

HELPING THOSE WHO DON'T HELP THEMSELVES:
IMPROVING CONSULTATION ATTENDANCE AND EFFECTIVENESS
IN A SCIENCE CLASS

by
Henry Lawrence Brooks

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Soli Deo gloria – To God alone be glory.

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ABSTRACT

Despite an abundance of extra-help slots scattered throughout our weekly schedule, I face a perennial problem: those students who most need help rarely seem to seek it voluntarily. The goal was to improve voluntary consultation period attendance while also improving the effectiveness of that time by boosting student-teacher rapport and physics understanding. The treatment involved reducing forced consultation visits – previously required for much poorly-done or missing work – instead offering extra credit for coming to consultation, then filling out a reflection form after each visit. Students were also shown their course grades more often, in hope of spurring them into greater action to boost those grades. The results of this treatment were favorable, with understanding increasing moderately, student-teacher rapport increasing substantially, and voluntary visits to consultation increasing dramatically. Notably, the biggest effects were seen among students who used consultation most. Students cited seeing their grade and earning extra credit for consultation attendance as primary motivators for changed behavior. I conclude that this treatment effectively improves consultation attendance among those who most need help. Additionally, I conclude the treatment to be the likely cause behind better use of consultation time as measured both by the increase in student-teacher rapport and in increased physics understanding.

CHAPTER ONE

INTRODUCTION AND BACKGROUND

Context of the Study

This project focuses on improving the effectiveness of consultation time for a ninth-grade physics course at Woodberry Forest School. This school is a private, all-boys, all-boarding high school. In a normal week, each class section meets for one 45-minute period and three 55-minute periods. In addition to attending roughly six such classes, most students will have one free block each day and, scattered throughout the week, 6 “consultation periods.” These are half-hour time slots designed for students to be able to come visit any teacher they wish, to make up work, ask questions, or otherwise improve their understanding of a subject – at other schools, such a time might be referred to as an “Extra Help” period or “office hours.” It is a wonderful thing to have such availability worked into a weekly schedule. Unfortunately, many students make poor use of this time. While students who are otherwise doing well in the course will occasionally drop in to ask a question, those who are struggling to do well in physics have rarely come in voluntarily. While I can and do require such students to come in with some frequency, this process is burdensome for me and can create tension between me and my students.

The goal, then, was, through normal classroom interventions, to better incentivize my ninth-grade boys to come to consultation, and to ensure that consultation time was geared towards positive rapport building. The few who have come voluntarily have often seen considerable improvements in their understanding over time, so improvements in this area would be one of the most effective interventions I could make, even if the number of students affected is small. While successful changes would likely be fairly unique to my classroom situation, my

two physics-teaching colleagues at this school, being in a very similar situation, will enjoy discussing these results and considering whether they might make similar implementations in their classrooms.

Focus Statement/Question

The purpose of this action research project is to determine whether changes in my incentive structures surrounding consultation were truly beneficial.

The specific questions for my research are these:

- What are the main barriers to my lowest-performing physics students coming to consultation voluntarily?
- How much difference do changes in the consultation period incentive structure make on voluntary consultation period attendance?
- To what extent do changes in the consultation period incentive structure improve perceived student understanding and student-teacher rapport?

CHAPTER TWO

CONCEPTUAL FRAMEWORK

Overview

My starting problem, as detailed above, was that my consultation periods are too sparsely attended, particularly by those who most need the help. I am not alone in this, as a review of the literature will show. This is a problem because office hours in particular, and Faculty-Student Interaction in general, are shown to be a critical element of all sorts of positive student outcomes. So, we will look at why students avoid office hours, given their clear helpfulness, and look at potential ways of overcoming these avoidances. Next, we will examine how to ensure that the interactions generated by increased consultation attendance are high quality, and finally, we will outline how the literature can be applied to my classroom situation. Throughout, I will assume that the literature, which is largely based in undergraduate settings, applies fairly well to my boarding-school setting, though, where possible, I will cite literature that specifically makes this connection.

What the Literature Says

Sparse Attendance

Several authors note, as almost a given, that office hours are sparsely attended: “As many instructors can attest, students rarely use [office hours]” (Griffin et al., 2014, p. 94). Griffin and her colleagues support this assertion with evidence from their study, finding in a large (N = 625) study of undergraduate students that “two-thirds reported never using office hours” for a given course (Griffin et al., 2014, p. 97). In a separate study looking at the habits of students in 6 different levels of college political science courses, Guerrero and Rod found that “the

relationship between academic need and seeking help is curvilinear, suggesting that students who perform exceptionally well and also students who perform very poorly are the least likely to seek help” (Guerrero and Rod, 2013, p. 406). So, not only do we find across the literature that office hours are not well used, but my experience that students who most need help rarely seek it applies equally in many other classrooms across the country.

Importance of Office Hours

Why is poor attendance a problem? Primarily because, as Chickering and Gamson note in their “Seven Principles for Good Practice in Undergraduate Education,” “Frequent student-faculty contact in and out of classes is the most important factor in student motivation and involvement” (Chickering and Gamson, 1987, p. 3). Quantitative studies support this claim; Guerrero and Rod, for example, find that “office hours positively affect student grades, even when controlling for a myriad of other factors” (2013, p. 404). Others agree (Vaughn, Schmisser, Kleinmann, and Stahl, 2024; Griffin et al., 2014). Guerrero and Rod’s conclusion is simple: “Instructors should consider engaging students face-to-face as a primary objective” (Guerrero and Rod, 2013, p. 408).

Perceived Barriers to Attendance

Many instructors, I included, already see such face-to-face engagement as a primary objective. Yet, as we have seen, students often avoid such engagement, particularly outside of class where it can be most individualized, and thus most helpful. In a study involving 39 undergraduate students broken into six focus groups, researchers found six barriers that students perceived to attending office hours more frequently, among which were the fear of an awkward interaction, a perception that their teacher didn’t care, feeling intimidated or stupid, and feeling that it was an imposition on their time (Vaughn et al., 2024). Others delve deeper into the

psychology of students' fears, finding that "certain personality types perceive needing help as detrimental to one's self-worth" (Guerrero and Rod, 2013, p. 405), for example, or that "students employ a form of mental calculus to weigh up the learning benefits and psychological risks involved in help seeking" (Peeters, Robinson, and Rubie-Davies, 2020, p. 548). The last of these cited studies was carried out in high school classrooms, suggesting that the same themes that are found on undergraduate campuses transfer well to high schools; in fact, a separate study on 576 four- through nine-year olds found that, "as early as age seven, children begin to connect asking for help with looking incompetent in front of others" – one of the same barriers cited by Vaughn's undergraduate focus groups (Good and Shaw, 2022, p. 31).

Lowering the Barriers

The literature differs somewhat more on how to overcome or lower these barriers, though some themes emerge. Vaughn finds, for example, six perceptions of how to mitigate the seeming threats of office hours, among which are efficiency, incentives, and instructor behavior. Griffin and her colleagues helpfully suggest some practical interventions: "explicit invitations to students to engage in out-of-class communication," and feedback (Griffin et al., 2014, p. 95). On the latter point, they find that "students who perceive the instructor's feedback as useful are more likely to attend office hours" (Griffin et al., 2014, p. 98). We could perhaps sum these views up by noting that positive interactions with faculty will reduce students' perception of psychological risk, which Peeters and colleagues find to be more important than trying to increase students' motivation to learn (Peeters et al., 2020, p. 533). Interestingly, these interactions need not be academic in nature. In fact, Cotten and Wilson, working with nine focus groups at a mid-sized university in the U.S., found that, "paradoxically, when students interact with faculty that are not

their instructors, academic interactions appear important. And when students interact with faculty that are their instructors, social interactions appear important” (Cotten and Wilson, 2006, p. 510).

Learning Reflections

One additional paper provides guidance for this project. McGrath, a statistics professor, performed action research in her classroom measuring the effect of a required office hour meeting paired with a learning reflection (McGrath, 2014, p. 83). She notes that “considerable research has indicated positive learning outcomes for students asked to generate questions,” and therefore asked students to generate questions to ask during office hours before coming in. Sure enough, she found that her intervention did significantly improve student learning in the short term, and continued to have positive impacts in the longer term as well (McGrath, 2014, pp. 84-85).

Applications for My Classroom

Quality Over Quantity

Based on all these findings from the literature, my goal could be stated simply: improve interactions between myself and my students in the context of consultation time. While achieving this goal necessitates getting students to attend consultation, since no interaction outside of class will otherwise exist, the focus will not be on sheer volume. As Cotten and Wilson note, the “frequency of contact between faculty... and students is not significantly related to intellectual development.... Rather, students’ perceptions of the quality and strength of their relationships with faculty explain intellectual growth” (Cotten and Wilson, 2006, p. 489). Therefore, a focus of my study will be improving the quality of time spent in consultation, regardless of whether or not I am able to improve the quantity of time students spend in consultation. One way this was

achieved was by taking McGrath's research into account and adding a learning reflection to time spent in consultation.

Desired Outcomes

As the quality of my interactions with students out of class improves, the hope is that two things will follow. First, students who have positive out-of-class interactions with me are more likely to want to return to consultation, building a positive reinforcement cycle. Second, regardless of whether specific learning improvements occur in consultation time, the literature suggests that student outcomes should improve in a number of related areas. Griffin nicely sums this all up: "Quality interaction with faculty members has been shown to be a core element of student engagement, which is highly correlated with every desired outcome of higher education, as well as with students' confidence in their intellectual abilities.... Office hours, by design, make space for such interaction" (Griffin et al., 2014, p. 95).

Measuring Rapport

Measuring consultation period attendance is a relatively straightforward matter. Measuring faculty-student interactions, however, is trickier, given the subjective nature of such interactions. Fortunately, many others have gone ahead of me in this field. Of particular note is the 34-item Professor-Student Rapport scale (PSRS) created by Wilson and Ryan based on input from undergraduate students (Broom, Dunbar, and Demir, 2024, p. 128). A reduced version of this scale was found to predict "student outcomes such as student attitudes toward the instructor and course as well as teacher-driven student motivation" (Wilson and Ryan, 2013, p. 130), and was also found to predict actual student semester-end grades (Wilson and Ryan, 2013, p. 133). Broom and his colleagues create a 20-item reduced scale based on a sample of 760 undergraduate students, applying more complicated statistical analyses. The resulting scale was a

significant predictor of perception of teacher, teacher effectiveness, perception of course, perceived learning, and expected final course grade (Broom et. al, 2024, p. 135). This reduced scale, and the item-specific statistics given in the paper, provide an excellent basis for my own version of a reduced PSRS.

CHAPTER THREE

METHODOLOGY

Demographics

My research sample consisted of both sections of ninth grade conceptual physics students that I teach. All 35 students were boys who live on campus during the school year, that being the nature of this school; ages of my students range from 14 to 16 years old. Tuition for a year, including room and board, is about \$70,000. While students at this school are therefore, on the whole, quite affluent, 44% receive some form of tuition assistance, which allows for a wide diversity of socioeconomic backgrounds. Similarly, students' academic backgrounds are quite mixed, so while some students are fully prepared for the challenges of an introductory physics class, others do not yet know how to read instructions carefully or keep their binders organized; many did not have homework at all in middle school.

Treatment

Baseline

First, it will be helpful to understand the normal state of affairs in my ninth-grade conceptual physics course. For the first half or so of the year, all homework assignments are graded on correctness. Little feedback is provided beyond simple checks and x's; however, students who receive less than half credit on the assignment are required to do corrections. These corrections earn boys no points back; the goal is to improve their understanding by the time they get to a test, while strongly incentivizing careful thinking the first time around. When a student needs to correct an assignment, or falls behind on in-class work, his name is written on a whiteboard in my classroom under the title of that assignment. When a boy has his name on the

board for more items than I judge him likely to catch up on in class, I require him to attend a consultation period.

In consultation periods, then, boys are generally focused on “getting their names off the board”; in other words, while they are welcome to ask me other questions, they generally correct the minimum required and then leave. Students are also not told their course grade except on report cards at the end of each 8-week marking period, since we want boys to learn to work to the task, believing that the proper grade will follow. All in all, there is little incentive for a boy to come to consultation if he is not required to.

New Incentive Structure

Several concurrent changes were made as part of the treatment for this project. While I had made some of these changes in the past, I did not perform any formal analysis on them, operating more on a “gut feel” level instead of pinpointing which changes might have been most helpful, if any. First, I provided more detailed feedback when grading nightly problem sets. Since the literature suggested that more helpful feedback leads to more student question-asking, this seemed like a natural change to make. Along related lines, students were no longer required to correct homework assignments, regardless of how poorly they did on them. While I continued to require students who were falling behind on in-class work to come to consultation, as such direct interventions were supported by the literature, the requirement to correct homework assignments kept the focus of consultation almost purely academic, leaving little room or incentive for the social interactions that my literature review suggests are key for rapport building and, ultimately, student success.

At the end of each consultation period during the treatment phase, students were asked to fill out a “Consultation Record Sheet” (Appendix A). This was a brief form that asked students to

confirm that they had asked me a couple of meaningful physics questions and had spent at least 15 minutes working on physics in consultation; additionally, they were asked to rate their time in consultation on a scale of “Very Unhelpful” to “Helpful” and to write one or two sentences as to what their big takeaways from that consultation session were. The goal was to solidify learning and to provide me with additional feedback as to how the students were feeling about their progress and the helpfulness of consultation. For every such form that a student filled out, he was given half points back on his lowest-scored homework assignment from the current marking period. This made the system fair while still providing the strongest incentive for students who most needed improvement in their understanding of physics. The specifics of student responses to these forms will not be a part of this study’s analysis or results due to IRB restrictions, but were nonetheless helpful to me as their teacher.

Finally, as another means of student feedback, boys were shown their trimester grade to date every time they received back a substantial assessment (every week or two), whereas previously I had only revealed grades on report cards. Conversations with students in past years suggested that, particularly for students struggling to remain motivated in physics, seeing their grade more often might provide the motivation they needed, and this also fell into the category of additional feedback to students.

Data Collection and Analysis Strategies

Instrumentation

The main item I used to collect data was a series of four identical surveys with 10 Likert-style questions and three open-ended response questions (Appendix B). The first 7 questions related to teacher-student rapport and were based off the reduced PSRS created by Broom and colleagues, to add validity to this instrument. I selected a handful of the questions from that

reduced version that had the most statistically significant relationships with actual outcomes, though I did tweak a few of them after pilot testing with students. Specifically, too many students were confused by how to answer a negative Likert-style question such as “Mr. Brooks is unhelpful,” so I rephrased a couple of these to read, for example, “Mr. Brooks is helpful.” Two other questions were designed to check students’ perceived physics understanding, while the remaining questions, including the open-ended responses, were designed to elicit information about incentives and barriers to consultation time, in a similar fashion to what I found in the relevant literature (particularly Vaughn et al., 2024, and Griffin et al., 2014). Feedback from peers in my MSSE courses, as well as from my professor, was taken into account while making these tweaks to ensure continued validity of these questions.

This survey was administered four total times over a 12-week period as a Google Form. During the first 6-week baseline period, the survey was administered in the first and sixth weeks; the two administrations in each period were designed to strengthen the reliability of this instrument. Similarly, there were two administrations during the six-week treatment period, during the second and sixth weeks. The final administration contained one additional open-ended question: “Have any of the recent changes (grades shown, no problem set corrections required, half points back, etc.) motivated you differently, whether positively or negatively? If so, please explain.” This was designed to get summary feedback from the students.

During both the baseline and treatment periods, I also kept a tally of how many boys came to consultation in a given period, divided by those who were required to come and those who came voluntarily. Finally, I recorded my own perceptions and observations on rapport and consultation effectiveness in a teacher journal. While this was more subjective than the other measures, it provided a different perspective that therefore brought greater reliability to the

project as a whole. I did not write observations on any set schedule, instead simply noting things as they caught my attention, as many teachers do in their normal day-to-day teaching practice.

Table 1, below, demonstrates how these data collection methods were used to address the different questions presented. For purposes of the table, I have separated the survey into its three components: consultation-related questions (Likert #9 and open-ended questions 1-4), understanding-related questions (Likert numbers 8 and 10), and rapport-related questions (Likert numbers 1-7). Having multiple data collection methods for each sub-question helped to ensure the validity of my survey pieces by checking for different pieces of evidence that told the same story. While the first sub-question has only two rather than three data collection methods, this was a more straightforward, observation-based question, making these parallel data collection methods sufficient.

Table 1. Research questions with corresponding data collection methods.

Research Question	Data Collection Method #1	Data Collection Method #2	Data Collection Method #3
What are the main barriers to my lowest-performing physics students coming to consultation voluntarily?	Survey Consultation-Related Questions	Teacher Observation Journal	
How much difference will changes in the consultation period incentive structure make on voluntary consultation period attendance?	Consultation Attendance Tallies	Survey Consultation-Related Questions	Teacher Journal
To what extent do changes in the consultation period incentive structure improve perceived student understanding and student-teacher rapport?	Survey Understanding-Related Questions	Survey Rapport-Related Questions	Teacher Journal

IRB Exemption

The research methodology for this project received an exemption from Montana State University's Institutional Review Board, and compliance for working with human subjects was maintained (see Appendix C).

CHAPTER FOUR

DATA ANALYSIS: CLAIMS AND EVIDENCE

ResultsBarriers

We will first examine the barriers standing in the way of more frequent student attendance at consultation periods. That barriers exist is certain. While, throughout the baseline and treatment periods, about 65% of students *did* attend consultation, many of these were one-time visits by students who would ideally be going far more often. Some recognize this: “I need to come a lot more often,” said one, or “I have other consultations; I should probably come to physics more though.” A total of 6 students explicitly noted similar feelings, while others implied that coming more often would help. When asked *why* they did not come to consultation more often, the majority of students were able to name specific barriers.

I took student answers to this first open-ended survey question, and divided answers into two groups: those who said they had been to consultation in the past few weeks, and those who said they hadn’t (since I am unable to track individual students over the course of this study, these groups are assumed independent of each other between surveys throughout this analysis). Students in both groups listed five main barriers to coming more frequently, shown below in Table 2. Mentions of each category were tallied independently, so some student responses are counted multiple times. Meanwhile, some responses didn’t answer the question (“questions” or “to understand physics better” were two in this category), and were left out of this analysis. Group sizes vary, as noted, by survey due to student absences and students adding/dropping my class over the course of the study.

Table 2. Student responses to the question, “What keeps you from coming to consultation more often?”

Reason	Baseline Consultation (<i>n</i> = 39)	Baseline No Consult. (<i>n</i> = 20)	Treatment Consultation (<i>n</i> = 38)	Treatment No Consult. (<i>n</i> = 22)
Not Needed	6	13	2	15
Other Classes	11	3	21	8
Tiredness/Needing a Break	12	1	8	0
Laziness	2	1	6	1
Scrolling Addiction	1	1	1	1

Not Needed

Several differences are immediately noted between the two groups. Of those who hadn’t been to consultation recently, approximately two thirds of students felt that they didn’t need to go (“I feel like I have a strong understanding of the material” was one representative response). In the group of students who had been to consultation, we see a drop from 15% of respondents saying they didn’t need to go more often before the treatment period to only 5% after the treatment was instituted. Moreover, one of those two students put a caveat on his response: “I feel strong about my understanding but I am sometimes too lazy to go over to the physics classroom.”

Other Classes

Work for other classes was the largest barrier mentioned, impacting both groups substantially, but having a greater impact on those who do attend consultation (42% of the Consultation group mention this barrier vs. 26% of the Non-consultation group). While other classes were mentioned much more during the treatment period than in the baseline period, this is likely due to varying workloads in other courses. For instance, the third survey found 50% of

all students mentioning other classes as a barrier; during this same time period, I had noted in my Teacher Observation Journal, “Major history paper in progress by third form [ninth grade] right now – seems to be taking a lot of their free time / consultation time.”

Tiredness/Needing a Break

The second most commonly-noted barrier was Tiredness/Needing a break, again more commonly found among those who did attend consultation. “Needing a break” came up multiple times, as did “Taking time out of a free period” and other similar remarks. Almost none of the students who did not come to consultation mentioned this as an issue (1 total mention). During the treatment period, only 21% of consultation-goers mentioned tiredness as an issue, vs. 30% before, but given that this oscillated up and down survey by survey there is no statistical significance in this drop.

Laziness and Scrolling

Two remaining barriers were cited: Laziness, and scrolling. “Me being lazy, I need to come a lot more often” was one representative response for the first, while “Need for doom-scrolling” was one of four similar responses in the second category. Out of the four boys who mentioned scrolling specifically, three used addiction-related language: “Scrolling addiction” and “My greedy need for scrolling during consultations” are two.

Other Barrier Data

The treatment succeeded both in getting some boys to come more often and in bringing better alignment between boys who need consultation and those who actually go. The percentage of boys attending consultation stayed fairly consistent across the four surveys (59%, 71%, 62%, 63%), while total visits went up from the baseline period (53) to the treatment period (65) – so

some students came more often. Meanwhile, as noted above, the percentage of students coming to consultation who said they didn't need to come more often dropped – demonstrating better alignment of desire for consultation with actual consultation attendance. Certainly, this matches an observation I made in Week 11: “Seeing some of the same boys over and over again – and they need it! Makes for very productive time because they know exactly what to expect.”

Impact on Voluntary Attendance

As mentioned above, visits to consultation increased from the baseline to the treatment period. But how much of that was voluntary? As shown in Figure 1 below, voluntary visits increased quite dramatically. The green-shaded region (Weeks 7-12) represents the treatment period.

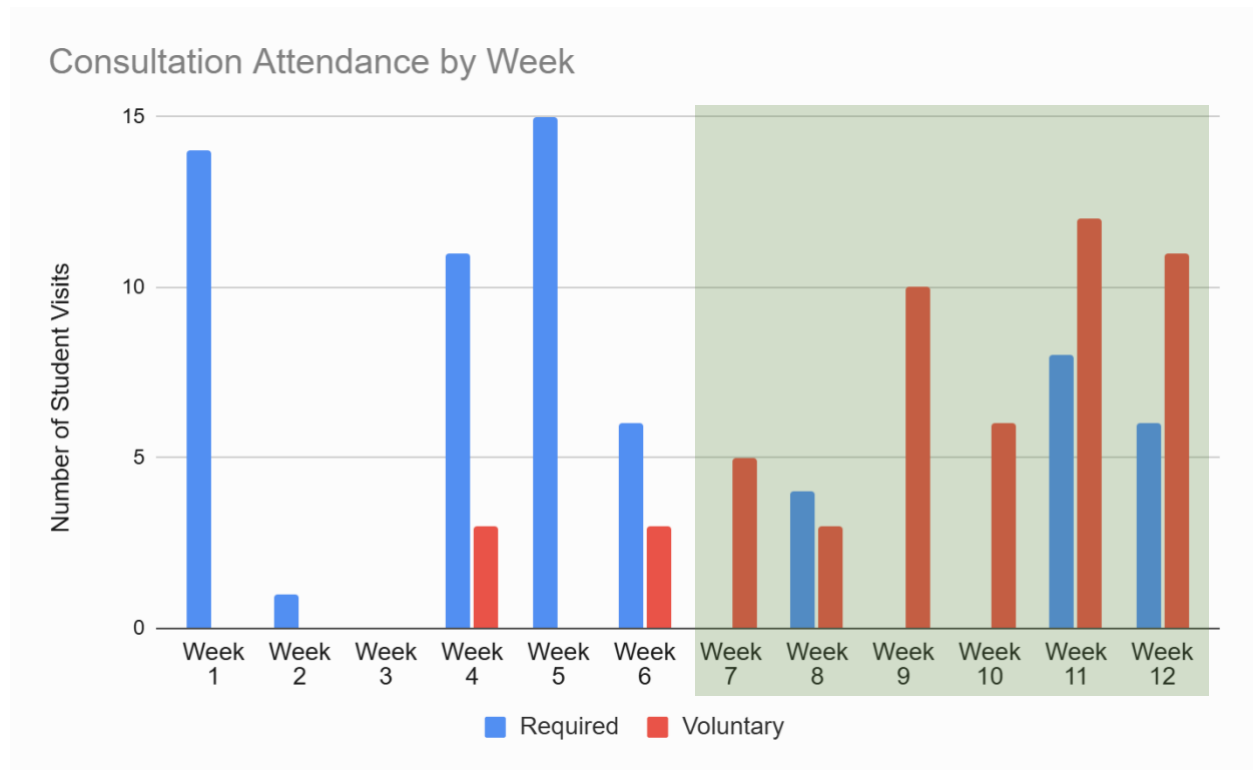


Figure 1. Number of student visits to consultation per week, divided into required and voluntary categories, $N = 35$ students.

Correlation

There were a total of 6 voluntary visits to consultation during the entire 6-week baseline period, while 47 voluntary visits were made during the treatment period. While there were still quite a number of required visits during the treatment period – students who were falling behind on work, generally – the 18 required visits during the treatment period still mark a dramatic decline from the 47 required visits during the baseline period. Survey #3 was given midway through Week 9; it is possible that this acted as a reminder to students of the ongoing treatment, thereby resulting in higher numbers in the final three weeks of the treatment.

Relatedly, consultation visits became much more spread out, not only between weeks as can be seen in Figure 1, but also within each week. When I require consultation visits, there are generally two times a week that I target, knowing that these are the most likely times that a student will be available. However, when students came voluntarily, they picked their times with much more flexibility. “A lot more students have been asking if they can meet during X period, or during Flex Time [Tuesday and Friday afternoons; not formally a “consultation period” but counted as such for these purposes].”

Causation?

Of course, other factors could potentially be at work in causing this shift – after all, freshmen can change a lot over the course of 12 weeks. This is where the fourth free-response question, given only on the final survey, provides insight (Table 3).

Table 3. Categorized responses to whether students were motivated differently by treatment, $N = 26$ students.

Response Type	# of Responses
Positive, mentioning:	17
Grades	11
Points Back	5
Negative	3
Ambiguous	6

When asked whether they had been motivated differently by my treatment, 65% of boys responded positively. Meanwhile, only 12% responded negatively – one simply said, “no”; another said, “I didn’t know there was any changes.” The remaining 23% were ambiguous or unclear (for instance, “Yes, they make this class a lot more stressful, and instead of prioritizing grades, I feel more focused on my learning.”) 11 boys specifically mentioned seeing their grades more often as a motivator, while 5 mentioned getting points back for showing up to consultation. One boy put these two factors together neatly: “These changes have motivated me in both ways. First, when I see my current grade, it catches me by surprise, not unmotivating me but a mix of feelings. Second, when we come to consultations we can get points back, this motivates me positively because it makes me want to come to consultation.” Another specifically linked the changes with voluntary attendance: “Yes I went twice voluntarily,” implying that he hadn’t previously gone voluntarily.

No students mentioned the increased feedback I had been giving on homework. Nonetheless, I noted in my journal during the treatment period, “small feedback lines have been making good conversation starters. Not often but enough to make them worthwhile, I think.”

This additional feedback increased the time required to grade a problem set by about a third. Similarly, no students mentioned the consultation feedback forms they filled out, but my observation was that these helped students feel that they had ownership of earning their points back, and helped boys stop and think about what they had learned before leaving my room -- a sort of "exit ticket," if you will.

Responses to the first free-response question, asking why students came to consultation, supported the conclusion that the changes made a positive impact on voluntary consultation attendance. During the baseline period, five students explicitly mentioned being required to come as their reason for coming – “I was forced but I don’t mind doing anything better,” for example; during the treatment period, only one did. One boy in the final survey said that he came “to get points back” – if not the most academic of reasons, at least this student provides a compelling case that the treatment helped motivate some students!

Interestingly, about 45% of students preferred learning in class to consultation throughout the surveys, while about 37% preferred learning in consultation (the remainder either saying they liked both equally, or giving unclear responses). This suggests that consultation itself didn’t become noticeably more attractive to students; rather, the incentives were what pulled them in. Nonetheless, of the students who said that they preferred consultation, almost all mentioned that they preferred it because it was a more 1-on-1 setting.

Rapport and Understanding

The 10 Likert-style multiple-choice questions provide our starting point for examining whether the treatment improved student understanding or student-teacher rapport. These questions are shown in Table 4 below (with the fully-formatted survey available in Appendix B).

Table 4. Likert-style questions as asked on each of the four surveys given in this project.

#	Question
1	Mr. Brooks is helpful.
2	I understand what Mr. Brooks expects of me.
3	I like Mr. Brooks's class.
4	Mr. Brooks makes class enjoyable.
5	I want to take other classes taught by Mr. Brooks
6	Mr. Brooks and I communicate well.
7	Mr. Brooks is eager to help students.
8	I feel great about my understanding of physics so far this year.
9	My understanding improves when I spend time in consultation.
10	In what grade range do you expect your year-end grade to be?

Questions 1-9 were answered on a 5-point scale, where a student's "Strongly agree" was assigned a score of 5 and a "Strongly disagree" was assigned a score of 1. On the final question, students had 5 options, each assigned a score for purposes of analysis: A range (5), B range (4), C range (3), D range (2), or NC [our equivalent of an F] (1). The mean response score for each of the 10 questions is shown below in Figure 2.

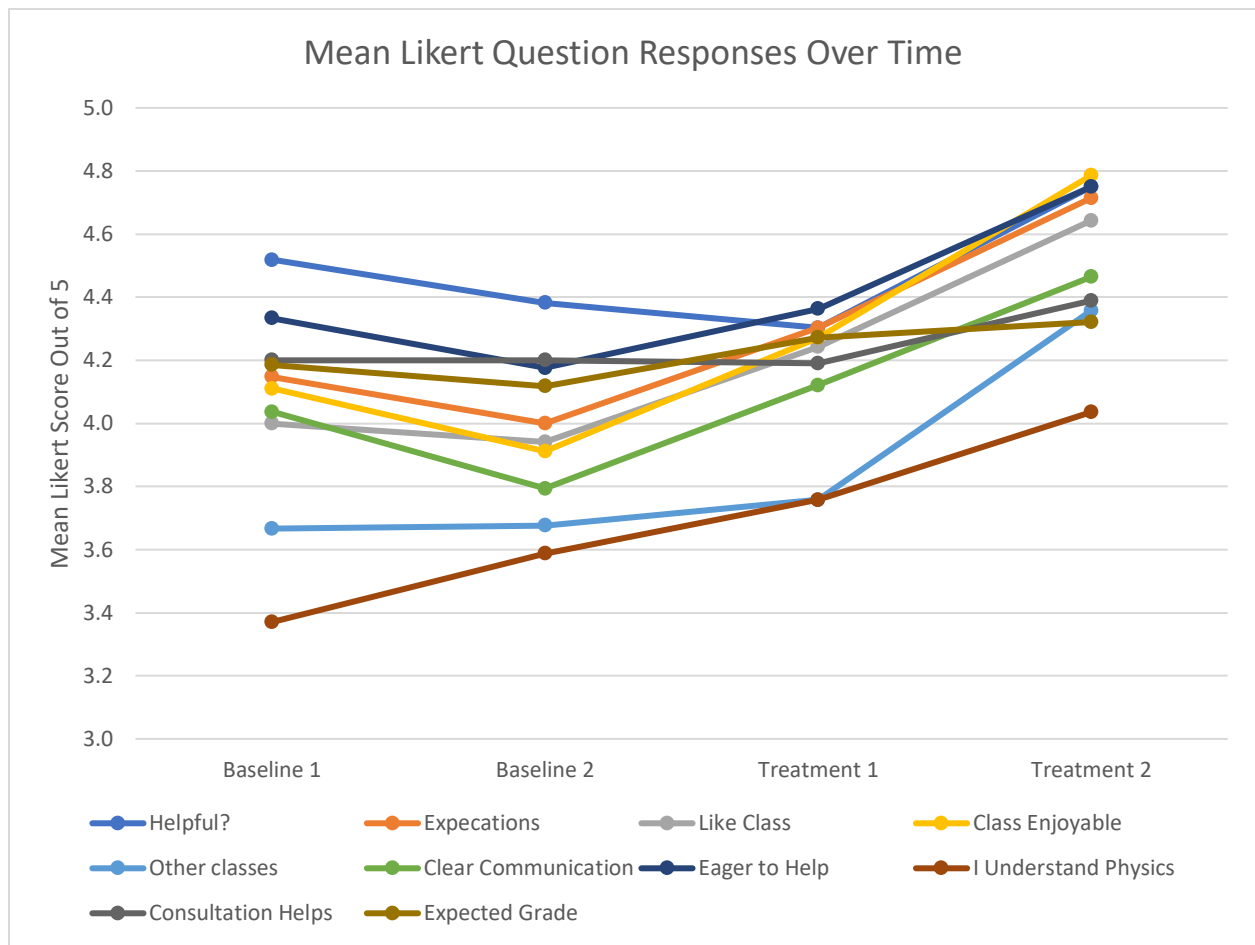


Figure 2. Mean score on each of the 10 multiple-choice questions over the course of four surveys, $N = 35$ students.

As Figure 2 shows, ratings in general went up, particularly during the treatment period. Happily, physics understanding went uniformly up throughout the 12-week study, suggesting that students felt more and more confident in their understanding of the course overall. Interestingly, though understanding was well correlated with expected grade ($r = 0.66$), the mean of students' expected grade was much higher (4.2 vs. 3.7), with a lower standard deviation (0.7 vs. 1.1) than the mean of students' self-rated understanding of physics, making the understanding of physics question the more useful one to track in this study. Students' self-reported understanding of

physics did increase moderately over the course of the study; based on a Welch's unpaired t test this finding is statistically significant at the 95% confidence level ($p = 0.033$).

Because a goal of this study was to see what impact consultation-specific interventions had on student-teacher rapport and student understanding, it is helpful to separate out those students who reported having gone to consultation shortly before each survey versus those who reported not having gone. This is done in Figure 3, below. For this figure, the first 7 Likert-style questions were averaged into one "Rapport" score, since these were all questions derived from the Professor-Student Rapport Scale mentioned in the Literature Review. The understanding score is simply the mean of Question 8 on the survey.

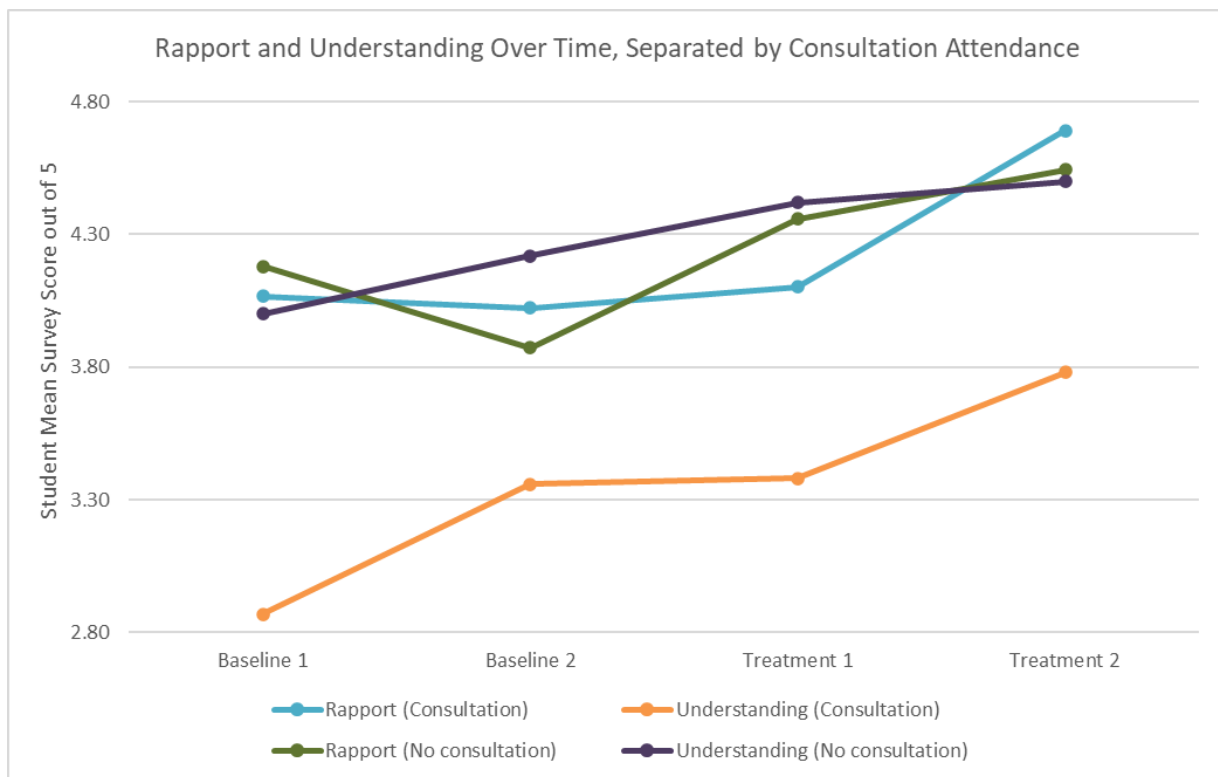


Figure 3. Mean rapport score and the mean understanding score given by students in each survey, separated by self-reported consultation attendance, $N = 35$ students.

At a glance, the chart supports a conclusion that our intervention was likely helpful for both understanding and rapport. While all four lines trend upwards overall, the rapport and

understanding lines for students who attended consultation accelerate upwards during the treatment period, while the lines for students who did not attend consultation almost flatten out.

Rapport

Looking specifically at rapport, we meaningfully positive changes during the treatment period. First, we find that rapport increases substantially from the first survey to the last (Hedges' g , measuring effect size, is 1.17, which is considered large; $p < 0.0001$). But there is no statistically significant increase in rapport from the first baseline survey to the first treatment period ($p = 0.6$); rather, all of the statistically significant change comes from the end of the baseline period to the end of the treatment period ($p < 0.0001$). Relatedly, if we look at the two cohorts show in Figure 3, we find that the increase in rapport is much more significant for the consultation-goers ($p < 0.0001$) than it is for the non-consultation-goers ($p = 0.084$). Putting this all together suggests that the treatment helped rapport overall, but had the greatest effect among those who experienced the treatment most directly.

I was able to directly observe this increase in rapport as well – especially since rapport runs both ways. As students came more to consultation more voluntarily, it became much easier to think more highly of them as they took initiative for their own learning. “Getting much easier to work with the boys who come. I feel like they are sometimes coming to see *me* rather than just to churn out work sometimes now!”, I wrote during week 10. One student even wrote me a thoughtful thank-you note during this time. Meanwhile, relationships with a few boys who were not interested in coming voluntarily nonetheless seemed to improve a touch as they were not required to come as often.

Understanding

The treatment may also have helped with understanding, though not as powerfully. Overall understanding by both groups increased moderately over the course of the study period ($g = 0.59$; $p = 0.033$). But the increase in understanding was not statistically significant for the no consultation group ($p = 0.15$). For the consultation-goers, however, their moderate increase in understanding *was* significant at the 95% confidence level ($g = 0.78$; $p = 0.039$). Again, we find encouraging evidence to suggest that the consultation treatment particularly helped those who needed help the most. While consultation is certainly still a place where students are largely “getting work done,” a greater percentage of consultation-goers mentioned something about “understanding” in the treatment period (38%) than in the baseline period (27%) when asked why they were coming to consultation. One student said he came because he was “wanting to understand material more and finishing work,” this response is representative of several in the treatment period.

CHAPTER FIVE

VALUE: REASONING AND REFLECTION

Claims from the StudyBarriers to Consultation

While the largest barriers to consultation – other courses and students’ tiredness or needing a break – are outside my immediate control, increasing the positive incentives did change the “mental calculus” discussed by Peeters et al. enough to help some students overcome those barriers (Peeters et al., 2020, p. 548). That other classes and students’ needing a break are the largest barriers makes sense. These both align with the “imposition on [students’] time” cited as a common barrier by Vaught et al. (2024). We saw that “other courses” was cited much more often by students otherwise attending consultation than by those not attending consultation, likely because those students who most need to come to physics consultation for extra help are also more likely to need help from teachers in other courses during these same times slots. Regardless, this suggests that, even for students earning low grades in my course, other teachers’ consultation periods were judged to be more important on a number of occasions, highlighting the importance of positive incentives. Since I did not change anything about other teachers’ consultation periods, or students’ sleep schedules, the improved overall consultation attendance points to an improved mental calculus for a number of boys.

Thankfully, a number of the barriers common in the literature did not appear in this study, suggesting that, overall, my consultation periods are fairly well structured. No students mentioned issues with consultation itself; while this could be the result of boys maintaining a certain level of politeness even in an anonymous survey, the main barriers do appear to be

outside my control. Fear of an awkward interaction, a perception that their teacher didn't care, or feeling intimidated or stupid were all barriers found in the literature that I did not see evidence of among my students (Vaughn et al., 2024). The high overall rapport scores also suggest that students do not on the whole see teacher interactions as a primary barrier.

My students were also surprisingly self-aware, suggesting that continued intervention efforts need not focus on students who never come to consultation. Many students were quickly able to name barriers to attending more frequently, and a few – those who claimed “laziness” – were willing to put the blame on themselves, demonstrating self-awareness. Those, then, who said they do not need to come to consultation are likely to usually be correct. Therefore, intervention efforts are most usefully directed at getting boys who are already coming to consultation for good reason to come *more*.

Changes to Consultation Attendance

The data suggest that the treatment had a large positive impact on voluntary consultation attendance, with knock-on benefits to both the students and myself. The dramatic uptick in voluntary visits meant that I had to schedule required consultations much less often, which was also reflected in the data. This was already beneficial to both my students and myself; my students because they were now receiving benefits for doing something they had otherwise been forced to do; myself because I had to spend much less time scheduling meetings with unwilling students. Given the three responses of the students who said that the changes did not motivate them differently, it is safe to say that none of my students was actively unhappy with the changes; there were just a few who weren't engaged enough with consultation to have strong feelings.

Students clearly saw a link between the treatment I had instituted and their own changed behaviors. That the most commonly-cited reason for improved motivation was simply seeing their course grade more often came as a surprise to me. The main reason for not showing students their open gradebook is simple: students are all too often stressed about grades, to the detriment of real learning. Yet clearly, some such stress is a necessary motivator for many students, likely because students have been implicitly trained to see those grades as their primary goal in education. That getting points back on homework assignments was another commonly-mentioned motivator was less surprising; I instituted this practice as part of my treatment in part because I knew that some other teachers allow opportunities for earning points back in consultation periods – students have mentioned to me in the past that they go to other consultations more frequently than mine in part because of this.

An unexpected benefit of this treatment was the more spread-out nature of consultation visits we saw in the data. Given our finding that most students who preferred learning in consultation to the class setting did so *because* they appreciated one-on-one time with me, this spreading out of visits should also have made each consultation visit that much more of a positive experience. Certainly, I found it much easier to work with students when they were coming in a steady trickle instead of the occasional “floods” of boys that were more common in the baseline period. I was reminded of Griffin’s statement, quoted at greater length in Chapter 3, that “Office hours, by design, make space for [quality interactions]” (2014, p. 95). Previous to my treatment, I did not always feel that my consultation periods *did* make room for quality interactions – too often, my room was either empty or a triage site. Increasingly throughout the treatment period, I felt that my office hours truly did make space for those quality interactions.

Improved Effectiveness of Consultation

While increased visits to consultation are a wonderful result, we are reminded from our literature review that quality interactions between faculty and students are more important than the quantity of those interactions (Cotten and Wilson, 2006). Happily, some of the strongest results of this study show that the quality of interactions between myself and my students did improve. I found that rapport increased substantially during the treatment period ($p < 0.0001$), particularly within the group who attended consultation, suggesting that even my modest changes to incentive structures made a big difference to my students. I observed this substantial shift in rapport directly in the classroom as well.

While we also observed improved student understanding, this result had become secondary to me over the course of the study. I observed a statistically significant increase in understanding among consultation-goers, but not among those who did not attend consultation, suggesting that attending consultation did make a difference in physics understanding. However, understanding had already been trending upward before the treatment period, making this result less clearcut. Certainly, I would not have expected to observe a substantial change in course grades had I been able to include those as part of this study; a 12-week period is relatively short compared to the 3-4 week cycle of major tests, and many other factors – varying difficulty levels of different units perhaps chief among these – would have also been at play with student grades. But I am playing the long game, and my review of the literature demonstrated that studies consistently point to long-term benefits of increased – and improved – faculty-student interactions. Therefore, as rapport increased, I increasingly became content to “trust the process” and focus more on my interactions with students than on whether their understanding was actually improving.

Value of the Study and Consideration for Future Research

Much of the value of this study lies in the immediate results. Students came to consultation more often of their own accord, built stronger rapport with me, and grew in their understanding of physics. Beyond those clearly helpful shifts, though, lie still more valuable impacts, which are harder to quantify. Students choosing voluntarily to come to consultation, even if prodded by incentives, means more students taking agency over their own learning, an essential step towards many other positive student learning behaviors. A student who chooses to come to consultation, for instance, might well leave the room with greater confidence in his understanding of physics – and that can matter more in the long run than whether or not he actually remembers more physics a day later than he would have without having come to consultation. Similarly, as students build stronger rapport with their teacher, they become more likely to engage more productively with class time, ultimately making consultation use less necessary.

From a pedagogical standpoint, this study provides a strong basis for continuing the positive incentives for consultation. This process saved me much time, and my students a certain amount of ill-will, and yet resulted in better outcomes. It is not often that an intervention has so few negative side effects. Additionally, the more voluntary nature of consultation made it much clearer which students were truly willing to put in more time and energy to achieve improved grades; particularly for a course that to many minds will always be a challenge, the ability to specifically reward these students while keeping the same incentives open to all is always a goal of mine that can be hard to achieve in the normal homework-lab work-assessment structure of the course. Too often, extra credit opportunities impose an extra burden that only the quickest

students (who least need that extra credit) are able to take on; this study revealed to me a way to solve this dilemma.

One of the areas I would most like to follow up on from this study would be the impact, if any, that this treatment in particular, or student consultation attendance in general, has on student grades. I would not expect large differences, or even any statistically significant difference over a relatively short study period, but I would be curious to know whether regular consultation attendance over the course of a semester causes larger improvements in student grades than not attending consultation. If the answer to that question were in the affirmative, that would be a boost not just to me as a teacher, but also to my students, as being able to share that datapoint with students repeatedly throughout the year could potentially help incentivize students still further, thus leading to a positive cycle of improvement.

While I have discussed some of the barriers students cite to attending consultation more frequently as being outside of my control, these barriers nonetheless intrigue me as areas for institutional improvement. Why is it, for instance, that about a quarter of consultation-goers note tiredness as a common barrier to attending consultation more often, while those who do not go to consultation never cite tiredness as a barrier? Are weaker students indeed overloaded, or do they need help changing their mindset from seeing free periods primarily as time to relax, to seeing those periods as opportunities to get work done or to seek help? Similarly, were the students who noted addictive phone usage as a barrier implicitly crying out for help? There is much to dig into here, some perhaps outside of the scope of what I will be able to usefully look into as a teacher, but some worthy of continued conversation with my department chair or dean of academics.

Impact of Action Research on the Author

I was greatly encouraged by multiple aspects of this project. For instance, while understanding levels are dramatically different between those who attend consultation and those who don't attend consultation, as shown in Figure 3, student-teacher rapport levels were essentially the same between these two groups. I would have expected those attending consultation, particularly in the baseline period, to report lower rapport, since I often feel that I have trouble connecting with some of these students for whom physics (or schoolwork in general) is a real challenge. So, learning that students are able to mentally separate "this is a hard class" from "I don't like this teacher" was an encouraging thing to learn.

Likewise, despite occasionally having less planning/prep time during the treatment period than during the baseline period, due to more students asking to schedule meetings during what would otherwise be prep time for me, I overall felt the more spread-out nature of consultation attendance to be a positive shift. After all, I teach because I enjoy the puzzle of figuring out how to help each student learn best, and this is easiest done in one-on-one or small group settings. I learn so much more about a student's personality in small consultation periods than I do in a whole string of regular class periods.

Overall, I come away from this project freshly reminded of my main goal as a teacher. I have often told people that I care very little whether students actually remember any physics a year out from my class. I hope, however, that many leave with a touch more curiosity about their world. I hope that they leave knowing that they were "known, challenged, and loved," as our Headmaster would say. Those goals are best accomplished when I focus on the boys as people first, rather than as students first. To quote again from one of the papers cited in my literature review, "Instructors should consider engaging students face-to-face as a primary objective"

(Guerrero and Rod, 2013, p. 408). They are right, and I too often forget this in the day-to-day busyness of teaching. As a numbers-focused person, however, having the results of this paper in the back of my mind will be a strong encouragement that focusing on the students truly leads to positive outcomes, both relationally and academically. I hope to hold onto this for years to come.

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APPENDICES

APPENDIX A: CONSULTATION RECORD SHEET

Consultation Record Sheet**Name:** _____**Date and Period of Consultation:** _____

By submitting an honestly- and thoughtfully-completed consultation record sheet, you will receive half points back on your lowest submitted homework from the current marking period.

To earn credit, you must have done all of the following:

- ☐ I asked Mr. Brooks at least 2 meaningful physics questions.
- ☐ I spent at least 15 solid minutes doing physics-related things in consultation.

This time was: *Very Unhelpful* *Unhelpful* *Neutral* *Helpful* *Very Helpful*

What are your 1 or 2 big takeaways from this time spent in consultation? This should be 1-2 full sentences.

APPENDIX B: STUDENT SURVEY

Rapport and Consultation Survey

* Indicates required question

Project and Consent Information

This survey is for Mr. Brooks; if you're not sitting in his class right now please wait until you are. I am working towards a Masters' Degree in Teaching from Montana State University, and as part of that degree I have been asked to work on a project in the classroom. For my project, I'll be looking to see if a shift that I often make regarding the incentives for consultation time actually makes a measurable difference in consultation effectiveness and/or with student-teacher rapport. This shouldn't impact you all much -- the biggest change for you will be some changes to consultation that I generally make this time of year anyway -- but if you are willing to participate, I would like to be able to use the results of four anonymous surveys I'm asking you to take over the next 12 or so weeks. So, here's what you need to know:

- This is technically research carried out by Montana State, since that's who I'm working with.
- If you have any questions, you're more than welcome to talk to me at any point or shoot me an email.
- You are also welcome to reach out to MSU's Institutional Review Board if you have any questions or concerns; they're in charge of making sure I handle your data carefully and you can reach out to them at this email address: IRB@montana.edu at any time. If contacting them, my reference number is #2025-2271.
- The surveys will all be anonymous Google forms, so all data collected are anonymous at the moment of collection, and I will not be able to determine who responded (or chose not to respond). Therefore, I will also have no way of linking individual responses across the four surveys, and will only be tracking aggregate class trends.

Most important thing:

Participation is voluntary, and you can choose to not answer questions you do not want to answer and/or you can stop at any time. Your participation or non-participation will not affect your grade or class standing in any way. You will still participate in consultation and be eligible for any incentives just the same as anyone else.

With each survey, you will be asked again whether you consent, by checking the appropriate box below. I need to ask this every time because I don't have any way of knowing who said "No" the first time -- so just hit "No" every time if you're opting out and you'll be all set. Thanks!

l. Do you agree to be part of Mr. Brooks's research project? *

Mark only one oval.

☐ Yes, I agree to be part of this Montana State University research. *Skip to question 2*

☐ No, I would rather not be part of this project. [Skip to section 2 \(Consent Declined\)](#)

Consent Declined

Sounds good! Mr. Brooks will ensure that you are not involved in this project in any way. You can now close out of the survey or click through if you want to look like you're on the same page as your peers; either way, Mr. Brooks will ignore your answers.

Rapport and Consultation Survey Questions

Please take your time answering the following questions. Honest answers are the most helpful ones!

2. Mr. Brooks is helpful

Mark only one oval.

Strongly Agree ☐ ☐ ☐ ☐ ☐ Strongly Disagree

3. I understand what Mr. Brooks expects of me.

Mark only one oval.

Strongly Agree ☐ ☐ ☐ ☐ ☐ Strongly Disagree

4. I like Mr. Brooks's class.

Mark only one oval.

Strongly Agree ☐ ☐ ☐ ☐ ☐ Strongly Disagree

5. Mr. Brooks makes class enjoyable.

Mark only one oval.

Strongly Agree ☐ ☐ ☐ ☐ ☐ Strongly Disagree

6. I want to take other classes taught by Mr. Brooks.

Mark only one oval.

Strongly Agree ☐ ☐ ☐ ☐ ☐ Strongly Disagree

7. Mr. Brooks and I communicate well.

Mark only one oval.

Strongly Agree ☐ ☐ ☐ ☐ ☐ Strongly Disagree

8. Mr. Brooks is eager to help students.

Mark only one oval.

	1	2	3	4	5	
Strongly Agree	☐	☐	☐	☐	☐	Strongly Disagree

9. I feel great about my understanding of physics so far this year.

Mark only one oval.

	1	2	3	4	5	
Strongly Agree	☐	☐	☐	☐	☐	Strongly Disagree

10. My understanding improves when I spend time in consultation. (If you have not come to consultation at all in the past 3-4 weeks, you may leave this one blank).

Mark only one oval.

	1	2	3	4	5	
Strongly Agree	☐	☐	☐	☐	☐	Strongly Disagree

11. In what grade range do you expect your year-end physics grade to be?

Mark only one oval.

☐ A ☐ B
☐ C ☐ D
☐ NC

Open-Ended Response

1. If you have come to consultation in the past 3 - 4 weeks, what reason(s) led you to come?

2. Regardless of whether or not you have come recently, what keeps you from coming to consultation more often?

3. Do you learn better in a class setting, in consultation, or some other setting? What makes you say that?

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APPENDIX C: IRB APPROVAL LETTER



IRB Protocol #2025-2271-EXEMPT APPROVED

From NoReply@TOPAZTI.net <NoReply@TOPAZTI.net>

Date Mon 12/8/2025 2:56 PM

To walter@montana.com <walter@montana.com>; Brooks, Henry <henry.brooks@student.montana.edu>; Szott, Brenna <brenna.szott@montana.edu>

****External Sender****

Hello Brooks, Henry,

Your protocol was reviewed by the IRB and has been approved.

PI: Brooks, Henry

Approval Date: 12/8/2025

Title: Helping Those Who Don't Help Themselves: Improving Consultation Period Attendance And Usage For Low-Performing Physics Students.

Protocol #: 2025-2271-EXEMPT

Review Type: Exemption

Expiration Date: 12/8/2030

Work described under this protocol may now commence. The PI is responsible for ensuring that the protocol accurately describes research practices being conducted.

- > Review Category designation determined by the IRB can be found in the final section of your protocol.
- > Any changes must be submitted via Amendment prior to implementation.
- > Per the Common Rule, research only requires Interim (annual) Review by the IRB if 1) it was reviewed via Full Committee or 2) is regulated by the FDA.
- > All research is subject to post approval monitoring.
- > All protocol types must be renewed 5 years after approval.
- > Inform the IRB once your research is complete so that the protocol may be inactivated.

Please contact your IRB Program Manager with any questions or if you are in need of assistance. Thank you for your diligence in the care of human subjects research participants.

Institutional Review Board for the Protection of Human Subjects | Office of Research Compliance | Montana State University

Access your protocol anytime at <https://nam10.safelinks.protection.outlook.com/?url=https%3A%2F%2Fmontanaproduct.topazti.net%2FElements%3FemailLink%3D11%252c102%252c14912&data=05%7C02%7Chenry.brooks%40student.montana.edu%7C1772bc8987f04e4eb61e08de3693e0d9%7C324aa97a03a644fc91e43846fbced113%7C0%7C0%7C639008205925785429%7CUnknown%7CTWFpbGZsb3d8evJFbXB0eU1hcGkiOnRydWUsIlYiOiIwLjAuMDAwMCIslIAiOiJXaW4zMilslkFoljoITWFpbCslldUljoyfQ%3D%3D%7C0%7C%7C%7C&data=Fi2le4PcAzigmq0JozGBUIAxTrXf%2FHJTWNh15fN00Ms%3D&reserved=0>