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Tracking Academic Success and Its Relationship with Student Success Center Usage and Demographics

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Tracking Academic Success and Its Relationship with Student Success Center Usage and Demographics

by

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1. Abstract

The purpose of the study is to quantify what types of UAH students are using the Student Success Center (SSC) for Calculus A and Calculus B and to examine student grades concerning SSC usage and various demographics. Quantifying this information leads to actionable data, which can be used (and interpreted) by the SSC, the UAH Math Department, or the UAH Academic Success Advocacy Program to better serve UAH students. The study collected survey information, course grades, and SSC attendance rates from 371 students in the Fall 2021 academic semester to find correlations between the three. The combined data showed that background math knowledge and prior coursework of students have a strong correlation with calculus course grades. Additionally, students who use the SSC correlate with slightly lower test and course grades. There are many confounding variables that contribute to these conclusions, restricting this study to only examine correlations rather than illustrate cause and effect between variables. This study will be continued through the Spring 2022 semester to examine the relationship between Calculus A and Calculus B, particularly in SSC usage and course grades, but that data is currently incomplete.

The study was approved by the Institutional Research Bureau (IRB) of the University of Alabama System on June 25, 2021. The principal investigator was Samuel Johnson with Kristen Thompson as the supervising faculty member. The study was conducted over the Fall 2021 and Spring 2022 academic semesters at UAH, and the participants were UAH students taking in-person Calculus A or Calculus B classes at those times. Students were surveyed to establish background information on demographics and academic (particularly in math) history as well. Individual test grades and final course grades of the students who consent to be in the study were collected from only the Calculus A or Calculus B course they were enrolled in for that particular semester. The grade information, the number of visits to the SSC, and the demographic information were de-identified, aggregated, and examined by the research team to establish correlations between SSC usage, demographics, and calculus scores. The collection of data in this study expires with the IRB on June 1, 2022.

2. Background

The study "Tracking Academic Success and Its Relationship with Student Success Center Usage and Demographics" is sponsored by the UAH Honors College as part of Samuel Johnson's Honors Capstone project. This study does not seek to examine what causal effect the SSC has on students; rather, the motivation for this study is to examine the correlations between academic scores and SSC usage more thoroughly by expanding the search criteria to include academic (math) history and other demographics. This ensures that no irresponsible claims are made for or against the SSC. The study encompasses all visits to the SSC, which includes appointment-based tutoring, PASS, and drop-in tutoring. The majority of student visits were to the PASS Program, accounting for 129 of 146 unique students. More specific explanations for PASS and the types of tutoring at UAH are in the following section, The UAH Student Success Center (page 5).

Smaller versions of this study are conducted by PASS leaders in which individual tests are examined based purely on a binary yes/no to PASS attendance and the test averages in each category. These reports quantify the difference in correlation for PASS attendance, which encourages more student attendance as generally the students who do attend score higher on tests. In contrast, this study seeks to create a more comprehensive test report for Calculus A and Calculus B by including student demographics, attendance for all SSC programs, and rate of attendance. When conducting the PASS reports, sometimes they will show that PASS attendees scored lower compared to their peers, which is more common in introductory courses (Calculus A, Calculus B, or General Chemistry I) than in later courses (Organic Chemistry or Cellular Biology). This would seem to imply that going to PASS causes students to score lower (on specific tests), but there are issues with that logic. The test reports (and this study) only report on correlations, not causal relationships as there are no baselines for the students' grades pre- and post-PASS (or for how PASS could impact non-attendees). Another facet is PASS attendance (all SSC services) is voluntary, so it is up to the student whether utilize the resources available to them (if they recognize a need or want additional understanding); therefore, random assignment is impossible as there will always be up to the motivation of the student to attend.

Calculus A and Calculus B were chosen as the best courses to perform the study on for three reasons: the established SSC resources available for each subject, the considerable number of students enrolled (and high SSC attendance rates), and the relatively little higher education experience of the students. The latter is important as it better illustrates the differences in backgrounds of the students, and the SSC models higher education learning/studying practices, which may also impact the students' grades. These study strategies can have a long-term impact on the success of the student in other courses, such as Calculus A students transitioning into Calculus B. This will be explored in future steps of the study, which is discussed in more detail in Further Steps and Recommendations (page 29). Finally, both calculus courses are foundational to many other courses, so there are many long-term effects from a content side that can impact future grades in more advanced STEM classes.

2.1. Brief History of Supplemental Instruction

Since the participants in this study attended PASS sessions at a much higher rate than other SSC offerings, it is valuable to examine The Supplemental Instruction (SI) model that PASS is based on. Based on developmental education, the first SI program was founded in 1973 at the University of Missouri-Kansas City (UMKC) by Deanna Martin to combat the spike in student attrition rates.[1] Developmental education inculcates a growth mindset into students such that they can improve in small, specific ways. Martin's original goal for SI was to decrease the number of students who earned a D, F, or withdrew from the course, so the pilot courses were first- and second-year courses with a lower overall passing rate (similar to Calculus A or B). Martin also sought to de-stigmatize academic support services by emphasizing SI as non-remedial (open to all student skill levels) and emphasizing its proactive in students' studies. SI acts as an extension of the classroom that serves as extra content practice and study technique implementation rather than a simple recitation of the material. Leaders of SI sessions are peer students who have taken the course, a structure that provides interpersonal rapport between the leader and students as well as a way to minimize cost. UMKC was concerned with the cost to students potentially providing decreasing/blocking usage, so the peer-to-peer instructional savings ensured students could attend these sessions for free (included in tuition). Attendance to SI sessions is voluntary; therefore, Martin incentivized usage by focusing on active learning through practicing study techniques and accomplishing concrete goals within the session so the students gain confidence, which ties into another key fact that Arendale found: [2]

> "Less than 25% of all students who drop out of college were involuntarily dismissed by their institution for failure to meet minimum academic performance standards such as a sufficient cumulative grade point average (Tinto, 1993). Many leave the institution due to extreme difficulty and frustration in high-risk courses (Noel, et al., 1985)."

This is a key subjective outcome of the SSC: student perception of their learning. It is arguably just as important students feel supported instead of simply performing well in the academic grade sense. The benefits of SI range from assisting in content to building study skills to changing student perceptions of learning, which may make its benefits appear in student grades, drop rates, etc. Finally, UAH uses the Peer Assisted Study Session (PASS) acronym while Supplemental Instruction (SI) is the name of choice by 95% of U.S. institutions, and PASS is the name most used in Australia for similar programs.[3] Overall, SI has expanded to thousands of colleges and universities across the globe as it has been reported that the International Center for Supplemental Instruction (ICSI) at UMKC has trained over 1,500 representatives from thirty countries to start SI programs.[4]

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[1] Arendale, David. "Historical Development of Supplemental Instruction (SI)". *Histories of Developmental Education*. The Center for Research on Developmental Education and Urban Literacy, University of Minnesota. 2002.
[2] Arendale. "Historical Development of Supplemental Instruction (SI)".
[3] Arendale. "Historical Development of Supplemental Instruction (SI)".
[4] Curators of the University of Missouri. "FAQ: Questions Regarding The International Center for Supplemental Instruction." The International Center for SI, UMKC SI. 2022.

2.2. The UAH Student Success Center

The Student Success Center (SSC) is the centralized department on campus for academic support, which includes PASS, content tutoring, drop-in tutoring, and academic coaching. The SSC is funded by the university, so students can (voluntarily) participate in any SSC services at no additional cost. PASS, tutoring, and drop-in tutoring are considered for this study as "SSC Attendance" as each supports Calculus A and Calculus B, although it should be noted that for the Fall 2021 semester, PASS represented 751 of the releasable 955 Calculus A and B visits, so that is by far the most used of the three. This means students are most likely to encounter the SI Model of academic support.

Content tutoring is based on the College Reading and Learning Association (CRLA) certification and other best practices. It is appointment-based, one-on-one education in which students can book 50-minute sessions with a tutor for one of their classes. During a tutoring session, students are critically thinking and actively solving problems with the tutor guiding student thought and correcting/clarifying information. Math drop-in tutoring is staffed by math department teaching assistants where students can show up unannounced to work on problems, ask questions, etc. A few drop-in tutors also served as lecturers in Calculus A and Calculus B during the study, so many of the attendances to that program functioned as office hours.

PASS follows the Supplemental Instruction (SI) model. PASS is in a group/classroom setting where students attend a structured session in which they work with classmates to solve problems and learn study techniques. In a session, the PASS Leader facilitates the groups' thought processes by introducing new ways to approach material, using various activities supported by learning theory, and providing a space for students to openly ask questions. PASS Leaders attend the class they support, which furthers the connection between the students and the PASS Leader, which is a likely reason for the disproportionally high PASS attendance.

The SSC has grown quickly over the past fifteen years and is constantly on the leading edge of various programs to better support students. It was created in 2006 under the Quality Enhancement Plan for the SACS reaccreditation process with PASS as a focal point. PASS began supporting select courses in Fall 2007. Courses are chosen for a variety of reasons from the number of students, the difficulty of the course, pass/fail rate, etc., and Calculus A and Calculus B has been supported in some capacity since the inaugural semester in 2007, with full support for all sections of the courses by 2016, except for Honors-only sections. In 2018, PASS restructured Calculus support to follow the Calculus courses' common curriculum structure, in which any enrolled student may attend any PASS Leader's sessions, regardless of section attendance. As there is considerable overlap between the SSC and PASS attendance engagement for Calculus A and Calculus B, many of the conclusions based on SSC data most closely are from PASS.

2.3. Studies of Supplemental Instruction

As PASS represents the majority of SSC usage in this study, it is beneficial to analyze how previous studies have been conducted on the effectiveness of other SI programs. The studies do not provide a perfect one-to-one comparison to this study, but they do give a starting point when considering methodology and the meaning of the results. In a meta-analysis of various SI programs between 2001 and 2010, Dawson, et. al. examined the effectiveness of prior studies. The conclusion most studies come to is that the data is not definitive, but there does seem to be empirical evidence SI raises final course scores and lowers Ds, Fs, and withdrawal (DFW) rates.[5]

No study in the analysis uses random assignment and many studies omit key background and sample information of their study, which may indicate that extraneous variables, such as motivation, may be impacting the studies. As a true experimental design including a control group, random assignment, etc. cannot be conducted in this study, the investigators had similar concerns that outside variables would limit the ability to determine causal conclusions. This is vital as Dawson et al. state, "Rather than assuming that return rate is caused by SI participation, it is important to acknowledge that the return rate could be the result of an unmeasured variable, for example, motivation."[6] As the third-variable problem of student motivation remains, this project cannot make confident conclusions about the causal relationship of the SSC with student grades, so only correlations of student types will be considered.

As this project examined first-year Calculus A and Calculus B courses, it is helpful to examine a study that focuses solely on similar first-year STEM courses, such as the study conducted by Peterfreuend et al. Parsing Peterfreuend's study, Dawson's meta-analysis found, "A study on the results of SI over 13 years in STEM courses indicated significant differences $(p < .005)$ for most of the courses. … In the entry-level courses, the authors noted that SI contributed to increased pass rates."[7] The significant result of this is that average grades might not be higher (or different), yet the DFW rate for SI attendees is lower, illustrating DFW rates are another facet to consider.[8]

Dawson's meta-analysis of studies concludes that no study shows direct causation between SI usage and grades or retention; rather, because SI attendance is voluntary, programs provide a way for motivated students to practice content and study strategies. This means SI may be another factor that keeps students enrolled, yet it still requires motivation on the part of the student to seek out SI and consistently attend sessions to gain these benefits. With the information gathered from prior studies, it is challenging to directly demonstrate direct causation, therefore, this study seeks only to observe the correlations among SSC usage, demographics, and student grades.

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[5] Dawson, van der Meer, Skalicky, and Cowley. "On the Effectiveness of Supplemental Instruction: A Systematic Review of Supplemental Instruction and Peer-Assisted Study Sessions Literature Between 2001 and 2010". *Review of Educational Research*, Vol. 84, No. 4, 609-639. December 2014.

[6] Dawson et al. "On the Effectiveness of Supplemental Instruction…". (629)

[7] Dawson et al. "On the Effectiveness of Supplemental Instruction…". (620)

[8] Drop students attended the SSC at lower rates in this study, matching the expectation. Additionally, letter grade distributions can be found in the Appendix.

3. Approval Process and Qualifications

As the study requires many participants along with the handling of personal information, it was approved through the Institutional Research Bureau (IRB) of the University of Alabama System. The study is classified as "Exempt" by the IRB as it uses surveys with de-identified participant information; it does not place participants at any civil or criminal liability; and in no way can it damage the participants' reputations.[9] Populations that are excluded from the study are those under the age of 18, as they cannot give consent, and prisoners, as a protected population that requires different documentation. The former is more impactful as much of the study was conducted in the fall semester, so some first-year students had not yet turned 18 at the time they filled out the consent form and therefore were excluded. After meeting additional criteria and answering questions by the IRB, the study was approved on June 25, 2021. The precedents for confidentiality, treatment of participants, etc. are dictated by the standards agreed upon by IRB and CITI in addition to FERPA[10] measures taken.

Both members of the research team are trained through the Collaborative IRB Training Initiative (CITI) and in FERPA to ensure that all proper handling of participant information is followed. The principal investigator is Samuel Johnson, sponsored by the Honors College, and the supervising faculty member is Kristen Thompson, who works as the Senior Coordinator of Peer Education in the SSC. Samuel also works for the SSC as a PASS Leader, but neither investigator has a personal stake in the study turning out one way or another; rather, it is an exploratory measure to examine trends of attendance and academic performance. As part of the application and approval process, both team members (Samuel Johnson and Kristen Thompson) were CITI[11] trained on conflict of interest, institutional responsibilities, export compliance, misconduct, risk assessment, consent, ethics, and various legal matters. In addition, before the study, both investigators were already FERPA trained to safely manage student grades. The last qualification is that Kristen Thompson, through her capacity working for UAH, has access to and approval for obtaining student attendance at the Student Success Center (SSC).

As both investigators work for the SSC, there is potential for conflicts of interest or inherent bias. This is mitigated as Kristen Thompson rarely interfaces directly with students. Samuel Johnson (a Calculus A PASS Leader) interacts with select Calculus A students through his role and therefore could affect attendance rates and/or quality of peer education, but he did not advertise PASS any more or less than in previous semesters or compared to other PASS Leaders. In addition, no intermediate results of the study were told to the participants to prevent a change in normal attendance patterns. As he is following the guidelines of the PASS Program, if Samuel Johnson were changed with a different PASS Leader, attendance rates and quality of instruction were unlikely to be affected, and thus, his involvement in the study had no bearing on results. As another safeguard to the study and per SSC guidelines, PASS Leaders cannot directly impact student grades. As there are no subjective scales or opinion-based questions within the surveys (page 63),

[9] Institutional Research Bureau. *Form 3: Application for Exemption for UAH Institutional Review Board*. University of Alabama System. Updated 04/2020. Accessed and approved 06/17/2021.
[10] Family Educational Rights and Privacy Act. FERPA is analogous to HIPPA for students' college information, focused on academic scores.
[11] Collaborative Institutional Training Initiative

the investigators cannot (un)intentionally change the information collected, so the information is immutable so far as the participants' self-report. Finally, there is nothing to be personally gained by the investigators either financially or reputationally. The focus of this study is the correlations among various demographic groups, their SSC usage, and their grades; it is not focused on showing causal concrete grade differences based on SSC usage. Because the use of the SSC is voluntary, the study seeks correlations among student groups, which means no direct conclusions can be made based on grade improvements due to the SSC as there is no baseline for the students. Any apparent conflicts of interest prove trivial due to the extensive training of the investigators and the lack of any incentive for the results to turn out one way or another.

3.1. Confidentiality

A core concern was to protect participants' FERPA rights (grades) and their right to personal privacy (background information on the surveys). This was accomplished by using strict confidentiality methods, particularly in the storage of their information. To ensure participant confidentiality for participant safety and mitigate potential bias, all information was de-identified before the analysis began. When designing this study, participant confidentiality became a top concern of the IRB due to the number of people (investigators, professors, students) who are working with the student's information, but at every step of the way, confidentiality was maintained using strict means. After the initial survey collection, there was no interface with the students; therefore, the direct risk to students is minimized. The survey responses were entered into a password-protected Excel spreadsheet on an external USB drive and stored in a secure location. The physical surveys were destroyed after the conclusion of the study, and the consent forms are stored in a sealed box in the locked office of the supervising faculty member to be destroyed in June 2023. Student grades are obtained via face-to-face contact (to avoid emailing grades) between the principal investigator and each professor whose class was surveyed. Each professor gave prior approval to release the grades of participating students when the study was designed. Once entered, any identifiable information of the students is removed from the study and stored separately as a four-digit code on a key kept only by the supervising faculty member. The participant key is the only remaining identifier of who participated in the study, and it will be destroyed on June 1, 2025. This ensures that no identifiable participant information can be seen by anyone except the investigators as well as it allows for a blind analysis of the raw data, removing any bias a name can create.

3.2. Study Parameters

Featured below are the parameters of the study, including size, duration, risks, initial hypothesis, research question, etc. Each of the bulleted line items below (see the Consent Form in the Survey section of the appendix on page 61) was approved by the IRB before the Fall 2021 semester. The short duration of the study and limited sample size are both due to the principal investigator's shortened time window as an undergraduate. Note: The study includes a Spring 2022 semester component, which at the time of writing had not been completed.

- **Research Question**
  - What are the correlations between Student Success Center usage and academic success (current and future) as measured by test scores and student demographics?
- **Hypothesis**
  - Subjects who use the Student Success Center will have higher academic scores than subjects who do not use the SSC, after correcting for variations in subject demographics.
- **Sample Size (for Fall 2021)**
  - 371 participants consented of 548 surveyed
    - A total of 770 enrolled in Calculus A and Calculus B, combined
    - Missing participants are attributed to one in-person section moving online, scheduling conflicts, students not attending class, students under age 18, etc.
  - Only in-person, non-Honors courses included
    - Honors sections do not have PASS Leaders and generally lower SSC attendance
- **Duration**
  - Conducted during the Fall 2021 semester (continues through Spring 2022)
  - Originally approved by the IRB on June 25, 2021
  - Expired on June 1, 2022
- **Population**
  - Students enrolled in Calculus A or Calculus B at UAH
  - To consent, participants must be aged 18+ and non-prisoner
- **Location**
  - Students filled out the surveys in the classroom they take the course
    - Samuel Johnson made initial contact and administered surveys
  - Academic scores were obtained by Samuel Johnson
  - SSC attendance rates were obtained by Kristen Thompson
- **Risks**
  - There were no risks to the participants
- **Incentives/Compensation**
  - There were no incentives to participate in the study
- **Identifying Subjects and Confidentiality**
  - All participant names were removed from the final results, leaving only a key to connect four-digit "student codes" to the name (destroyed June 1, 2025)

4. Methodology

After design and approval from the IRB (see Approval Process and Qualifications on page 7), the study began by coordinating with the UAH calculus lecturers in the over twenty sections to find times in their classes to give the surveys. Each section consisted of 30-50 students and section locations, professors, and times varied, yet each uses the same general course outline, so all were similar enough to be considered the same course. Class attendance tends to decrease throughout the semester, so for higher return rates, the surveys were given close to the beginning of the semester (late August/early September). Samuel Johnson administered the surveys by first explaining the process and the strict confidentiality such that the participants could make informed consent to be in the study. During this time, it was noted that the formal language of the consent forms made many students uneasy about what they were agreeing to, so for further studies, the consent form will need to be re-worded. After the students filled out the surveys, the paper copies were then stored in a sealed box to prevent changes/tampering. Once collected, the data was hand-entered into a password-protected Excel spreadsheet on an external USB drive by Samuel Johnson. The semester proceeded as normal with the students using the SSC and being tested just as any other semester. Once final grades were submitted by the lecturer, individual test scores, grades on the final, and final course grades were collected in person by Samuel Johnson from each lecturer and entered into Excel. SSC attendance information was extracted by Kristen Thompson (through her regular duties as the Senior Coordinator of Peer Education) and entered into Excel by Samuel. This process continued through the spring semester to all Calculus A and Calculus B sections. Results are discussed in Findings (page 15).

4.1. Surveys

A key component of this study is the surveys, which are the critical difference between this study and similar projects conducted by the SSC and UAH as the surveys differentiate students into various demographic categories to compare differences in test grades more closely. For the full survey, see the Survey on page 63. Additionally, separating students into categories can show SSC attendance trends for groups of students with similar backgrounds. Surveys are self-reported by the students, and bias from this was mitigated as each line item in the survey is a strict fact of the participant, which was chosen from a list of options. Another aspect to explore may be to examine who filled out the surveys (and consented to be in the study) as there could be trends in willingness to participate. Paper surveys were chosen to ensure a higher response rate as online surveys, while easier, tend to have a lower return rate. The return rate for the Fall 2021 semester was 371 participants consenting out of a possible 548 surveyed and 770 total enrollment. The two hundred "missing" participants are due to one section of a course moving online, a low response rate from the online sections (which were omitted), and various scheduling conflicts. The leading reasons for students who did not consent (and thus did not fill out the survey) are students not attending class, being uneasy about the formality of the consent form, and not being 18+. For the results of the surveys and further analysis, see Findings (starting on page 15) as well as Calculus A Data and Calculus B Data.

The following are some of the questions each line item seeks to answer:

- **College:**
  - What impact does academic college have on calculus grades or SSC usage?
  - Is there stigma or extra encouragement to use the SSC, given a certain college?
- **Honors College:**
  - Do honors students in non-honors courses use the SSC at different rates than non-honors?
  - Is there a clear grade delineation suggesting the student could have taken Honors Calculus?
- **Major:**
  - Do certain majors do better/worse in calculus?
    - If so, should UAH trial run major-specific calculus courses?
- **First Semester at UAH:**
  - How do students transition from outside UAH (high school or another college) to UAH?
  - If students are "off-sequence," how does that impact motivation to use SSC and grades?
- **First-Generation College Student:**
  - Are there differences in first-generation grades and SSC usage?
  - What are the similarities between first-generation students and other demographics?
- **Student Type:**
  - Do returning/transfer students attend the SSC at the same rate as traditional students?
    - If so, should sessions times be changed to cater to non-traditional students?
  - Are the extra levels of material/review the SSC offers enticing to returning students?
- **Live on On/Off-Campus:**
  - Is the distance to campus for an SSC visit discouraging students?
  - How are grades impacted by how close students live to campus?
- **High School Type:**
  - Do students from public/private/home schools respond differently to academic support?
  - Is there a bias in student perception of the SSC based on high school experiences?
- **Graduating Class Size:**
  - Is there a clear distinction between college-level math preparedness and high school size?
  - Do people who attended schools of a certain size tend to use the SSC more or less?
- **Pre-Requisite Course at UAH:**
  - If a student took the pre-requisite course at UAH, does that change their academic habits?
  - Does the math background of students who are required to take pre-requisite courses impact how likely they are to use available resources?
- **AP Course in High School:**
  - Should students who have taken AP courses move directly into Calculus B?
  - How does any AP experience affect students' use of academic support services?
- **High School Equivalent:**
  - Does a high school equivalent prepare students to move directly into Calculus B?
    - Are all high school equivalents equal?
  - Does familiarity with material change student study habits?

- **Repeating Course at UAH:**
  - Is there higher attendance to the SSC for students taking the course a second time?
  - Do repeat students have different levels of confidence that impact their test scores?
- **Modality of Prior Course:**[12]
  - Are all prior course modalities equal?
  - Does the change of delivery brought on by COVID-19 change the quality of education?
- **Number of Credit Hours:**
  - Do students use the SSC more if they are taking more/fewer courses?
  - How does course load impact grades?
- **Number of Working Hours:**
  - Do students use the SSC at the same rates if they work part- or full-time jobs?
  - How many students of a certain type of work part- or full-time jobs?

4.2. Collection of Student Grades

The three student grades gathered in this study were individual test scores, grades on the final exam, and final course grades. Individual test scores were collected as they serve as benchmarks for how well students understand each unit's material, which shows incrementally the students' study habits and familiarity with the content. The test scores were averaged across the semester to expose overall habits and show an unaltered (by homework, collaborative work, etc.) score for the middle of the semester in which students are focusing on more than just finals. The grade on the final exam was considered as it illustrated how much of the material the student's retained from the semester and how well each student prepares for the comprehensive exam. The two types of test grades are needed as demographics/SSC usage may have a different impact while in the middle of a semester (individual tests) than at the end of the semester (finals). The comparisons can also influence how the common final (or individual tests) for Calculus A is constructed as each section creates its tests, but all students take a common final. The final course grades were examined as they exhibit how well the students know the material (tests) and how they fulfilled other course duties (homework, attendance, etc.). For example, a student may know the content well and receive high test grades, but they may consistently not put full attention into the homework while another student may struggle with the material but pay extra care to do well on the homework. If these two cases have similar final grades, it provides a way to analyze what different demographics tend to be more likely to have: higher test averages (lower homework) or higher final grades (lower test averages). Each of the three academic scores gathered provide different information about the students and their habits concerning SSC usage and demographics to reveal overall trends that can better inform both the SSC and the UAH Math Department.

[12] Modality is how the course is presented, which can be fully in-person (face-to-face), only synchronous (instructor teaches online in real time), hybrid (some synchronous/some in-person), or only asynchronous (online but no 'live' instruction – generally pre-made videos for the students to watch).

4.3. Data Analysis and Descriptions

Data for this study were aggregated to see overall attendance and grade trends for each demographic of the students. Excel was used (over other statistical programs like Minitab or SPSS) to examine the connections due to Excel's relative ease of use and easy access such that this study can be replicated exactly without the need for specialized programs.

Each of the following items in the list was focused on in this study for a different reason, which is described next to the item title. After the information section, there is an abbreviated list of the most common Excel functions used to examine the data. The data and the conclusions associated with each item are explored in Findings (page 15) and the full tables and charts produced by them are included in the Appendix (starting on page 33).

Information to be Examined

- **Prior Math Experience:** Relevant academic history of each student. The student has taken…
  - *Pre-Requisite at UAH:* Pre-Calculus (for Calculus A), Calculus A (for Calculus B) at UAH.
  - *AP Equivalent:* AP Calculus A/B and/or B/C in high school.
  - *High School Equivalent:* Any calculus courses in high school.
  - *Repeating Course:* The exact course at UAH in the previous semester.
  - *First Time Seeing Material:* The student does not meet any of the previous four criteria, they are considered "first-timers."
  - Note: UAH is usually accepting of external college credits, so it was not deemed necessary for an additional "Took the Same Course at Different University" category to be included.
- **Residence Proximity to Campus:** Where the student lives (near campus). The student lives…
  - *On-Campus:* On-campus housing i.e., residence halls.
  - *< 30 min. Off-Campus:* Within a 30-minute drive of campus.
  - *> 30 min. Off-Campus:* More than 30 minutes away from campus.
- **High School Type:** The school type each student attended. The student attended…
  - *Public:* Publicly funded high school.
  - *Private:* Privately funded high school.
  - *Home:* Home-schooled i.e., a catch-all for online homeschool, co-op homeschool, etc.
- **Student Type:** Whether a student is attending UAH straight after high school, returning after a break, or transferring from a different institution.
  - *Traditional:* The student attends UAH immediately after high school (no gap or short gap between high school and college).
  - *Returning:* The student has had at least a two-year gap between high school and college enrollment.
  - *Transfer:* The student started college at an institution other than UAH.
- **SSC Usage:** How much a student uses the Student Success Center.
  - *0-1 SSC (No SSC):* 0-1 attendances. One attendance was included as a trial run for students to try the SSC and decide not to continue using it.
    - Students are considered to be independent of the SSC's influence.
  - *Light:* 2-4 attendances. The student rarely attends the SSC, usually before a test or multiple sessions for a specific topic.
    - Students are minimally impacted by the SSC beyond slight individual test increases.

  - *Medium:* 5-9 attendances. The student attends sessions at a rate of one every other week to nearly one per week.
    - Students are somewhat impacted by the SSC and have made it an intermittent to consistent part of their study routine.
  - *Heavy:* 10+ attendances. The student is considered a "regular" user by the SSC as the students attend, on average, one session per week. This category also includes "super-users" who use the SSC multiple times per week.
    - These students are most impacted by the SSC as they have made attending sessions a steady part of their study habits.
  - *Any SSC:* 1+ attendances.
- **Academic Scores:** What the student's academic grades are.
  - *Average Test Grade:* The average score of the student's test grades.
  - *Final Exam Grade:* The score the student made on the final exam.
  - *Final Course Grade:* The (percent) grade entered onto the student's transcript.
- **First Generation:** Whether a student has at least one parent with a four-year degree.
- **Academic College:** Where the student's major is classified.
  - Reduced to College of Science and College of Engineering due to low sampling size of the other colleges.
- **First Semester at UAH:** Whether this is the student's first semester at UAH.
- **Honors College:** Whether the student is also a member of the Honors College.
  - Note: Many Honors College students take an Honors section of calculus, but this study examines the Honors students who do *not* take an Honors section.
- **Drop:** The student did not complete the course.
  - Includes withdraws, drops, failures to take the final, etc.

Excel Functions Used to Analyze the Data

- **Averages:** Finds the mean of a type of test grades for a given subset of demographics and/or SSC attendance rate.
  - AVERAGEIFS(Test_Averages, Total_SSC, "<="&Light_End, Total_SSC, ">="&Light_Start, PreReq, "Y")
- **Standard Deviations:** Finds the standard deviation of the sample of grades for a data subset.
  - STDEV.S(IF(HSEquiv = "Y", Test_Averages))
- **Total Probabilities to Use SSC:** Finds the total probability for a student to be considered both a demographic and attend the SSC at a given rate (divide by all possible students).
  - COUNTIFS(College, "ENG", Total_SSC, "<="&No_End) / Number_of_Students
- **Conditional Probabilities to Use SSC:** Finds the conditional probability for a student who is demographic to use the SSC at a rate (divide by the number of students in the demographic).
  - COUNTIFS(College, "ENG", Total_SSC, "<="&No_End) / COUNTIF(College, "ENG")

5. Findings

The purpose of this study was to discover correlations between Student Success Center usage, academic success as measured by test grades, and student demographics. Full tables and charts for the information discussed in the following sections can be found in the Appendix (page 33).

For SSC usage compared directly with test grades, no SSC-attending group scored higher than the non-SSC group, which is seen below in Figures 5-1 and 5-3 "Calculus A(B) Testing Summary" (page 16). This implies the original hypothesis must be adjusted to better fit what is occurring as it did not include other factors, such as the motivation of the students as attendance to SSC is voluntary. Notable outliers to this trend are students who are repeating the class, who were home schooled, and who are first-generation college students. These relationships and others will be explored in Student Grade Correlations to Student Success Center Usage (page 17), and with the full information is found within Calculus A Data (page 34) and Calculus B Data (page 47) in the appendix. As this is a correlation study, it is impossible to determine how each demographic's grades would have been different if they had used the SSC at different rates.

The study also explored how various demographics (specifically students' pre-requisite math experience) correlated with academic grades, independent of SSC usage. The groups that scored significantly higher in each of the three testing metrics include Honors College students, students who took AP or other high school equivalents, and students who were home schooled. More nuanced relationships exist as well, such as first-generation students scoring lower than non-first-generation students or first-semester UAH students scoring a full letter grade higher than students who were in their second (or further) semester at UAH. It is important to note that just because one group scored higher in this study does not mean that it is inherent the same group will score higher in all classes across all universities across all time; rather, it is a correlation-based snapshot into what the Fall 2021 UAH Calculus A and Calculus B classes were. For a deeper analysis of the relationships between demographics and grades, see Student Grade Correlations to Demographic Information (page 20).

Finally, this study intends to examine which groups may (or may not) have higher rates of SSC usage and make connections as to why a group might attend at a different rate, such as the stigma of reaching out for assistance, not knowing what support services UAH offers, etc. A breakdown of these attendance rates is seen below in Figures 5-2 and 5-4 "Calculus A(B) Demographics,"[13] and the full set of charts is in the Appendix (page 33). Students who took equivalent high school courses (AP or not) used the SSC less (~25%) than the average, but students who had never seen calculus (no pre-requisite classes), attended higher (~30%) than the average. Those who were repeating the course and returning students attended at the lowest rates while Honors College students were among the top repeat users. These connections are likewise repeated in the conditional probability analysis. The final key result is the PASS Program saw the majority of SSC uses for Calculus followed by content tutoring and drop-in tutoring. More in-depth analyses can be seen in Student Success Center Usage to Demographics Correlations (page 24).

[13] "0-1 SSC" includes one 'trial visit' while "Any SSC" includes all attendances greater than zero. The former was chosen because the 0-1 SSC category can include students who attended an SSC service once and decided to study through other means. The latter was chosen as a binary yes/no to SSC use to see if the motivation to use the SSC at least once plays out differently than students who fully avoid it.

Calculus A Testing Summary			
Demographic	Average Test Score	Average Grade on the Final	Average Final Score
Average	77.16	66.71	79.84
Yes Pre-Req at UAH	71.59	58.26	75.59
Yes Equivalent AP	81.70	73.02	83.39
Yes Equivalent High School	79.45	70.72	81.59
First Time Seeing Material	78.78	66.40	81.05
Repeating Course	74.54	59.30	76.07
Yes On Campus Housing	76.45	66.30	79.03
Near Off Campus Housing	78.65	67.75	81.90
Far Off Campus Housing	78.25	66.88	80.00
Yes First Generation	73.41	64.55	76.37
Not First Generation	78.30	67.35	80.81
College of Engineering	76.28	66.85	79.25
College of Science	80.19	67.13	81.79
Yes First Semester at UAH	79.48	70.28	81.76
Not First Semester at UAH	68.49	52.79	72.35
Public High School	76.72	65.87	79.56
Private High School	77.41	69.31	79.40
Home School	82.78	72.00	85.22
Yes Honors	84.52	68.43	83.86
Not Honors	76.62	66.59	79.54
Traditional Student	77.01	67.11	79.76
Returning Student	82.68	71.00	84.78
Transfer Student	74.51	57.33	77.31
0-1 SSC	78.29	69.62	80.64
Light SSC	78.94	64.04	80.72
Medium SSC	72.51	60.26	77.52
Heavy SSC	72.24	58.58	76.66
Any SSC	74.71	60.94	78.27
Drop	60.64		

Figure 5-1 "Calculus A Testing Summary"

Calculus A Demographics					
Demographic	Number of Students	Unique Attendance	Percent Attend	Total Attendance	Attendance per...
Average	272	111	41%	763	6.87
Yes Pre-Req at UAH	89	39	44%	307	7.87
Yes Equivalent AP	109	30	28%	110	3.67
Yes Equivalent High School	162	52	32%	274	5.27
First Time Seeing Material	59	32	54%	242	7.56
Repeating Course	16	4	25%	36	9.00
Yes On Campus Housing	173	74	43%	462	6.24
Near Off Campus Housing	72	25	35%	191	7.64
Far Off Campus Housing	27	12	44%	110	9.17
Yes First Generation	70	31	44%	210	6.77
Not First Generation	202	80	40%	553	6.91
College of Engineering	181	78	43%	545	6.99
College of Science	80	27	34%	179	6.63
Yes First Semester at UAH	213	87	41%	511	5.87
Not First Semester at UAH	59	24	41%	252	10.50
Public High School	224	95	42%	656	6.91
Private High School	35	12	34%	73	6.08
Home School	9	4	44%	34	8.50
Yes Honors	16	8	50%	114	14.25
Not Honors	256	103	40%	649	6.30
Traditional Student	239	99	41%	684	6.91
Returning Student	13	3	23%	18	6.00
Transfer Student	20	9	45%	61	6.78
0-1 SSC	187	187	69%	26	0.14
Light SSC	37	37	14%	104	2.81
Medium SSC	22	22	8%	150	6.82
Heavy SSC	26	26	10%	483	18.58
Any SSC	111	111	41%	737	6.64
PASS	100	100	37%	632	6.32
Tutoring	25	25	9%	88	3.52
Drop-In	18	18	7%	43	2.39
SSC Totals	111	111	41%	763	6.87
Drop	66	22	33%	59	2.68

Figure 5-2 "Calculus A Demographics"

Calculus B Testing Summary			
Demographic	Average Test Score	Average Grade on the Final	Average Final Score
Average	72.86	67.97	78.44
Yes Pre-Req at UAH	68.52	60.92	74.63
Yes Equivalent AP	79.78	73.36	81.13
Yes Equivalent High School	77.39	72.73	80.44
First Time Seeing Material	71.48	71.20	79.20
Repeating Course	68.14	55.67	70.42
Yes On Campus Housing	75.54	69.40	79.05
Near Off Campus Housing	68.64	65.55	76.97
Far Off Campus Housing	80.08	70.80	82.40
Yes First Generation	64.87	68.31	75.62
Not First Generation	74.53	67.91	79.00
College of Engineering	72.88	67.67	78.81
College of Science	72.61	67.81	77.85
Yes First Semester at UAH	78.76	79.21	84.74
Not First Semester at UAH	68.50	59.49	73.69
Public High School	73.85	69.09	78.97
Private High School	67.14	64.78	77.33
Home School	71.20	58.25	72.50
Yes Honors	79.88	75.08	83.33
Not Honors	71.74	66.70	77.57
Traditional Student	75.07	68.96	79.25
Returning Student	59.23	55.00	70.00
Transfer Student	61.94	63.86	74.14
0-1 SSC	74.96	69.87	79.67
Light SSC	68.83	65.00	76.00
Medium SSC	61.04	59.13	71.50
Heavy SSC	71.43	61.25	77.25
Any SSC	65.84	61.56	74.28
Drop	42.09		

Figure 5-3 "Calculus B Testing Summary"

Calculus B Demographics					
Demographic	Number of Students	Unique Attendance	Percent Attend	Total Attendance	Attendance per...
Average	99	35	35%	192	5.49
Yes Pre-Req at UAH	62	19	31%	80	4.21
Yes Equivalent AP	46	17	37%	74	4.35
Yes Equivalent High School	51	19	37%	95	5.00
First Time Seeing Material	9	5	56%	44	8.80
Repeating Course	12	5	42%	36	7.20
Yes On Campus Housing	49	17	35%	123	7.24
Near Off Campus Housing	43	15	35%	58	3.87
Far Off Campus Housing	7	3	43%	11	3.67
Yes First Generation	23	13	57%	67	5.15
Not First Generation	76	22	29%	125	5.68
College of Engineering	63	25	40%	137	5.48
College of Science	34	9	26%	54	6.00
Yes First Semester at UAH	41	19	46%	115	6.05
Not First Semester at UAH	58	16	28%	77	4.81
Public High School	81	31	38%	171	5.52
Private High School	12	3	25%	8	2.67
Home School	5	1	20%	13	13.00
Yes Honors	13	4	31%	46	11.50
Not Honors	86	31	36%	146	4.71
Traditional Student	81	24	30%	117	4.88
Returning Student	4	4	100%	13	3.25
Transfer Student	14	7	50%	62	8.86
0-1 SSC	74	74	75%	10	0.14
Light SSC	10	10	10%	33	3.30
Medium SSC	9	9	9%	61	6.78
Heavy SSC	6	6	6%	88	14.67
Any SSC	35	35	35%	182	5.20
PASS	29	29	29%	119	4.10
Tutoring	10	10	10%	47	4.70
Drop-In	7	7	7%	26	3.71
SSC Totals	35	35	35%	192	5.49
Drop	19	7	37%	48	6.86

Figure 5-4 "Calculus B Demographics"

5.1. Student Grade Correlations to Student Success Center Usage

In general, students who attended the SSC scored up to half a letter grade lower than non-attendees, which is seen above in Figures 5-1 and 5-3 "Calculus A(B) Testing Summary." This is without any correction for demographics, which immediately implies there is more to the analysis of SSC vs. non-SSC than direct comparisons. This does not mean the SSC is causing students to score lower as these are correlations that make it difficult to estimate what grade difference using the SSC has, causally. For the full data sets and more examinations, see the Appendix (page 33), and the following two subsections, in which Calculus A and Calculus B are considered separately. The two courses are analyzed separately because the demographics of the students who take each course in the fall semester are quite different, such as students in fall Calculus A are generally 'on sequence' for most STEM degrees while students in fall Calculus B could have tested past Calculus A, taken pre-requisites at UAH before, or began in pre-calculus courses at UAH.

There are a few notable exceptions to the trend of SSC users scoring lower than non-SSC users. One such exception is in the 16 students who repeated Calculus A. Only 4 of these students used the SSC, yet each of the attendees scored up to a full letter grade higher than their non-SSC peers. This small sample set is subject to too much variation to have complete confidence these trends are stable for more repeat students, but it does provide hesitancy to the claim of SSC attendees universally score lower.

Additionally, one category with more clear delineations in data is the first-generation students in Calculus A. These students attended the SSC at slightly above average rates but scored higher in every attendance group across all three academic scores when compared to first-generation non-SSC users. These numbers are relatively stable as for the 70 total students, 31 of them used the SSC (at varying levels), and there are no significant outliers in this subset. The largest gap in grades is first-generation students who used the SSC at a medium rate (5-9 visits), who scored 13 points higher than the overall non-SSC average of first-generation students. This implies first-generation students benefit more from added academic support; however, it should be noted first-generation students scored 3-5 points lower than their non-first-generation peers in Calculus A.

Overall, the data imply students who use the SSC in Calculus A and Calculus B will score lower (albeit either equal or lower by a few points) in the course when compared to non-SSC-using students. This could be explained in two ways. One, the students who see themselves as "struggling" in the course may be more motivated to use the resources available to them. Alternatively, this could be seen as the SSC having a stigma as "only for those who need *help*" or a reactive measure to fix grades rather than a proactive means. This difference should not be considered a wholly negative trait; rather, it shows many students who may need extra instruction/support are seeking out and using the SSC. Both explanations rely on the students having an inconsistency between their desired grade and their current grade, which in turn can be caused by a variety of factors, such as a discrepancy in prior background knowledge (compared to peers), varying study skills, inefficient time management, or even a disconnect between preferred learning styles and the professor's lecture style.

Calculus A

The following list gives the notable differences between demographics for testing information. The full tables are in Calculus A Data (page 34). Based on this, the group most correlated most positively by the SSC is first-generation college students, and the groups correlated most negatively by the SSC are Honors College and AP students. There are other smaller connections, but most are either weakly correlated or the sample size is small enough that little confidence can be given to the data. Figure 5.1-1 "Calculus A - Strict SSC v. Grades" at the bottom shows students who attend the SSC score lower overall; therefore, it appears in Calculus A that students who attend the SSC continue to score lower than their non-SSC peers due to some third variable, such as motivation, need for extra support, lack of math confidence (math anxiety), etc. These third variables are explored further in Conclusions (page 27).

Demographic Category that Scored Higher with SSC Use:

- Repeating Course
- Transfer Student (not Heavy Usage)
- Home School
- First Generation

SSC Statistically Indifferent (±3%):

- High School Equivalent; First Time Seeing Material
- Traditional Student; Returning Student
- Not Honors Students (not Heavy Usage)
- College of Engineering; College of Science (uneven distribution)
- First Semester at UAH; Not First Semester (uneven distribution)
- On-Campus Housing; Far Off-Campus Housing
- Private High School

Demographic Category that Scored Lower with SSC Use:

- Prior AP; Pre-Requisite at UAH
- Honors Students
- Near Off-Campus Housing
- Public High School
- Not First Generation

Calculus A - Strict SSC v. Grades

Demographic	Average Test	Average Final Score	Average Final Grade	Std. Dev. Test	Std. Dev. Final	Std. Dev. Final Grade
Average	77.16	66.71	79.84	15.59	20.44	12.70
0-1 SSC	78.29	69.62	80.64	16.09	35.24	38.24
Light SSC	78.94	64.04	80.72	10.63	33.27	39.58
Medium SSC	72.51	60.26	77.52	11.65	27.78	28.52
Heavy SSC	72.24	58.58	76.66	17.43	22.86	13.37
Any SSC	74.71	60.94	78.27	14.54	30.74	33.78

Figure 5.1-1 "Calculus A - Strict SSC v. Grades"

Calculus B

The demographics and types of students in Calculus B are different than in Calculus A for the fall semester, yet most categories for Calculus B follow similar trends as is seen above for the Calculus A students. The "0-1 SSC" group continues to score higher than the individual SSC groups as is seen below in Figure 5.1-2 "Calculus B - Strict SSC v. Grades." The Calculus B group has 99 students in the fall study (Calculus A has 272), so confidence in the correlations is stronger for the Calculus A group, yet there is still valuable information gathered from the Calculus B-only group. For the full tables of Calculus B grades, usage rates, etc., see Calculus B Data (page 47).

The strongest positive correlations to higher grades with more SSC usage are similar to Calculus A with Repeat, Transfer, and First Time Seeing Material students scoring higher than their equivalent non-SSC-attending peers. The significance of each category is low as each has a small sample size ranging from three to six students in the SSC attended groups. Another strong relationship is that each of the SSC-attended groups had a higher overall change in average test grade (and grade on the final) to final course grade, a trend followed similarly in Calculus A.

One key issue of Calculus B is the smaller sample size. For example, there are only six students who attended the SSC in the "Heavy" usage range. The standard deviation for that category in the test score range is extremely tight (4 points) while all other categories have up to nine times that, showing a high degree of similarity (in test grades) between demographics who attend the SSC very often. Other standard deviations for groups remain high, yet are mostly stable between categories, which is another divergence from the Calculus A data, which was more inconsistent. While large standard deviations would be teased out with a larger sample of students, the means of each demographic for SSC-attended groups is lower than the non-SSC-attended group showing an overall trend beginning to form. Possible reasons for these score differences and trends are discussed further in Conclusions (page 27) with explanations such as student motivation, student need for extra personalized instruction, inexperience with math, etc.

The key findings in the fall Calculus B data are that students tend to score lower on average than in fall Calculus A and students in Calculus B who attend the SSC correlate with lower grades than their peers with a sharper difference than in Calculus A.

Calculus B - Strict SSC v. Grades

Demographic	Average Test Score	Average Grade on the Final	Average Final Score	Std. Dev. Test Score	Std. Dev. on the Final	Std. Dev. Final Score
Average	72.86	67.97	78.44	17.89	18.74	12.08
0-1 SSC	74.96	69.87	79.67	18.36	31.83	32.32
Light SSC	68.83	65.00	76.00	17.20	34.25	38.64
Medium SSC	61.04	59.13	71.50	12.74	23.31	23.86
Heavy SSC	71.43	61.25	77.25	4.08	30.68	36.62
Any SSC	65.84	61.56	74.28	16.65	31.40	33.64

Figure 5.1-2 "Calculus B - Strict SSC v. Grades"

5.2. Student Grade Correlations to Demographic Information

Demographics and prior math exposure of students have many strong correlations with student grades in Calculus A and Calculus B (for the falls semester). The complete set of figures is in the Appendix (page 33) and key figures for this section are Figures 5-1 and 5-3 "Calculus A (B) Testing Summaries" (above). As Calculus A and Calculus B have different demographics during the fall semester, each will be considered separately in the following subsections.

The first investigation is how different pre-requisite math classes correlate with student grades in Calculus A and B at UAH. The range of the pre-requisite test scores (from the lowest-scoring group to the highest-scoring group of demographics) is eight points in Calculus A and eleven points in Calculus B, so there are definitive differences. For both classes, the highest scorers were those who took an AP equivalent to calculus in high school followed by those who took a high school equivalent. Students who had never seen the material before scored higher than those repeating the class and those who took the pre-requisite class at UAH. The latter correlation is likely due to the students who take pre-requisites at UAH and Calculus B in the fall are nearly guaranteed to have started with a pre-calculus course at UAH.[14] These students did not test into Calculus A, so they are likely to have lower math confidence/experience than those who did not take a pre-requisite, which is another example of a third variable dictating the data.

Demographic groups with a significant correlation to grades include first-generation students, first-semester UAH students, and Honors College students. First-generation students (neither parent has a four-year degree) score four grade points lower across each testing category than non-first-generation students. This may be due to many outside factors that are not addressed in this project. Students in their first semester at UAH score a full letter grade higher than non-first semester students. This is a probable third variable problem as for Calculus A, 88% of non-first semester students took pre-calculus at UAH and 25% are repeating. The high degree of overlap for the non-first semester with other categories is high because the students did not have the placement scores and/or math confidence to immediately go into Calculus A. It means there is a tangential correlation between non-first semester students and testing grades. Honors College students scored half a letter grade higher than their non-Honors peers.

Other demographics do not have as strong of correlations due to sample size variations or smaller differences, so no definitive conclusions can be made about them. These include the following: housing types with high variation; College of Science vs. College of Engineering with nearly identical scores; and high school types with inconsistent grade distributions. The last category to lack clear correlation is student type, which at first glance appears to have significant differences, but the sample sizes are too small to make definitive claims.

[14] Traditional STEM majors take Calculus A in the fall and Calculus B in the spring. To take Calculus A in the fall with already taken pre-requisites at UAH means the student must have taken pre-calculus at UAH. To take Calculus B in the fall *and* take pre-requisites at UAH, students must have either repeated either calculus course or started the fall of their first semester in pre-Calculus, taken Calculus A in the spring, then Calculus B in the next fall. In all cases, the student is highly likely to have started with pre-calculus at UAH.

Another key part of this study is examining the relationship between average test grades, the grade on the final exam, and the final course grade. This is significant because while average test grades can serve as an estimator for the final grade in the course and final test grade, more factors influence each. The final course grade includes homework, attendance, and collaboration grades, so a marked difference between the final course grade and individual test (or final test) grades also includes other factors and student behaviors outside of test grades. This could mean the student has a strong desire to perform well in the class but has gaps in background knowledge, math anxiety, or other limiting factors when it comes to test-taking. Conversely, a student may have high test scores but a relatively lower final course grade, indicating that the student was able to demonstrate knowledge of the material but may not have sufficiently kept up with other coursework. Both cases are important as they can provide a glimpse of motivation and conscientiousness, which can have long-term effects on students' performance in college. In both Calculus A and Calculus B, the lowest category of grades is the grade on the final exam, then individual tests are five and eleven points higher (respectively for A, B), but in either, the average course grade is the highest of the three at a high C (grade in the high 70s). It should be noted that these averages (and all in this study) do not include students who did not take the final exam (and/or dropped/withdrew). This decision was made at the start of the study so as not to widen the standard deviation and artificially lower the average grades. The overall average grade of each category is the benchmark that all other categories are compared against in this and the following two subsections.

Calculus A

Students of a given demographic score differently on tests and have different final grades in Calculus A, which is shown in Figure 5.2.1 "Calculus A Demographics v. Final Grade in Course" (below) and in Calculus A Data (page 34).

Students who scored the highest in Calculus A include Honors College students and students who have taken a Calculus AP class in high school, and there is a high confidence in each conclusion due to relatively large sample sizes. This can be explained as both groups generally possess more in-depth math skills than their peers, which is needed for Calculus A. Other high-scoring groups, like Home School or Returning students, do not have sufficient sample sizes to make complete conclusions but show clear trends of scoring higher in Calculus A.

Conversely, the student types who scored the lowest are those repeating the course and those who are not in their first semester at UAH. Aside from how these two are concomitant, this can be attributed to the same third variable of math skills as those who are not in their first semester at UAH are likely to have taken the pre-requisite at UAH (another low-scoring three category) due to either low ACT scores, low high school GPA, etc. (see footnote #14 on page 20).

Additional interesting comparison-based correlations are how College of Science students scored higher than College of Engineering; how non-first-generation students scored higher than first-generation students; and how on-campus housing has the lowest grade set of the three housing options. The academic college connection does not appear to have one clear-cut explanation. The (not) first-generation college student difference could have a few possible explanations: first-generation students do not have the support system to help them navigate college (parental wisdom, etc.), or simply attending college may be more important than achieving the top marks in each class. One last aspect is the on-campus housing group scored the lowest of the three housing options. This may be due to the how some who drive to attend college are at a different station in life in which they feel more pressure to do well in courses, or it may be a simple biased sample as many more people in this study lived on campus than off.

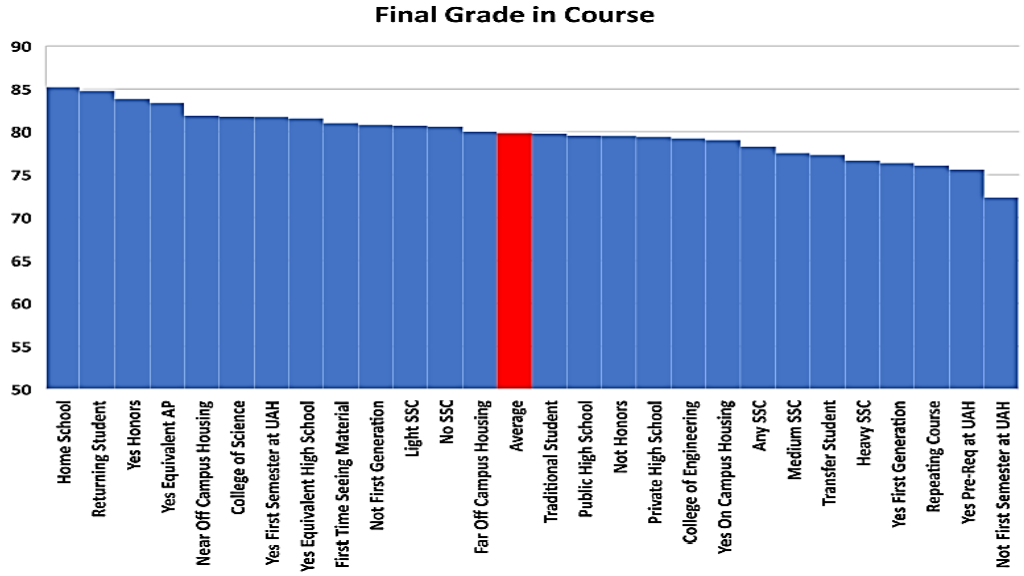

Figure 5.2-1 "Calculus A Demographics v. Final Grade in Course"

Calculus B

The correlations between Calculus B grades and demographics are similar to those of Calculus A, but differences become more pronounced as there is a fifteen-point (grade) range between demographic groups, compared with the Calculus A difference of less than ten (grade) points. Figure 5.2-2 "Calculus B Demographics v. Final Grade in Course" (below) and Calculus B Data (page 47) gives additional details for the grade breakdown.

Part of the reason the differences within and between demographic categories are more pronounced is the smaller sample size for Calculus B (99 participants). For example, returning and home school students have the smallest populations with 4 and 5 students, respectively. Each of the demographics' average grades is lower than the average, but the confidence interval is too wide for true conclusions to be made.

Similar trends as in Calculus A emerge here as many of the same groups again score above the average. Such groups include Honors College students scoring high, AP students scoring higher than any other pre-requisite type, etc. Comparably, groups scoring on the low end are those repeating the course, first-generation students, and transfer students. One trend from Calculus A that becomes more stratified here is how private school students scored lower than public school students, going against prior assumptions, yet third variables could influence this, such as how there are more AP students from public than private schools (see Calculus B Data on page 47).

One case study is students who live in the "Far Off-Campus" category. Seven students live more than 30 minutes away from campus (drive time). Two of these students dropped, yet the students who did not drop had rather high test averages, which is against the assumption that those students tend to score lower.[15] This could be a case in motivation as the students who stayed enrolled through the semester scored above average despite the time spent with a long commute every day. Overall, as Calculus B shows similar trends to Calculus A, these trends may not be isolated to only entry-level math courses; they may continue across other disciplines as well.

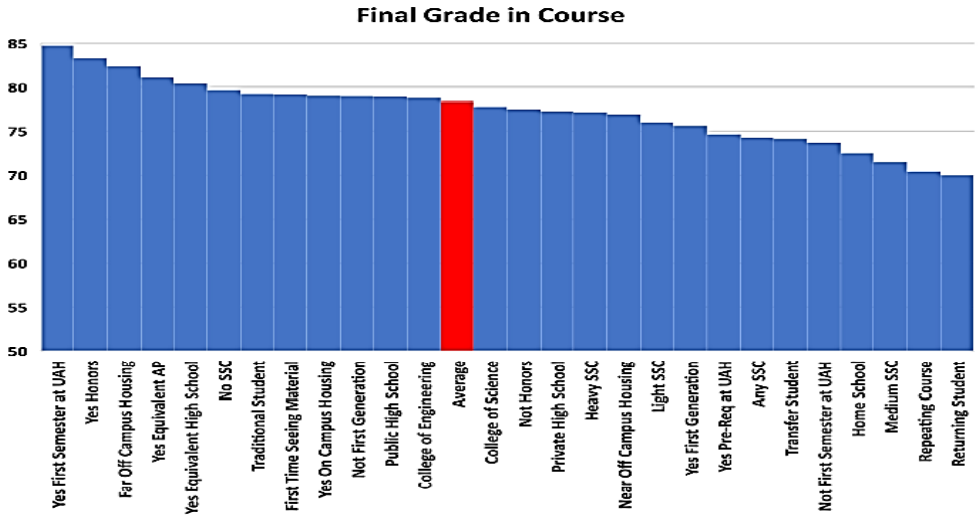

Figure 5.2-2 "Calculus B Demographics v. Final Grade in Course"

[15] Taylor, Ryan, Mitra, Raktim. "Commute satisfaction and its relationship to post-secondary students' campus participation and success." Transportation Research Part D: Transport and Environment, Volume 96, July 2021.

5.3. Student Success Center Usage to Demographics Correlations

The previous two sections considered how SSC usage and student demographics correlated to grades, yet it is also important to examine the correlation between demographics and SSC usage. Calculus A and Calculus B will be considered independently below, but a key difference is that for the fall semester, Calculus A has higher unique attendance rates and return visit rates than Calculus B. This is seen above in Figures 5-2 and 5-4 "Calculus A(B) Demographics" (page 16) as well as in the full tables and charts in the Appendix (page 33). PASS holds the largest percentage of the three types of SSC attendances examined.

The strongest correlation between SSC usage and a particular student demographic type is in pre-requisites; students who had more robust pre-requisites (or the same type of class) attended at a lower rate with lower overall unique attendance when compared to students who had never seen the material before. The contrapositive is also true in that students who had never seen the material before attended at higher rates and averages. Similarly, students in their first semester at UAH attended above the average (unique visit) rate. Students who attended private high schools attend the SSC at lower rates and at much lower consistency (lower average visit per attended student) than students who attended public schools. Home schooled students do not have a large enough sample for confident claims, yet early results imply they are consistent users. Another stark difference is in attendance rates for the Colleges of Science and Engineering in which engineering students are more likely to attend by a fair margin than science students.

Many of these trends cannot be satisfactorily explained without a high degree of conjecture; therefore, the correlations present here should not be extrapolated out to all courses in all semesters. Rather, the results of this study should be taken for the fall semester Calculus A and Calculus B as a starting point to examine more trends. One way to gain confidence more in these correlations would be to follow up with climate surveys[16] throughout the semester to gauge student reasons for attending the SSC. This is due to how there are many third variables for each correlation beyond simple motivation that influence *why* students attend at different rates. One such thought experiment is to consider why private school students might be less likely to use the SSC. One additional variable is the type (or depth) of educational differences between high school types. As seen in the two-way tables in Calculus A Data (page 34), Calculus A students who took AP classes have a lower relative percentage for private schools (37%) compared to public schools (42%), but this does not address the differences in quality of instruction (or how well the information was retained) as this study does not have the students' AP test scores. This process can be repeated for all demographics, but the important result of doing this is to avoid stereotyping students and to consider what outside influencing factors lead to these trends. The purpose of the study is to provide a pulse as to what students appear to be more/less likely to attend the SSC and have the SSC respond accordingly, not to make broad generalizations about *why* these trends occur.

[16] Surveys that aim to hear from the students, particularly in examining what factors contribute to their academic success, both in and out of the classroom.

Calculus A

Students in Calculus A attended the SSC at different rates with varying degrees of consistency (visit per unique student), which is seen below in Figure 5.3-1 "Calculus A Demographics v. SSC Attendance" (with full data in Calculus A Data page 34).

The group with the highest relative visit rate is students who have not taken any pre-requisites with those who did attend the SSC averaging 7.56 visits. This means students in Calculus A with a (perceived) pre-requisite disadvantage are the most consistent users of the SSC for any prior knowledge group. Other high return usages/high average visits demographics include Honors College students, far off-campus housing students, and home-schooled students (small sample).

Groups with a low number of unique attendances and low average usage rates are non-traditional (returning), students with equivalent AP and equivalent high school, and students who withdrew from the course. Returning students often are in a different station in life with more time constraints, so lower usage may be a factor in having limited time in the day. Students who have taken similar courses in high school scored higher than their peers who had not taken similar courses in high school (seen above in Student Grade Correlations to Demographic Information on page 20), so their motivation to use the SSC is likely lower if they are achieving the grade in the class they desire. Finally, students who dropped Calculus A attended the SSC at the lowest average visit per student of any category with the second-lowest overall visit rate.

Another interesting set of trends is the demographic groups with high unique student attendances and average visits per student, or vice-versa. There were three groups with a high number of unique students but low average visits per student: transfer students, first-generation students, and on-campus students. These visits fall into the trial visit category in which students tried out the SSC's services a few times, but did not make it a consistent part of their study routine. Opposite that is the low unique rate, high consistency students, which consisted of repeat and near off-campus students. The former gives another case study into motivation as fewer repeating students utilize the SSC, but when they do, they appear to be more motivated to attend consistently.

Overall, without personal interviews with students as to why/why not they attended the SSC, it is difficult to identify core reasons for these trends, yet it is clear that there is a distinction between demographics that warrants further study. One explanation is that motivation plays a key role in why students use the SSC (and their grades), which is explored further in Conclusions (page 27).

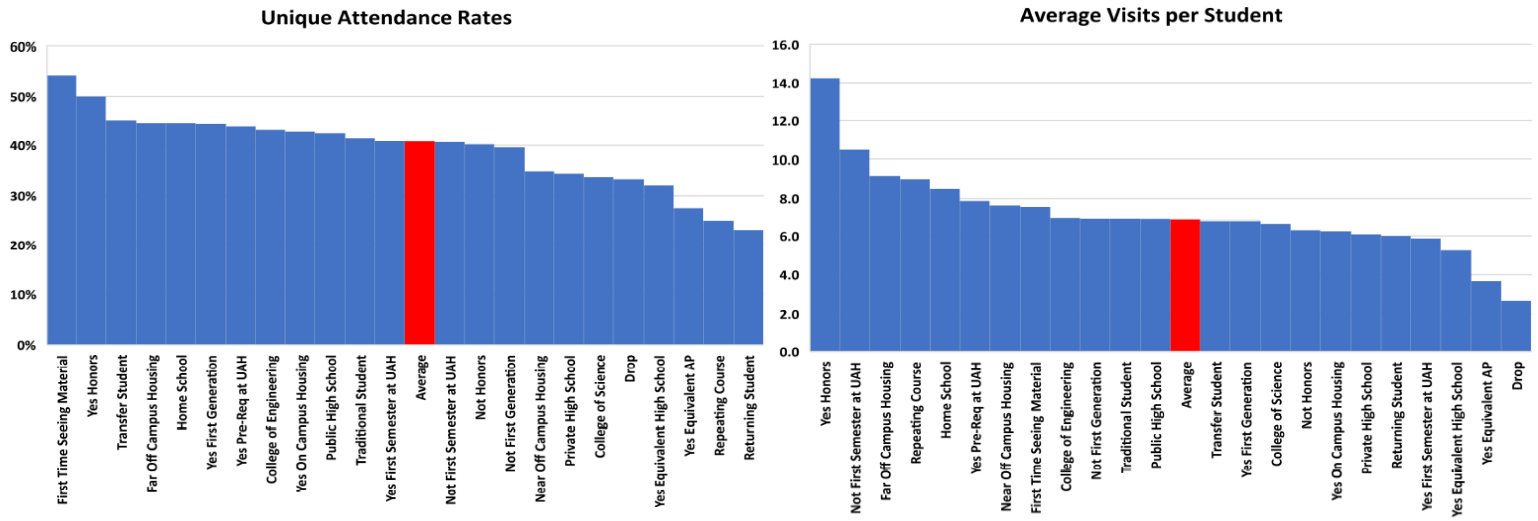

Figure 5.3-1 "Calculus A Demographics v. SSC Attendance"

Calculus B

Calculus B has similar overall correlations of demographics to attendance as Calculus A, but as students who take Calculus B in the fall semester tend to have different backgrounds, it will be considered separately. The attendance rates in Calculus B also have a wider range, and when compared to Calculus A, Calculus B has lower rates (35% from 41%) and lower averages (5.49 from 6.87 visits). For the full tables, see Calculus B Data (page 47), and the summary is given below in Figure 5.3-2 "Calculus B Demographics v. SSC Attendance."

As Calculus B has a smaller sample size (99 students), there are a few spurious relations that provide little added information. Chiefly, all four of the returning students in Calculus B attended the SSC, so it appears they have the highest rate, but the sample size is so small these can be considered outliers. Home school students also have a small sample size of five students, yet only one of them attended the SSC.

Groups with a high number of unique students and high repeat attendance are those who had never seen calculus before and transfer students (transferred to UAH from a different college). Both may be due to the students feeling the need to "reach out" and use the academic support structures offered, such as the SSC, due to a (perceived) difference in math comfort/skill level from their peers. Alternatively, the demographics who attended the SSC the least in both unique rate and consistency are students who attended private high schools, traditional students, and students who had taken Calculus A at UAH (pre-requisite at UAH).

The most compelling trends are when a demographic group has a high number of unique students using the SSC, but relatively low visit numbers, or vice-versa. For example, students who had taken AP calculus in high school have a higher than average attendance rate but a comparatively small average visit size, which implies they investigated what the SSC has to offer and then made the decision to not attend further sessions, which may be the stigma of using the academic support (see Conclusions page 27). Similarly, students who live far from campus and first-generation college students also follow the aforementioned trend. The reverse correlation also occurs as College of Science, non-first-generation, and on-campus housing students all have comparatively rare unique attendances but high return rates. Overall, Calculus B has marginally different attendance rates than Calculus A, but each comparison of demographical correlations to SSC usage tells a unique story as to what is occurring and gives a starting point to better support each student group.

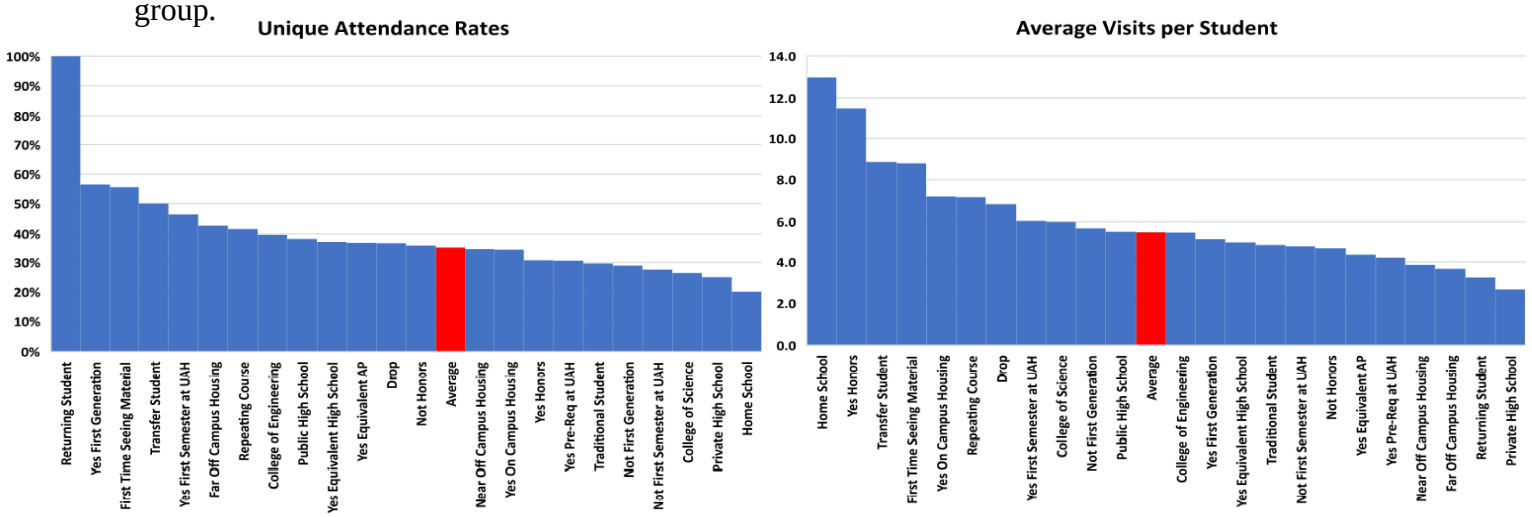

Figure 5.3-2 "Calculus B Demographics v. SSC Attendance"

6. Conclusions

The overarching conclusions of this study are twofold: one, there are lurking variables influencing the grade and SSC attendance data; two, the discovery of how different demographic groups score and attend the SSC can be used to bring positive change to UAH students. The two suspected lurking variables impacting SSC usage are the internal motivation of the students and the stigma associated with using academic support services. As the data gathered in the study is a correlation, not causation, any difference in test grades or SSC usage rates cannot be directly attributed to a given demographic group. Rather, the study is intended to better illustrate relationships between demographic groups, calculus scores, and SSC usage, which serves as a climate report to UAH to better inform what (if any) changes are needed to best ensure students are comfortable and performing up to their potential.

Motivation is an ethereal quality that is difficult to quantify and likewise difficult to instill, but it might be the pivoting factor that dictates the differences in test scores and SSC usage, even more than math skills or familiarity with the material. The exact intrinsic motivators that lead students to attend the SSC, work to thoroughly learn the material, or work to achieve higher grades are not considered in this study, but it is clear motivation plays a role in each. For example, many of the SSC visits included in this study were only a few days before the students' test, which shows many students may be only motivated to attend the SSC during "crunch time" right before a test. This is in contrast to some students who decided to attend the SSC at regular intervals, regardless of where they were in the testing cycle. These two types of students are included in the SSC attendance data, but they might be different enough that another demographic pair may need to be added in the future – regular attendee vs. pre-test attendee. These types of students are explored in the book *How Learning Works* by Ambrose et. al., in which the authors found that students who are motivated by intrinsic values or learning goals (desire to learn the material) tend to learn the material on a deeper level and persist more in the face of adversity when compared to students who are motivated by instrumental (extrinsic) values or performance goals, such as achieving a certain grade or avoiding failing.[17]

Another factor that influences motivation is self-perceived learning outcomes as students may not feel they see immediate benefits from using the SSC. Continuing the previous example of only using the SSC before a test, consider the students who did not believe (or *feel*) attending sessions before the test benefited them, so they do not continue attending SSC services. Students might not be motivated to consistently attend the SSC if they do not feel it is giving them a clear and distinct advantage in the course. In *How Learning Works*, the authors demonstrate that students with a high degree of agency and internal attribution have grounded expectations for learning and thus are more likely to (with additional factors) stay motivated to master course content throughout the semester. Another key factor examined by Ambrose is to ensure that students recognize the value in learning/studying with specific strategies. This may be the missing piece for students to *feel* like they are making progress in their studies by attending the SSC, as PASS leaders and tutors connect why each learning method is used and how each aids in studying. This is why the continuation of this study includes examining how SSC attendance in Calculus A correlates with Calculus B

[17] Ambrose, Susan, et. al. *How Learning Works*, Chapter 3: "What Factors Motivate Students to Learn?" Wiley. 2010.

grades so that long-term benefits can be explored alongside the immediate, which is studied further in Further Steps and Recommendations (page 29).

Another key consideration is how to address the stigma associated with "help" based resources such as the SSC. Like motivation, stigmas are difficult to counteract, and often, academic support services can be seen as only for those who are truly struggling or used as a reactive measure. Combined, these factors can create the student attitude of, "I will only use SSC when I must, such as after I fail a test." Many students begin attending the SSC after a disappointing test grade, but it is the SSC's philosophy to encourage proactive measures (on the part of the student) to prepare their study skills ahead of time to avoid the situation of responding after a lower-than-expected test grade. This creates the same disconnect as in motivation where students may not see the benefits of attending the SSC early in a testing cycle (lowering attendance rates), and only feel the pressure right before a test. Attending sessions immediately before a test may lead to students becoming overwhelmed and retaining minimal information. Students of this type would be included in the SSC attendance data set, but may not score as high as non-attendees who were more consistent in their independent studies, which skews the data to reflect lower scores for those who use SSC. Another unintended outcome of students attending only before a test or only when they are unsure of the material is that it creates a self-fulfilling prophecy as students see their peers (who are perceived as struggling) attending SSC services, which furthers the idea some people have that the SSC is only for struggling students. As for how to combat this stigma, it will be a combined effort of SSC marketing and an overall culture change (along with other factors) that is explored more in Further Steps and Recommendations (page 29).

This study is intended to be a catalyst to motivate change and help UAH (through the SSC, the UAH Math Department, or the UAH Academic Success Advocacy Program) to better understand and serve its students. The data shows many clear correlations that can be acted upon, such as the distinctions between SSC attendance rates and grades of students of different pre-requisite math backgrounds. Another factor to examine is how different academic colleges have different attendance rates, and to pinpoint why that is and if there is anything that can be done to ensure that all majors feel comfortable attending the SSC. The final change, which is explored more in Further Steps and Recommendations (page 29), is to assess whether pre-requisite requirements and overall math placement needs to be updated to fit what the current student population needs.

Many correlations found in this study are more complicated to act upon as pre-requisite course requirements can, but are still interesting. For example, there is evidence that if a student is first-generation or attended a particular high school type, their likelihood to use the SSC and their grades are different, but currently neither lends themselves directly to a simple change that can be made. One clear plan of action is to ensure all students are (and feel) supported by UAH, which means advertising support services remains important. Other correlations, such as housing type or student type (traditional, transfer, or returning) are more readily actionable as UAH Housing and Residence Life or Professional Studies can amend their programs to build awareness of resources or to encourage students to study together with programs, but these are outside the purview of this study. Overall, many correlations prove frustrating to observe and not be able to change for the better, which is why it remains important to not stereotype students based on their academic history/demographic and assume facts about them.

7. Further Steps and Recommendations

This study is not complete as there is still data being collected for the Spring 2022 semester for both Calculus A and Calculus B students. This data will be examined in the same manner as Fall 2021, but it will include additional analysis, such as how Calculus A grades correlate with Calculus B grades for each demographic or SSC attendance rate and how SSC attendance in Calculus A correlates with Calculus B grades (long-term implications). More in-depth information on how each of the variables in this study interacts with one another will be gathered such that the conclusions of the study will no longer be restricted to only the fall semester.

If the study were conducted again, there are multiple aspects to be modified, such as more focused collaboration with the Math Department or more in-depth tracking of students. Collecting each section's grades was a tedious process in which the principal investigator went to every office of instructors who taught calculus with varying degrees of scheduling conflicts. In the future, it would be more beneficial to have a Math Department staff/faculty member as an investigator on the research to both streamline the grade collection process and to more centralize the data collection (for surveys and grades). This study did not collect any interview information from the students (anecdotes, additional surveys, etc.), which means that conclusions for why particular trends occur are one-sided examinations from the researchers. If students were interviewed or surveyed as to their internal motivations for (not) attending the SSC, whether they feel they could have studied more or less, etc., more precise conclusions can be made. The surveys could also include students ranking their confidence levels in their math acumen throughout the semester and identifying student perceptions of what the toughest part of the semester is. The conclusions gathered with these types of surveys could then be acted upon in more detail by each entity mentioned next.

It is important to consider the long-term effects of Calculus A on other courses, most specifically Calculus B, because proficiency in it can change the academic success of students. Calculus is a cornerstone of many STEM majors, so it is key for students to truly master the material; otherwise, students may spend more time reviewing and relearning calculus concepts when they should be learning new material. This study tracked students across the calculus sequence because one goal of the SSC is to demonstrate study techniques that can be used in all courses (present and future), not just in one specific course. This is particularly prevalent at UAH (in the fall semester) as two-thirds of calculus students are in the College of Engineering and two-fifths of calculus students are Mechanical/Aerospace Engineering majors. Much of the material learned in calculus will follow engineering students throughout their studies. Moreover, learning how to study for math-based courses becomes vital for students, so spending additional time using the SSC in Calculus A and Calculus B to master the material and learn study strategies can pay dividends for the students later in their academic careers. There is still the stigma that early classes, such as Calculus A or Calculus B, have as they can be perceived as "easy" by students (when compared to higher-level classes), which contributes to the stigma associated with using academic support services, which may affect SSC attendance rates. This is explored further in Conclusions (page 27), and there might not be one clear answer for how to combat it.

Recommendations from the results of this study include adjusting SSC marketing to encourage attendance from more specific/under-attending groups, re-examining what pre-requisites are considered sufficient for Calculus A and Calculus B, and utilizing the S-section of Calculus A differently by changing the requirements needed to be enrolled in it.[18]

The SSC can use this information to affect the promotion of support for entry-level courses as the study highlights which demographics use the SSC more or less. Currently, the SSC advertises its services heavily in Calculus A and Calculus B, primarily through the PASS Leaders in each class section and UAH-wide emails. PASS Leaders play a key role in SSC usage, which is evidenced by PASS having the majority of Calculus A and Calculus B attendance at the SSC. Emails have mixed effectiveness as they rely on students to read all emails and take enough interest to be motivated to act and utilize SSC services. This ties into how to best inculcate motivation in students, which has far too many internal factors to make definitive claims on. Additionally, PASS having the largest percentage of SSC attendance yields the conundrum of whether (and how) drop-in and content tutoring should be promoted more (increased exposure) and/or in a more concerted manner to encourage more usage of those services. It is worthwhile to increase the exposure of students to more one-on-one-based tutoring as some students prefer to learn in that type of setting. Specific types of exposure may include becoming more targeted in welcoming/encouraging students of a particular demographic, such as appealing to first-generation college students with "College can be hard to navigate at first – the SSC is here to help!" Other examples may be to have a personal testimonial from a returning student about how the SSC aided them or to partner with a specific academic College (Science or Engineering) with joint advertisements.

As this study provides hard data for how students of a certain academic background perform in early calculus courses, it can be applied to examine what pre-requisite course requirements may sufficiently prepare students for Calculus A and Calculus B. Placement in the course is determined by prior college credits, AP testing scores, and ACT/SAT scores. Some students take a collegiate pre-calculus course and transition to Calculus A while others start their first semester in Calculus A. Once a student is to be placed in Calculus A, it is a combined decision of the student and their academic advisor which section to be placed in, normal or S-section (see footnote 18 below). The issue lies in many students lacking certain foundational algebra/trigonometry skills needed for Calculus A, yet can manage calculus in all other regards. The S-section be used in a more frequent and targeted manner. The S-section should be the only option for certain students to register with few exceptions; thus, minimizing the purgatory of a student that is beyond pre-calculus but just below Calculus A readiness. Such students to consider enforcing this on are those who are repeating the course, those in a certain ACT/SAT range, those who earned a C in the pre-requisite pre-calculus course, etc. This would ideally help students stay on their degree track while also getting the extra practice they need to master the material, which future classes rely heavily upon. Additionally, this may help with attrition later in students' academic careers so they have the same background calculus skills as their peers.

[18] The S-section meets for an extra day every week to review algebra/trigonometry; therefore, it is meant for students who have some gaps in their background math knowledge but are prepared in most other ways for Calculus A.

This study found strong correlations among several types of pre-requisite math courses and student grades (and SSC usage). One key question with this is what types of pre-requisites are considered "sufficient" to move into Calculus A or Calculus B. The group with the highest test scores is AP students, but are the grades different enough that they can move directly to Calculus B (or even Calculus C)? Prior AP credit is a facet that should be re-evaluated using this data, but there does not appear to be a clear threshold for what AP test score should be considered adequate. Similar to prior AP coursework, students who took the high school equivalent to calculus scored higher than their peers. Therefore, students who took a high school calculus course should still take Calculus A due to variations in high school instruction, the lack of a consistent gauge to compare students against, and the smaller differences in test scores when compared to AP students. Other placement aspects to re-evaluate are ACT/SAT scores, grade in pre-calculus (if taken at UAH), and transfer credits. A fascinating question is whether a high ACT score with limited high school math instruction is considered sufficient to move directly into Calculus A. Whether students who lack a pre-calculus course on their high school transcript should be assigned to the S-section is a question which should be examined further. As thoroughly evidenced by the data in this study, students who take a pre-calculus course at UAH tend to score lower in Calculus A than their peers. Many factors contribute to this, but it is still important to assess what grade in pre-calculus is adequate to move to (a normal or S-section of) Calculus A. Finally, transfer calculus courses were not considered in this study due to the small sample size and variation of instruction, but examining the relationship between transfer calculus credits and scores in later UAH calculus courses provides yet another avenue for future research.

Overall, this project shows that there are correlations between SSC usage, demographic groups, and Calculus A and Calculus B course grades. The starkest grade and SSC attendance differences can be seen in the categories of students with different prior math experience groups. There are other, more subtle, differences among other sets, such as how Honors College students generally score higher than their non-Honors peers or how students in their first semester at UAH (fall semester) score significantly higher than students who are not in their first semester. When separated based on SSC usage, it appears that students who attend the SSC correlate with lower overall final course grades across most demographics. However, no direct causal conclusions can be drawn from this data as many confounding variables could be influencing the attendance rates and test scores,[19] so this project serves more as a starting point to find what connections may exist for following up more targeted research. This study will conclude with a Spring 2022 accompaniment in which the fall Calculus A students will be tracked into spring Calculus B to observe the relationship between Calculus A grades and SSC usage with Calculus B grades and SSC usage.

[19] Variables such as motivation, the voluntary nature of SSC attendance, hesitancy to attend the SSC based on academic support stigma, and other internal factors within each student.

8. Sources

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All additional research was conducted by Samuel Johnson in the Fall 2021 semester at the University of Alabama in Huntsville in Calculus A and Calculus B courses

9. Appendix

Figure 9.1-1 "Calculus A Attendance vs. Demographics"					
Demographic	**Number of Students**	**Unique Attendance**	**Percent Attend**	**Total Attendance**	**Attendance per…**
Average	272	111	41%	763	6.87
Yes Pre-Req at UAH	89	39	44%	307	7.87
Yes Equivalent AP	109	30	28%	110	3.67
Yes Equivalent High School	162	52	32%	274	5.27
First Time Seeing Material	59	32	54%	242	7.56
Repeating Course	16	4	25%	36	9.00
Yes On-Campus Housing	173	74	43%	462	6.24
Near Off Campus Housing	72	25	35%	191	7.64
Far Off-Campus Housing	27	12	44%	110	9.17
Yes First Generation	70	31	44%	210	6.77
Not First Generation	202	80	40%	553	6.91
College of Engineering	181	78	43%	545	6.99
College of Science	80	27	34%	179	6.63
Yes First Semester at UAH	213	87	41%	511	5.87
Not First Semester at UAH	59	24	41%	252	10.50
Public High School	224	95	42%	656	6.91
Private High School	35	12	34%	73	6.08
Home School	9	4	44%	34	8.50
Yes Honors	16	8	50%	114	14.25
Not Honors	256	103	40%	649	6.30
Traditional Student	239	99	41%	684	6.91
Returning Student	13	3	23%	18	6.00
Transfer Student	20	9	45%	61	6.78
0-1 SSC	187	187	69%	26	0.14
Light SSC	37	37	14%	104	2.81
Medium SSC	22	22	8%	150	6.82
Heavy SSC	26	26	10%	483	18.58
Any SSC	111	111	41%	737	6.64
PASS	100	100	37%	632	6.32
Tutoring	25	25	9%	88	3.52
Drop-In	18	18	7%	43	2.39
SSC Totals	111	111	41%	763	6.87
Drop	66	22	33%	59	2.68

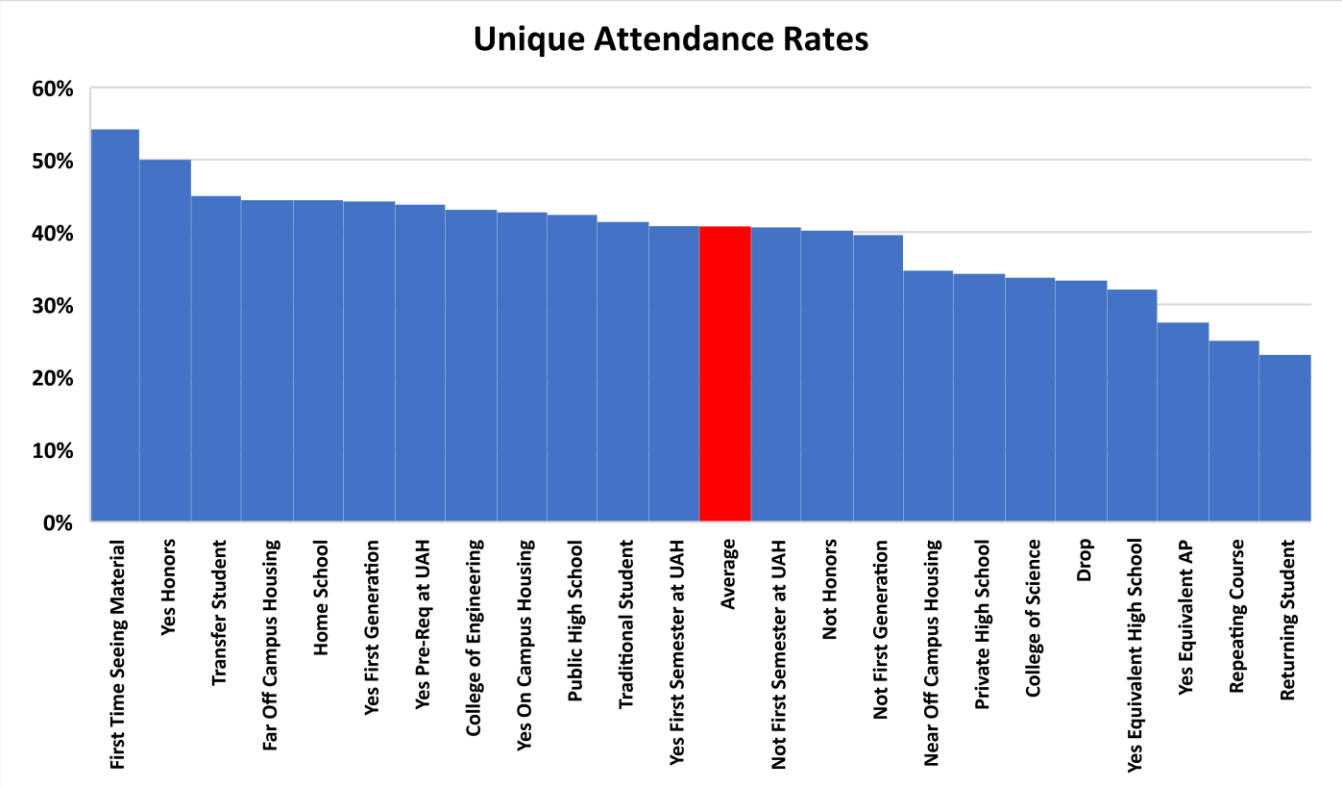

Figure 9.1-2 "Calculus A Unique Attendance Rates"

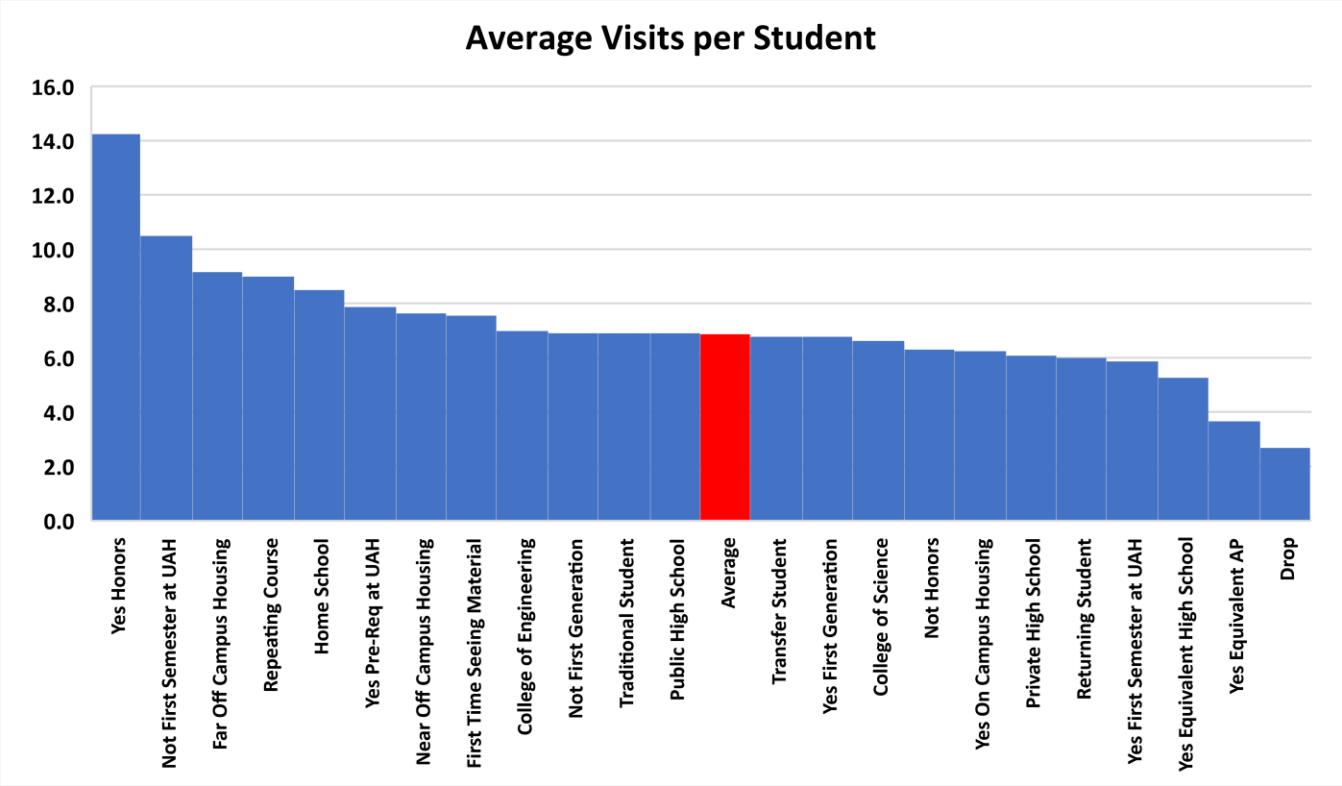

Figure 9.1-3 "Calculus A Average Visits per Student"

Figure 9.1-4 "Calculus A Grades vs. Demographics"			
Demographic	**Average Test Score**	**Average Grade on the Final**	**Average Final Score**
Average	77.16	66.71	80.02
Yes Pre-Req at UAH	71.59	58.26	76.06
Yes Equivalent AP	81.70	73.02	83.51
Yes Equivalent High School	79.45	70.72	81.82
First Time Seeing Material	78.78	66.40	81.05
Repeating Course	74.54	59.30	76.07
Yes On-Campus Housing	76.45	66.30	79.27
Near Off-Campus Housing	78.65	67.75	81.96
Far Off-Campus Housing	78.25	66.88	80.00
Yes First Generation	73.41	64.55	76.79
Not First Generation	78.30	67.35	80.93
College of Engineering	76.28	66.85	79.53
College of Science	80.19	67.13	81.79
Yes First Semester at UAH	79.48	70.28	81.93
Not First Semester at UAH	68.49	52.79	72.65
Public High School	76.72	65.87	79.77
Private High School	77.41	69.31	79.40
Home School	82.78	72.00	85.22
Yes Honors	84.52	68.43	83.86
Not Honors	76.62	66.59	79.73
Traditional Student	77.01	67.11	79.96
Returning Student	82.68	71.00	84.78
Transfer Student	74.51	57.33	77.31
0-1 SSC	78.29	69.62	80.78
Light SSC	78.94	64.04	81.31
Medium SSC	72.51	60.26	77.52
Heavy SSC	72.24	58.58	76.66
Any SSC	74.71	60.94	78.51
Drop	60.64		

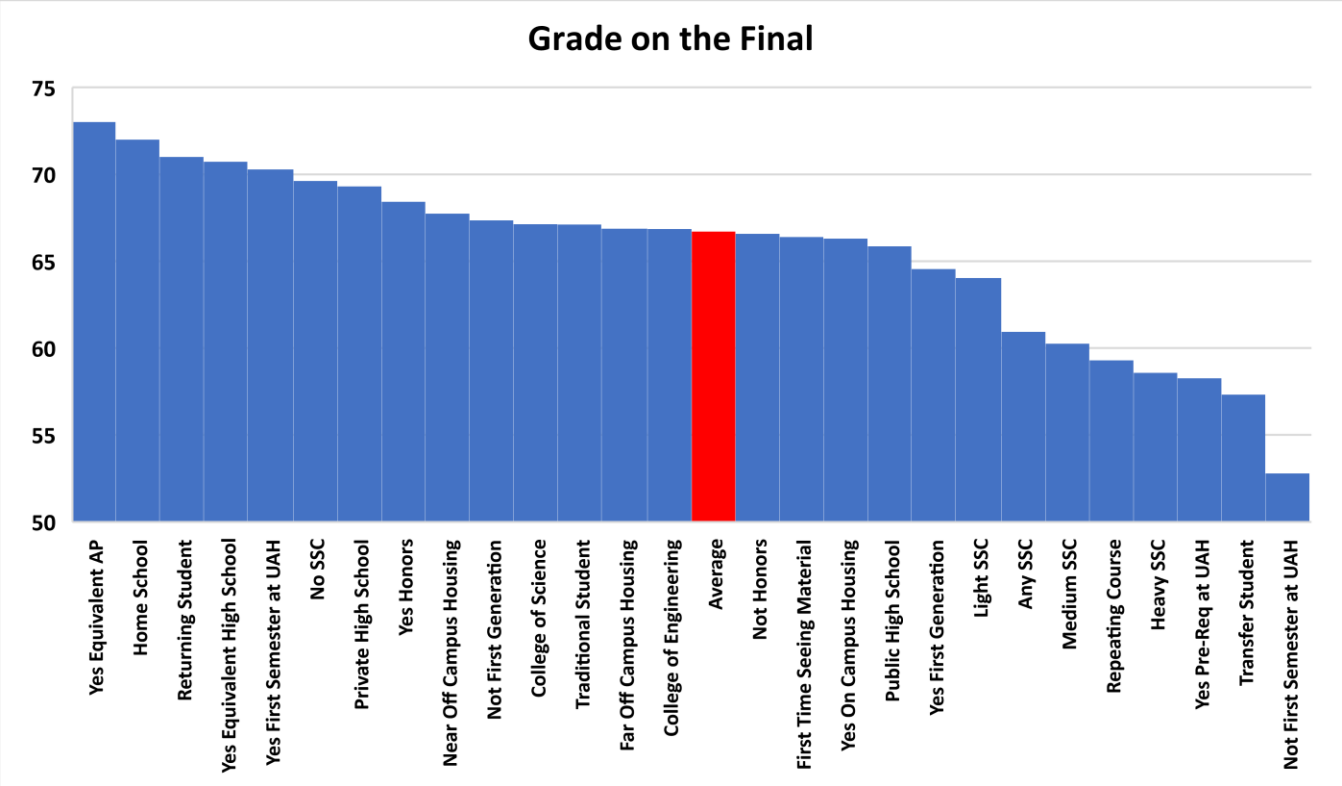

Figure 9.1-5 "Calculus A Grade on the Final"

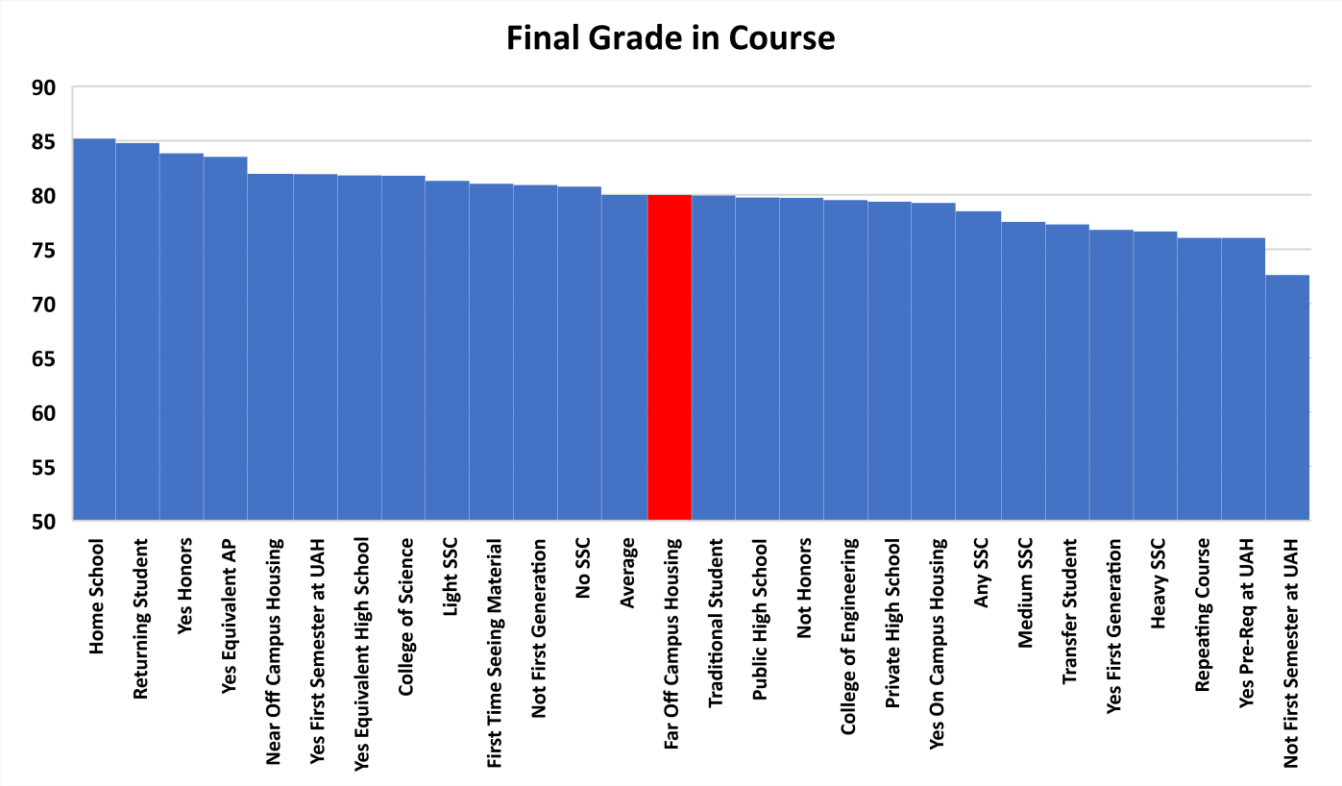

Figure 9.1-6 "Calculus A Final Grade in Course"

Figure 9.1-7 "Calculus A Standard Deviations"			
Demographic	**Test Score**	**Final**	**Final Score**
Average	15.59	20.44	12.70
Yes Pre-Req at UAH	16.96	33.45	37.03
Yes Equivalent AP	13.65	28.99	29.98
Yes Equivalent High School	14.96	31.59	31.59
First Time Seeing Material	12.81	33.74	38.28
Repeating Course	12.49	31.05	37.33
Yes On-Campus Housing	15.67	32.31	34.78
Near Off-Campus Housing	15.63	35.58	38.13
Far Off-Campus Housing	14.38	35.50	39.62
Yes First Generation	15.69	34.27	38.46
Not First Generation	15.38	33.11	34.84
College of Engineering	15.97	34.14	36.72
College of Science	14.01	33.40	36.58
Yes First Semester at UAH	14.30	33.63	36.45
Not First Semester at UAH	17.07	30.56	34.77
Public High School	15.02	33.35	36.29
Private High School	18.61	33.18	33.25
Home School	14.36	35.86	40.78
Yes Honors	11.75	27.42	29.38
Not Honors	15.70	33.95	36.58
Traditional Student	15.66	33.10	35.62
Returning Student	14.47	36.70	40.17
Transfer Student	14.18	34.31	39.47
0-1 SSC	16.09	35.24	37.92
Light SSC	10.63	33.27	39.33
Medium SSC	11.65	27.78	28.52
Heavy SSC	17.43	22.86	13.37
Any SSC	14.54	30.74	33.02
Drop	19.05		

Figure 9.1-8 "Calculus A Grades vs. SSC Usage"			
Test Grades vs. SSC Usage, Corrected for Prior Knowledge			
Given First Time Seeing Material			
	Average Test Score	**Average Grade on the Final**	**Average Final Score**
0-1 SSC	79.00	68.30	81.12
Light SSC	81.14	58.60	80.46
Medium SSC	79.30	63.80	81.80
Heavy SSC	76.59	67.33	80.78
Any SSC	76.59	64.04	79.41
Given Proper Pre-Req at UAH			
0-1 SSC	73.90	64.06	78.73
Light SSC	79.69	62.43	80.43
Medium SSC	65.86	53.00	72.86
Heavy SSC	61.32	41.00	67.09
Any SSC	67.66	50.46	72.46
Given Prior AP Experience			
0-1 SSC	82.51	74.35	83.87
Light SSC	78.28	65.64	82.20
Medium SSC	76.85	69.75	81.75
Heavy SSC	72.13	61.00	77.00
Any SSC	75.79	67.76	81.22
Given High School Equivalent			
0-1 SSC	79.68	71.50	81.65
Light SSC	79.23	67.73	82.75
Medium SSC	73.57	63.22	78.59
Heavy SSC	83.80	75.29	86.44
Any SSC	77.62	68.13	82.37
Given Repeating Course			
0-1 SSC	72.64	59.33	74.45
Light SSC	78.20	56.50	77.50
Medium SSC	84.20	63.00	82.00
Heavy SSC	72.79	61.00	77.00
Any SSC	78.35	59.25	78.50

Test Grades vs. SSC Usage, Corrected for Colleges			
Given the College of Engineering			
	Average Test Score	**Average Grade on the Final**	**Average Final Score**
0-1 SSC	76.78	69.32	80.02
Light SSC	80.50	64.72	81.31
Medium SSC	69.92	57.11	75.99
Heavy SSC	72.85	62.30	77.36
Any SSC	75.22	62.23	78.61
Given College of Science			
0-1 SSC	82.46	70.67	82.88
Light SSC	78.24	65.00	86.00
Medium SSC	76.80	66.63	81.50
Heavy SSC	65.31	37.40	70.20
Any SSC	73.76	57.19	78.81
Test Grades vs. SSC Usage, Corrected for First Semester			
Given YES First Semester			
	Average Test Score	**Average Grade on the Final**	**Average Final Score**
0-1 SSC	80.20	71.98	82.11
Light SSC	78.77	65.15	81.81
Medium SSC	74.49	64.00	79.42
Heavy SSC	79.22	70.06	82.94
Any SSC	77.74	66.40	81.50
Given NO First Semester			
0-1 SSC	69.79	57.91	74.31
Light SSC	79.81	58.50	78.83
Medium SSC	66.99	49.80	72.20
Heavy SSC	61.08	40.20	66.60
Any SSC	66.58	46.58	70.65
Test Grades vs. SSC Usage, Corrected for Student Type			
Given Traditional Student			
	Average Test Score	**Average Grade on the Final**	**Average Final Score**
0-1 SSC	78.07	69.82	80.69
Light SSC	78.29	63.81	81.10
Medium SSC	72.26	59.44	76.37
Heavy SSC	72.75	60.78	77.48
Any SSC	74.62	61.48	78.45

Given Returning Student			
	Average Test Score	**Average Grade on the Final**	**Average Final Score**
0-1 SSC	82.27	76.33	86.28
Light SSC	81.43	60.50	80.15
Heavy SSC	88.40	60.00	85.00
Any SSC	83.75	60.33	81.77
Given Transfer Student			
0-1 SSC	77.96	58.83	77.12
Light SSC	88.20	76.00	88.00
Medium SSC	73.85	64.67	83.67
Heavy SSC	58.33	32.50	63.00
Any SSC	71.07	55.83	77.50
Test Grades vs. SSC Usage, Corrected for Honors			
Given YES Honors			
	Average Test Score	**Average Grade on the Final**	**Average Final Score**
0-1 SSC	89.64	68.57	85.71
Light SSC	74.32	65.50	79.50
Medium SSC	72.13	63.00	77.00
Heavy SSC	82.48	71.00	84.50
Any SSC	78.67	68.29	82.00
Given NO Honors			
0-1 SSC	77.65	69.68	80.51
Light SSC	79.34	63.91	81.48
Medium SSC	72.54	60.11	77.55
Heavy SSC	70.38	56.32	75.23
Any SSC	74.27	60.11	78.12
Test Grades vs. SSC Usage, Corrected for Housing			
Given YES On-Campus Housing			
	Average Test Score	**Average Grade on the Final**	**Average Final Score**
0-1 SSC	77.04	68.19	79.45
Light SSC	78.54	66.18	82.01
Medium SSC	68.81	56.10	74.29
Heavy SSC	75.02	61.69	78.44
Any SSC	75.05	62.16	78.89
Given Within 30 min (Off-Campus)			
0-1 SSC	81.17	73.47	84.46
Light SSC	79.43	58.33	79.22
Medium SSC	75.30	64.17	80.83
Heavy SSC	64.85	48.33	71.67
Any SSC	73.19	56.94	77.24

Given Outside 30 min (Off-Campus)			
	Average Test Score	**Average Grade on the Final**	**Average Final Score**
0-1 SSC	79.86	70.00	80.54
Light SSC	83.12	62.00	82.00
Medium SSC	79.29	66.33	81.67
Heavy SSC	72.22	61.50	77.03
Any SSC	76.23	63.38	79.39
Test Grades vs. SSC Usage, Corrected for High School Type			
Given Public High School			
	Average Test Score	**Average Grade on the Final**	**Average Final Score**
0-1 SSC	78.00	68.90	80.80
Light SSC	77.83	62.82	80.69
Medium SSC	72.00	61.00	77.23
Heavy SSC	71.87	57.29	75.67
Any SSC	74.15	60.37	77.95
Given Private High School			
0-1 SSC	78.62	71.61	79.42
Light SSC	91.40	82.00	89.00
Medium SSC	76.00	47.00	80.00
Heavy SSC	67.01	58.50	76.78
Any SSC	72.57	60.50	79.35
Given Home Schooled			
0-1 SSC	77.18	70.67	82.33
Light SSC	92.00	73.00	87.30
Medium SSC	77.75	61.00	80.00
Heavy SSC	101.00	86.00	97.00
Any SSC	90.25	73.33	88.10
Test Grades vs. SSC Usage, Corrected for First Generation			
Given YES First Generation			
	Average Test Score	**Average Grade on the Final**	**Average Final Score**
0-1 SSC	71.83	61.86	73.73
Light SSC	77.55	65.43	80.57
Medium SSC	78.32	79.25	86.33
Heavy SSC	73.87	65.88	78.64
Any SSC	76.16	68.53	80.97
Given NOT First Generation			
0-1 SSC	80.08	71.61	82.47
Light SSC	79.48	63.47	81.62
Medium SSC	70.97	55.20	75.17
Heavy SSC	71.52	55.33	75.78
Any SSC	74.17	58.06	77.58

Figure 9.1-9 "Calculus A Demographics vs. SSC Usages"

Letter Grades vs. SSC Usage

"Given the student made X LETTER GRADE, % went to SSC"

Conditional Probability for Letter Grade vs. SSC Usage

	0-1 SSC	Light SSC	Medium SSC	Heavy SSC
A	78%	7%	5%	9%
B	56%	22%	11%	11%
C	64%	11%	13%	13%
D	70%	7%	7%	15%
F	58%	0%	8%	33%

Total Probability for Letter Grade vs. SSC Usage

A	16%	1%	1%	2%
B	11%	4%	2%	2%
C	13%	2%	3%	3%
D	7%	1%	1%	1%
F	3%	0%	0%	1%

College vs. SSC Usage

"Given the students is in the COLLEGE OF ___, % went to SSC"

Conditional Probability for College vs. SSC Usage

	0-1 SSC	Light SSC	Medium SSC	Heavy SSC
ENG	69%	15%	5%	11%
SCI	71%	9%	14%	6%

Total Probability for College vs. SSC Usage

ENG	46%	10%	3%	7%
SCI	21%	3%	4%	2%

Pre-Req vs. SSC Usage

"Given the student had ____ PRE REQ, % went to the SSC"

Conditional Probability for Pre-Req vs. SSC Usage

	0-1 SSC	Light SSC	Medium SSC	Heavy SSC
UAH Pre-Req	65%	12%	10%	12%
AP	83%	12%	4%	1%
First Time	58%	15%	12%	15%
Repeat	75%	13%	6%	6%
HS Equiv	78%	12%	6%	4%

Total Probability for Pre-Req vs. SSC Usage

UAH Pre-Req	21%	4%	3%	4%
AP	33%	5%	1%	0%
First Time	13%	3%	3%	3%
Repeat	4%	1%	0%	0%
HS Equiv	46%	7%	3%	3%

First Generation vs. SSC Usage				
"Given the student is (or is not) FIRST GENERATION, % went to SSC"				
Conditional Probability for First Generation vs. SSC Usage				
	0-1 SSC	**Light SSC**	**Medium SSC**	**Heavy SSC**
Yes First Gen.	66%	16%	7%	11%
Not First Gen.	70%	13%	8%	9%
Total Probability for First Generation vs. SSC Usage				
Yes First Gen.	17%	4%	2%	3%
Not First Gen.	52%	10%	6%	7%
Honors vs. SSC Usage				
"Given the student is (or is not) in HONORS, % went to SSC"				
Conditional Probability for Honors vs. SSC Usage				
	0-1 SSC	**Light SSC**	**Medium SSC**	**Heavy SSC**
Yes Honors	56%	13%	6%	25%
Not Honors	70%	14%	8%	9%
Total Probability for Honors vs. SSC Usage				
Yes Honors	3%	1%	0%	1%
Not Honors	65%	13%	8%	8%
First Semester vs. SSC Usage				
"Given the student is (or is not) in their FIRST SEMESTER at UAH, % went to SSC"				
Conditional Probability for First Semester vs. SSC Usage				
	0-1 SSC	**Light SSC**	**Medium SSC**	**Heavy SSC**
Yes First	70%	15%	8%	8%
Not First	64%	10%	8%	17%
Total Probability for First Semester vs. SSC Usage				
Yes First	55%	11%	6%	6%
Not First	14%	2%	2%	4%
Housing vs. SSC Usage				
"Given the student has HOUSING at _____, % went to SSC"				
Conditional Probability for On-Campus Housing vs. SSC Usage				
	0-1 SSC	**Light SSC**	**Medium SSC**	**Heavy SSC**
On Campus	70%	14%	7%	9%
Off (within 30)	71%	13%	8%	8%
Off (outside 30)	56%	15%	15%	15%
Total Probability for On-Campus Housing vs. SSC Usage				
On Campus	44%	9%	4%	6%
Off (within 30)	19%	3%	2%	2%
Off (outside 30)	6%	1%	1%	1%

Student Type vs. SSC Usage				
"Given the student is ____ TYPE, % went to SSC"				
Conditional Probability for Student Type vs. SSC Usage				
	0-1 SSC	**Light SSC**	**Medium SSC**	**Heavy SSC**
Traditional	69%	13%	8%	10%
Returning	77%	15%	0%	8%
Transfer	55%	15%	20%	10%
Total Probability for Student Type vs. SSC Usage				
Traditional	61%	12%	7%	8%
Returning	4%	1%	0%	0%
Transfer	4%	1%	1%	1%
High School Type vs. SSC Usage				
"Given the student attended a _____ HIGH SCHOOL, % went to SSC"				
Conditional Probability for High School Type vs. SSC Usage				
	0-1 SSC	**Light SSC**	**Medium SSC**	**Heavy SSC**
Public	67%	16%	8%	9%
Private	83%	3%	3%	11%
Home	56%	11%	22%	11%
Total Probability for High School Type vs. SSC Usage				
Public	55%	13%	7%	8%
Private	11%	0%	0%	1%
Home	2%	0%	1%	0%

Figure 9.1-10 “Calculus A Letter Grades vs. SSC Usage”

"Given the student used the SSC ___ amount, % made the grade___"					
Cond. Probability for Letter Grade vs. SSC Usage					
	A	**B**	**C**	**D**	**F**
0-1 SSC	23%	17%	19%	10%	4%
Light SSC	11%	32%	16%	5%	0%
Medium SSC	14%	27%	32%	9%	5%
Heavy SSC	19%	23%	27%	15%	15%
Total Probability for Letter Grade vs. SSC Usage					
0-1 SSC	16%	11%	13%	7%	3%
Light SSC	1%	4%	2%	1%	0%
Medium SSC	1%	2%	3%	1%	0%
Heavy SSC	2%	2%	3%	1%	1%

Figure 9.1-11 "Calculus A Two-Way Participant Demographics"

Total: 272	Pre-Req at UAH	Equivalent AP	Equivalent High School	First Time Seeing Material	Repeating Course	On Campus Housing	Near Off Campus Housing	Far Off Campus Housing	First Generation	Not First Generation	College of Engineering	College of Science	Ys First Semester at UAH	Not First Semester at UAH	Public High School	Private High School	Home School	Yes Honors	Not Honors	Traditional Student	Returning Student	Transfer Student	Drop
Pre-Req at UAH	89																						
Equivalent AP	25	109																					
Equivalent High School	39	109	162																				
First Time Seeing Material				59																			
Repeating Course	11	2	6		16																		
On Campus	43	78	116	39	2	173																	
Near Off Campus	35	26	36	12	10		72																
Far Off Campus	11	5	10	8	4			27															
First Generation	21	18	38	18	2	44	16	10	70														
Not First Generation	68	91	124	41	14	129	56	17		202													
College of Engineering	56	73	115	37	10	123	41	17	47	134	181												
College of Science	30	32	42	19	5	42	29	9	20	60		80											
First Semester at UAH	37	100	142	58	1	157	36	20	55	158	149	56	213										
Not First Semester at UAH	52	9	20	1	15	16	36	7	15	44	32	24		59									
Public High School	68	95	133	51	13	148	56	20	66	158	149	65	177	47	224								
Private High School	16	13	24	4	2	18	12	5	3	32	26	8	27	8	0	35							
Home School	4	0	3	2	1	4	3	2	0	9	5	4	6	3	0	0	9						
Yes Honors	4	9	11	3	0	15	0	1	2	14	8	6	14	2	16	0	0	16					
Not Honors	85	100	151	56	16	158	72	26	68	188	173	74	199	57	208	35	9		256				
Traditional Student	72	104	153	52	9	168	54	17	60	179	162	66	196	43	202	30	5	16	223	239			
Returning Student	5	4	6	2	3	1	9	3	3	10	10	3	6	7	9	1	2	0	13	0	13		
Transfer Student	12	1	3	5	4	4	9	7	7	13	9	11	11	9	13	4	2	0	20	0	0	20	
Drop	28	13	28	17	6	36	20	10	23	43	46	19	49	17	55	6	3	2	64	54	4	8	66
0-1 SSC	58	91	126	34	12	121	51	15	46	141	125	57	149	38	149	29	5	9	178	166	10	11	50
Light SSC	11	13	20	9	2	24	9	4	11	26	27	7	31	6	35	1	1	2	35	32	2	3	13
Medium SSC	9	4	9	7	1	12	6	4	5	17	9	11	17	5	19	1	2	1	21	18	0	4	3
Heavy SSC	11	1	7	9	1	16	6	4	8	18	20	5	16	10	21	4	1	4	22	23	1	2	0
Any SSC	39	30	52	32	4	74	25	12	31	80	78	27	87	24	95	12	4	8	103	99	3	9	0

Figure 9.2-1 "Calculus B Attendance vs. Demographics"					
Demographic	**Number of Students**	**Unique Attendance**	**Percent Attend**	**Total Attendance**	**Attendance per…**
Average	99	35	35%	192	5.49
Yes Pre-Req at UAH	62	19	31%	80	4.21
Yes Equivalent AP	46	17	37%	74	4.35
Yes Equivalent High School	51	19	37%	95	5.00
First Time Seeing Material	9	5	56%	44	8.80
Repeating Course	12	5	42%	36	7.20
Yes On-Campus Housing	49	17	35%	123	7.24
Near Off Campus Housing	43	15	35%	58	3.87
Far Off-Campus Housing	7	3	43%	11	3.67
Yes First Generation	23	13	57%	67	5.15
Not First Generation	76	22	29%	125	5.68
College of Engineering	63	25	40%	137	5.48
College of Science	34	9	26%	54	6.00
Yes First Semester at UAH	41	19	46%	115	6.05
Not First Semester at UAH	58	16	28%	77	4.81
Public High School	81	31	38%	171	5.52
Private High School	12	3	25%	8	2.67
Home School	5	1	20%	13	13.00
Yes Honors	13	4	31%	46	11.50
Not Honors	86	31	36%	146	4.71
Traditional Student	81	24	30%	117	4.88
Returning Student	4	4	100%	13	3.25
Transfer Student	14	7	50%	62	8.86
0-1 SSC	74	74	75%	10	0.14
Light SSC	10	10	10%	33	3.30
Medium SSC	9	9	9%	61	6.78
Heavy SSC	6	6	6%	88	14.67
Any SSC	35	35	35%	182	5.20
PASS	29	29	29%	119	4.10
Tutoring	10	10	10%	47	4.70
Drop-In	7	7	7%	26	3.71
SSC Totals	35	35	35%	192	5.49
Drop	20	8	40%	52	6.50

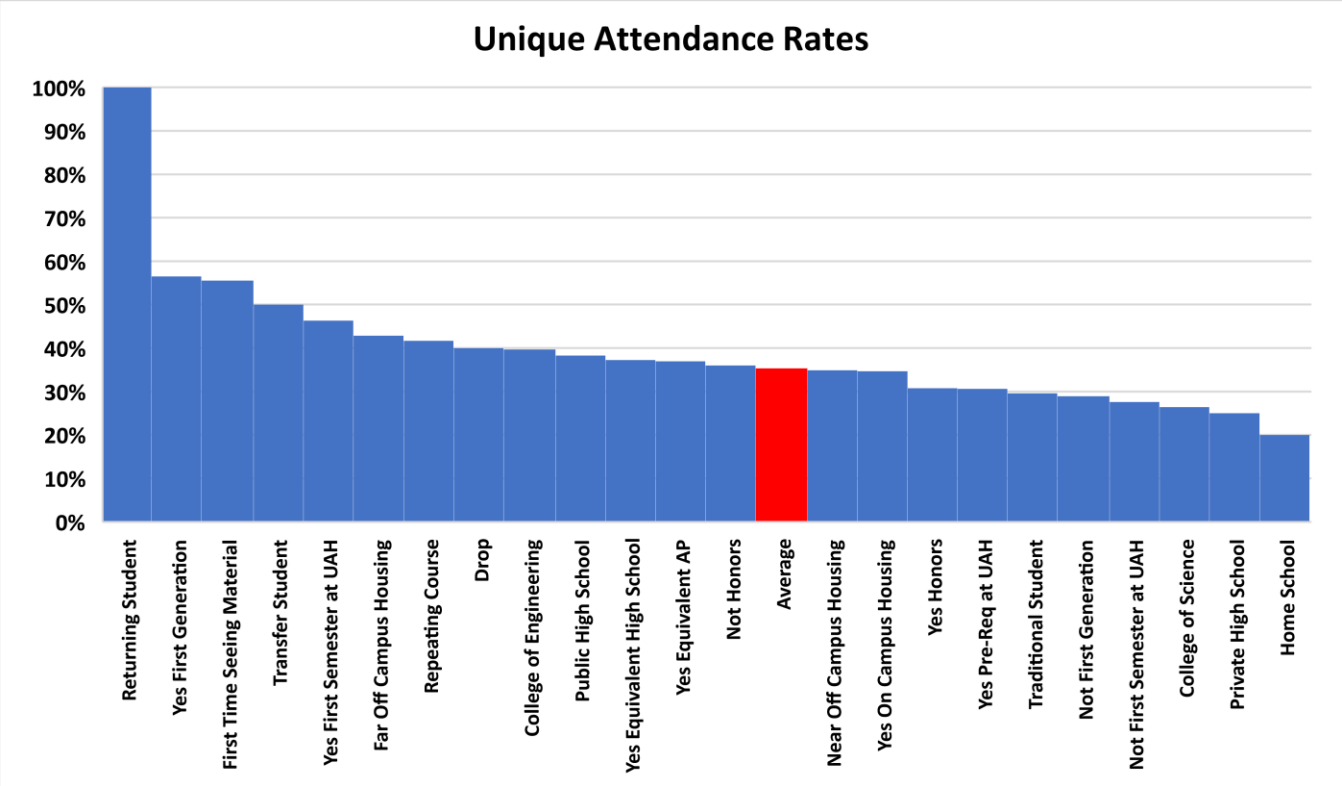

Figure 9.2-2 "Calculus B Unique Attendance Rates"

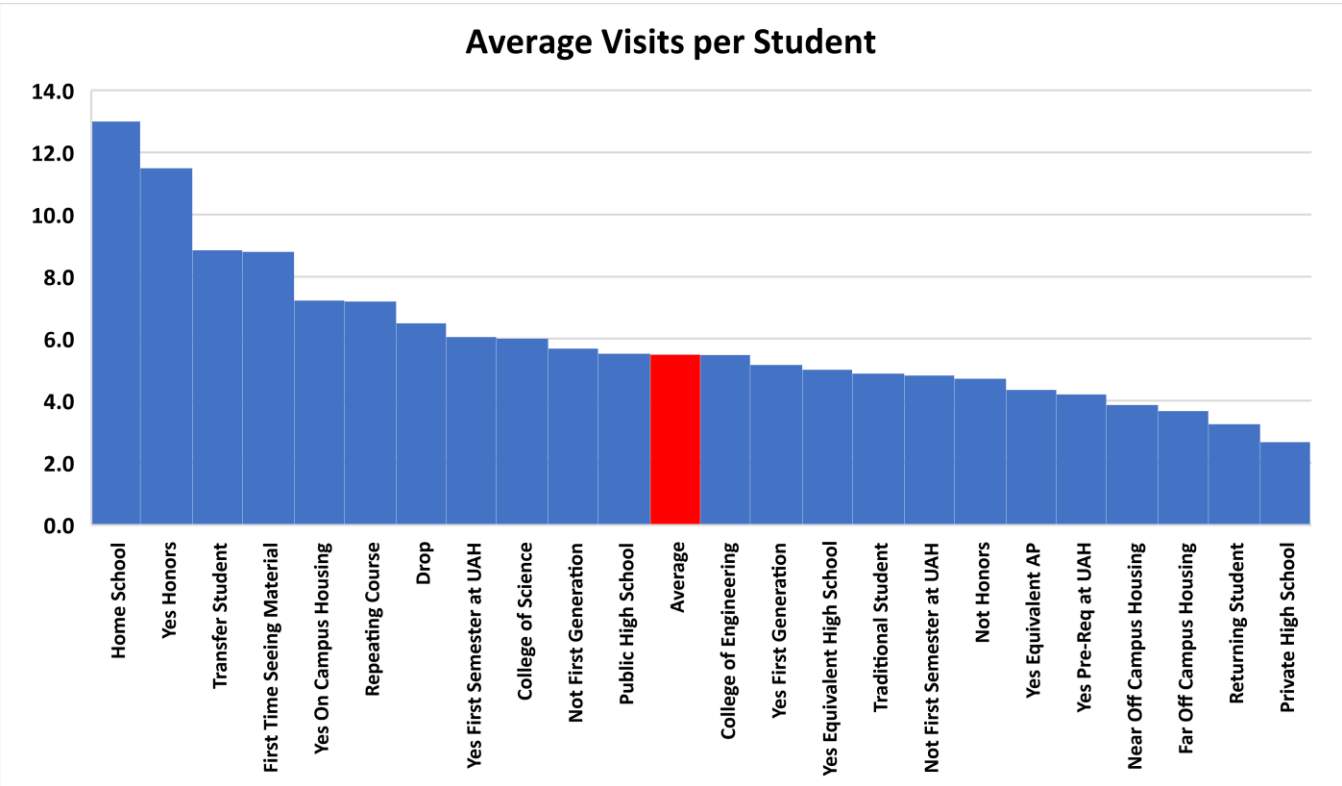

Figure 9.2-3 "Calculus B Average Visits per Student"

Figure 9.2-4 "Calculus B Grades vs. Demographics"			
Demographic	**Average Test Score**	**Average Grade on the Final**	**Average Final Score**
Average	72.86	67.97	78.44
Yes Pre-Req at UAH	68.52	60.92	74.63
Yes Equivalent AP	79.78	73.36	81.13
Yes Equivalent High School	77.39	72.73	80.44
First Time Seeing Material	71.48	71.20	79.20
Repeating Course	68.14	55.67	70.42
Yes On-Campus Housing	75.54	69.40	79.05
Near Off-Campus Housing	68.64	65.55	76.97
Far Off-Campus Housing	80.08	70.80	82.40
Yes First Generation	64.87	68.31	75.62
Not First Generation	74.53	67.91	79.00
College of Engineering	72.88	67.67	78.81
College of Science	72.61	67.81	77.85
Yes First Semester at UAH	78.76	79.21	84.74
Not First Semester at UAH	68.50	59.49	73.69
Public High School	73.85	69.09	78.97
Private High School	67.14	64.78	77.33
Home School	71.20	58.25	72.50
Yes Honors	79.88	75.08	83.33
Not Honors	71.74	66.70	77.57
Traditional Student	75.07	68.96	79.25
Returning Student	59.23	55.00	70.00
Transfer Student	61.94	63.86	74.14
0-1 SSC	74.96	69.87	79.67
Light SSC	68.83	65.00	76.00
Medium SSC	61.04	59.13	71.50
Heavy SSC	71.43	61.25	77.25
Any SSC	65.84	61.56	74.28
Drop	42.09		

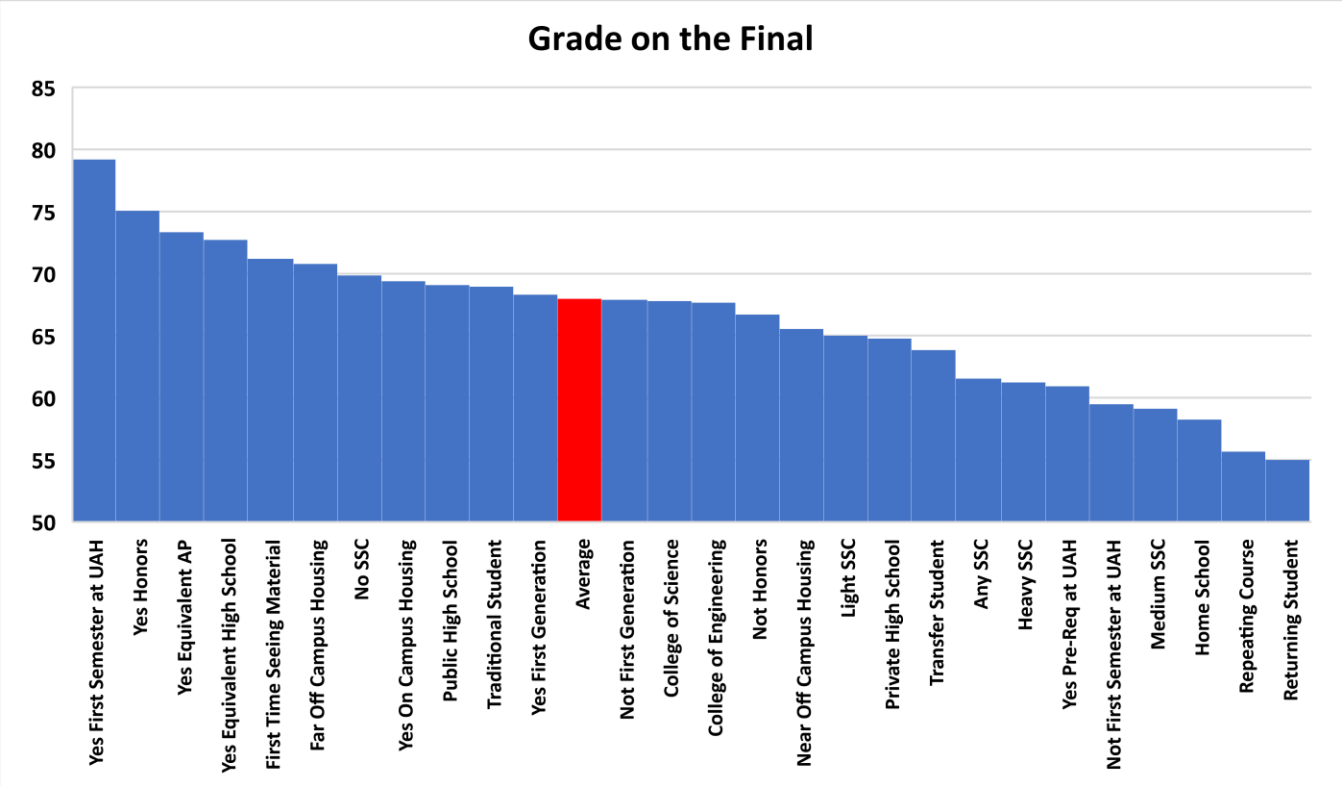

Figure 9.2-5 "Calculus B Grade on the Final"

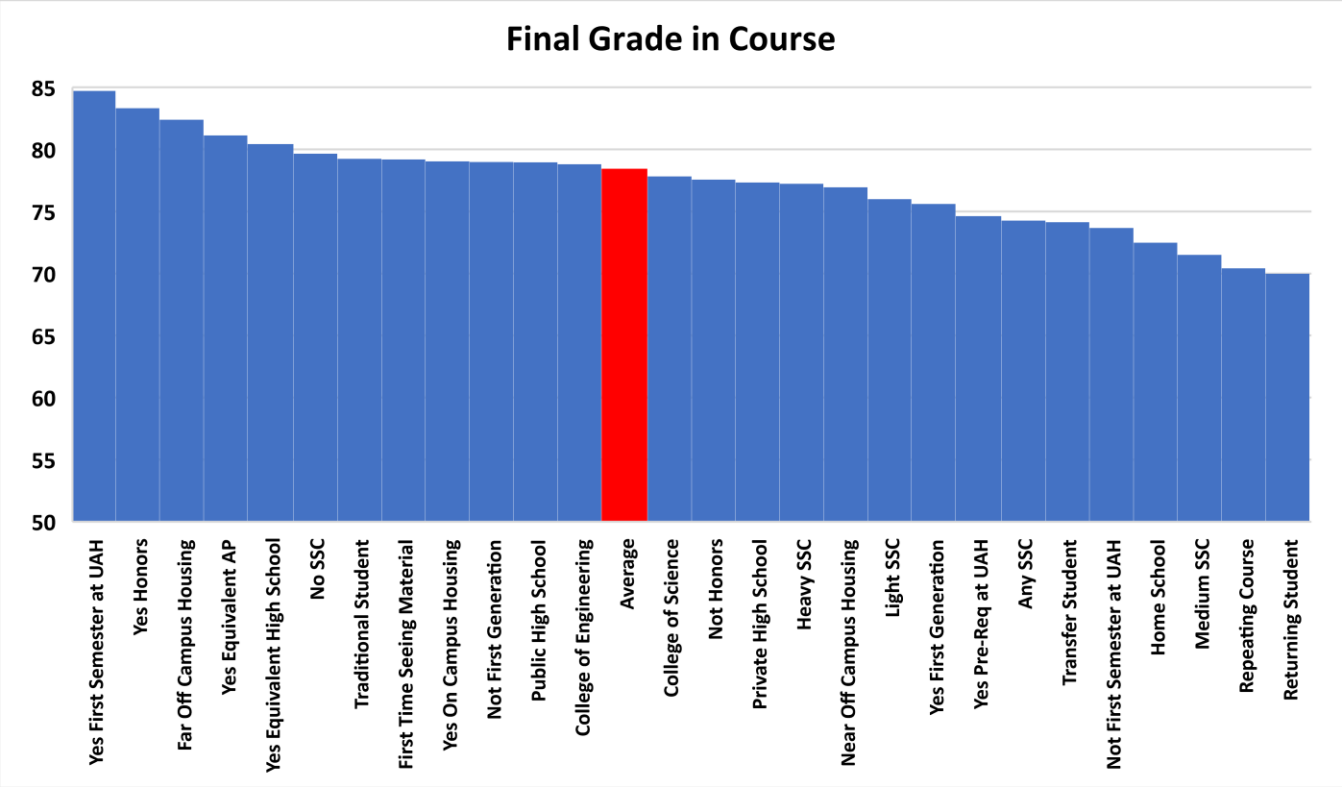

Figure 9.2-6 "Calculus B Final Grade in the Course"

Figure 9.2-7 "Calculus B Standard Deviations"			
Demographic	**Test Score**	**Final**	**Final Score**
Average	17.89	18.74	12.08
Yes Pre-Req at UAH	17.20	28.67	31.99
Yes Equivalent AP	14.75	19.99	17.09
Yes Equivalent High School	16.64	23.62	23.62
First Time Seeing Material	17.63	38.24	39.81
Repeating Course	12.78	15.34	10.02
Yes On-Campus Housing	16.13	29.74	28.58
Near Off-Campus Housing	19.58	32.41	35.79
Far Off-Campus Housing	12.00	35.12	37.99
Yes First Generation	19.10	36.37	38.58
Not First Generation	17.17	28.96	28.95
College of Engineering	18.39	30.83	31.76
College of Science	17.17	33.06	34.90
Yes First Semester at UAH	18.63	33.27	33.27
Not First Semester at UAH	15.98	28.46	32.22
Public High School	18.26	32.53	33.43
Private High School	17.18	30.36	34.11
Home School	11.24	27.81	30.35
Yes Honors	13.23	25.81	24.37
Not Honors	18.28	32.25	33.92
Traditional Student	17.02	30.26	30.32
Returning Student	7.15	25.94	30.71
Transfer Student	19.85	33.14	37.81
0-1 SSC	18.36	31.83	32.32
Light SSC	17.20	34.25	38.64
Medium SSC	12.74	23.31	23.86
Heavy SSC	4.08	30.68	36.62
Any SSC	16.65	31.40	33.64
Drop	14.98		

Figure 9.2-8 "Calculus B Grades vs. SSC Usage"			
Test Grades vs. SSC Usage, Corrected for Prior Knowledge			
Given Prior AP Experience			
	Average Test Score	**Average Grade on the Final**	**Average Final Score**
0-1 SSC	82.80	75.91	82.97
Light SSC	71.90	68.00	76.25
Medium SSC	66.74	61.40	73.00
Heavy SSC	67.90	65.00	77.00
Any SSC	74.61	69.71	78.00
Given High School Equivalent			
0-1 SSC	80.02	75.38	82.24
Light SSC	71.90	68.00	76.25
Medium SSC	65.55	60.83	72.67
Heavy SSC	67.90	65.00	77.00
Any SSC	73.77	63.82	74.36
Given Repeating Course			
0-1 SSC	68.76	53.75	70.50
Light SSC	51.00	49.00	55.00
Medium SSC	71.20	63.00	73.50
Heavy SSC	74.20	63.00	79.00
Any SSC	66.90	59.50	70.25
Given First Time Seeing Material			
0-1 SSC	78.67	70.67	77.67
Light SSC	76.00	68.00	80.00
Heavy SSC	76.60	76.00	83.00
Any SSC	64.28	72.00	81.50
Given Proper Pre-Req at UAH			
0-1 SSC	70.13	62.74	75.97
Light SSC	62.81	56.75	70.25
Medium SSC	62.25	55.50	69.83
Heavy SSC	67.00	41.00	70.00
Any SSC	62.88	54.64	70.00

Test Grades vs. SSC Usage, Corrected for Colleges			
Given the College of Engineering			
	Average Test Score	**Average Grade on the Final**	**Average Final Score**
0-1 SSC	74.92	68.74	79.45
Light SSC	71.81	68.20	80.20
Medium SSC	62.91	64.00	74.67
Heavy SSC	70.50	60.67	76.67
Any SSC	67.67	64.79	77.07
Given College of Science			
0-1 SSC	74.86	71.00	80.27
Light SSC	51.00	49.00	55.00
Medium SSC	54.50	44.50	62.00
Heavy SSC	74.20	63.00	79.00
Any SSC	58.55	50.25	64.50
Test Grades vs. SSC Usage, Corrected for First Semester			
Given YES First Semester			
	Average Test Score	**Average Grade on the Final**	**Average Final Score**
0-1 SSC	82.18	83.04	86.76
Light SSC	86.60	79.00	87.67
Medium SSC	58.23	59.75	72.25
Heavy SSC	72.25	70.50	80.00
Any SSC	69.55	68.56	79.11
Given NO First Semester			
0-1 SSC	70.08	60.72	74.75
Light SSC	55.51	51.00	64.33
Medium SSC	64.55	58.50	70.75
Heavy SSC	70.60	52.00	74.50
Any SSC	62.14	54.56	69.44
Test Grades vs. SSC Usage, Corrected for Student Type			
Given Traditional Student			
	Average Test Score	**Average Grade on the Final**	**Average Final Score**
0-1 SSC	76.78	70.38	80.34
Light SSC	70.61	67.00	77.25
Medium SSC	64.77	61.71	72.43
Heavy SSC	71.80	58.50	76.50
Any SSC	67.86	62.85	74.54

Given Returning Student			
	Average Test Score	**Average Grade on the Final**	**Average Final Score**
0-1 SSC	69.20	70.00	78.00
Light SSC	52.80	54.00	67.00
Medium SSC	55.70	41.00	65.00
Any SSC	54.25	47.50	66.00
Given Transfer Student			
0-1 SSC	60.43	62.75	70.75
Light SSC	76.00	68.00	80.00
Heavy SSC	71.05	64.00	78.00
Any SSC	64.59	65.33	78.67
Test Grades vs. SSC Usage, Corrected for Honors			
Given YES Honors			
	Average Test Score	**Average Grade on the Final**	**Average Final Score**
0-1 SSC	84.24	80.67	86.56
Medium SSC	56.80	58.00	68.00
Heavy SSC	71.80	58.50	76.50
Any SSC	66.80	58.33	73.67
Given NO Honors			
0-1 SSC	73.52	68.00	78.48
Light SSC	68.83	65.00	76.00
Medium SSC	61.57	59.29	72.00
Heavy SSC	71.05	64.00	78.00
Any SSC	65.68	62.20	74.40
Test Grades vs. SSC Usage, Corrected for Housing			
Given YES On-Campus Housing			
	Average Test Score	**Average Grade on the Final**	**Average Final Score**
0-1 SSC	78.10	71.69	80.31
Light SSC	71.03	72.67	79.33
Medium SSC	65.26	58.00	72.20
Heavy SSC	70.50	60.67	76.67
Any SSC	68.49	62.73	75.36
Given Within 30 min (Off-Campus)			
0-1 SSC	70.32	67.44	78.16
Light SSC	65.90	57.33	72.67
Medium SSC	52.68	55.50	67.50
Heavy SSC	74.20	63.00	79.00
Any SSC	61.42	57.67	72.00

Given Outside 30 min (Off-Campus)			
	Average Test Score	**Average Grade on the Final**	**Average Final Score**
0-1 SSC	83.85	70.50	84.00
Medium SSC	65.00	72.00	76.00
Any SSC	65.00	72.00	76.00
Test Grades vs. SSC Usage, Corrected for High School Type			
Given Public High School			
	Average Test Score	**Average Grade on the Final**	**Average Final Score**
0-1 SSC	76.02	71.60	80.48
Light SSC	75.94	67.20	77.80
Medium SSC	61.04	59.13	71.50
Heavy SSC	71.43	61.25	77.25
Any SSC	67.49	62.00	74.71
Given Private High School			
0-1 SSC	70.72	66.13	78.63
Light SSC	51.07	54.00	67.00
Medium SSC			
Heavy SSC			
Any SSC	51.07	54.00	67.00
Given Home Schooled			
0-1 SSC	71.20	58.25	72.50
Test Grades vs. SSC Usage, Corrected for First Generation			
Given YES First Generation			
	Average Test Score	**Average Grade on the Final**	**Average Final Score**
0-1 SSC	67.90	72.67	78.89
Light SSC	51.04	51.50	61.00
Medium SSC	70.50	65.50	75.50
Any SSC	58.83	58.50	68.25
Given NOT First Generation			
0-1 SSC	76.20	69.38	79.81
Light SSC	82.18	71.75	83.50
Medium SSC	58.34	57.00	70.17
Heavy SSC	71.43	61.25	77.25
Any SSC	68.18	62.43	76.00

Figure 9.2-9 "Calculus B Demographics vs. SSC Usages"

Letter Grades vs. SSC Usage				
"Given the student made X LETTER GRADE, % went to SSC"				
Conditional Probability for Letter Grade vs. SSC Usage				
	0-1 SSC	**Light SSC**	**Medium SSC**	**Heavy SSC**
A	94%	6%	0%	0%
B	72%	11%	11%	6%
C	79%	4%	8%	8%
D	64%	7%	21%	7%
F	67%	17%	17%	0%
Total Probability for Letter Grade vs. SSC Usage				
A	16%	1%	0%	0%
B	13%	2%	2%	1%
C	19%	1%	2%	2%
D	9%	1%	3%	1%
F	4%	1%	1%	0%
First Generation vs. SSC Usage				
"Given the student is (or is not) FIRST GENERATION, % went to SSC"				
Conditional Probability for First Generation vs. SSC Usage				
	0-1 SSC	**Light SSC**	**Medium SSC**	**Heavy SSC**
Yes First Gen.	61%	22%	9%	9%
Not First Gen.	79%	7%	9%	5%
Total Probability for First Generation vs. SSC Usage				
Yes First Gen.	14%	5%	2%	2%
Not First Gen.	61%	5%	7%	4%
College vs. SSC Usage				
"Given the students is in the COLLEGE OF ___, % went to SSC"				
Conditional Probability for College vs. SSC Usage				
	0-1 SSC	**Light SSC**	**Medium SSC**	**Heavy SSC**
ENG	71%	11%	11%	6%
SCI	79%	9%	6%	6%
Total Probability for College vs. SSC Usage				
ENG	45%	7%	7%	4%
SCI	27%	3%	2%	2%

Honors vs. SSC Usage				
"Given the student is (or is not) in HONORS, % went to SSC"				
Conditional Probability for Honors vs. SSC Usage				
	0-1 SSC	**Light SSC**	**Medium SSC**	**Heavy SSC**
Yes Honors	69%	0%	8%	23%
Not Honors	76%	12%	9%	3%
Total Probability for Honors vs. SSC Usage				
Yes Honors	9%	0%	1%	3%
Not Honors	66%	10%	8%	3%
Pre-Req vs. SSC Usage				
"Given the student had ____ PRE REQ, % went to the SSC"				
Conditional Probability for Pre-Req vs. SSC Usage				
	0-1 SSC	**Light SSC**	**Medium SSC**	**Heavy SSC**
UAH Pre-Req	77%	11%	10%	2%
AP	78%	9%	11%	2%
First Time	44%	22%	11%	22%
Repeat	67%	8%	17%	8%
HS Equiv	76%	8%	12%	4%
Total Probability for Pre-Req vs. SSC Usage				
UAH Pre-Req	48%	7%	6%	1%
AP	36%	4%	5%	1%
First Time	4%	2%	1%	2%
Repeat	8%	1%	2%	1%
HS Equiv	39%	4%	6%	2%
First Semester vs. SSC Usage				
"Given the student is (or is not) in their FIRST SEMESTER at UAH, % went to SSC"				
Conditional Probability for First Semester vs. SSC Usage				
	0-1 SSC	**Light SSC**	**Medium SSC**	**Heavy SSC**
Yes First	68%	10%	12%	10%
Not First	79%	10%	7%	3%
Total Probability for First Semester vs. SSC Usage				
Yes First	28%	4%	5%	4%
Not First	46%	6%	4%	2%

Housing vs. SSC Usage				
"Given the student has HOUSING at _____, % went to SSC"				
Conditional Probability for On-Campus Housing vs. SSC Usage				
	0-1 SSC	**Light SSC**	**Medium SSC**	**Heavy SSC**
On Campus	71%	8%	10%	10%
Off (within 30)	81%	9%	7%	2%
Off (outside 30)	57%	29%	14%	0%
Total Probability for On-Campus Housing vs. SSC Usage				
On Campus	35%	4%	5%	5%
Off (within 30)	35%	4%	3%	1%
Off (outside 30)	4%	2%	1%	0%
Student Type vs. SSC Usage				
"Given the student is ____ TYPE, % went to SSC"				
Conditional Probability for Student Type vs. SSC Usage				
	0-1 SSC	**Light SSC**	**Medium SSC**	**Heavy SSC**
Traditional	80%	7%	9%	4%
Returning	25%	50%	25%	0%
Transfer	57%	14%	7%	21%
Total Probability for Student Type vs. SSC Usage				
Traditional	66%	6%	7%	3%
Returning	1%	2%	1%	0%
Transfer	8%	2%	1%	3%
High School Type vs. SSC Usage				
"Given the student attended a _____ HIGH SCHOOL, % went to SSC"				
Conditional Probability for High School Type vs. SSC Usage				
	0-1 SSC	**Light SSC**	**Medium SSC**	**Heavy SSC**
Public	73%	10%	11%	6%
Private	83%	17%	0%	0%
Home	80%	0%	0%	20%
Total Probability for High School Type vs. SSC Usage				
Public	60%	8%	9%	5%
Private	10%	2%	0%	0%
Home	4%	0%	0%	1%

Figure 9.2-10 "Calculus B Letter Grades vs. SSC Usage"					
"Given the student used the SSC ___ amount, % made the grade___"					
Cond. Probability for Letter Grade vs. SSC Usage					
	A	**B**	**C**	**D**	**F**
0-1 SSC	22%	18%	26%	12%	5%
Light SSC	10%	20%	10%	10%	10%
Medium SSC	0%	22%	22%	33%	11%
Heavy SSC	0%	17%	33%	17%	0%
Total Probability for Letter Grade vs. SSC Usage					
0-1 SSC	16%	13%	19%	9%	4%
Light SSC	1%	2%	1%	1%	1%
Medium SSC	0%	2%	2%	3%	1%
Heavy SSC	0%	1%	2%	1%	0%

Figure 9.2-11 "Calculus B Two-Way Participant Demographics"

Total: 99	Pre-Req at UAH	Equivalent AP	Equivalent High School	First Time Seeing Material	Repeating Course	On Campus Housing	Near Off Campus Housing	Far Off Campus Housing	First Generation	Not First Generation	College of Engineering	College of Science	Ys First Semester at UAH	Not First Semester at UAH	Public High School	Private High School	Home School	Yes Honors	Not Honors	Traditional Student	Returning Student	Transfer Student	Drop
Pre-Req at UAH	62																						
Equivalent AP	23	46																					
Equivalent High School	26	44	51																				
First Time Seeing Material				9																			
Repeating Course	10	7	8		12																		
On Campus	29	24	27	3	7	49																	
Near Off Campus	29	18	20	5	5		43																
Far Off Campus	4	4	4	1	0			7															
First Generation	14	8	10	3	4	14	7	2	23														
Not First Generation	48	38	41	6	8	35	36	5		76													
College of Engineering	36	30	31	7	8	33	26	4	19	44	63												
College of Science	25	15	19	2	4	16	15	3	4	30		34											
First Semester at UAH	8	26	30	8	1	24	14	3	10	31	30	10	41										
Not First Semester at UAH	54	20	21	1	11	25	29	4	13	45	33	24		58									
Public High School	50	41	43	8	10	37	37	7	17	64	54	25	33	48	81								
Private High School	8	5	5	1	1	6	6	0	4	8	7	5	6	6	0	12							
Home School	4	0	2	0	0	5	0	0	1	4	1	4	1	4	0	0	5						
Yes Honors	6	6	9	1	1	12	1	0	3	10	7	6	8	5	8	1	3	13					
Not Honors	56	40	42	8	11	37	42	7	20	66	56	28	33	53	73	11	2		86				
Traditional Student	53	40	45	3	11	43	32	6	18	63	53	26	31	50	67	9	4	13	68	81			
Returning Student	4	2	2	0	0	1	3	0	2	2	3	1	1	3	3	1	0	0	4	0	4		
Transfer Student	5	4	4	6	1	5	8	1	3	11	7	7	9	5	11	2	1	0	14	0	0	14	
Drop	12	1	3	4	0	6	12	1	9	10	10	8	7	12	15	3	1	1	18	11	1	7	19
No SSC	48	36	39	4	8	35	35	4	14	60	45	27	28	46	59	10	4	9	65	65	1	8	13
Light SSC	7	4	4	2	1	4	4	2	5	5	7	3	4	6	8	2	0	0	10	6	2	2	3
Medium SSC	6	5	6	1	2	5	3	1	2	7	7	2	5	4	9	0	0	1	8	7	1	1	1
Heavy SSC	1	1	2	2	1	5	1	0	2	4	4	2	4	2	5	0	1	3	3	3	0	3	0
Any SSC	19	17	19	5	5	17	15	3	13	22	25	9	19	16	31	3	1	4	31	24	4	7	0

Consent Form

Tracking Academic Success and Its Relationship with Student Success Center Usage and Demographics

You are invited to participate in a research study finding correlations in academic scores, SSC usage, and demographics. The study is designed to help better understand the effects of the SSC and who uses it most.

The primary investigator is *Samuel Johnson* from the UAH Honors College

PROCEDURE TO BE FOLLOWED IN THE STUDY

- Participation in this study is COMPLETELY VOLUNTARY
- Once written consent is given, you will be asked to complete the attached survey
  - You will be asked questions about your academic history and other demographic information
- Your test grades only in this specific course will be collected throughout the semester
- Samuel will then compare test scores, SSC usage, and demographics with de-identified information

DISCOMFORTS AND RISKS FROM PARTICIPATING IN THIS STUDY

- There are no expected risks associated with your participation

EXPECTED BENEFITS

- Results from this study can benefit UAH students by helping the SSC better understand student needs and reactions based on demographics to adjust the promotion of SSC and better serve the student population

INCENTIVES AND COMPENSATION FOR PARTICIPATION

- There are no incentives for participation

CONFIDENTIALITY OF RESULTS

- Participant numbers are used, and these numbers will be made available only to researchers directly involved with this study, ensuring strict confidentiality
  - Participant Number: You will be randomly assigned an arbitrary code that de-identifies your information
  - A master key will be made that connects your name and number, which will be destroyed after three years
- The survey will be destroyed upon completion of data entry (by June 1, 2022)
- This consent form will be destroyed after one year from the time of consent
- Your survey/test scores will only be released to those individuals who are directly involved in the research and only using your participant number
- The test scores will be collected by Samuel Johnson from your professor (at midterms and after finals) in an Excel format, given through a USB drive

FREEDOM TO WITHDRAW

- You are free to withdraw from the study at any time
- You WILL NOT BE PENALIZED in any form due to withdrawal
- Investigators reserve the right to remove any participant without regard to the participant's consent

CONTACT INFORMATION

- If you have questions later, contact the Principal Investigator *Samuel Johnson* at sdj0014@uah.edu
  - Faculty Supervisor: *Kristen Thompson* (SSC), at (256) 824-6216 or at knm0008@uah.edu

If you have questions about your rights as a research participant, or concerns/complaints about the research, you may contact the Office of the IRB at (256) 824-6992 or email the IRB chair Dr. Bruce Stallsmith at irb.@uah.edu

If you agree to participate in our research, please sign and date below

By signing the line below, you are releasing your survey results and test scores in Calculus A/Calculus B to Principal Investigator *Samuel Johnson*.

_____	_____	_____
Name (Please Print)	Signature	Date

This study was approved by the Institutional Review Board at UAH and will expire in one year from June 01, 2021

Survey

Course Information:

1.) *Your Legal Name*: (Please Print Legibly) _____

2.) *Course*: (Circle One) **Cal-A (MA 171)** **Cal-B (MA 172)**

3.) *Section Number*: **1 2 3 4 5 6 7 8 9 10 11**

Instructor Name: _____

Background Information:

4.) *College*: (Circle One)

Engineering	**Arts/Humanities/Social Science**	**Professional Studies**
Science	**Education**	**Graduate School**
Nursing	**Business**	

5.) *Are you an Honors College student?* (Circle One)

Yes **No**

6.) *Major*: _____

7.) *Is this your first semester at UAH?* (Circle One)

Yes **No**

8.) *Are you a first-generation college student?* (Circle One)

Yes [Neither parent has a 4-year degree] **No** [At least one parent has a 4-year degree]

9.) *What type of student are you?* (Circle One)

Traditional [started college at UAH immediately after high school]

Returning [a gap of more than two years after high school/last college experience]

Transfer [did not start college at UAH]

10.) *Do you live on/off-campus?* (Circle One)

On-Campus **Off-Campus (<30 min. drive)** **Off-Campus (30+ min. drive)**

Academic History:

11.) *What type of high school did you graduate from?* (Circle One)

Private School **Public School** **Homeschool** **Boarding School**

12.) *How large was your high school graduating class (approx. number)?* _____

13.) *Have you taken the pre-requisite for this course at UAH?* (Circle One)

(Circle One) **Yes** **No**

[Cal A prerequisite = Pre-Cal (MA 112 or 113)]
[Cal B prerequisite = Cal A (MA 171)]

If yes, how did you take it? (Circle One)

Synchronous Online **Asynchronous Online** **Hybrid** **In-Person**

14.) *Did you take an AP course similar to this course?*

(Circle One) **Yes** **No**

[AP Cal A/B or AP Cal B/C]

If yes, how did you take it? (Circle One)

Online **In-Person**

15.) *Did you take any high school equivalent to this course?*

(Circle One) **Yes** **No**

If yes, how did you take it? (Circle One)

Online **In-Person**

16.) *Have you taken this (exact) course at UAH before?* [Repeating the Course]

(Circle One) **Yes** **No**

If yes, how did you take it? (Circle One)

Synchronous Online **Asynchronous Online** **Hybrid** **In-Person**

Other Information:

17.) *How many credit hours are you taking this semester?* _____

18.) *How many hours per week do you work at a job?* _____

Email any questions or concerns you may have to sdj0014@uah.edu.

THANK YOU FOR COMPLETING THE SURVEY!