online resource when the professor does not allow it.	1	4	1	3	5	5-10 times
8. Looking up and copying answers to homework questions from a solutions manual or other online resource when the professor does not have an explicit policy about doing so.	0	5	0	3	6	5-10 times
9. Using a device with internet capabilities during an exam when the teacher does not allow it.	4	5	0	3	0	1-2 times
10. Fabricating or tweaking data in a research project.	4	2	3	2	1	3-5 times
11. Lying to a professor to gain more time for a homework assignment or to have an exam moved.	3	2	3	2	2	3-5 times
12. Using AI to write code or solve a homework problem when the professor does not allow it.	1	2	3	3	5	5-10 times
13. Entering course materials (notes, lecture materials, homework questions, practice exam questions, etc.) into an AI chatbot or LLM.	0	3	1	4	6	5-10 times

Table 17: STEM students estimates of how frequently their peers engaged in each of the thirteen academic dishonesty behaviors in the past. Both the number of estimates of each frequency and the median estimate for each question is represented.

From these data, we can conclude that students believe that some types of cheating are more common than others. Specifically, most cheating occurs outside of the classroom or at least not during major exams. Finally, STEM students estimate that the average peer of theirs participates in a significant amount of academic dishonesty every year; their estimates classify their peers as active cheaters.

4.2 Honor Council Data

Data was provided to us from the Honor Council about student cheating in physics and STEM courses to provide temporal data and further context to the survey data. Specifically, we obtained data from the last five years (2019-2024) detailing the number of reports in non-physics STEM courses and physics courses, the number of these cases which resulted in verdicts of not responsible versus responsible, the charges that were applied to these cases, and for physics courses, the course level (100, 200, 300, 400) in which each case was reported. It is important to note that these are only cases which were reported, and do not represent every instance of academic dishonesty in the physics department in the past five years. Additionally, professors are typically the reporting party in most cases, as students indicated in their surveys that most physics students are not willing to report their peers. Thus, the academic dishonesty identified by professors will be biased towards in-class activities like exams, where professors are better able to identify instances of academic dishonesty.

Physics cases made up 5.8% of cases reported in all STEM courses and 4.3% of all reported cases in the College of Arts & Sciences, for a total of 34 cases reported in physics in the past five years. Additionally, 88.2% of reported students in physics courses were found responsible for the alleged violation, compared with 79.3% of reported students in all STEM courses. 86.8% of cases reported in physics were reported for cheating. The most common cheating charge, making up 84.2% of all cases reported in physics was "Cheating: seeking, using, giving, or obtaining unauthorized assistance or information in any academic assignment or examination" [2]. The other cheating charge, which was applied to 2.6% of all cases reported in physics was "Cheating: violating the electronic device policy as described in the Honor Code" [2]. Breaking these violations down by assignment, 76.3% of cases pertained to cheating on a test, while only 7.9% of cases pertained to cheating on an assignment. Next, plagiarism charges were applied in 10.5% of physics cases, with the specific charge being "plagiarizing, whether intentionally or unintentionally, in any assignment." One additional case (2.6% of total cases reported) was reported with a charge for violating community standards, specifically "any action or inaction offensive to integrity." Finally, of the physics cases reported, 82.4% of them were reported in a 100-level course, 5.9% were reported in a 200-level course, 8.8% were reported in a 300-level course, and 2.9% were not affiliated with a particular course.

This data matches well with our survey data on several points. First, the majority of cases were reported in introductory courses, which is exactly what physics students themselves reported when they were asked about incidents of cheating of which they are aware. In these courses, there is a greater opportunity for academic dishonesty because of the greater level of anonymity which comes the larger class size as well as because the assignments tend to be taken from a standard introductory textbook for which solutions can be found online. Additionally, many students take these courses who aren't physics majors and aren't particularly motivated to care about learning the material. These students may be more motivated to cheat when the course becomes difficult because they care less about the material.

Next, the Honor Council data indicates that 76.3% of cases involved cheating on an exam, while only 7.9% of cases involved cheating on an assignment. While this may initially seem contradictory to the reports we received in our surveys from physics students, several things must be considered. First, professors are more likely to catch cheating on exams than on assignments that occur outside of the course, so they are more likely to report exam-based cheating. Next, research tells us that students are more likely to cheat in scenarios where they believe they will not be caught, and they are clearly caught significantly less when cheating outside of the class, so it makes sense that they report cheating significantly more on assignments that take place outside of the class[3].

4.3 Interview Analysis

Interviews were conducted with physics students, including physics majors, physics minors, physics and astronomy majors, biophysics majors, engineering sciences majors, and astronomy minors. Students were not explicitly asked about their major or minor, but several students self-reported that they were physics majors, and several students self-reported that they were a physics minor and had a primary major in a different STEM department. Thus, this analysis assumes that the students who completed the interviews are able to comment on their experiences both in physics and in other STEM courses and that they are able to compare their experiences between the different disciplines.

The first three questions were designed to collect information about the typical physics assignment as it is experienced by students. The first question asked students to explain the key aspects of the questions asked in physics courses. Several themes emerged in students' responses: the creativity of physics problems, importance of conceptual understanding, and the emphasis on showing work when solving a problem. Several participants pointed to how creative physics problems are; they often provide a clear setup but then require extrapolation from lecture materials and can't all be solved the same way. Additionally, nearly every participant pointed to the fact that success in physics requires more than just understanding lecture notes, as the problems given in problem sets and on exams often require a deeper knowledge and understanding of the concepts than what can be taught in lecture. One student stated that their conceptual understanding benefits significantly from understanding the history of physics, and another that merely memorizing the textbook or even just doing practice problems was not enough to garner the deeper understanding necessary to be successful. Finally, nearly every participant emphasized that physics problems almost always ask you to show your work and offer significant partial credit for showing work, even when it is incorrect, because professors prioritize conceptual understanding over a numerically correct answer.

The second question asked participants to explain the key aspects of the answers that they provide in their physics courses. Across the board, participants reported that physics courses always require work to be shown, as students demonstrate their knowledge through the work it takes to get to a solution rather than by just providing an answer. Additionally, this work is typically in the form of math equations and drawings, not writing out detailed arguments or hypotheses.

The third question asked students to explain the most important aspects of how they study in physics classes. Many participants explained that collaboration is extremely important to them when studying for physics courses. Specifically, having a dialogue with their peers about a concept can help them understand it in a way that wasn't taught in the textbook or lecture, which can be highly valuable. Additionally, participants also stated that reading the textbook is important for their physics courses, as the textbook is often designed to help with conceptual understanding, not just solving the problems. Across the board, participants emphasized that for physics they focused on obtaining a robust conceptual understanding of the material rather than on doing practice problems.

Next, questions four and five asked about how physics impacts student's decisions about academic integrity. Questions four and five asked participants to identify ways that physics coursework promotes or discourages academic integrity. Several students explained that it is logistically very difficult to cheat in physics; exams aren't often reused from year to year, professors often write their own problems instead of using ones that are in a textbook with an answer key, and physics problems can be difficult to google and find online. Additionally, nearly every participant argued in some way that physics builds and is extremely difficult, so cheating on homework assignments will only result in a poor exam grade, as it is extremely difficult to catch up once you have fallen behind. Additionally, many students pointed to the fact that partial credit in physics encourages students to write down what they know, even if it isn't entirely correct, rather than copying an answer from some other source. Finally, a few students identified that, in general, physics students care about learning physics and are proud and excited when they finally do achieve understanding, so it is completely counterintuitive to cheat because it prevents those moments of joy.

On the flip side, there are many aspects of physics courses that encourage academic dishonesty. One of the most common themes among participants' responses was that in laboratory courses, especially introductory ones, students are often instructed to complete an experiment that is designed to calculate a well-known constant, such as the gravitational constant. Because students know what they are looking for, it is easy and tempting to edit data to achieve a value closer to the actual value. Additionally, some lab classes might be graded based on how close a student's result is to the actual value, which adds even more temptation. The main other aspect of physics classes that participants identified as encouraging academic dishonesty is the difficulty of physics and its propensity to intimidate students. Combined with student's high grade goals, many students may feel hopeless to achieve understanding and be motivated to cheat because of this.

Questions six and seven asked students about problem solving strategies and skills they have developed from their physics courses. By far the most commonly identified skill or problem solving strategy was collaboration with others. Participants consistently identified that physics has taught them the value of collaboration and the benefit of asking someone else for their perspective or process. Additionally, endurance, intuition, and visualization were several specific skills that participants commonly stated that they had gained because of their involvement in physics. Additionally, participants consistently stated that their development of these skills in their physics courses had significantly benefited them in their other STEM classes and that they used these skills frequently outside of physics. Finally, reworking problems was also a common study method used by many participants, especially reworking homework problems and doing the same problem with multiple different methods.

The eighth question asked students to describe a scenario in which academic dishonesty benefits a physics student's learning. In answering this question, most participants focused on Honor Code violations in which the student is not following a policy but is doing so with the specific intention of gaining understanding. For example, collaborating, accessing answer keys, or using artificial intelligence when these resources are not allowed, but with the specific intention of understanding the material. Participants emphasized that the important part here is a student's purpose in seeking out unauthorized assistance, and that academic dishonesty only benefits a student's learning when it is done to obtain a better understanding, not to obtain a better grade or to meet a deadline.

Similarly, the ninth question asked students to describe a scenario in which academic dishonesty hurts a physics student's learning. Every response pointed to academic dishonesty on homework problems and participants all indicated that this kind of academic dishonesty seriously hurts students when it comes time for their exams because by participating in this type of academic dishonesty, they do not learn the material in depth. Specific examples of methods of academic dishonesty included copying answers from an answer key, googling to find answers, copying a friend's answers, and using artificial intelligence to get an answer and then copying it.

Questions ten and eleven asked participants about the frequency with which physics students engage in academic dishonesty that benefits and hurts their learning, respectively. Participants agreed that physics students care about learning the material, especially in higher-level courses where a greater percentage of students are physics majors. Thus, most participants estimated that physics students participate more often in academic dishonesty that helps their learning than in academic dishonesty that hurts their learning. However, few participants felt that either behavior was extremely common, with most estimates ranging between one or two people being academically dishonest per assignment and 20-30% of the course being academically dishonest per assignment. Several participants also identified that some professors aren't clear in their syllabi about what constitutes academic dishonesty or don't emphasize that they care about it, so students may rarely stop to consider if their behaviors are within the allowed boundaries of the course.

Question twelve asked students to respond to different conditions in a story and indicate whether or not they believe the typical physics student would cheat based on what was happening in the story. The first condition was that the assignment was relatively small, only worth 5% of the student's overall grade. Participants agreed that only a few students would be academically dishonest in this scenario, specifically students who didn't care as much about their coursework or who were just inclined to cheat, but the vast majority of physics students would complete the assignment with care. The second condition was that the assignment was worth much more, 25% of the student's overall grade. Participants were split about this condition, but most responded that more students would cheat on this than a smaller assignment since the grade pressure was higher. However, many participants suggested that physics students wouldn't just go straight to copying from an answer key, but would attempt the problems themselves and only after getting stuck or not understanding something would they then reach for an unauthorized resource.

The next condition, that the assignment is short and they have a week to work on it, prompted agreement. Most participants answered that the typical physics student would not cheat on an assignment like this, as they would start it early and get it done without much fuss. Participants did acknowledge that there are some people who will cheat no matter what, so they estimated that a very small percentage of people would cheat on an assignment like this. The next condition was that the student waited until two nights before the assignment was due to start working on it. This condition garnered a significantly more mixed response, with some participants stating that the student would still make significant efforts to do the problem on their own or ask for an extension, and some stating that at that point a greater proportion of physics students would start to panic and might cheat.

The next condition introduced the first indication of struggle, stating that the assignment is significantly more time consuming or challenging than expected. At this point, participants indicated that significantly more students would choose to cheat, as they would become overwhelmed and frustrated, and lose their motivation to complete the assignment honestly. The next condition, that the student is struggling to understand the concepts required to complete the assignment, had significantly more disagreement among participants. Many stated that the student would try to go to office hours or seek other resources or an extension to improve their learning rather than just resorting to cheating, but that if the student could not gain understanding in time they would resort to cheating.

The next several conditions addressed office hours that a student might attend to help address their lack of understanding. First, the student attends the TA's office hours and receives a general direction but no specific help or instruction. Many participants pointed out that the kind of student who goes to office hours is not the kind of student who cheats, so if a student attends office hours they are very unlikely to then go and copy the answers, even if they don't get an exact answer from the TA. If the student then went to the professor's office hours and again received a general direction but no specific help or instruction the participants did not believe that they would be any more inclined to cheat than with the previous condition. Participants stated that they often found their instructor's explanations in office hours to be very beneficial to their understanding, even if the professor does not directly explain the solution to the problem, so they stated that the typical physic student would then go and try to rework the problem with their improved understanding and get the answer on their own. The next condition, that the professor is unwilling to help the student in office hours and is demeaning, prompted significantly more participants to say that the student might cheat. Some participants stated that if the professor clearly doesn't care about the material or the student's learning, then the student will not be motivated to put effort into their work. However, the estimate proportion of students who would cheat still remained low, with several participants saying that this would not affect physics students who care about their learning.

The next three conditions addressed what a student would do if they are completely unable to answer various portions of an assignment. The first condition stated that the student was completely unable to answer one small question on the assignment. Several participants stated that most physics students would reach for resources that are considered less acceptable but which wouldn't constitute cheating, like an upperclassmen, google, or artificial intelligence. Several participants stated that students might just allow it to be wrong since it doesn't count for much of their grade. A few participants stated that since it is such a small question, students might not feel like it is serious cheating to look up the answer for it, so they might be more comfortable with cheating in that case. The next condition stated that the student is unable to answer multiple parts of one major question. This condition brought up concerns about multi-part questions, and many participants stated that the typical physics student might be worried if they weren't able to complete the first part of a multi-part question because then they would not be able to complete the rest of the question and would lose more points than they should. So, they stated that the student might look up the answers to the parts that they couldn't do and still try to do the rest themselves so that they can get credit for the parts of the problem that they understand. One participant stated that the majority of students would reach out to the professor because the lack of understanding on such a large portion of the assignment demonstrates that the student is missing a large concept that they will need to understand for the exam and other concepts in the class that build. The next condition, that the student is unable to complete multiple major questions on the assignment prompted most participants to indicate that the student would reach out for help from their professor or peers, but wouldn't feel comfortable cheating on such a large part of a major assignment.

The next two conditions addressed peer pressure and group assignments. The first condition was that the assignment was a group assignment, and the student's partner is a peer who is on the Honor Council. This would represent someone who does not engage in academic dishonesty and who might be more likely to report a peer for academic dishonesty if they caught them. All participants agreed that doing work with a peer who is on the Honor Council would make the typical physics student less likely to cheat, although one participant mentioned that they did not believe it would affect the student's behavior when they weren't with the Honor Council peer. The next condition, that the student's partner is a peer who frequently cheats on exams, represented working with someone who frequently cheats and wouldn't judge their peer for taking a shortcut. Several students expressed that the typical physics student would likely be alarmed at being paired on a group project with someone like that, as they would be concerned that the part of the project that the other person completed would be copied from an answer key or taken from an artificial intelligence program without their knowledge. One participant stated that if they felt that their partner had used a resource that wasn't allowed, they would call them out and encourage them to do the work themselves, offering help if needed. Several others stated that being paired with such a peer might make it easier to cheat, especially if their partner is vocal about how much easier it is to cheat and how little they are likely to get caught.

The next condition was that the professor explained in detail what would constitute an Honor Code violation and the student knows that copying an answer key would be cheating. Many participants felt that a professor explaining that they care about academic integrity and take the Honor Code seriously would make the typical physics student less likely to cheat, but several felt that it would only make them less likely to cheat in class but wouldn't affect their actions when they are doing out-of-class assignments. All participants agreed that students who are bent towards cheating will still cheat, even if the professor cares about integrity, because they feel that they will not get caught.

The last condition was that a friend who took the class last year explains that everyone always cheats on the assignment, essentially normalizing cheating and telling the student to give up on doing it on their own. The vast majority of participants felt that this would make it very likely for the typical physics student to give up and cheat on the assignment, although several offered other options. One participant suggested that if everyone always cheats, the professor may not realize that the assignment is impossible, so it would be important to communicate this and ask if the assignment could be changed or the class could have an extension.

Question thirteen provided participants with a series of scenarios and they were asked to identify which scenarios justified academic dishonesty. The only scenario in which participants agreed that the academic dishonesty was justified was one in which the student was looking at an answer key with the goal of learning the material, not to get a better grade. Many participants qualified their agreement, one by saying that it is only justified if the student looks at the key after they have submitted the homework, and several others by saying that it is only justified if the student only does so occasionally or when they have truly exhausted all other resources.

All participants agreed that it is not justifiable for a student to cheat just because they are busy; all students are busy at some point and learning time management skills is part of the purpose of college. Additionally, participants agreed that the professor's behavior does not justify academic dishonesty on the part of the student. If a professor is rude, unkind, or assigns a ridiculous amount of work, students are still responsible for following course policies and completing their work with integrity.

There were several scenarios that the participants didn't agree on as well. First, participants were mixed when deciding whether cheating was justified for a student who had recently gone through a serious hardship, like the death of a close friend or family member. Several participants felt that academic dishonesty in that case is justified, since the student shouldn't be expected to complete their work in such a situation. However, many participants pointed to the vast number of resources that are available to students. The student could request an extension, take an incomplete in the course, or even just reach out to the professor and explain the situation. Second, participants disagreed about a scenario in which a student is unsure about the meaning of the syllabus and use a resource that isn't allowed but which they thought was allowed. Many participants felt that if this was a true misunderstanding, it wasn't the fault of the student; the professor should have been more clear with their expectations. However, others pointed out that it is extremely easy for a student to ask for clarification, and that a student should never assume an outside resource is allowed or abuse the vagueness of a syllabus to take a short cut.

Question fourteen asked participants to choose the situation in which they felt that a physics student is more likely to violate the Honor Code. Participants indicated that students would be more likely to cheat on a coding assignment than a written problem set, more likely to cheat on a homework assignment than an in-person test, more likely to cheat on an individual assignment than a group project, and more likely to cheat on an exam the student felt unprepared for than an exam they studied well for. Participants cited reasons like the ease of cheating without being caught, the availability of resources, and the student's attitude about the assignment or exam. Finally, participants disagreed about whether a student would be more likely to cheat on an assignment worth 1% or an assignment worth 25% of the course grade. Some participants stated that students feel grade pressure and want to do well on larger assignments, so they would be more likely to cheat, while others stated that the smaller assignment might seem less important or significant and so students might take it less seriously and be more inclined to cheat on it.

5 Discussion

5.1 Research Question 1

The first research question, "What is the current state of the integrity culture of the physics department?" was answered primarily in the survey data. We found that there was a stark contrast in every method of measurement we employed between assignments that students completed in the classroom, such as exams, and assignments that students complete on their own time outside of the classroom.

First, there is significantly more security and less opportunity for cheating in the classroom. In the physics department, exams are mostly given in person with well-defined guidelines about the resources available for use during the exam (usually only a formula sheet provided by the instructor, occasionally a cheat sheet or course textbook). Additionally, past years exams generally cannot be found illicitly online and exams aren't reused from year to year, so it is difficult for a student to obtain unauthorized assistance before the exam takes place. Exams are not regularly administered to multiple sections of a class at different times, so students have a limited ability to get exam questions or answers ahead of time from their peers. Practice exams, past years exams, and office hours are generally provided before the exam by the instructor, so students have a wealth of resources they can use to prepare. Students also take cheating on exams very seriously, rating all three cheating behaviors which occur during an exam as serious academic dishonesty. Finally, in their reports of their own behaviors, their reports of their peers actual behaviors, and their reports of the typical physics student's behaviors, they indicated the lowest levels of cheating occurred on exams.

However, the data from the Honor Council indicates that cheating does still occur during exams, and it is the most heavily reported reported form of cheating. This inconsistency between students' reports and the Honor Council data likely exists for several reasons. First, professors have an easy time catching cheating on exams and are likely to report it when they do catch it because it is generally considered to be a more serious form of cheating. Comparatively, cheating on homework assignments is often more difficult to detect and many professors consider it to be a much less severe form of cheating, so they might look the other way or allow the student to redo the assignment without penalty. Finally, physics students indicating that in general, physics students do not report one another for Honor Code violations, so the vast majority of reporting in physics courses will come from professors. All these factors mean that the cases reported in physics classes are more likely to pertain to exams or other assignments that students complete in the classroom, regardless of whether cheating in the classroom is actually more common than cheating outside of the classroom. In short, the data from the Honor Council indicates to a greater extent what is reported than the full extent of the cheating that actually takes place.

Assignments completed at home, which mostly include homework and lab reports, have little security and a large amount of opportunity for cheating. Solutions manuals often exist for course textbooks and professors assign textbook problems frequently. If a solutions manual is not available, it is very likely that there still exist substantial resources online, including materials that are specific to the textbook questions students are assigned. For example, there are series of YouTube videos explaining the answers to nearly every textbook question for several of the most common physics textbooks used in upper-level physics courses. Another resource is artificial intelligence, which can be very effective, if prompted well, at explaining and solving undergraduate-level physics problems. In addition to having more opportunity for cheating, physics students also consider most cheating behaviors that occur on homework assignments to be trivial to moderate cheating, indicating that there is more acceptance among students of the behaviors themselves and the individuals who participate in them. They estimate that their peers participate in these behaviors somewhat frequently and homework-related cheating behaviors were the only behaviors in which physics students themselves reported a non-never median participation. All this to say, cheating was more socially acceptable to students and more commonly reported on assignments that students complete outside of the classroom, and there are significantly more opportunities for cheating on these types of assignments.

Based on interview responses, physics students care about their learning and understand that they benefit from struggling through a problem. The interviews highlighted situations in which most physics students might have a propensity to cheat, namely when they are particularly stressed or there is strong deadline pressure. Additionally, interviews emphasized that students value collaboration for helping them to understand and master concepts, but demonstrated in surveys that collaborative cheating is common and relatively difficult to catch. Thus, students may not always understand the line between collaboration and cheating, and frustrations with not understanding material or student's desire to "help out" their peers may lead to academic dishonesty.

Academic dishonesty was concentrated in introductory courses, and this was demonstrated in both the survey data and the data from the Honor Council. Physics students of all years reported observing academic dishonesty in their introductory courses more so than in their upper-level classes. When students were asked to consider the single course in which they had observed the most academic dishonesty, 75% of students responded that this was a beginner or intermediate course. Data from the Honor Council indicates that 88.3% of reported cases in the past five years were in beginner or intermediate courses. Part of the reason for this is likely that introductory and intermediate courses have higher enrollments, so there are likely to be a greater number of students who cheat in those courses compared to the smaller core and advanced classes. In addition, those courses are required for students with majors that aren't related to physics, like mathematics, applied mathematics, and quantitative sciences. These individuals may be less motivated by a love of physics to pursue learning the material honestly, especially when their semesters get busy.

Finally, there is indication in students' survey and interview responses that though physics students disapprove of cheating on exams, they do not strongly disapprove of cheating on homework assignments, engage in occasional collaborative cheating behaviors, and rarely if ever report each other to their professors or the Honor Council. The academic integrity culture is likely one which focuses on learning but allows students to justify their cheating and receive little to no condemnation from peers as long as their ultimate goal is learning and they only cheat because they are extremely busy or completely unable to understand the material.

Therefore, physics students generally care about their work and take care to do it within the accepted boundaries set forth by the Honor Code and their professors. However, when stress arises, physics students will be academically dishonest, typically in ways that they don't believe are serious cheating, on assignments which offer a greater temptation to cheat through more easily available resources and a lower likelihood of getting caught. Based on this conclusion, future interventions in the physics department should focus on maintaining the security of exams and increasing the security of assignments completed outside of the classroom, so that students are forced to go through the learning process honestly or fail honestly, both of which provide valuable feedback to the instructor and learning opportunities to the student.

5.2 Research Question 2

Research Question 2, "How do physics students navigate academic integrity concerns on physics assignments?" was answered primarily through the interviews as well as by a few questions in the survey for physics students. We found that overwhelmingly physics students care about the material they are learning and the learning process; they are not looking to cheat. The most important reason physics students choose physics is because they enjoy it and care about it, with many students also hoping to pursue a career in a physics-related discipline. Additionally, many interview participants emphasized in their responses that they believe that physics students care about their work and know that doing their assignments with integrity benefits their learning.

We also found that physics students overwhelmingly believe that they have the resources to succeed in their physics classes without cheating. Survey data showed that physics students do not think that cheating is necessary to pass classes or succeed as a physics student. Furthermore, interview responses to question 12, in which students were asked when in a serious of unfortunate events the typical physics student would cheat often described the many resources that are available to students, like office hours, and emphasized that physics students rely heavily on those resources first.

The typical physics problem requires conceptual understanding, visualization, math skills, and intuition. It provides a clear setup and then asks students to extrapolate from their lectures and demonstrate a deeper conceptual understanding. Additionally, physics problems nearly always require students to show work, because the process of getting to the answer is where students are actually able to demonstrate their conceptual understanding. Professors care significantly less about a correct final answer than about the correct process for solving a problem, because it is the process that is the difficult part; many questions only ask for variable answers and don't include numerical values so that students will understand that the priority is the process. Additionally, many students commented that physics has helped them to understand math at a significantly deeper level; physics professors typically emphasize a conceptual understanding of what it means for an equation to relate two quantities, and this helps students connect math and variables to the real world.

With regard to problem solving and studying, physics students emphasized in their interviews that collaboration is one of their greatest study tools, as it allows them to hear other perspectives and methods for approaching a problem. They consistently stated that they ask peers for help when they are stuck and provided collaboration as an example of a situation in which academic dishonesty might actually help a student's understanding of the material. This is a great tool for physics students to be practicing in their undergraduate education as collaboration of some kind is essential in nearly all lines of work that graduates pursue. However, collaboration also provides an opportunity for academic dishonesty, particularly because the line between collaboration and cheating can often be very fine. Students reported that collaborating on assignments when it isn't allowed and turning in an assignment done, entirely or in part, by another student or one copied, entirely or in part, directly from another student's work were among the most common academic dishonesty behaviors in the department.

Finally, physics students care deeply about their learning and enjoy the process of learning. This was made clear during the interviews; the only situation in which physics students consistently felt that academic dishonesty was justified was when a student uses unauthorized assistance with the goal of learning and not to benefit their grade. In particular, physics students felt that this was more justifiable than a student cheating because of a significant life event or an unclear syllabus, which are typically considered much more common and acceptable reasons to cheat. Additionally, they were very comfortable with the struggle of physics and consistently explained that struggling to solve a problem and learning not to give up has been incredibly beneficial for them.

When it comes to navigating academic integrity concerns on physics assignments, physics students clearly care about learning the material and are not easily swayed to cheat. They understand that putting in the work is required to succeed, and they have no qualms with doing so. They feel that they reap great benefits from working hard in their physics classes and struggling through learning and that they can succeed without having to cheat. Academic dishonesty is typically a last resort except for a select few who have a propensity for it. When students feel the pressure of a deadline or get stuck, academic dishonesty is one of the many methods they use to get an answer. Some go back and try to understand the question or assignment later, but many will cheat and leave it at that.

5.3 Research Question 3

Research Question 3, "How does academic integrity in physics compare with other STEM departments?" was answered both in the surveys and the interviews. Physics and other STEM fields at Emory are closely related, and survey responses were very similar for physics students and non-physics STEM students, with a few notable differences. STEM students classified their peers as more active cheaters than physics students did, but reported similar levels of academic dishonesty in other measures. STEM students also reported greater agreement with the idea that faculty don't often handle Honor Code violations the same way, and disagreed more strongly with the statement that their peers cheat because they care about learning the material. STEM students also reported using artificial intelligence slightly more often than physics students, both when asked about their studying and when asked to report the frequency with which their peers use artificial intelligence in a manner that violates the Honor Code.

In interviews, many differences were identified between physics and other STEM disciplines. It is important to note that these differences were reported by physics students, so they are perceived differences that physics students encounter between their physics courses and their other STEM courses. However, they may not be real, substantial differences, as physics students are likely to have more experience with physics courses than with other STEM courses, particularly they are likely to have experience with upper-level physics courses, but only with lower-level STEM courses. Several survey participants self-reported that they were physics minors and had a STEM major other than physics, so this effect is likely fairly minimal, but is important to keep in mind when interpreting these results.

Physics students emphasized that physics problems are more creative and require visualization, which is not usually necessary for other STEM courses. Additionally, they identified that physics coursework requires a deep intuition and conceptual understanding that was not always required or asked of them in their other STEM classes. As examples of this, they pointed to the emphasis in physics on showing your work and the ability to achieve partial credit, even for incorrect answers. They also stated that they were required to write fewer words in physics than in other STEM disciplines; physics problems focus on providing a proper setup and then executing the math correctly.

When asked about study methods and resources, physics students agreed that collaboration is much more important in their physics courses than in other STEM courses; they often need the input of a peer to fully understand a concept in multiple ways. Additionally, students stated that their conceptual understanding was their priority in physics, whereas practice problems and repetition were more helpful in other STEM classes.

In many ways, physics and other STEM disciplines share the same academic integrity concerns and trends: more cheating occurs outside the classroom and students view such academic dishonesty as less severe, students use similar resources to study, and wouldn't report their peers for a violation. However, physics students perceive differences between the problems that they tackle in their physics classes and their non-physics STEM classes, and these differences affect how they approach academic integrity in their physics coursework.

5.4 Recommendations to the Physics Department & Faculty

With these results in mind, we offer suggestions to the physics department at Emory to improve the academic integrity of their students and better their learning ability. Ultimately, students who are honest and participate in the struggle of learning physics will learn the relevant physics better and will also develop into more tenacious, curious physicists.

Recommendations for exams:

1. Continue primarily evaluating students using in-person exams.

   The surveys revealed that most physics exams are given in-person, which provides significantly less opportunity for cheating than take-home exams. Because exams occur in person, students are not able to upload their exams to homework help websites like Chegg or CourseHero, preventing previous years' tests from becoming available online along with their solutions. Indeed, physics students reported that physics exams for their classes are never available online or they reported that they did not know, meaning that they had never tried to look. This is excellent, because it cuts off a source of cheating that is very common in other disciplines which have more take-home exams. If a professor provides students with a take-home exam, they should expect that students will be using their notes and the course textbook at the very least and should make these resources fair game; disallowing them only punishes the honest students who will complete the test without them.

2. Continue to create new exams each year.

   Most students reported that their professors never or several times administered the same or a very similar test as in previous years. When a professor reuses old exams, they provide a way for students to gain an advantage. Getting a previous year's test can be very easy, especially if professors hand tests back to students after they are graded; a student could ask an upperclassmen for their test from when they took the course or might be able to find the exam online. Thus, it is good that this is very uncommon; as difficult as it is to come up with an entirely new exam year after year, it is very beneficial for limiting cheating behaviors and providing a fair exam environment to students.

3. Allow students to complete test corrections for credit.

   Allowing students to complete test corrections is an effective instructional method that benefits student learning and decreases cheating behaviors. If students are able to receive partial credit back on an exam for correcting problems that they missed, they are incentivized to reflect on their gaps in learning, solidify their understanding, and prioritize their learning over their grades. Additionally, the knowledge that partial credit can be obtained for missed questions takes away some of the panic that students feel during an exam when they reach a question they don't know how to do. Physics students indicated in the surveys that most of the time they feel anxious or nervous during exams. This policy will help to reduce that anxiety, which will in turn reduce cheating. Instructors may consider treating test corrections as an extra credit opportunity or requiring them, and they should replace a small assignment, such as a weekly homework or reflection, instead of being added on to the student's workload in addition to all of their regular assignments. Additionally, the solutions for the exam should not be released until after test corrections are due so that students are not able to copy the answers.

4. Proctor exams actively and record where students sit or assign seats to students.

   Students will cheat less when there is a greater likelihood of getting caught. Nearly every physics student will face the temptation at some point in an exam to copy off of a neighbor or use their phone because physics exams are challenging. Having active proctoring, where the professor and TA are regularly walking around the room and monitoring students' progress, makes the idea of cheating during a test much more risky and will deter many students. The purpose of examinations is to give the students and professor feedback about the student's learning, so if a student is artificially inflating their score through cheating, they are robbing themselves of the opportunity to learn the material better and are robbing the professor of the valuable feedback they gain from seeing where students do poorly on an exam. It ultimately benefits students learning for their exam scores to be honest, so having policies that promote this is important. If a student seems fidgety or seems to be looking at their neighbor's test or an electronic device, it can be very beneficial to have a record of where students sat or have a seating chart so that the exams of their neighbors can be checked for similarities. When students know that their professors use these methods and tools to catch cheating, they are much less likely to fall to the temptation.

Recommendations pertaining to homework assignments:

1. Have a clear policy in the syllabus about allowed resources.

   Having clear policies that explain what constitutes academic dishonesty in a course benefits both professors and students. Physics students indicated in their survey responses that a clear policy increases their perception of the severity of the violation and makes them much less likely to engage in academic dishonesty. A thorough policy should include information about the resources that students are allowed to use on homework assignments and those that are forbidden (i.e. class notes, integral tables, the textbook, the internet, solutions manuals, solutions videos on

YouTube, and artificial intelligence). Additionally, expectations about citations should be made clear so that students understand the extent to which they are expected to divulge the resources that they use. Finally, the policy should also include information about allowed resources during exams. If a cheat sheet or the course textbook is allowed, this should be in the syllabus. If exams will be given in a take-home format, the syllabus should be clear about this and explain the resources that are allowed on these exams. A large proportion of students in academic integrity research state that they were unaware that their actions constituted cheating or plagiarism (whether students truly did not understand the policies or they were just using this as an excuse to be punished less severely remains unclear)[8]. This policy will help prevent students from committing accidental plagiarism or accidentally using resources that aren't allowed and will reduce students' ability to claim this excuse if they are reported.

2. Collaborate between courses to have similar or the same policies about allowed resources on homework.

   Students agree that most faculty are very clear in their syllabus about what constitutes academic dishonesty; however, each course is currently different with different expectations and boundaries. Creating a cohesive policy that is the same in every physics course will give students the impression of consistency and will limit their perception that certain faculty are more lenient or harsh, or that different professors handle violations in different manners. It will also help to inform and educate them about the academic integrity concerns that they need to understand as budding physicists. There are, of course, some courses that will have unique integrity concerns, such as courses that involve coding or a significant number of lab reports. These courses should also have clear policies about allowed resources and expectations for citation and should, to the extent that it makes sense, align with other courses on these policies.

3. Assign homework once weekly.

   Because deadline pressure is one of the driving factors of physics students' cheating, it is prudent, within reason, to make an effort to avoid placing undue deadline pressure on students. One of the methods to avoid this is to assign homework once weekly instead of multiple times each week. Research shows that the majority of honest physics students start their homework assignments several days before they are due and work on them progressively throughout the week[13]. Students are often taking other difficult classes and have other commitments. When homework is assigned weekly, students have a greater ability to work it into their schedules so that they are able to complete it on time. Professors should encourage this behavior but also allow students to make mistakes with managing their time and learn better habits.

4. Where possible, create policies that force students to demonstrate their learning.

   Students report the most cheating and the most cavalier attitudes about cheating on homework; however, homework is vital for learning. Thus, policies that will in some way force students to take their homework seriously by demonstrating their knowledge of their own answers will help students avoid cheating. Specifically, having students meet individually with the professor once every week or two weeks to explain their answers to a random question or questions on the most recent homework assignment is an excellent method for achieving this. It is generally very easy to tell if a student has used ChatGPT or another artificial intelligence program or a solutions manual when you ask them to explain their reasoning in person. Additionally, this is an opportunity for the instructor to give real-time feedback on a student's thought process and reasoning. Finally, it can make grading less of a hassle for professors, as students can be evaluated during the conversation, and provides more immediate feedback to the student, who gets a grade and correction in person. This is obviously not very feasible for large classes, but in smaller courses it could be very beneficial.

   Another possible method to achieve this goal would be to have students take turns explaining the answer to one of the homework problems in class. This is beneficial to the students, as teaching something is one of the best ways to learn it, as well as to the class, who might have been confused about the problem or benefit from seeing someone else's reasoning. Additionally, it checks the presenter's understanding of the question and forces them to spend time understanding the question.

5. Avoid assigning only textbook problems.

   Most textbooks used in physics courses provide a wealth of practice problems; however, they are also at least several years old and have a solutions manual or another source of solutions available online. Thus, assigning textbook problems gives students an opportunity to engage in academic dishonesty by copying solutions, which is not ideal. One method for limiting this is to assign some homework problems which the professor comes up with for which no key exists. Instructors do not need to invent every homework problem and can mix original problems with textbook problems. This ensures that at the bare minimum, students are being forced to solve some problems on their own. Additionally, provided the original problems are approximately the same level of difficulty as the textbook problems, the instructor can compare students scores between the two to gain an idea of where there might be cheating taking place.

Recommendations for other course policies:

1. Provide clear information about the difference between collaboration and cheating.

   Physics students emphasized that they value collaboration: it helps them see the material from a new perspective, identify gaps in their learning, and gives them the opportunity to test their knowledge by teaching a peer. However, the surveys found that collaborative cheating behaviors are common, and students may not always understand the line between collaborative learning and collaborative cheating. Providing clear examples of the differences between these behaviors, including clear guidelines about behaviors such as sharing homework answers, will help students go into these situations with clear heads about what will benefit their learning and what is giving them an unfair advantage.

2. Have clear and forgiving late work policies.

   While it is important to hold students accountable to a deadline and curate their time-management skills, the interviews revealed that the main instigating factor in a physics student's cheating is time pressure. Physics students care about their assignments and their learning, so they generally put a significant amount of effort into understanding the course material and completing their assignments with integrity. Time pressure is one of the main factors that can throw this off and instigate a student to cheat on a homework assignment. As a professor, you cannot control how many other classes students are taking or how they manage their time. However, having clear and forgiving late work policies will help students to plan well, additionally, physics students demonstrated in the surveys that they care about their professors' policies. This looks like allowing students a certain number of 1-day or 2-day extensions per semester or taking a small percentage off of their total grade on the assignment for each day the assignment is late. Allowing students to drop their lowest homework grade may also achieve this goal. Finally, encouraging students to still submit their homework after the deadline and being willing to provide them with feedback, even if their grade is reduced or zeroed because they submit late, will put the focus on the content of the course and provide them with the opportunity to get feedback about their understanding.

3. Invest in education about the Honor Code and academic integrity.

   Students should have easy access to relevant information about academic integrity in physics. This includes information about proper citation techniques in laboratory work, allowed resources on homework, and the specifics of the Honor Code. Physics students should not be making mistakes because they are unaware of their professor's policies. To a certain extent it is up to them to take their own personal academic integrity into their own hands, but the department should make an effort to have clear and available policies and guidelines. Additionally, professors might consider taking a few minutes in some introductory and intermediate courses and labs to explain these concerns, especially things like the line between collaboration and copying, how to use resources like ChatGPT appropriately, and what internet resources are trustworthy, useful, and allowed. As difficult as it can be to find time in already full lectures to add in this information, it will ultimately benefit students learning.

   Additionally, point students to resources about studying and time management. Students often come to Emory from high schools that didn't challenge them as much as Emory will or from very structured environments in which they were not expected to manage their own time. College is the time when they have to learn to do this on their own, so having resources and support regarding study methods and problem solving techniques will benefit them immensely.

4. Scaffold large assignments.

   Though few courses in physics assign students with a semester-long project or assignments of similar length, courses that do have this structure will benefit their students by scaffolding these assignments into smaller ones that are due throughout the time before the deadline. For example, having portions of longer lab reports due instead of the entire report at once will help students keep up with the course material and will force them not to leave the entire assignment until the last minute, when they are more likely to feel time pressure and cheat.

5. Utilize plagiarism and cheating detection software and methods.

   Emory is partnered with TurnItIn so that essays (or in the case of physics, lab reports) can be easily checked for plagiarism. Additionally, if a student was seen accessing an electronic device and there is valuable, pertinent course material on Canvas that a student could use to gain an advantage, a Canvas report can be generated for that student during the time of the exam that shows whether or not they accessed Canvas and what information they viewed. When students know that these methods of detection are used, they will be less likely to cheat or plagiarize, and cases in which they do will be much more straightforward.

6. Reach out to the Honor Council administrators if there is a concern about academic misconduct and report cases to the Honor Council more frequently.

   The Honor Council administrators exist to adjudicate cases but also to consult with faculty if they have a concern but aren't sure that an Honor Code case should be opened. Consulting with the Honor Council administrators does not automatically create a case, and they are a resource for faculty beyond just dealing with case reports and sanctions. A general guideline is that if an instructor feels inclined to withhold points on an assignment or sanction a student in some other manner due to suspicion of cheating or plagiarism, the Honor Council should be contacted to discuss the case.

   Though it can be an extremely time-consuming and uncomfortable process, there is significant value in reporting cases to the Honor Council. First, Emory has one of the most well-trained Honor Councils in the country, as it is the only college which requires its Honor Council members to participate in a class in tandem with their work on the Honor Council. These students, to the best of their ability, provide a fair hearing process and rely on the standard of clear and convincing evidence to find students responsible for a violation. This process was created by students back in the early 1900s and it is to students advantage for it to be used[2]. Second, one of the best methods for decreasing cheating is to catch it more frequently; if students feel that they are more likely to be caught, they will be much less likely to risk being punished. Reporting potential violations to the Honor Code whenever they are noticed will provide the impression to students that if they cheat, they are more likely to be caught. However, it is very important to create balance with this recommendation, as a professor reporting every possible instance of academic dishonesty can create distrust, which only hinders the learning environment.

Finally, the vast majority of students' reports about the cheating that they are aware of focused on cheating that occurs outside of the classroom. Students self-reported a cheating rate of about 38%, almost entirely on out-of-class assignments. However, only 7.9% of Honor Code cases in the past five years from the physics department had to do with assignments outside of the classroom. Presumably, most of the cheating that occurs in the physics department is not caught.

7. Include information about the standard sanction for an Honor Code violation in course materials.

   The standard sanction for a first violation of the Honor Code is failure of the course, a 1-year Honor Code probation, during which time the student is not in good academic standing with the University, and mandatory completion of an educational program about the Honor Code and academic integrity. Students should be familiar with this sanction because it helps to put the cost of their decisions into perspective. Getting a zero on one homework assignment because a student ran out of time is much less severe than the standard sanction for a first violation, and this may encourage students to be more willing to simply not submit things instead of cheating. This information can be included along with the Honor Code pledge on major assignments or exams and can be included in the course syllabus.

   Though professors need not indicate this to students, they should know that the Honor Council considers mitigating and aggravating circumstances when deciding on a sanction in each case, so the standard sanction is not assigned blindly to every first violation. Instead, things like the value of the assignment, severity of the cheating, and the professors recommended sanction play a large role in determining a sanction.

8. Encourage students to submit nothing or partial work rather than cheating.

   Encouraging students to refrain from cheating by simply not submitting anything or submitting only partially completed assignments instead of submitting work that is not their own provides valuable feedback to the instructor; it is an indicator of the length and difficulty of the assignment, as well as the progress of the student on learning the course material. Additionally, this is valuable feedback to the student about their time management skills and will help to develop their own personal integrity. This policy can also include providing a small amount of partial credit to students if they explain what they don't understand about a problem or what is preventing them from completing it. This will help students to understand what they don't know and identify gaps in their learning.

5.5 Future Work

Future work should focus on implementing and monitoring the suggestions provided to the physics department and faculty. Specifically, this survey has provided a baseline understanding of the cheating that occurs in the physics department in the present day. The same survey could be administered in five to ten years after some of the suggestions are implemented to investigate their effectiveness and how the department culture has changed as a result. In the meantime, the physics department and faculty should focus, as usual, on implementing excellent methods of teaching, scholarship, and research and apply these suggestions as they are useful to improve student learning outcomes.

Additionally, this study could be expanded to include other schools' physics departments to investigate whether the trends found in cheating attitudes and behaviors are unique to Emory or are more broadly true.

Finally, this study was one of the first to attempt to address cheating at the department level and successfully found many patterns within the department as well as many avenues for the physics department specifically to improve student learning outcomes. This study could be repeated in other departments, likely with a different set of behaviors than the thirteen we focused on as would be appropriate to a different department. This study demonstrated the potential for department-level impacts on student's academic integrity, and this should be further pursued in the future.

5.6 Conclusion

This study was one of the first to evaluate the integrity culture of a specific department, within its larger context as a STEM department, and make recommendations that are specific to that department. Additionally, it was one of a few studies within physics education research to address academic integrity and the specific concerns physics students and professors must navigate within physics.

This study found that physics students perceive that problem solving and a deep conceptual understanding are very important to their success; therefore, they prioritize academic integrity in their work because they know that the only way to become successful in physics is to work hard and struggle towards understanding. However, when they become busy or stressed by deadlines, these ideals do not always hold up, and many students end up cheating, especially on assignments they complete outside of the classroom, where cheating detection is more difficult and cheating is viewed as less severe.

Effective strategies to address academic dishonesty in undergraduate physics focus on ensuring that students are required to demonstrate their knowledge in a secure environment, such as on an in-person exam or in office hours by explaining their homework answers. Clarity and consistency about policies, allowed resources, and expectations about citation promotes trust between students and faculty. Finally, excellence in teaching and mentoring will motivate students to work hard and have respect for the subject they are taking care to learn.

A Survey Questions

Screening Questions

1. Is your major or minor part of the physics department?

2. Are you a STEM major or minor?

STEM students:

1. What is your year?

2. What department houses your STEM major or minor? Note: if you are in a joint major, select multiple departments as applicable.

3. Rate the following based on their importance to you when choosing your STEM major/minor: (scale: not important at all, somewhat important, moderately important, extremely important)

   (a) I enjoy and care about the classes I get to take as a part of my major/minor.

(b) This major/minor will help me on a certain career path.

(c) This major/minor will allow me to get a job that pays well or make a lot of money in my career.

(d) This major/minor is expected or useful for students with my pre-professional path.

(e) This major/minor will allow me to have access to certain research groups or programs I am interested in.

(f) My parents / family / mentors / friends want me to choose this major/minor.

4. When preparing for an exam in the department of your STEM major/minor, how often do you do the following? (Scale: Unsure, never, sometimes, about half of the time, most of the time, always)

   (a) Form a study group with other students.

   (b) Cram last-minute.

   (c) Study the notes of another student who is taking the course with you.

   (d) Use copies of tests from previous years to study.

   (e) Study the notes of another student who took the course in a previous semester.

   (f) Study for longer than most other students in the class.

   (g) Study for less time than most other students in the class.

   (h) Feel anxious or nervous during the exam.

   (i) Enjoy taking the exam.

   (j) Attend the office hours of your professor, TA, or LA.

   (k) Use artificial intelligence when studying.

5. Rate the following based on their importance to you when studying for exams in the department of your STEM major/minor: (scale: not important, somewhat important, moderately important, extremely important)

   (a) Your notes.

   (b) The textbook.

   (c) Homework assignments.

(d) Previous years' tests.

(e) Practice exams provided by the instructor.

(f) The instructor or TA's office hours.

(g) Artificial intelligence.

6. Rate how strongly you consider the following behaviors to be academic dishonesty (Scale: Not academic dishonesty, trivial academic dishonesty, moderate academic dishonesty, serious academic dishonesty):

   (a) Getting exam questions or answers ahead of time from someone who has already taken the same exam.

   (b) Copying from another student on a test or exam, with or without the student's knowledge.

   (c) Working on the same homework with multiple students when the teacher does not allow it.

   (d) Turning in an assignment done entirely or in part by another student.

   (e) Turning in an assignment copied, entirely or in part, directly from another student's work.

   (f) Using unpermitted notes during an exam.

   (g) Looking up and copying answers to homework questions from a solutions manual or other online resource when the teacher does not allow it.

   (h) Looking up and copying answers to homework questions from a solutions manual or other online resource when the teacher does not have an explicit policy about doing so.

   (i) Using a device with internet capabilities during an exam when the teacher does not allow it.

   (j) Fabricating or tweaking data in a research project.

   (k) Lying to a professor to gain more time for a homework assignment or to have an exam moved.

   (l) Using AI to write code or solve a homework problem when the teacher does not allow it.

(m) Entering course materials (notes, lecture materials, homework questions, practice exam quesitons, etc.) into an AI chatbot or LLM.

7. Rate how strongly the following behaviors are considered to be academic dishonesty by your peers in your STEM major/minor (Scale: Not academic dishonesty, trivial academic dishonesty, moderate academic dishonesty, serious academic dishonesty):

   (a) Getting exam questions or answers ahead of time from someone who has already taken the same exam.

   (b) Copying from another student on a test or exam, with or without the student's knowledge.

   (c) Working on the same homework with multiple students when the teacher does not allow it.

   (d) Turning in an assignment done entirely or in part by another student.

   (e) Turning in an assignment copied, entirely or in part, directly from another student's work.

   (f) Using unpermitted notes during an exam.

   (g) Looking up and copying answers to homework questions from a solutions manual or other online resource when the teacher does not allow it.

   (h) Looking up and copying answers to homework questions from a solutions manual or other online resource when the teacher does not have an explicit policy about doing so.

   (i) Using a device with internet capabilities during an exam when the teacher does not allow it.

   (j) Fabricating or tweaking data in a research project.

   (k) Lying to a professor to gain more time for a homework assignment or to have an exam moved.

   (l) Using AI to write code or solve a homework problem when the teacher does not allow it.

   (m) Entering course materials (notes, lecture materials, homework questions, practice exam quesitons, etc.) into an AI chatbot or LLM.

8. How many times within the past year on average do you believe your peers in the department of your STEM major/minor have engaged in the following behaviors: (scale: unsure, never, once or twice, three to five times, five to ten times, more than ten times)

    (a) Getting exam questions or answers ahead of time from someone who has already taken the same exam.

    (b) Copying from another student on a test or exam, with or without the student's knowledge.

    (c) Working on the same homework with multiple students when the teacher does not allow it.

    (d) Turning in an assignment done entirely or in part by another student.

    (e) Turning in an assignment copied, entirely or in part, directly from another student's work.

    (f) Using unpermitted notes during an exam.

    (g) Looking up and copying answers to homework questions from a solutions manual or other online resource when the teacher does not allow it.

    (h) Looking up and copying answers to homework questions from a solutions manual or other online resource when the teacher does not have an explicit policy about doing so.

    (i) Using a device with internet capabilities during an exam when the teacher does not allow it.

    (j) Fabricating or tweaking data in a research project.

    (k) Lying to a professor to gain more time for a homework assignment or to have an exam moved.

    (l) Using AI to write code or solve a homework problem when the teacher does not allow it.

    (m) Entering course materials (notes, lecture materials, homework questions, practice exam quesitons, etc.) into an AI chatbot or LLM.

9. Rate how much you agree or disagree with the following statements concerning the department of your STEM major/minor: (scale: strongly disagree, somewhat disagree, neither agree nor disagree, somewhat agree, strongly agree)

(a) Different faculty members don't often handle Honor Code violations the same way.

(b) Faculty members do not care about the Honor Code.

(c) Faculty members don't try hard to catch Honor Code violations.

(d) In general, faculty are clear in their syllabi about what they consider cheating.

(e) My peers would report their peers if they knew they cheated.

(f) Most of my peers never violate the Honor Code while at Emory.

(g) If my peers did not cheat, they would fail.

(h) Cheating is necessary to succeed in the department of my major/minor.

(i) In general, my peers strongly disapprove of other students violating the Honor Code.

(j) In general, my peers have a working knowledge of the Honor Code and how it applies to their coursework.

(k) When my peers cheat, they do it only to obtain a better grade.

(l) When my peers cheat, it is because they care about learning the material.

Physics Students:

1. Rate the following based on their importance to you when choosing your physics major/minor: (scale: not important at all, somewhat important, moderately important, extremely important)

   (a) I enjoy and care about the classes I get to take as a part of my major/minor

   (b) This major/minor will help me on a certain career path

   (c) This major/minor will allow me to get a job that pays well or make a lot of money in my career

   (d) This major/minor is expected or useful for students with my pre-professional path

   (e) This major/minor will allow me to have access to certain research groups or programs I am interested in

   (f) My parents/family/mentors/friends want me to choose this major/minor

2. Select, from the following list, the types of classes which you have taken or are currently taking in the physics department:

   (a) An introductory class: Any 100-level physics class

   (b) An intermediate class: Any 200-level physics class

   (c) A core class: 361 (Classical Mechanics), 365 (Electricity and Magnetism), 421 (Thermodynamics and Statistical Mechanics), 461 (Quantum Mechanics), 444W (Advanced Lab)

   (d) An advanced class: Any 300, 400, or 500-level physics class that isn't a core class

3. How many of your physics classes have done the following? (scale: Unsure, None, Several, Most, All)

   (a) Allowed the use of a cheat sheet during exams

   (b) Allowed the use of the course textbook or other course notes during exams

   (c) Assigned essays or lab reports as a significant portion of the coursework

   (d) The professor stated that reading the textbook was required

   (e) Reading the textbook was necessary to do well in the course

   (f) A solutions manual existed online for the course textbook, and the professor assigned problems from the textbook for homework

   (g) Some or all exams were given in a take-home format

   (h) A practice exam was provided before major exams

   (i) Previous year's tests are available online, but the professor did not put them there and does not intentionally share them with students

   (j) During exams, seats were assigned or the professor recorded where every student sat

   (k) The professor (and/or their TAs) offered multiple office hours regularly throughout the week

   (l) The syllabus contained a clear policy about academic integrity

   (m) The professor discussed the Honor Code at some point to help explain to students what is appropriate for the class

(n) The professor administered the same test to multiple sections of the class at different times

(o) The professor used the same or a very similar test as in previous years

(p) The professor provided a copy of a past year's exam before major exams

(q) The professor closely monitored students while they were taking exams

(r) The professor had students orally explain their homework or major assignments, either one-on-one or as a presentation, to ensure they understood what they had submitted

4. When preparing for an exam, how often do you do the following? (scale: Unsure, Never, Sometimes, Most of the time, Always)

   (a) Form a study group with other students

   (b) Cram last-minute

   (c) Study the notes of another student who is taking the course with you

   (d) Use copies of tests from previous years to study

   (e) Study the notes of another student who took the course in a previous semester

   (f) Study for longer than most other students in the class

   (g) Study for less time than most other students in the class

   (h) Feel anxious or nervous during the exam

   (i) Enjoy taking the exam

   (j) Attend the office hours of your professor, TA, or LA

   (k) Use artificial intelligence when studying

5. Rate the following on their importance to you when studying for exams: (scale: not important, somewhat important, moderately important, extremely important)

   (a) Your notes

   (b) The textbook

   (c) Homework assignments

   (d) Previous years' tests

   (e) Practice exams provided by the instructor

(f) The instructor or TA's office hours

(g) Artificial intelligence

6. Rate how strongly the following behaviors are considered academic dishonesty by your physics peers: (scale: not academic dishonesty, trivial academic dishonesty, moderate academic dishonesty, serious academic dishonesty)

   (a) Getting exam questions or answers ahead of time from someone who has already taken the same exam.

   (b) Copying from another student on a test or exam, with or without the student's knowledge.

   (c) Working on the same homework with multiple students when the teacher does not allow it.

   (d) Turning in an assignment done entirely or in part by another student.

   (e) Turning in an assignment copied, entirely or in part, directly from another student's work.

   (f) Using unpermitted notes during an exam.

   (g) Looking up and copying answers to homework questions from a solutions manual or other online resource when the teacher does not allow it.

   (h) Looking up and copying answers to homework questions from a solutions manual or other online resource when the teacher does not have an explicit policy about doing so.

   (i) Using a device with internet capabilities during an exam when the teacher does not allow it.

   (j) Fabricating or tweaking data in a research project.

   (k) Lying to a professor to gain more time for a homework assignment or to have an exam moved.

   (l) Using AI to write code or solve a homework problem when the teacher does not allow it.

   (m) Entering course materials (notes, lecture materials, homework questions, practice exam quesitons, etc.) into an AI chatbot or LLM.

7. How many times within the past year on average do you believe your peers in the physics department have engaged in the following behaviors? (scale: Never, once or twice, three to five times, five to ten times, more than ten times)

   (a) Getting exam questions or answers ahead of time from someone who has already taken the same exam.

   (b) Copying from another student on a test or exam, with or without the student's knowledge.

   (c) Working on the same homework with multiple students when the teacher does not allow it.

   (d) Turning in an assignment done entirely or in part by another student.

   (e) Turning in an assignment copied, entirely or in part, directly from another student's work.

   (f) Using unpermitted notes during an exam.

   (g) Looking up and copying answers to homework questions from a solutions manual or other online resource when the teacher does not allow it.

   (h) Looking up and copying answers to homework questions from a solutions manual or other online resource when the teacher does not have an explicit policy about doing so.

   (i) Using a device with internet capabilities during an exam when the teacher does not allow it.

   (j) Fabricating or tweaking data in a research project.

   (k) Lying to a professor to gain more time for a homework assignment or to have an exam moved.

   (l) Using AI to write code or solve a homework problem when the teacher does not allow it.

   (m) Entering course materials (notes, lecture materials, homework questions, practice exam quesitons, etc.) into an AI chatbot or LLM.

8. What percentage of your peers in the physics department do you believe have cheated, as defined by the Emory Honor Code on an assignment, quiz, or test in the past year?

9. Select, from the following list, the classes in which you have observed a peer being academically dishonest at least once:
   (a) An introductory class: Any 100-level physics class
   (b) An intermediate class: Any 200-level physics class
   (c) A core class: 361 (Classical Mech), 365 (Electricity and Magnetism), 421 (Thermo and Stat Physics), 461 (Quantum Mechanics), 444W (Advanced Lab)
   (d) An advanced class: Any 300, 400, or 500-level physics class that isn't a core class

10. Of those selected above, consider the class in which you observed the greatest number of instances of academic dishonesty: What category best describes the class?
   (a) An introductory class: Any 100-level physics class
   (b) An intermediate class: Any 200-level physics class
   (c) A core class: 361 (Classical Mech), 365 (Electricity and Magnetism), 421 (Thermo and Stat Physics), 461 (Quantum Mechanics), 444W (Advanced Lab)
   (d) An advanced class: Any 300, 400, or 500-level physics class that isn't a core class

11. Which categories best describe the academic dishonesty? (select as many as may apply)
   (a) Getting exam questions or answers ahead of time from someone who has already taken the same exam.
   (b) Copying from another student on a test or exam, with or without the student's knowledge.
   (c) Working on the same homework with multiple students when the teacher does not allow it.
   (d) Turning in an assignment done entirely or in part by another student.
   (e) Turning in an assignment copied, entirely or in part, directly from another student's work.
   (f) Using unpermitted notes during an exam.

(g) Looking up and copying answers to homework questions from a solutions manual or other online resource when the teacher does not allow it.

(h) Looking up and copying answers to homework questions from a solutions manual or other online resource when the teacher does not have an explicit policy about doing so.

(i) Using a device with internet capabilities during an exam when the teacher does not allow it.

(j) Fabricating or tweaking data in a research project.

(k) Lying to a professor to gain more time for a homework assignment or to have an exam moved.

(l) Using AI to write code or solve a homework problem when the teacher does not allow it.

(m) Entering course materials (notes, lecture materials, homework questions, practice exam questions, etc.) into an AI chatbot or LLM.

(n) Other

12. As a percentage of the total number of students enrolled with you in the class, approximately how many individuals did you observe being academically dishonest in the class?

13. As a percentage of the total number of students enrolled with you in the class, approximately how many individuals do you believe were academically dishonest in the class, whether or not you personally saw them?

14. Rate how much you agree or disagree with the following statements concerning the physics department: (scale: strongly disagree, somewhat disagree, neutral, somewhat agree, strongly agree:

    (a) Different faculty members don't often handle Honor Code violations the same way

    (b) Faculty members do not care about the Honor Code

    (c) Faculty members don't try hard to catch Honor Code violations

    (d) In general, faculty are clear in their syllabi about what they consider cheating

    (e) Physics majors would report their peers if they knew they cheated

(f) Most physics majors never violate the Honor Code while at Emory

(g) If physics majors did not cheat, they would fail

(h) Cheating is necessary to succeed in the physics department

(i) In general, physics majors strongly disapprove of other students violating the Honor Code

(j) In general, physics majors have a working knowledge of the Honor Code and how it applies to their coursework

(k) When physics students cheat, they do it only to obtain a better grade

(l) When physics students cheat, it is because they care about learning the material

15. Rate how strongly you consider the following behaviors to be academic dishonesty: (scale: not academic dishonesty, trivial academic dishonesty, moderate academic dishonesty, serious academic dishonesty)

    (a) Getting exam questions or answers ahead of time from someone who has already taken the same exam.

    (b) Copying from another student on a test or exam, with or without the student's knowledge.

    (c) Working on the same homework with multiple students when the teacher does not allow it.

    (d) Turning in an assignment done entirely or in part by another student.

    (e) Turning in an assignment copied, entirely or in part, directly from another student's work.

    (f) Using unpermitted notes during an exam.

    (g) Looking up and copying answers to homework questions from a solutions manual or other online resource when the teacher does not allow it.

    (h) Looking up and copying answers to homework questions from a solutions manual or other online resource when the teacher does not have an explicit policy about doing so.

    (i) Using a device with internet capabilities during an exam when the teacher does not allow it.

(j) Fabricating or tweaking data in a research project.

(k) Lying to a professor to gain more time for a homework assignment or to have an exam moved.

(l) Using AI to write code or solve a homework problem when the teacher does not allow it.

(m) Entering course materials (notes, lecture materials, homework questions, practice exam questions, etc.) into an AI chatbot or LLM.

16. How many times within the past year have you engaged in the following behaviors in your physics classes (reminder that this survey is completely anonymous)? (scale: Never, once or twice, three to five times, five to ten times, more than ten times)

(a) Getting exam questions or answers ahead of time from someone who has already taken the same exam.

(b) Copying from another student on a test or exam, with or without the student's knowledge.

(c) Working on the same homework with multiple students when the teacher does not allow it.

(d) Turning in an assignment done entirely or in part by another student.

(e) Turning in an assignment copied, entirely or in part, directly from another student's work.

(f) Using unpermitted notes during an exam.

(g) Looking up and copying answers to homework questions from a solutions manual or other online resource when the teacher does not allow it.

(h) Looking up and copying answers to homework questions from a solutions manual or other online resource when the teacher does not have an explicit policy about doing so.

(i) Using a device with internet capabilities during an exam when the teacher does not allow it.

(j) Fabricating or tweaking data in a research project.

(k) Lying to a professor to gain more time for a homework assignment or to have an exam moved.

(l) Using AI to write code or solve a homework problem when the teacher does not allow it.

(m) Entering course materials (notes, lecture materials, homework questions, practice exam questions, etc.) into an AI chatbot or LLM.

17. How often have you cheated, as defined by the Emory Honor Code, on any assignment in the physics department in the past year? (scale: Never, once or twice, three to five times, five to ten times, more than ten times)

B Interview Questions

1. Explain the most important way that the questions asked in your physics coursework are different from the questions asked in the coursework of any non-physics STEM classes you have enrolled in?

2. Explain the most important way that the answers you provide in your physics coursework are different from the answers you provide in the coursework of any non-physics STEM classes you have enrolled in?

3. Explain the most important way that your study habits in your physics classes are different from your study habits in the non-physics STEM classes you have enrolled in?

4. Explain a way that your physics coursework promotes academic integrity that your other STEM coursework has not.

5. Explain a way that your physics coursework promotes academic dishonesty that your other STEM coursework has not.

6. What skills have you developed from your physics classes that you could not have developed if you had not taken them?

7. Explain two to three problem-solving strategies or study methods you currently use which you have learned about from your involvement in the physics department. Do you use these problem-solving strategies in courses for other departments?

8. Give an example of a scenario in which academic dishonesty gives a physics student an advantage that benefits their learning.

9. Give an example of a scenario in which academic dishonesty gives a physics student an advantage that hurts their learning.

10. How often does the typical physics major at Emory choose to engage in academically dishonest behaviors that benefit their learning?

11. How often does the typical physics major at Emory choose to engage in academically dishonest behaviors that hurt their learning?

12. A physics student is taking a 200-level physics class that is moderately difficult, but not overwhelming. The professor seems reasonable and typical for a physics professor and has a short statement in their syllabus about the Honor Code, which reads: *"The goal of this course is to learn physics. Collaboration with classmates and other resources is encouraged, but at the end of the day, it is your learning that matters. Therefore, all work you submit must represent your own understanding. See the Emory Undergraduate Honor Code for further guidance."* Furthermore, the professor explained her Honor Code statement in more depth during the first day of class. She is fine with students using outside resources to supplement their learning, but everything a student submits should represent their own understanding. At what point in this story would the typical physics student copy an answer from the textbook answer key and submit it without understanding it at all?

    (a) The assignment is worth 5% of their overall course grade.

    (b) They misread the syllabus; the assignment is actually worth 25% of their overall grade in the course.

    (c) They have a week to work on the assignment, and the assignment is relatively short.

    (d) They wait until two nights before it is due to start working on it.

    (e) The assignment is significantly longer or more time-consuming than they anticipated.

    (f) The student is struggling to understand the concepts required to complete the assignment.

    (g) The student attends the TA's office hours and the TA gives them a general direction, but no specific help or instruction.

(h) The student attends the professor's office hours and the professor gives them a general direction, but no specific help or instruction.

(i) The student attends the professor's office hours, but the professor is unwilling to help them and is demeaning.

(j) The student is completely unable to answer one small question on the assignment.

(k) The student is completely unable to answer multiple parts of one major question on the assignment.

(l) The student is completely unable to answer multiple major questions on the assignment.

(m) This is a group assignment, and the student's partner is a peer who is on the Honor Council.

(n) This is a group assignment, and the student's partner is a peer who frequently cheats on exams.

(o) The professor spent a large amount of time on the first day of class explaining in detail what would constitute an Honor Code violation in this course, and the student knows that the professor considers copying solutions to be an Honor Code violation.

(p) A close friend who took the class last year tells the student that everyone always cheats on this assignment and no one is able to do it without outside references.

13. In which of the following events or situations is the act of academic dishonesty justified? Why or why not?

(a) A student recently found out about the death of a close friend or family member and has a medium-size assignment due soon, so they ask a friend who took the course last year to help them through the assignment and end up copying their answers.

(b) A student has multiple medium-size assignments due soon and is stressed about completing them all in time, so they use ChatGPT to write several lines of code for an assignment and submit it without understanding the code, even though it is against the course policy.

(c) A student looks up an explanation in the solutions manual, knowing it would help them gain a better understanding of the relevant physics, not just help them achieve a better grade, even though it is against the professor's course policy.

(d) A student's professor is extremely rude and unnecessarily harsh, being completely unhelpful in office hours and assigning homework due the week of breaks and right before exams. The student copies answers from a solution manual and submits them without understanding them, when it is against the course policy, on a homework assignment that is due the day before a major exam in the course.

(e) A student is unsure about the meaning of their professor's syllabus statement about the Honor Code, and assumes that using ChatGPT is appropriate, when the professor actually did not intend for students to be allowed to use ChatGPT.

14. Select the option you feel represents the assignment or scenario in which a physics student is more likely to violate the Honor Code. Why did you choose this?

    (a) A coding assignment vs. a written problem-set.

    (b) An in-person test vs. a homework assignment.

    (c) A group project vs. an individual homework assignment.

    (d) An assignment worth 1% of the overall course grade vs. an assignment worth 25% of the overall course grade.

    (e) An exam the student felt they studied well for vs. an exam for which the student crammed last minute and felt unprepared.

15. Do you have any other comments or questions?

References

[1] Emory College of Arts & Sciences. *Emory College Faculty Bylaws*. https://college.emory.edu/secure/senate/bylaws/index.html. Accessed: April 4, 2025. 2024.

[2] Emory College of Arts & Sciences. *Honor Code*. https://catalog.college.emory.edu/index.html. Accessed: March 20 2025. 2022.

[3] W.J Bowers. *Student Dishonesty and Its Control In College*. Bureau of Applied Social Research, Columbia University, 1964.

[4] M. Daumiller et al. "Cheating as a prosocial act? Helping others with aademic cheating is related to social goals and cooperative norms". In: *Assessment & Evaluation in Higher Education* 49.7 (2024), pp. 948–961. DOI: 10.1080/02602938.2023.2290979.

[5] J.L Docktor and J.P Mestre. "Synthesis of discipline-based education research in physics". In: *Physical Review Special Topics – Physics Education Research* 10 (2 Sept. 2014), pp. 020119-1–020119-58. DOI: 10.1103/PhysRevSTPER.10.020119. URL: https://link.aps.org/doi/10.1103/PhysRevSTPER.10.020119.

[6] Emory Department of Economics. *STEM Designated*. https://economics.emory.edu/stem/stem.html. Accessed: April 4, 2025.

[7] T.B. Gallant. "Academic Integrity as a Teaching & Learning Issue: From Theory to Practice". In: *Theory Into Practice* 56 (2 2017), pp. 88–94. DOI: 10.1080/00405841.2017.1308173.

[8] N. Granitz and D. Loewy. "Applying Ethical Theories: Interpreting and Responding to Student Plagiarism". In: *Journal of Business Ethics* 72 (2007), pp. 293–306.

[9] D. Lonsdale. "Intentions to Cheat: Ajzen's Planned Behavior and Goal-Related Personality Facets". In: *The Journal of Psychology* 151.2 (2017), pp. 113–129.

[10] D.L. McCabe. "The Influence of Situational Ethics on Cheating Among College Students". In: *Sociological Inquiry* 62.03 (Aug. 1992), pp. 366–374.

[11] D.L. McCabe, K.D. Butterfield, and L.K. Treviño. *Cheating in College: Why Students Do It and What Educators Can Do About It*. The Johns Hopkins University Press, 2012.

[12] J. Moten Jr et al. “Examining Online College Cyber Cheating Methods and Prevention Measures”. In: *The Electronic Journal of e-Learning* 11 (2 2013), pp. 139–146.

[13] D.J. Palazzo et al. “Patterns, correlates, and reduction of homework copying”. In: *Physical Review Special Topics – Physics Education Research* (Mar. 2010). DOI: 10.1103/PhysRevSTPER.6.010104. URL: https://link.aps.org/doi/10.1103/PhysRevSTPER.6.010104.

[14] M.L. Rigdon and A.P. D’Esterre. “The Effects of Competition on the Nature of Cheating Behavior”. In: *Southern Economic Journal* 81.4 (Apr. 2015), pp. 1012–1024.

[15] C. Schwieren and D. Weichselbaumer. “Does competition enhance performance or cheating? A laboratory experiment”. In: *Journal of Economic Psychology* 31 (2010), pp. 241–253.