

Keeping in School Shape:
A Descriptive and Interpretive Analysis of the Activity of Ten Students in a Calculus
Review Program Conducted Over an Academic Break

by

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ABSTRACT

Learning loss occurs during academic breaks, and this can be detrimental to student success especially in sequential classes like Arizona State University's Engineering Calculus sequence in which retention of the topics taught in a prior class is expected. The Keeping in School Shape Program (KiSS) is designed as a cost effective, efficient, and accessible way of addressing this problem. The KiSS program uses push technology to give students a way to regularly review material over academic breaks while also fostering a growth mindset.

Every day, during an academic break, students are sent a link via text message or email to access a multiple-choice daily review problem which represents material from a previous course that is requisite for success in an upcoming course. Before solving the daily problem, students use a 5-point scale to indicate how confident they are that they can solve the problem. Students then complete the daily review problem and have a variety of resources to support them as they do so, as well as options after they complete it. Students are able to view a hint and try a problem again, view a solution, and attempt a challenge problem. On Tuesdays (aka 2's-Days) students are given the opportunity to complete either an additional daily review problem or an additional challenge problem, and on Sundays (aka Trivia Days) students can decide between completing only a mathematics trivia question or trivia along with the daily review problem.

There is much to be learned from each individual student who participates in the KiSS program. Three surveys were conducted during the Winter Break 2020 KiSS program that gave insight into students' experience in the KiSS program along with their personal background and mindset regarding mathematics. Ten students responded to all

three of these surveys. This thesis will present a case study for each of these ten students based on their data from program participation and survey responses. Conclusions will be drawn regarding ways in which the KiSS program is helping students and ways in which it can be improved to help students be better prepared for their upcoming studies.

ACKNOWLEDGMENTS

I would like to acknowledge all of my committee members and thank them for being a part of my thesis committee and for their feedback. I would especially like to thank my thesis advisor Dr. Carla van de Sande who showed incredible trust in me by allowing me to jump right into the Keeping in School Shape program which she has spent years creating and researching. She gave me the space and capability to implement any idea that came to mind and learn more than I could in any class. She has supported every endeavor and given me endless feedback in the little time we have been working together. Without her this thesis would not have been possible, and I am very excited for the future of working with her as I continue my education as a PhD student studying Mathematics Education at Arizona State University.

I would also like to acknowledge Aysia Guy as it was a lively discussion with her that led to me meeting Dr. van de Sande and beginning to pursue research in Math Education. Furthermore, I would like to acknowledge all of the professors at ASU who I have been an Instructional Aide for as every experience I have had as an IA has silently been fostering an interest in Math Education.

DEDICATIONS

I would like to dedicate this thesis to my mom Mary Salzarulo Vandenberg who implemented many of the tools used in the Keeping in School Shape program throughout my formative years to help me succeed in math. I would also like to dedicate it to my dad John Vandenberg who was a math major and teacher himself and my sister Jena Vandenberg who was my first student and always pushes me to be a better teacher.

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Chapter 1: Introduction

Overview

The Keeping in School Shape (KiSS) program is designed to engage students entering Calculus 2 (MAT 266) at Arizona State University throughout the academic break before they begin MAT 266. This overview will walk through how students are recruited and enrolled in the program, how they interact with the program on a daily basis, and the different parts of the program.

The students who are recruited for the program are those who will be taking MAT 266 in the upcoming semester. By the time students are informed of the program the majority will have already enrolled in their MAT 266 course for the following semester. Typically, students will have taken Calculus 1 in the form of MAT 265 at Arizona State University in the semester before they take MAT 266, but some of the students who participated in the program had taken it earlier and/or at a different institution.

Efforts to recruit students involved reaching out to instructors and students in a variety of ways. In the KiSS Winter Break 2020 session (KiSS WB 2020) students were contacted by instructors as well as an email from the Arizona State University School of Mathematical and Statistical Sciences. Instructors who taught MAT 265 in Fall 2020 and instructors who would be teaching MAT 266 in Spring 2021 were sent an email explaining the KiSS program and were asked to inform their students about the program. Sending this email to both sets of instructors ensured that students who had yet to enroll for MAT 266 were still informed of the program. The email included a message to the instructor, a message the instructor could pass on to students, the charity statistics for the last KiSS program, and a colorful pamphlet aimed at appealing to students. One professor

allowed the author to come to their class and briefly explain the program to students. The pamphlet was also distributed via Reddit. A similar email was sent to an employee of the School of Mathematical and Statistical Sciences who in turn sent out information about the program to all students who were enrolled in MAT 266 in the upcoming semester. This ensured that students who were planning on taking MAT 266 in the upcoming semester were informed about the KiSS program, even if instructors did not pass on the information or if an instructor had not been assigned to a class yet. Recruitment materials can be found in Appendix A.

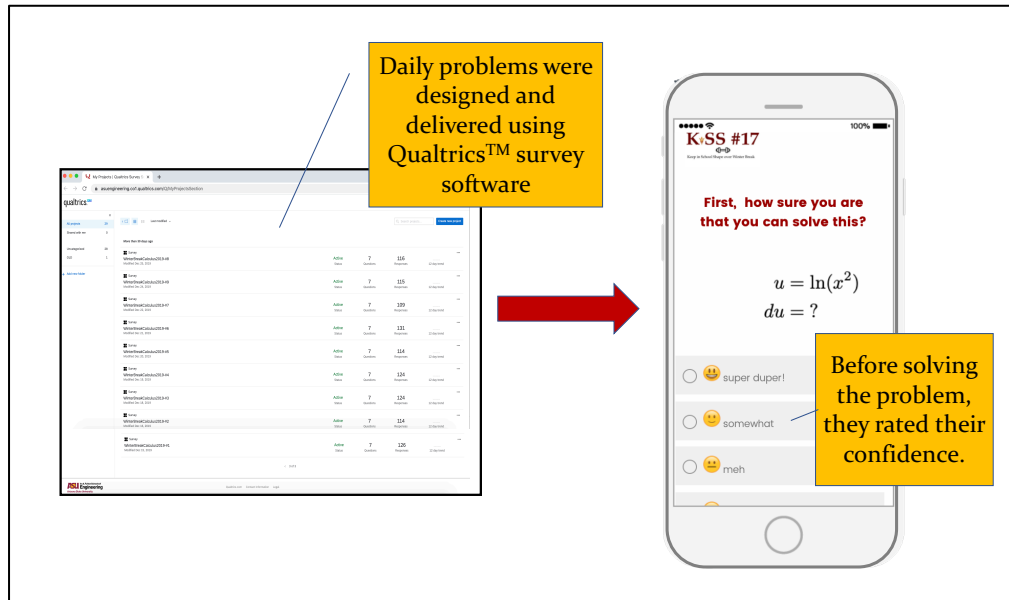
To enroll in the KiSS program, students were instructed to text a self-selected code name to a phone number listed on the recruitment pamphlet. In addition to providing the program administrator with students' contact information, this ensured anonymous participation. Students did not have to feel self-conscious since their identity was protected. Students could enroll in the program at any time during the academic break, although the large majority of students enrolled prior to the start of the program.

Every day starting the Monday after the end of the semester, students were sent a message either via email or text. The survey software QualtricsTM was used to create and distribute the daily review questions. The cost of distributing the surveys via text message was \$0.0003 per question and distributing the surveys via email was free of cost. When students clicked on the daily message, they were taken directly to the daily problem (Figure 1). Initially they viewed the problem and gave a rating of how confident they felt about being able to solve the problem on a five-point scale. After rating their confidence, students were then presented with the problem along with five multiple choice options. All students received the same daily problem, but the order of the multiple-choice options

was randomized. Each problem was sent out at 10:00 AM Mountain Standard Time and was available to students for 24 hours. Appendix B contains an example of each problem and function type.

Figure 1

Qualtrics™ and Rating Confidence



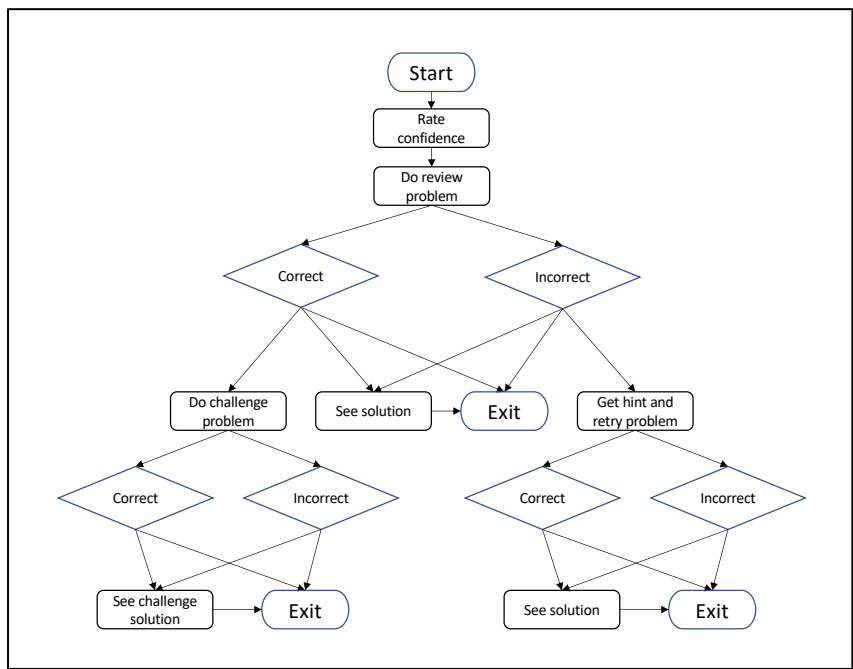
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After trying the daily review problem and choosing one of the five multiple choice options, students received a feedback message telling them if they answered the question correctly or incorrectly. Figure 2 shows a flowchart of the options that students had in the daily review activity. If the student got the daily review problem wrong, they could choose to see a hint, see the solution, or exit. If they viewed the solution, they were then done for the day. If they chose to see a hint, they could attempt the problem again after viewing the hint. After the second attempt students received another feedback

message telling them if they answered correctly or incorrectly. This time students had the same options regardless of the outcome, namely viewing the solution or exiting.

Figure 2

Flowchart for Daily Review



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If the student answered the daily review question correct on their first try, the student could view the solution, exit, or attempt a related challenge problem. If they chose to complete a challenge problem, they did not rate their confidence on it but instead were taken directly to it. After completing the challenge problem, they could opt to see the solution or exit.

Every question in the KiSS program was tagged with a topic that categorizes the type of problem and the type of functions involved. These topics included derivatives,

integrals, limits, and algebra/precalculus. Figure 3 depicts the percentage of each of these problem types that was included in the KiSS WB 2020 program. Furthermore, the type of functions involved in solving the problem were tagged. These included logarithmic, inverse trigonometric, algebraic, trigonometric, and exponential functions. Figure 4 depicts the percentage of problems involving each type of function in the KiSS WB 2020 program.

Figure 3

Percentage of each Problem Type

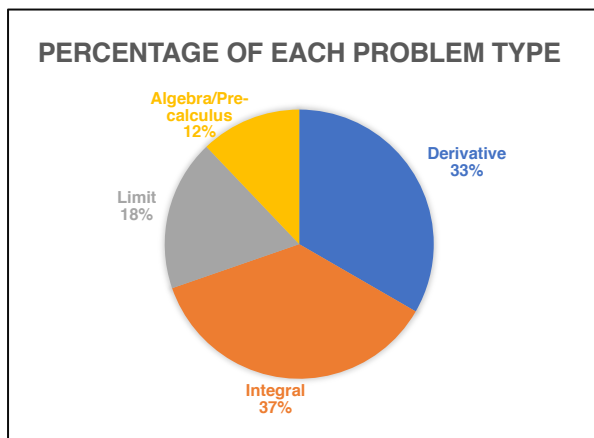
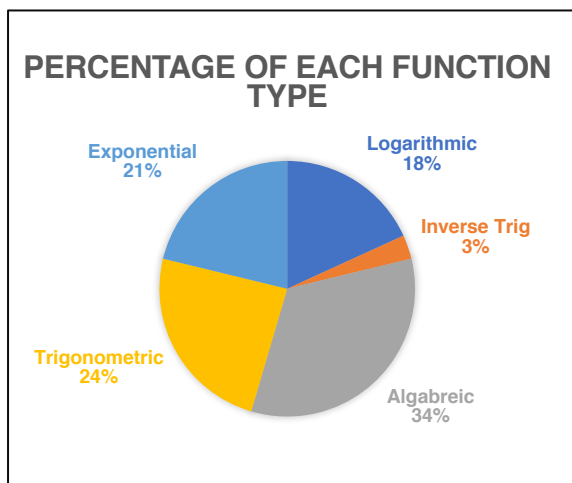


Figure 4

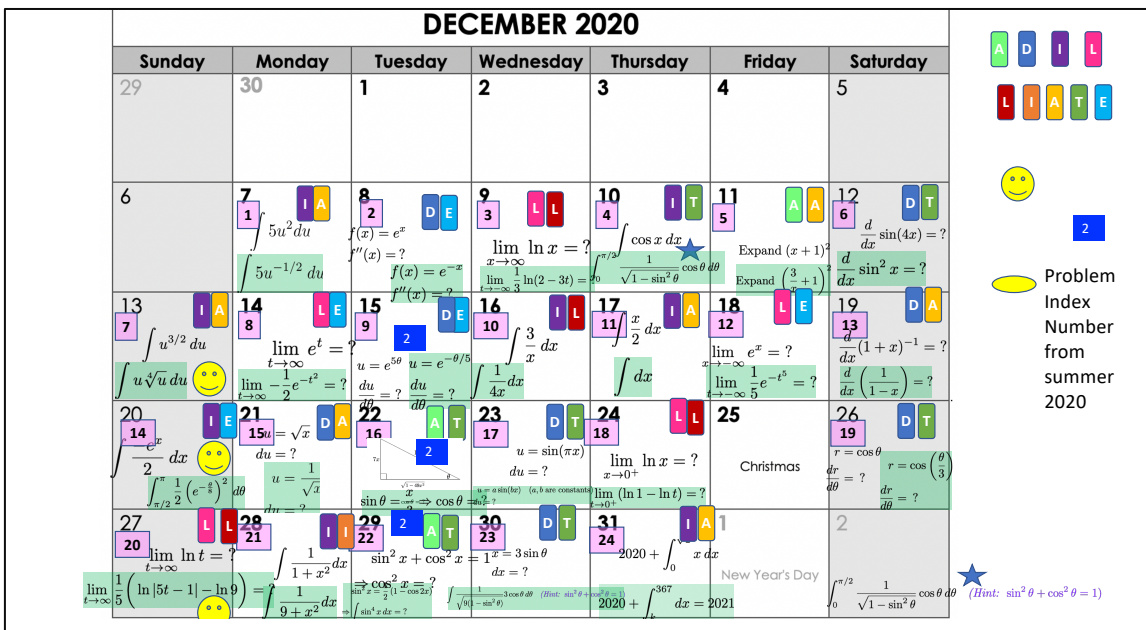
Percentage of Each Function Type



These tags allowed for better analysis of trends in a student’s retention and also allowed for more specific questions to be asked in the surveys to track any relationships between student confidence and a specific type of problem or function.

Figure 5

Portion of Calendar of Problems

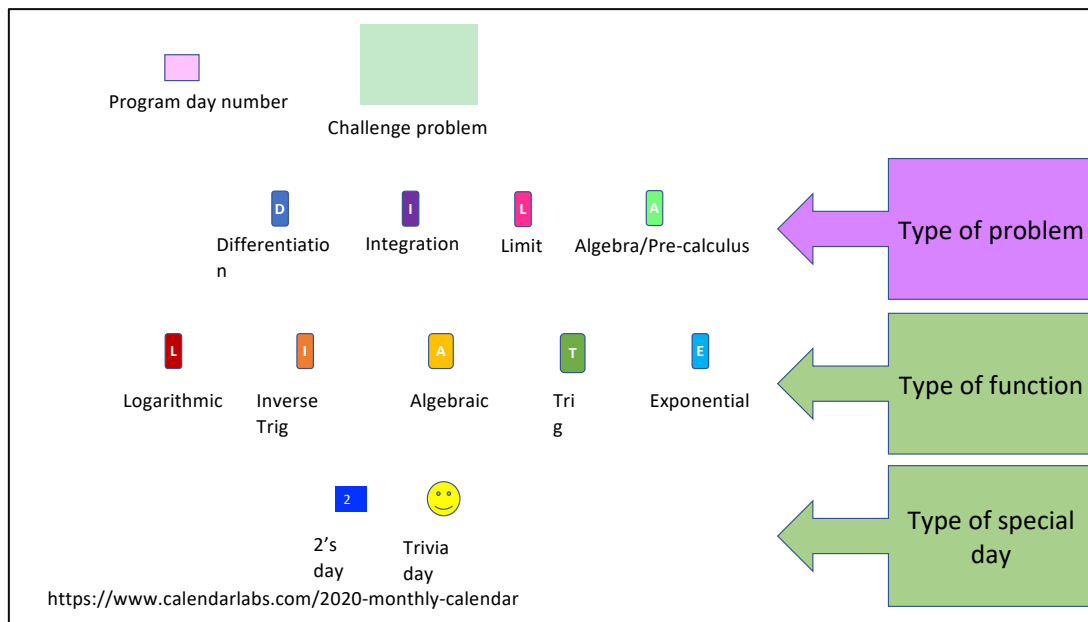


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A calendar of problems was created throughout the program to track each day’s problems, as well as the type of problem and function type it involved. Figure 5 shows a portion of the KiSS WB 2020 calendar. Figure 6 contains the key to the symbols used in the calendar. Color coding the symbols helped program administrators ensure that the KiSS review program contained a variety of problem and function types.

Figure 6

Key for Calendar of Problems

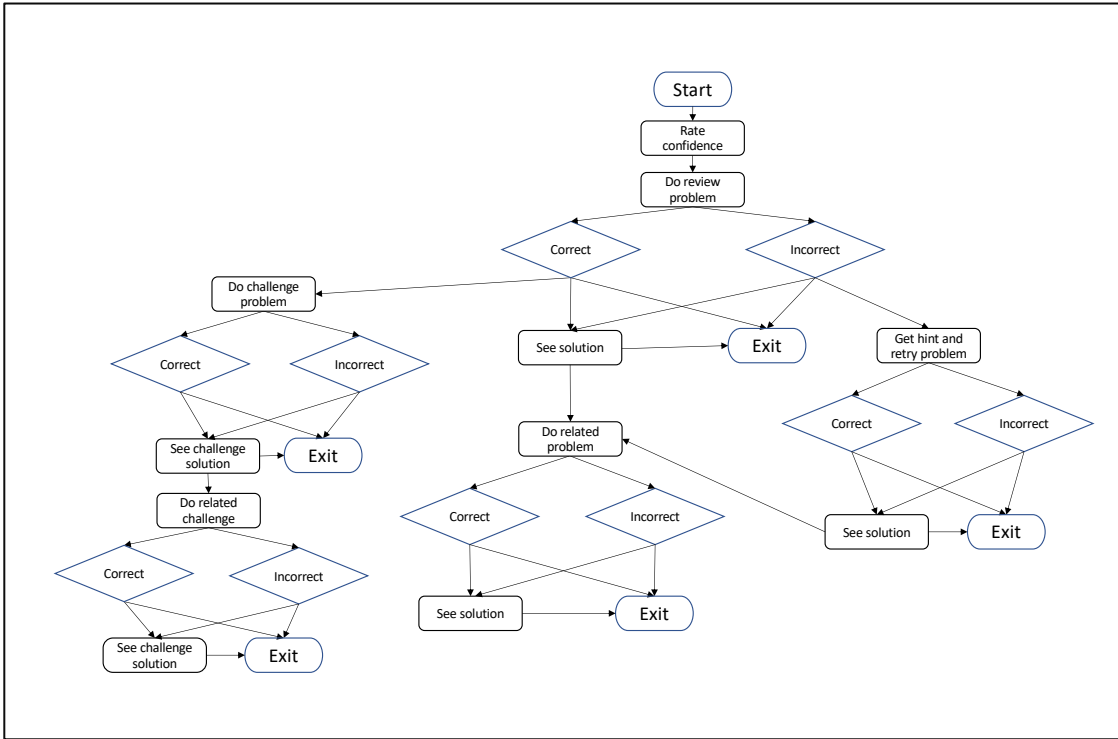


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In order to add variety to the KiSS program experience, additional options were available on certain days of the week, namely Tuesday (2's-Days) and Sundays (Trivia Days). On 2's-Days students were given the opportunity to do an extra related problem regardless if they got the initial or challenge problem correct or not. Figure 7 depicts the various options available to students on 2's-Days. If students got the daily review problem incorrect, they had the option to see the solution, exit, or get a hint and retry the problem. If they chose to see the solution or retry the problem, they then had the opportunity to do a related second problem.

Figure 7

Flowchart for 2's-Days



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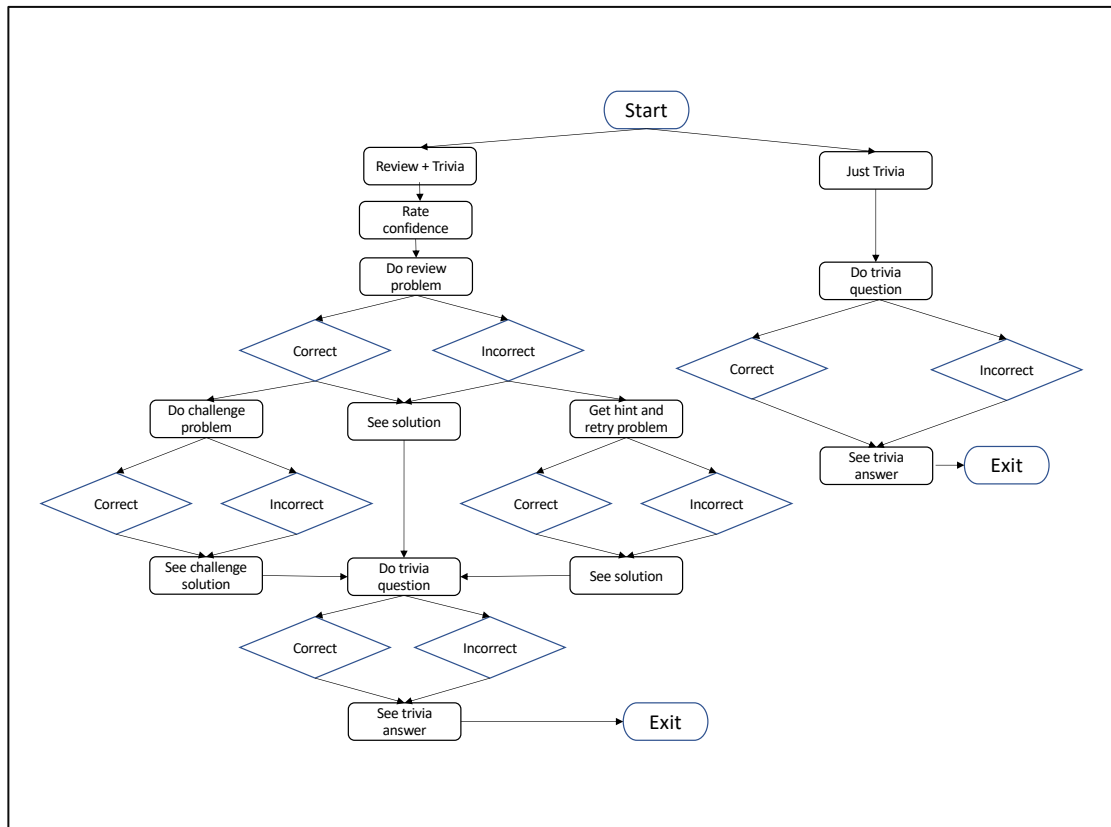
If students got the daily review problem correct, they could see the solution and do a related problem, exit, or do a challenge problem. If students chose to do the challenge problem, they then had the ability to do a related challenge problem if they got the question challenge correct or incorrect.

On Sundays, students could choose between completing just a mathematics related trivia question or the daily review problem followed by a trivia question. Figure 8 depicts the various options available to students on Trivia Days. If students chose to do both the daily review problem and the trivia question, their options for the daily review

problem were the same as on a regular KiSS program day. If they chose to do just the trivia question, then they were taken directly to the trivia question. The trivia questions can be found Appendix B.

Figure 8

Flowchart for Trivia Days



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An integral part of the KiSS program was the link between participation and giving to good causes. Whenever students answered a problem correctly, they could choose one of five charities or good causes to receive a point. At the end of the program, the charity with the most points accrued throughout the session was given a donation.

This charity aspect was intended to replace the pressure for getting problems right that is normally present in the classroom with a communal motivation to do good. Students were informed of this charity aspect during the recruitment process using a flier that described the charities and donation from a previous KiSS session (Figure 9). The charitable organizations were chosen before every session to include a range of causes that would be relevant to students, and the KiSS WB 2020 charities were also picked in consideration of the COVID-19 pandemic. Students were given an update of the points earned by each charity on a holiday that occurred during the program in lieu of the daily review problem. For example, in KiSS WB 2020 the update occurred on December 25 in between Day 18 and Day 19.

Figure 9

Charity Flier for KiSS Winter Break 2020

The flier features the KiSS logo on the left, which consists of the letters 'KISS' in a stylized font with a yellow and red arrow pointing upwards through the 'S'. To the right of the logo are five charity logos stacked vertically: American Red Cross, NO KID HUNGRY, ASU Foundation (Arizona State University) Student Crisis Fund, Pitchfork Pantry, and Lost Our Home (PET RESCUE) Helping people. Saving pets. The main text on the right reads: 'Last winter break, the program donated \$625 to The Cancer Research Institute. This winter the KiSS program will donate \$ for participation to non-profit COVID-19 causes.' At the bottom left, it says 'From: Carla van de Sande'.

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A series of surveys was conducted at different time points in KiSS WB 2020. The surveys were conducted using the Qualtrics survey software to maintain consistency with the daily review problems. The first or “entry” survey was sent to students after they texted a self-selected code name to the program indicating that they wanted to participate. A second or “exit” survey was sent out at the end of the program, in between the second to last and last problems. Finally, students were asked in the exit survey if they would be willing to give more feedback on their program experience. Those who replied in the affirmative were sent a questionnaire asking if they would like to provide this additional feedback via an email questionnaire, a zoom interview, or a phone interview. Both email questionnaires and zoom interviews were selected. The email questionnaires used the Qualtrics software, and the zoom sessions were scheduled during the first two weeks following the end of the KiSS WB 2020 session.

The Surveys

An entry survey was sent out to students close to the time when they enrolled in the program. The survey can be found in the Appendix C. The entry survey included only five questions in order to encourage students to respond. The survey was designed to gain insight into a student’s experience and confidence after completing Calculus 1 or MAT 265, how they felt about MAT 266 at the beginning of winter break as a point for future comparison, and how they heard about the program. The entry survey received responses from 255 students.

The exit survey included ten questions and 151 students responded. The survey can be found in the Appendix C. This survey was designed to provide insight into how program participation impacted student perception of their preparedness for MAT 266.

The survey asked about student confidence with regard to Calculus 1 and Calculus 2, in general, as well as with regard to the specific topics covered throughout the program. Students were also asked if they would have reviewed any Calculus 1 material over the break if they had not participated in the KiSS program and what motivated them to continue participating in the program. In order to gauge how students perceived the structure of the KiSS program, the exit survey asked students to rate the helpfulness of various features of the KiSS program (such as hints), as well as to rate features the program could potentially include. Finally, students were asked if they would be willing to give additional feedback and given space to leave any comments they had about the program.

If students agreed to give additional feedback, they were then sent a survey by email asking if they would like to do so via a Zoom interview, an interview over the phone, or a survey sent out by email. If they selected Zoom or a phone call as the interview modality, they were asked to give a time and date preference. If students indicated that they would like to give their feedback via survey, they were sent the extended feedback survey via email. Eight students completed the written survey and two students participated in a Zoom interview. The extended feedback survey, which can be found in Appendix C, was much more in depth than the previous two surveys and had a total of 38 questions, most of which were open ended and allowed students to enter their responses in a text box. The survey questions were preceded by a statement informing students how their responses would be used and to get their consent to use the information they provided. The students were first asked to give personal information such as gender, race and ethnicity, type of schooling prior to university, year in college, and major. They were also asked to

describe their experiences with Calculus 1, and their mindset in regard to mathematics. The subsequent sections of the survey inquired about the student's opinion of the various features of the program and their experience within the program. Students were also asked to compare their experience with the KiSS program to their experience in a classroom. The next portion of the extended feedback survey inquired about how the students thought the program could be personalized for students and improved. Specifically, students were asked if they would like to see a similar program occur during the semester, if the program could be personalized more and, if so how, and what additional resources could have been provided. Finally, students were asked to give feedback on the charity aspect of the KiSS program and if they would be interested in participating in further research. The survey concluded with a comment/suggestion box for students to give any additional feedback. The two interviews that were conducted via Zoom included the same questions and followed the same order as those conducted via the survey instrument. Students who participated via Zoom were sent the consent form prior to the interview and were asked to give their consent before the interview as well. The interviews were recorded and transcribed by the author using Microsoft Word 360 transcription tools (Appendix D).

Chapter 2: Background and Methodology

The KiSS program uses principles of learning theory to combat the loss of learning that occurs when students are not engaged in formal instruction. In particular, the KiSS program provides students with visible opportunities to regularly review previously learned content that they will need for future courses, while also encouraging students to adopt a positive mindset regarding their ability to improve with effort.

The “Summer Gap” Effect

K-12 students suffer a significant loss of learning over breaks from formal instruction. This “summer slide” or “summer melt” occurs for many school subjects but is especially pronounced for mathematics (Cooper, 2003). Students lose approximately one month of instruction over the course of a lengthy summer break. Recently, a similar loss of learning was documented at the university level for students enrolled in an introductory STEM course sequence (van de Sande & Reiser, 2018). Students who had a summer gap between the two courses in the sequence performed much more poorly in the second course than did students who completed the two courses within a single academic year. Having a lengthy time period between the courses was detrimental to success in the second course which relied on the retention and fluency of many skills taught in the first course. Although this loss of learning was measured over a summer break of several months’ duration, it stands to reason that whenever students experience any lengthy pause in their learning (such as winter break), they are at risk of losing critical skills.

Push Technology

In today’s society many people are used to getting information without even asking for it. Anytime you agree to receive notifications from an app, you are agreeing to push technology, meaning that information is being pushed to you without you having to ask for it every time (Franklin & Zodnik, 1998). The KiSS program recognizes that this is one of the best ways to reach students, as it means that students do not have to seek out review opportunities but instead receive them directly and visibly on a device that they frequently use (van de Sande, 2017; 2019). Presumably if, instead of simply clicking on a

link that takes them directly to the daily review question, students had to go onto the Internet and log onto a website every day, participation would be much lower.

Retrieval Practice

Some cognitive scientists hold that, in order for students to maintain their knowledge, they have to apply that knowledge and in doing so “retrieve” it into memory (Bjork, 1988). The act of “retrieving” knowledge especially for educational purposes is known as “retrieval practice” and, when students engage in “retrieval practice” (for example by testing whether they recall certain skills or procedures), they are actively using their knowledge and applying it. The KiSS program delivers daily retrieval practice opportunities to students. Every problem that students encounter is a typical Calculus 1 problem and utilizes common Calculus 1 skills and procedures. In order to solve the daily KiSS problem students must retrieve this previously learned knowledge and apply it. Retrieval practice is known to aid in the long-term retention of subject matter and is more conducive to retention than traditional studying (Roediger III & Butler, 2011). Furthermore, retrieval practice is especially beneficial when it is engaged in on a regular, spaced basis (Agarwal, Roediger, McDaniel, McDermont, 2013). The KiSS program promotes regular retrieval practice by sending students a daily problem that is only open for 24 hours so that students are not tempted to complete a large set of the practice problems at one time.

Fostering a Growth Mindset

In addition to purely cognitive factors, a student’s perception of their ability to improve in a subject area, i.e., their mindset, plays a critical role in learning behaviors and outcomes (Boaler, 2013). A student’s mindset affects the effort they put forth, the

way they address challenges, and, ultimately, their success (Dweck, 2014). Students with a fixed mindset believe that their intelligence cannot be increased with practice and perseverance and are therefore reluctant to put forth effort trying to improve. Students with a growth mindset, on the other hand, believe that learning from mistakes and taking on challenges are beneficial for improving their ability. A growth mindset has been found to be beneficial in a wide variety of disciplines, including mathematics in which self-efficacy can play a large role in student success (Dweck, 2000; 2015; Lee, 2009; Yeager et al., 2019). In the KiSS program, feedback messages, hints, and challenge problems all promote a growth mindset. After students answer a question, they see a feedback message revealing whether the response was correct or incorrect. If a student answers the question incorrectly, the message is not demoralizing, but instead encourages the student to persist by viewing a hint and trying again (Figure 10). If a student gets the question correct, the message praises the student for their success with the intent of encouraging further participation and engagement (Figure 11).

Figure 10

Feedback Message for Incorrect Answer



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Figure 11

Feedback Message for Correct Answer

Yay! This is a sign of your future success! :D

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Figure 12

Feedback Message for Correct Answer after Hint

See? A little hint is all it took!

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In addition, since effectively fostering a growth mindset not only means praising effort but more importantly praising learning (Dweck, 2015), the feedback messages that students get after using the hint and getting the question correct praise the student for persevering after failing (Figure 12).

The hints themselves are also designed to support students and build their confidence while trying the problem again. The hint always includes the question so that students do not have to remember the problem while viewing the hint. In order to support the preferences of various students, the hints often include both mathematical and verbal cues (Figure 13).

Figure 13

Example of a Hint

$$\int u^{1/2} du$$

HINT:

$$\int u^n du = \frac{1}{n+1} u^{(n+1)} + C, \quad n \neq -1$$

**Power Rule Backwards (Add 1 to power and multiply by reciprocal of the new power.)*

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If students were simply allowed to try the problem again without the support of a hint, they might have little to no idea of what to try differently. This support gives students a push and, hopefully once students know they will be provided with a hint if needed, they will continue to retry the daily problems that they initially answer incorrectly. Furthermore, if a student were to try the problem again without support, they might have a larger chance of getting the question wrong a second time, which could lead to a decrease in confidence and hinder the development of a growth mindset.

Chapter 3: Case Studies

A total of ten students participated in all three surveys. These ten students offer a unique perspective on the types of students who are participating in the KiSS program as well as how they are participating. Each case study will follow a student throughout the entire program from start to finish while analyzing their participation using the data collected from daily review problems, challenge problems, and survey responses. Students signed up with a code name but will be referred to with given aliases to further

protect their identity and for reference consistency. Table 1 gives the name of each student as well as a short description of their personal background and calculus background.

Table 1

Case Study Overview

	Personal Background	Calculus Background
Student 1 : Albert	Albert identified himself as a Southeast Asian male who went to public school and is a freshman studying Electrical Engineering. Albert will be addressed using pronouns he/him/his.	Albert completed MAT 265 at ASU in Fall 2020.
Student 2: Bella	Bella identified as a white female who attended public school and stated she is a “junior?” and studying Biochemistry. Bella will be addressed using pronouns she/her/hers.	Bella has not yet taken MAT 265 and to our knowledge also not Calculus 1.
Student 3: Carl	Carl identified himself as a Mexican male who attended private school and is a freshman studying Electrical Engineering. Carl will be addressed using pronouns he/him/his.	Carl took Calculus 1 as an AP AB level class.
Student 4: David	David identified himself as a white male who attended public and private school and is a sophomore studying Electrical Engineering. David will be addressed using pronouns he/him/his.	David took Calculus 1 roughly six years ago.
Student 5: Emma	Emma identified herself as a brown South Asian female who attended private school and is a freshman studying Chemical Engineering. Emma will be addressed using pronouns she/her/hers.	Emma did not specify exactly when she took Calculus 1 but said it was in college.

Student 6: John	John identified himself as a black Asian male who is a first-generation college student who attended public school. John is a sophomore studying Mechanical Engineering. John will be addressed using pronouns he/him/his.	John took MAT 265 at Arizona State University.
Student 7: Kendall	Kendall identified herself as a white female who received a mix of private, public, and vocational technical education. She is a junior studying Astrogeology. Kendall will be addressed using pronouns she/her/hers.	Kendall took a calculus series at a community college between 2018 and 2020.
Student 8: Liam	Liam identified himself as a white male who attended public school. Liam is studying Physics and is a returning student. Liam will be addressed using pronouns he/him/his.	Liam took MAT 265 twice at Arizona State University.
Student 9: Michael	Michael identified himself as a white Hispanic male who attended public school. He is studying Electrical Engineering, is a returning student, and is roughly a junior. Michael will be addressed using pronouns he/him/his.	Michael took Calculus 1 at the American Military University.
Student 10: Nicholas	Nicholas identified himself as a white male who attended public school. He is studying Electrical Engineering, a returning student, and is somewhere between freshman and sophomore status. Nicholas will be addressed using pronouns he/him/his.	Nicholas took MAT 265 last fall.

Each student approached the program in a unique way and exhibited different levels of accuracy and confidence throughout the program. Figure 14 depicts the ratio of problems answered incorrectly to total questions answered for all ten students without including the students' second try after a hint. Figure 15 depicts the same ratio but

includes the second try after hints. Both figures include a student's average confidence above their respective data above their respective data

Figure 14

Accuracy and Average Confidence (without second try)

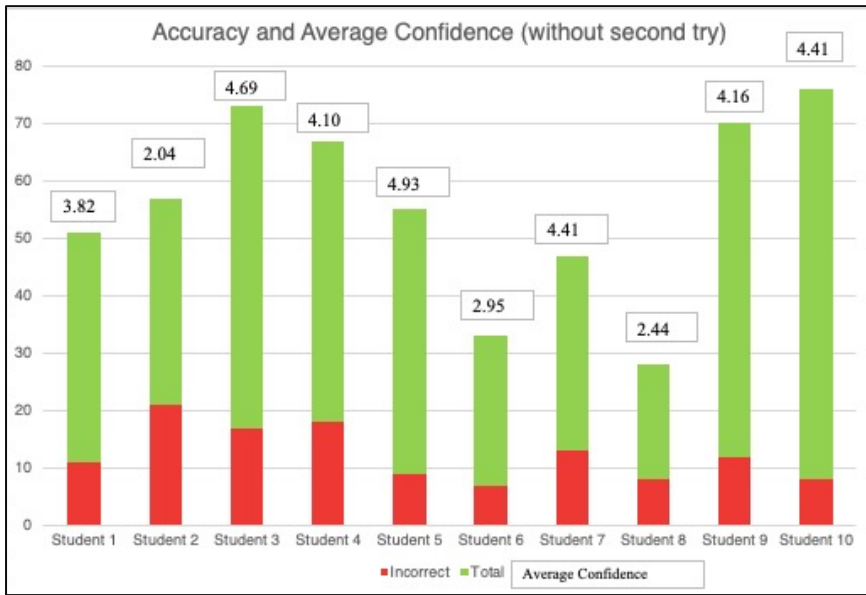
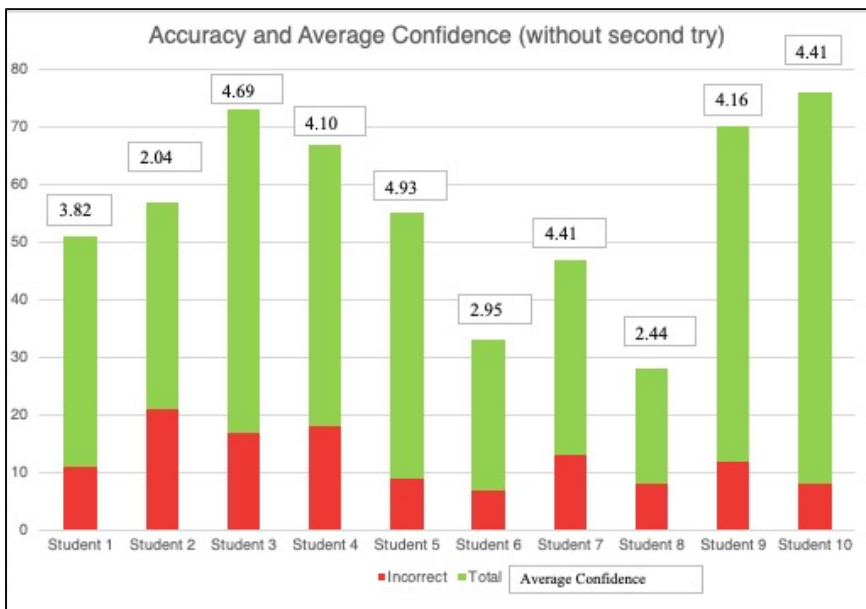


Figure 15

Accuracy and Average Confidence (with second try)



Each case study will follow the same format and include the same content for each student. The first eight students gave their extended feedback in the form of a survey. The responses to these surveys can be found in Appendix D. Student 9 and Student 10, Michael and Nicholas, gave their feedback in the form of an interview that was conducted over Zoom. The transcript of their interviews can be found verbatim in Appendix D.

The case studies include a descriptive and interpretative analysis for each student. The descriptive analysis begins with an overview of the student that includes their personal background as well as a description of their relationship and mindset in regard to mathematics. Next, the student's participation and accuracy is described, followed by their resource usage, i.e., how they used hints, solutions, and the opportunities to complete challenge problems. This is followed by a description of the student's actions on 2's-Days and Trivia Days. Then the student's confidence and their charitable selections are discussed. Each case study concludes with an interpretive analysis of the student's KiSS experience.

Student 1 – Albert

Descriptive Analysis

Overview Albert identified himself as a Southeast Asian male who went to public school and is a freshman studying Electrical Engineering. Albert completed MAT 265 at ASU in Fall 2020 and felt the class was “challenging but not impossible.” Albert stated he was not “the biggest fan” of math but respects math and respects people that like it. When asked about his mindset in regard to math, Albert said he “felt that some people are born with skill and some are not. However [he] also believe[s] those without can put in effort to at least match up with those born with it if not surpass them.” Albert participated in the KiSS program using his mobile phone and received the daily review problem via text message. At the beginning of the program in the entry survey Albert indicated that he felt he had learned and would remember “about half” of the Calculus 1 content he had been taught in MAT 265 and felt “meh” (3) confident about going into MAT 266. At the end of the program, he indicated he was “somewhat” (4) confident in regard to Calculus 1 material and that the KiSS program helped him feel “somewhat” confident (4) going into MAT 266. Thus, after completing the KiSS program his confidence increased for both Calculus 1 and Calculus 2 skills. Albert also indicated in the exit survey that he would not have otherwise reviewed any Calculus 1 material over break.

Participation and Accuracy Figure 16 depicts Albert’s participation opportunities and accuracy on each day of the KiSS program. Green squares indicate that a problem was answered correctly; red squares indicate that a problem was answered incorrectly; gray squares indicate that a problem opportunity was open for the student on that day but that the student chose not to engage in it. For instance, on Day 1, Albert

answered the daily review problem correctly and therefore could have chosen to do the challenge problem but did not. As can be seen in Figure 16, Albert participated on every single day of the KiSS program. Of the 33 days on which Albert participated, he answered 27 of the initial daily review problems correctly and 6 incorrectly. Five of the days he participated were Trivia Days, four were 2's-Days, and 24 were normal. One of the days on which Albert answered the daily review problem and got it incorrect but did not try again was a 2's-Day.

Figure 16

Student 1 Participation and Accuracy

Related Challenge																																	
Related Daily Review																																	
Challenge																																	
Second Try																																	
Daily Review																																	
Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33

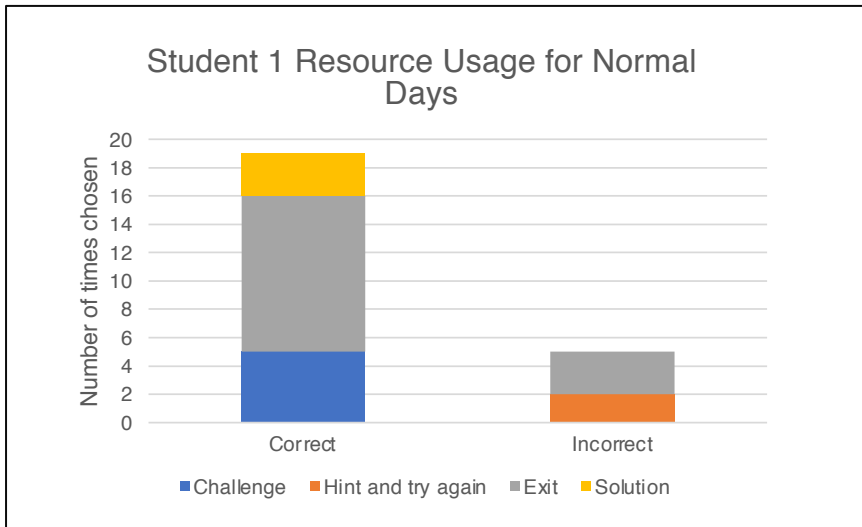
Resource Usage Figure 17 shows the number of times Albert used the available opportunities (doing a challenge problem, viewing a hint and trying the problem a second time, viewing the solution, or exiting), depending on whether he got the daily problem correct or not. Albert participated in 24 normal KiSS days. On five of these days Albert answered incorrectly. Of those five times Albert chose to try the problem again twice and exit three times. The two times in which Albert tried the daily review problem a second time after viewing a hint, he got the question correct on his second try. However, in his extended feedback survey Albert indicated that he “usually didn’t” use the hints but indicated that they were helpful. When asked how he used the hints he said he “read part of it and only read it over.” It is interesting that, despite finding them helpful, Albert did not use the hints on the other four days he answered a question incorrectly. Albert did not

view the solution after getting the daily review question incorrect, but he did view the solution three times after answering the daily review problem correctly.

With regard to the challenge problems, Albert had 19 opportunities to push himself by attempting the challenge problem but only chose to do so five times on normal KiSS days (Figure 17). All five times were at the beginning of the program suggesting that Albert felt more comfortable pushing himself in the beginning. He answered the challenge question correctly the first and third time he tried the challenge question. After getting it wrong the fifth time, he never tried the challenge question again on a normal day. When asked if he would have wanted to have the opportunity to try the challenge problem even if he got the daily review question wrong, he said “sometimes.”

Figure 17

Student 1 Resource Usage for Normal Days



2's-Days Albert participated in all four 2's-Days that occurred during KiSS WB 2020. He indicated that he had “no strong feelings towards” 2's-Days. On the first of these he answered the initial daily review problem correctly, but then exited and did not take the opportunity to do any of the extra problems. On the second 2's-Day he again answered the initial daily review question correctly. This time he chose to do a challenge problem and answered correctly. However, instead of viewing the solution and/or trying a related challenge problem he exited. On the third 2's-Day Albert again answered the initial daily review question correctly and opted to try a challenge problem. This time he answered it incorrectly. Even though he had the choice to view the solution and try a related challenge problem, he decided to exit. On the last 2's-Day Albert answered the initial daily review problem incorrectly, and then exited without viewing the solution or the hint. When asked if he felt more confident doing the second problem after completing the first, Albert said, “no if anything the opposite usually.” Although Albert never did a related daily review problem or related challenge problem, he indicated that on 2's-Days he did the additional problem “most of the time,” illustrating how Albert's recollections were not always consistent with his actual participation.

Trivia Days Albert also participated in all five Trivia Days and consistently chose to do calculus first followed by trivia. In the extended feedback survey, Albert noted that he did both “because I felt I could learn some math and some trivia” and stated the trivia questions “were a nice change of pace.” He always answered the initial daily review question correctly on Trivia Days, but never chose to try the challenge problem. He instead went straight to trivia. In terms of accuracy, Albert answered the first and last trivia question correctly but the middle three incorrectly.

Problem and Function Type As stated earlier, every problem in the KiSS program is tagged according to the main type of problem and the type of function. In the entry survey Albert indicated that he struggled with integrals and limits, and with logarithmic functions, inverse trigonometric, and trigonometric functions. Despite getting most of the integral and limit review problems correct (Figure 18), his confidence did not appear to increase much following participation in the KiSS program since, in the exit survey he rated his confidence in integrals a “meh” (3) and in limits “not at all” (2). His perception of the types of functions that he found challenging was slightly more attuned with his performance in that trigonometric functions appeared to cause him difficulty (Figure 19). At the same time, however, he did not perceive algebraic functions as being a potential source of difficulty, but this was the type of function that was hardest for him to correctly handle.

Figure 18

Student 1 Problem Type and Accuracy

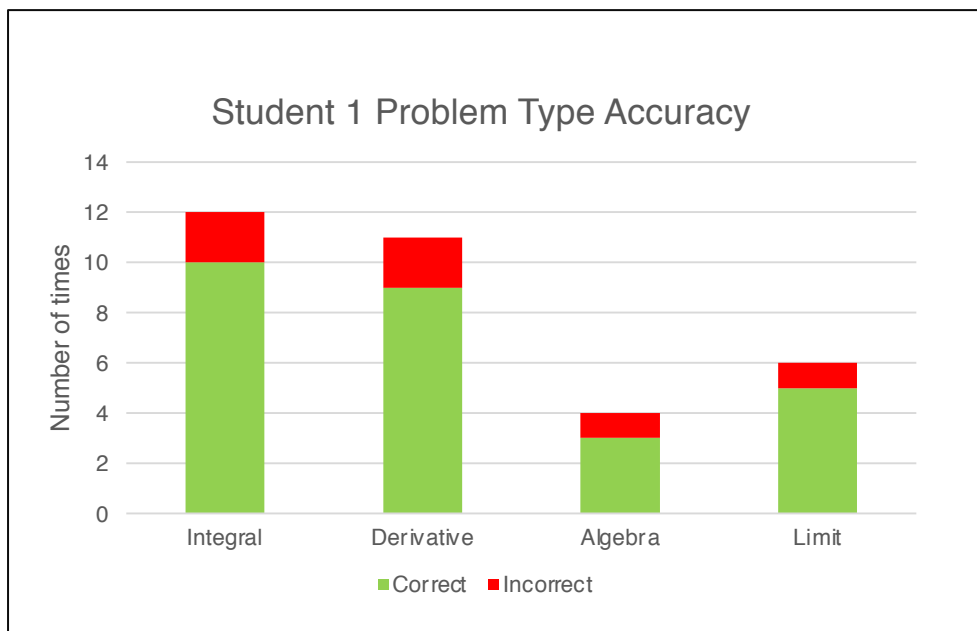


Figure 19

Student 1 Function Type and Accuracy

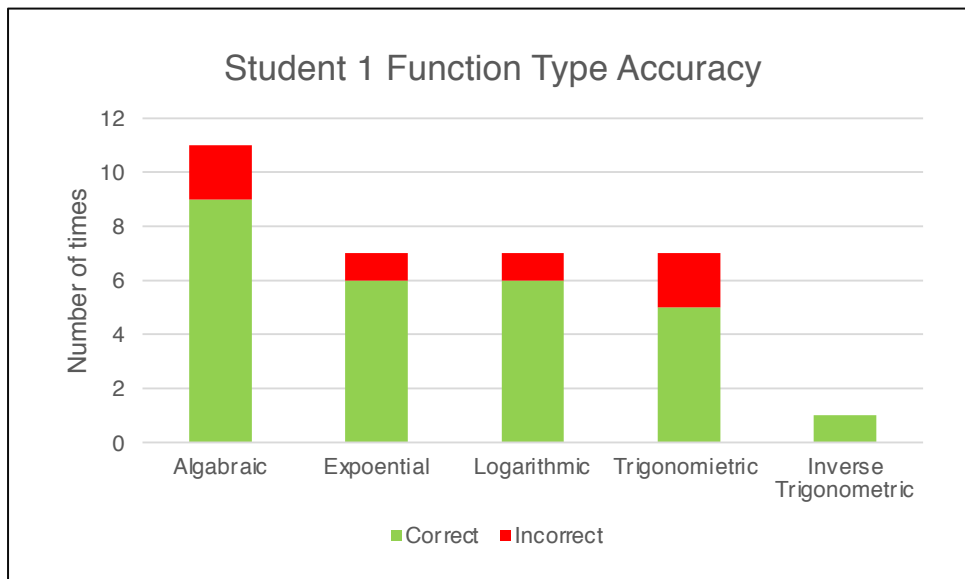
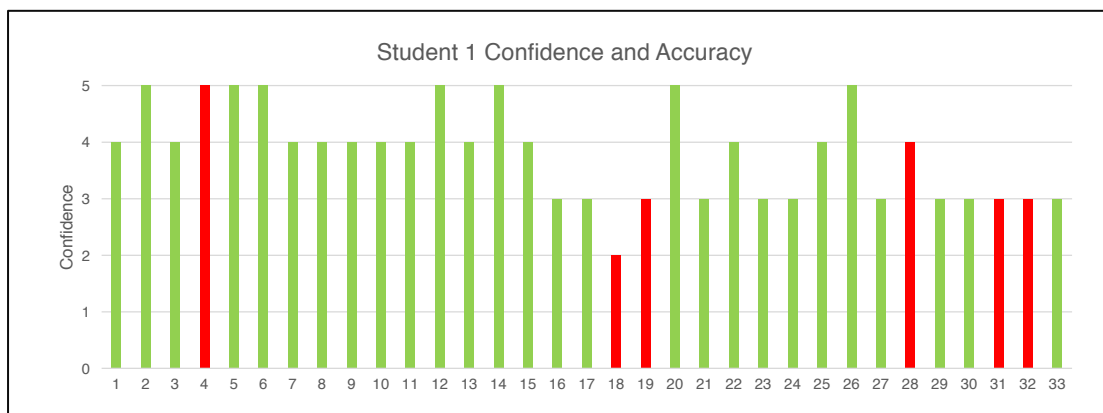


Figure 20

Student 1 Confidence and Accuracy



Confidence Figure 20 depicts Albert's confidence rating for each of the daily review problems, together with his accuracy. Green and red colors indicate correct and incorrect responses, respectively. In general, Albert's confidence was lower in the second half of the KiSS program. Albert's average confidence across the KiSS program was 3.82. On the days on which Albert got the daily review question wrong on his first try, his average confidence rating was 3.33, lower than his overall average. However, it was only lower than a 3 on one of these days and was higher than a 3 on two of them. For the problems Albert got correct, his average confidence was 3.92. Figures 21 and 22 show that Albert's average confidence was higher for derivatives than integrals which is not perhaps to be expected of a student who has just finished Calculus 1, i.e. differential calculus. However, this correlates with his accuracy in integrals and derivatives. Albert noted in the extended feedback survey that getting a question correct during the KiSS program felt different than getting a question correct during a class because in "class there [is] slightly more satisfaction due to the fact that it counts towards your grade." Although Albert said that when he got a question wrong, he was "a little upset but more invigorated to do better next time," he did not always try the problem again suggesting that perhaps in his mind getting the question wrong was the end of the road for that day and doing "better next time" referred to the next day he tried. When asked if it was getting the initial question correct that encouraged Albert to do the challenge problem, he responded that "it was more [he] wanted to improve."

Figure 21

Student 1 Function Type and Average Confidence

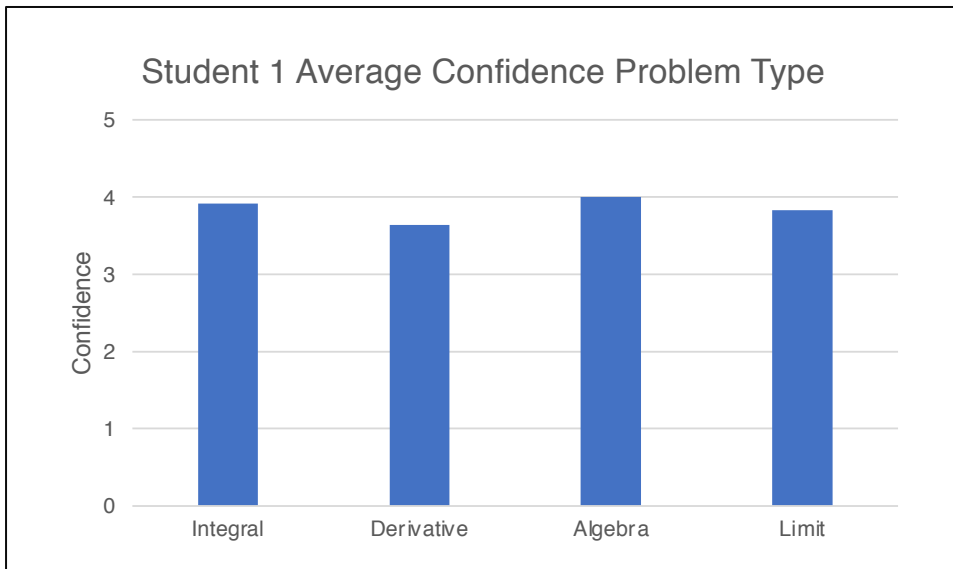
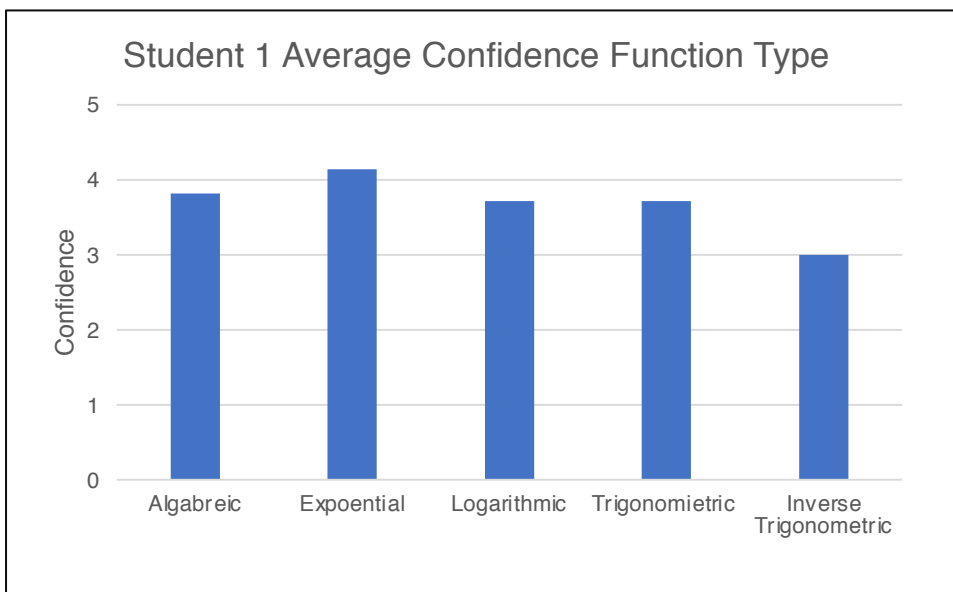


Figure 22

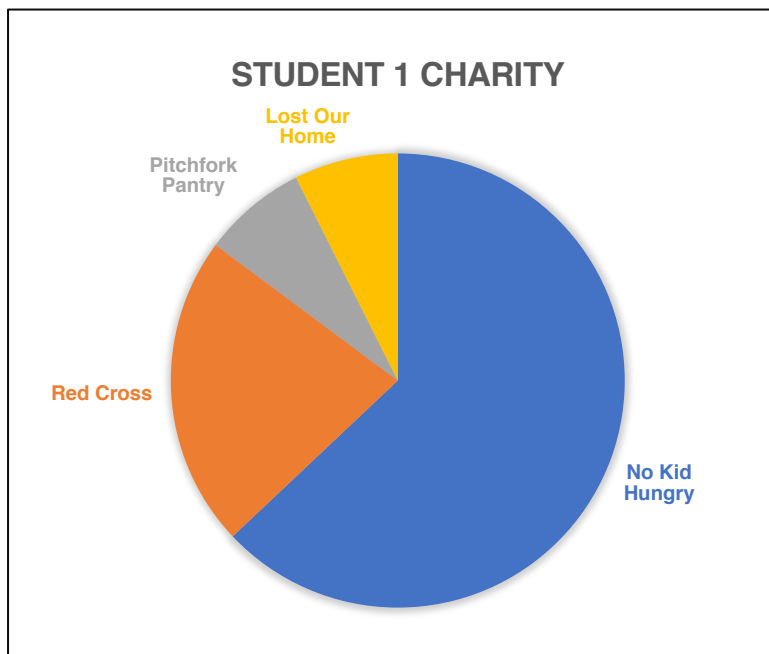
Student 1 Function Type and Average Confidence



Charity Albert selected four of the five charities over the course of the program (Figure 23). Albert never chose the ASU Foundation Student Crisis Fund. In the extended feedback survey, Albert said that the charity aspect is “very good motive to do good and check in every day.” When asked if he would want to have a voice in selecting which charities or good causes were available from which to choose, he was noncommittal and just said “potentially.”

Figure 23

Student 1 Charity Picks



Interpretative Analysis

Albert is a student who participated often and with good accuracy. His confidence in his ability to answer a question was also high as can be seen in his high average confidence rating. However, he did not exhibit a growth mindset because, when he got a question wrong, he opted to look at the solution or exit the program for the day, instead

of viewing the hint and trying again. Furthermore, he rarely choose to push himself by completing a challenge problem or taking advantage of the extra opportunities on 2's-Days. This may be explained by taking a closer look at the few times he did choose to use a hint or complete a challenge problem. His accuracy after using a hint suggests that when Albert used the hints, they were enough to support him getting the question correct on his second try. It is also important to note that in the beginning of the program Albert not only had a higher confidence, but he was also willing to try the daily review problem again the first two times he answered it incorrectly. From the third time on, he did not view the hint and try again. This same trend can be seen when looking at whether or not Albert chose to do a harder problem if he got the daily review problem correct. Of the 24 normal days (days not including Trivia or 2's-Days) Albert answered 19 correctly. On five of those 19 days Albert decided to try the challenge problem, on the remaining 14 he chose to exit. All five of these days were at the beginning of the program. Furthermore, he got the challenge problem correct twice and incorrect three times. The first two times he got the challenge problem incorrect he viewed the solution, the third time he answered incorrectly he exited. That was also the last time he tried the challenge problem on a regular day.

Student 2 – Bella

Descriptive Analysis

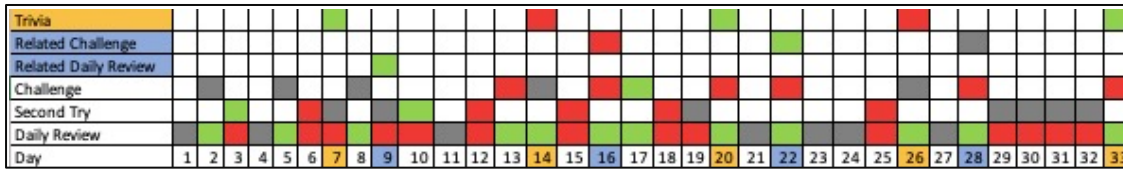
Overview Bella identified herself as a white female who attended public school and stated she is a “Junior?” studying biochemistry. The interesting thing about Bella is that she had not yet taken MAT 265 and to the author’s knowledge also not Calculus 1. She said she was “currently enrolled in MAT 265 in Spring A and taking MAT 266 in B”

meaning that she would be taking MAT 265 during a session A class in the Spring 2021 semester. While Bella was not the ideal participant for this program because the program assumes Calculus 1 knowledge, she could still benefit from participation. When asked to describe her relationship with math, she said she is “not a fan of math, and [she] think[s] it boils down to not having a solid foundation in math. She still struggle[s] with knowing how to study for math classes and tests to do well.” As for her beliefs about the role effort plays in learning mathematics, she believes “it can be improved with focus and determination, but also takes a certain person to really excel and naturally do math.” As could be expected for a student with little Calculus 1 experience, Bella felt that she had learned and would remember “some but not much of” Calculus 1 materials and was “not very” confident going into MAT 266. However, at the end of the program she was “somewhat” confident with both Calculus 1 content and MAT 266. Bella indicated she would not have reviewed Calculus 1 skills over the break had she not done the KiSS program. She left a comment in the exit survey saying the KiSS program “really helped [her] prepare for the content [she would] be seeing.”

Participation and Accuracy Bella answered 12 of 27 questions correctly, 14 incorrectly, and did not answer one. Of the 27 days that Bella participated, 18 were normal KiSS days, four were 2’s-Days, and five were Trivia Days. On the first day of the program while Bella clicked on the problem and rated her confidence, “not very” (2), she did not answer the question. The first question will thus be omitted from the remaining analysis. On the remaining 17 normal days Bella answered five daily review questions correctly and 12 daily review questions incorrectly (Figure 24).

Figure 24

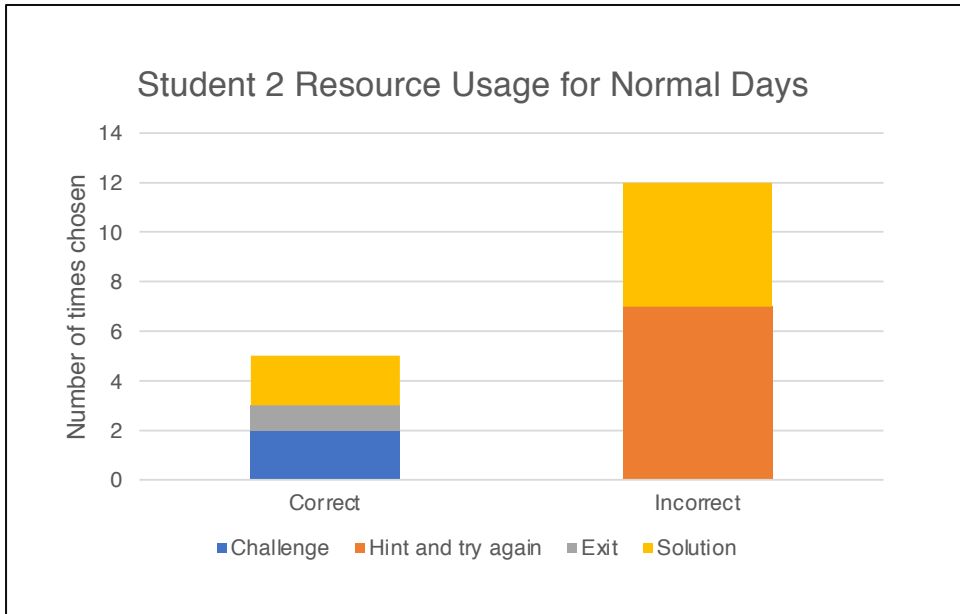
Student 2 Participation and Accuracy



Resource Usage Figure 25 depicts the breakdown of Bella’s choices based on whether she answered the daily review problem correctly or incorrectly. On the 14 days Bella answered the daily review problem incorrectly, she looked at the hint and tried again seven times and wanted to see the solution the other seven times. Of the 12 normal daily review questions that Bella answered incorrectly, she chose to get a hint and try again seven times and see the solution five times. When she tried the question again after viewing a hint, she got it correct twice on the second try and incorrect five times. When asked about the hints in the extended feedback survey, Bella indicated that she, “might or might not have” used them and then did not answer the remaining questions about the hints, e.g. if they were helpful or how they were used. Each time Bella tried the daily review question a second time she still asked to look at the solution. As for the five normal daily review questions Bella answered correctly, she chose to see the solution afterwards twice, exit after once, and try a harder question twice. Bella had the opportunity to push herself nine times but only chose to twice. The first time she attempted a challenge problem she answered incorrectly, but the second time she answered correctly. Bella answered in the survey that she would not have wanted the opportunity to try the challenge question even if she answered the daily review problem incorrectly.

Figure 25

Student 2 Resource Usage for Normal Days



2's-Days Bella participated in all four 2's-Days . On the first one she answered the daily review problem incorrectly, chose to look at the hint and then try the related problem which she answered correctly. On the second 2's-Day she answered the daily review problem correctly, selected to try the challenge problem which she answered incorrectly. She chose to view the hint and then try the related challenge problem which she also answered incorrectly. She chose to view the solution to the related challenge problem. On the third 2's-Day Bella answered the daily review problem correctly, opted to try the challenge problem which she answered incorrectly. She viewed the solution and selected to try the related challenge problem which she answered correctly. She still viewed the solution to the related challenge problem. On the final 2's-Day Bella again answered the daily review problem correctly and chose to try a challenge problem which she answered incorrectly. She still wanted to try the challenge but did not do the problem

this time. On the extended feedback survey Bella did not answer the question about how she felt about 2's-Days. She did say that she completed the additional problem "most of the time."

Trivia Days Bella participated in all five Trivia Days. On all five of them she chose to complete calculus then trivia. The first trivia day she answered the daily review problem incorrectly but on the remaining four she answered it correctly. On two of the occasions when she answered the daily review problem correctly, she chose to try the challenge question. She did not get the challenge question correct either time. Bella got three of the trivia questions correct: the first, middle, and last. In the extended feedback survey Bella noted that she thought the trivia problems "were fun."

Problem and Function Type In the entry survey Bella indicated that she struggled with derivatives, integrals, limits, and algebra. Furthermore, she also struggled with logarithmic, inverse trigonometric, algebraic, trigonometric, and exponential functions. In the exit survey she indicated a confidence of "somewhat" (4) for derivatives, "somewhat" (4) for integrals, "super duper" (5) for limits, and "super duper" (5) for algebra and pre-calculus. Figures 26 and 27 describe Bella's accuracy in both the problem types and function types she encountered throughout the program.

Figure 26

Student 2 Problem Type and Accuracy

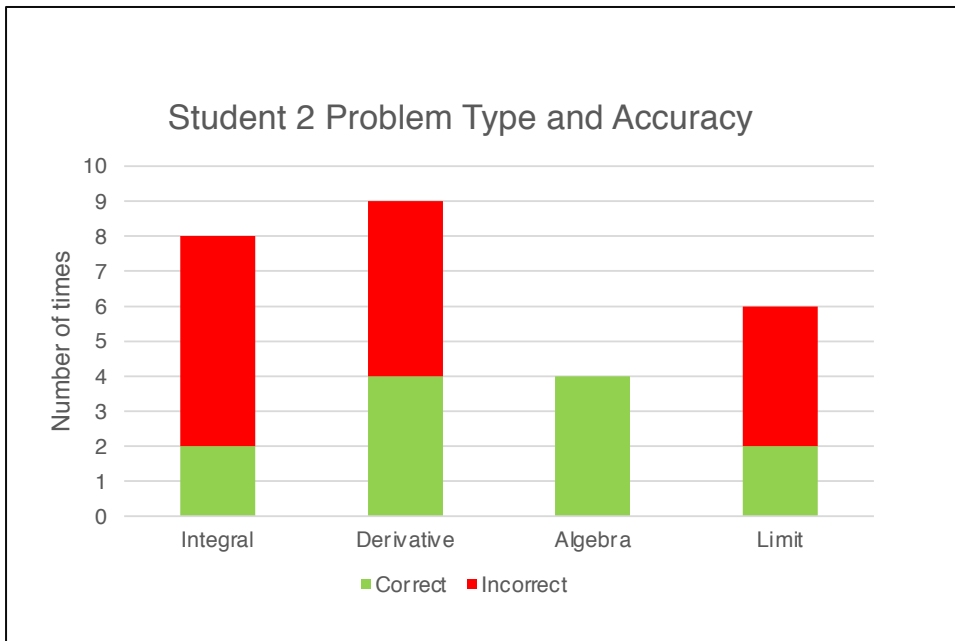


Figure 27

Student 2 Function Type and Accuracy

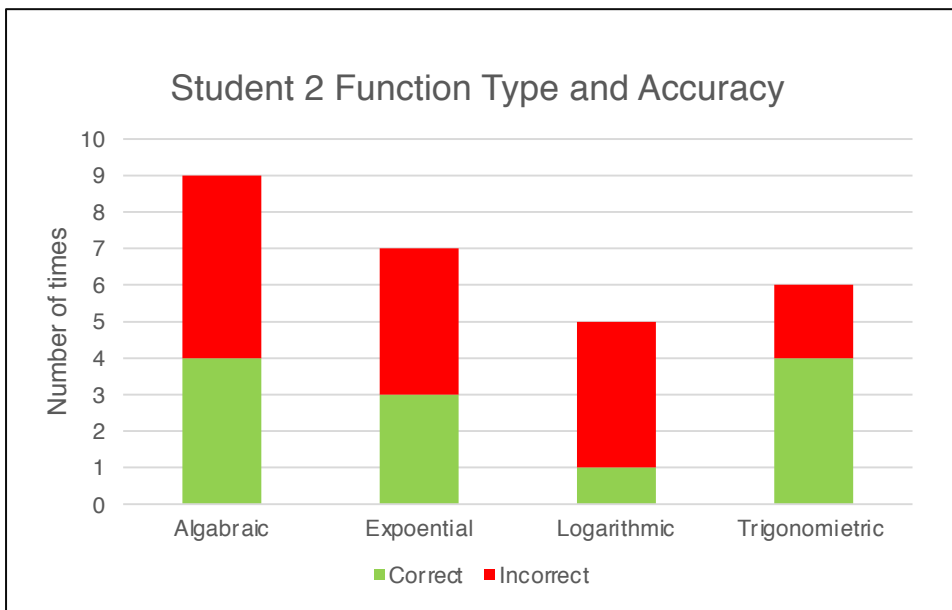
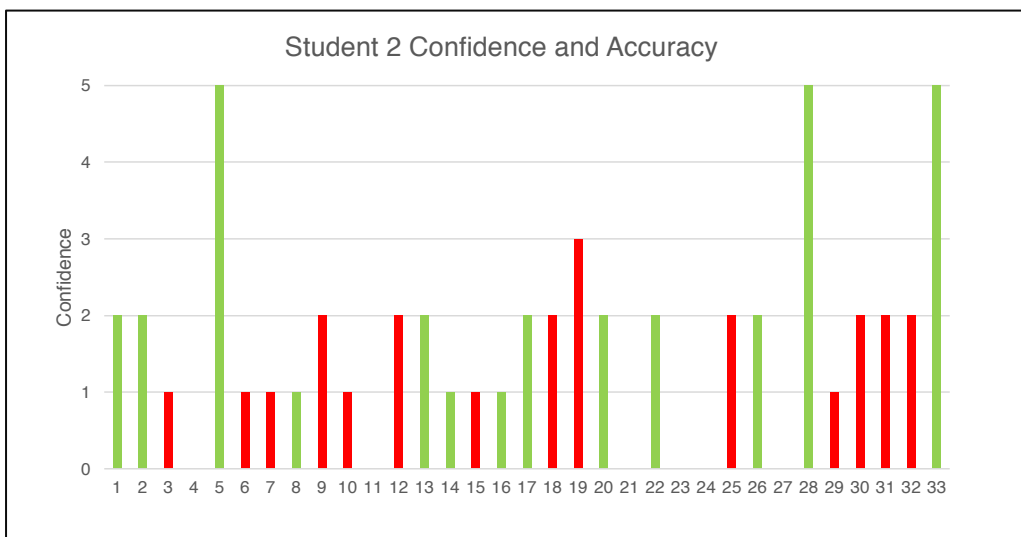


Figure 28

Student 2 Confidence



Confidence As seen in Figure 28 Bella’s confidence was below average for most of the program. She had an average confidence rating of 2.04 across the entire program, 2.4 across days she answered correctly, and 1.67 across the days she answered incorrectly. Overall, her confidence was low with most days her confidence being “not at all” (1) or “not very” (2). There were only three days when her confidence was high, but she did get the question correct on each of those three days, and she never indicated a confidence above “meh” (3) on days she answered incorrectly. Figures 29 and 30 display Bella’s confidence with the various problem types and function types she encountered. Recalling her problem type accuracy seen in Figure 24, it is interesting to note that her high confidence in algebraic functions does correspond with always answering the algebraic type problems correctly.

Figure 29

Student 2 Problem Type and Average Confidence

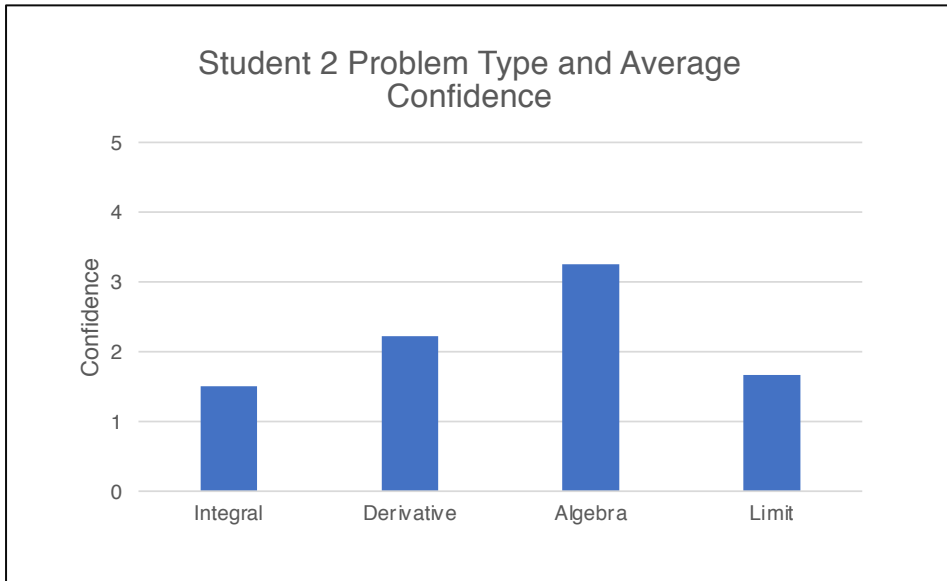
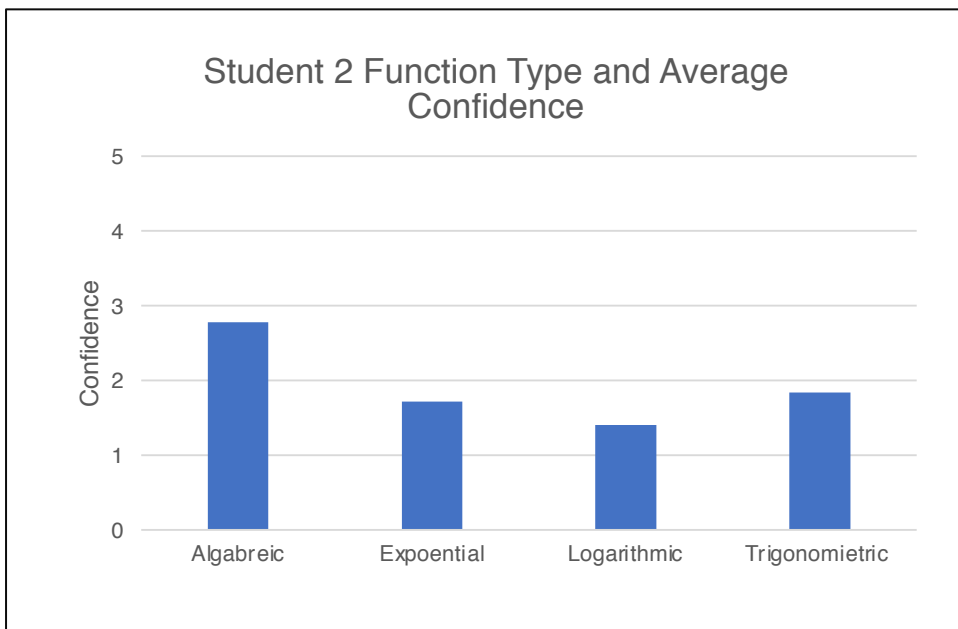


Figure 30

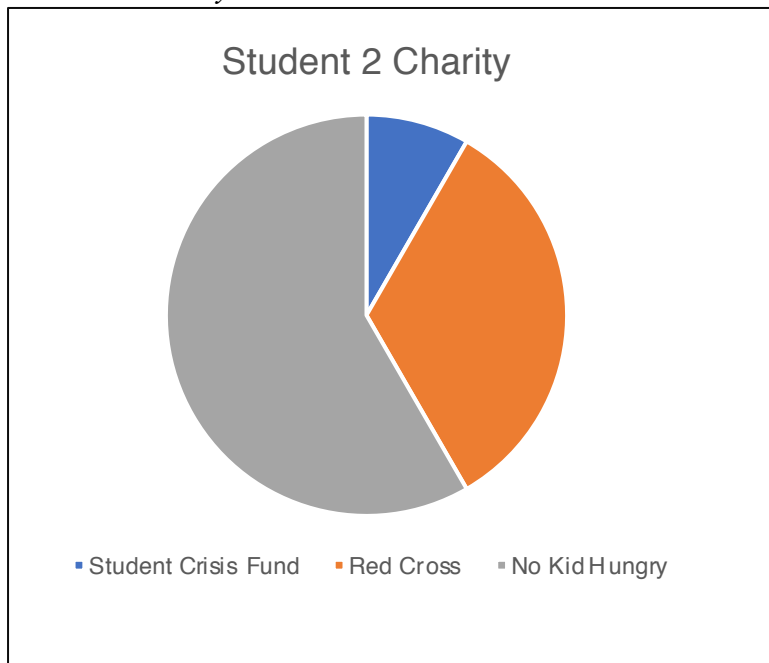
Student 2 Function Type and Average Confidence



Charity Bella did not answer any of the questions associated with the charities in the extended feedback survey. She only selected three charities throughout the program and selected the Student Crisis Fund most often (Figure 31).

Figure 31

Student 2 Charity



Interpretative Analysis

Despite her low accuracy and confidence Bella stated in her exit survey in the section where students could leave extra feedback that the KiSS program “really helped [her] prepare for the content” that she thought she would be seeing in MAT 265 and MAT 266. Bella’s performance and confidence throughout the program could be explained by the fact that she most likely had very little experience with Calculus 1 and Calculus 2 content. Bella always took advantage of 2’s-Days and Trivia Days but did not always choose to push herself on normal days. Furthermore, Bella did not always use the hints to try the problem again which would have given her extra preparation for knowing

how to complete these problems correctly. However, she never exited when she answered a question incorrectly, she instead chose to view the solution. Bella started off the program using the hints and trying again but on the last four questions that she answered incorrectly she chose to view the solution instead. This may have been the result of answering the question incorrectly on her second try multiple times even after viewing the hint, or due to her performance on 2'-s Day 28 when she chose to try a harder problem and answered it incorrectly. The correlation between Bella's average confidence on days she answered questions correctly and her accuracy on those days indicates she has a good grasp of the material she does know.

Student 3 – Carl

Descriptive Analysis

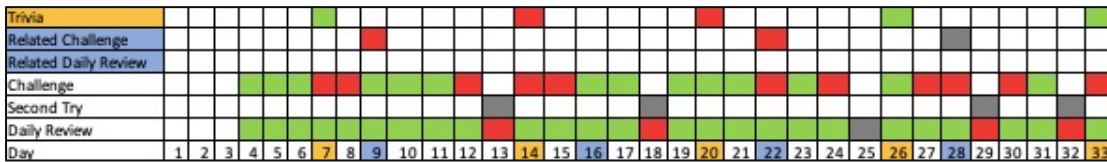
Overview Carl identified himself as a male of Mexican descent and a freshman. He attended “Mexican private school which was an American school in which [h]e had AP classes.” Carl is studying Electrical Engineering and studied Calculus 1 in the AP program and said he did not “master all the content.” Carl mentioned that he likes math “even though sometimes [he] find[s] [it] too long.” As for his mindset, Carl believes that “you can improve with hard work.” Carl used his phone to answer the daily review problem via text message. Carl indicated at the beginning of the program that he felt he had learned and would remember “about half” of Calculus 1 content before the program and was “somewhat” confident with Calculus 1 content at the end of the program. As for Calculus 2 content Carl felt he was “not very” confident with Calculus 2 content before the program and “somewhat” confident afterwards which is a significant jump in

confidence. Carl indicated that he would not have reviewed any Calculus 1 skills had it not been for the KiSS program.

Participation and Accuracy Carl participated in 29 days of which 20 were normal KiSS days, four were 2’s-Days, and five were Trivia Days. He answered 25 daily review problems correctly and four incorrectly (Figure 32). He did not participate in Days 1, 2 and 3 because he did not have access to the questions. Other than that, the only day he did not participate was Day 25.

Figure 32

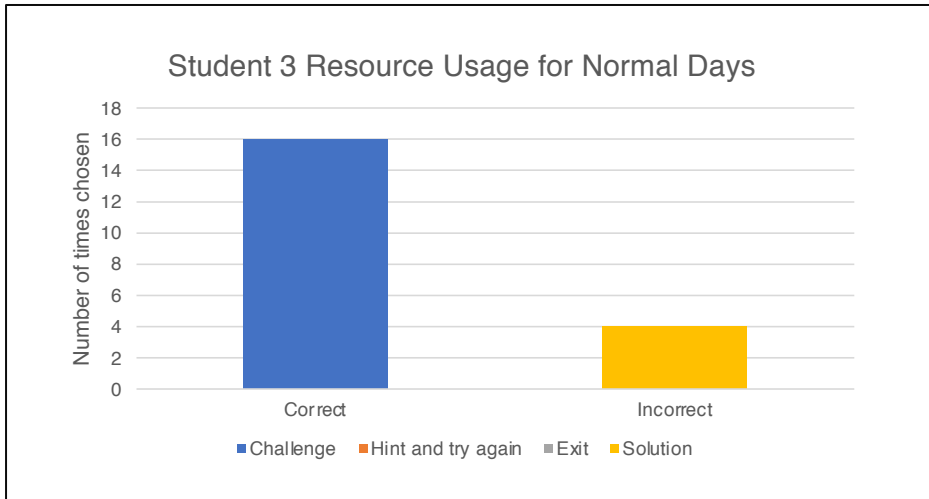
Student 3 Participation and Accuracy



Resource Usage Carl completed 20 normal KiSS days, answering correctly on 16 of these and always choosing to do the challenge problem. For the four times he answered the challenge problems incorrectly, he decided to view the solution instead of simply exiting for the day (Figure 33). In the extended feedback survey Carl answered that he “might or might not” have used the hints. In fact, in the survey, he said he “did not remember” what the hints were and whether or not they were helpful. However, he does always try the challenge. Of those 16 times that he attempted the challenge problem Carl answered it correctly ten times and incorrectly six times. Carl said that he would have wanted to try the challenge problem even if he answered the daily review problem incorrectly.

Figure 33

Student 3 Resource Usage for Normal Days



2's-Days Carl participated in a total of four 2's-Days. He answered the daily review problem correctly each time and always chose to do a challenge problem. The first two 2's-Days he answered the challenge problem correctly and the second two he answered incorrectly. Regardless he always chose to do the related challenge problem. The first 2's-Day after completing the daily review problem and challenge problem, Carl attempted the related challenge problem and answered it incorrectly. He then viewed the solution. On the second 2's-Day that he completed the daily review problem and challenge problem Carl attempted the related challenge problem answered correctly and exited. On the third 2's-Day after completing the daily review problem and challenge problem Carl attempted the related challenge problem answered incorrectly and viewed the solution. On the last 2's-Day that Carl participated in, he completed the daily review problem and challenge problem and then selected that he wanted to view the solution and try a related problem. However, he exited after viewing the solution without trying the related challenge problem. In the extended feedback survey when asked how he felt about

2's-Days Carl responded "Yes." and stated that he completed the additional problem "every time." He also responded in the affirmative that he felt more confident doing the second problem.

Trivia Days Carl participated in five Trivia Days and always chose to do trivia and calculus. He always answered the daily review problem correctly on Trivia Days and then tried the challenge questions. He answered the challenge problem correctly twice. Carl answered the trivia question on three of the five Trivia Days correctly. In the extended feedback survey Carl said that he answered both the trivia and Calculus because he "had time so it was fun." He replied in the affirmative when asked if he enjoyed the trivia questions and if he had learned anything.

Problem and Function Type Carl indicated in the entry survey that he struggled with derivatives, integrals, limits, and algebra. He also struggled with logarithmic, inverse trigonometric, algebraic, and trigonometric functions. In the exit survey he indicated that he had a confidence of somewhat (4) for derivatives, "not very" (2) for integrals, "meh" (3) for limits, and "super duper" (5) for algebra and pre-calc. His low rating for integrals is odd as he had high accuracy for problems with the integral problem type (Figure 34). Furthermore, he answered all problems with exponential and trigonometric functions correctly but listed trigonometric functions as something with which he struggled (Figure 35).

Figure 34

Student 3 Problem Type and Accuracy

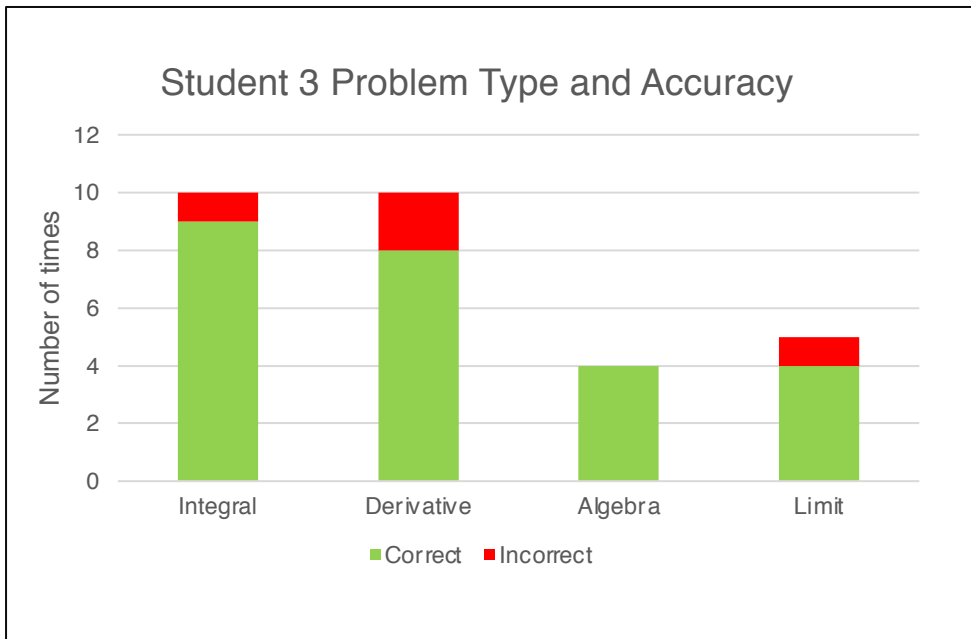


Figure 35

Student 3 Function Type and Accuracy

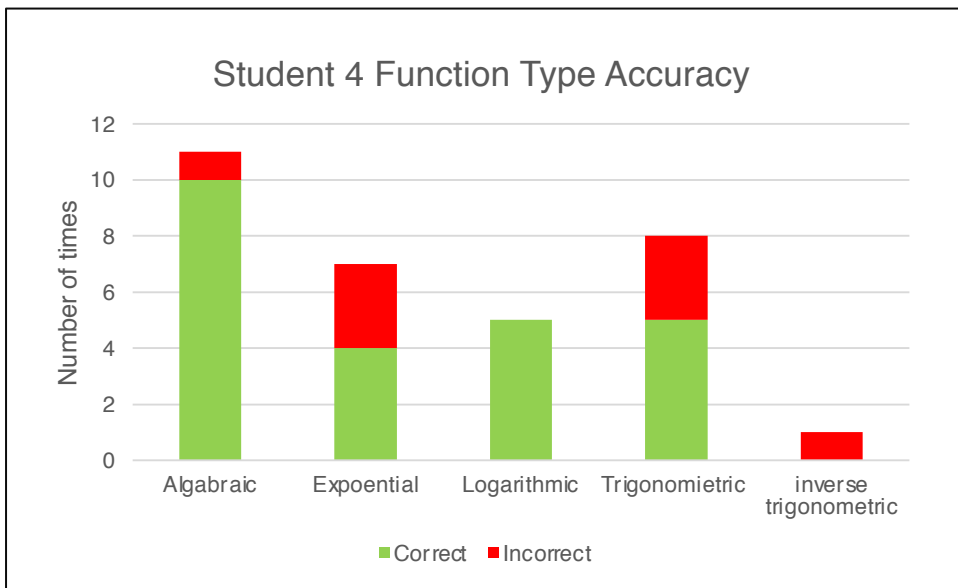
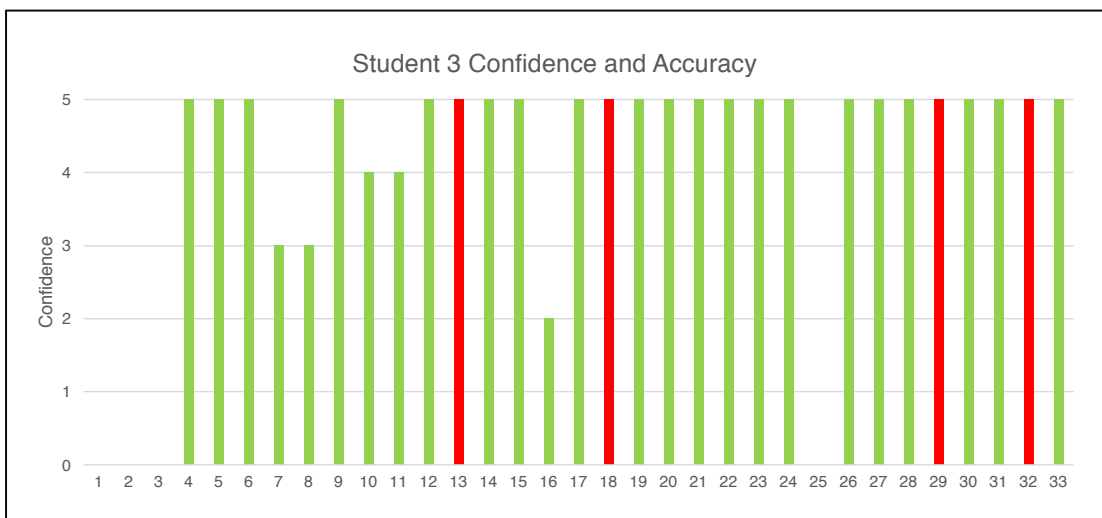


Figure 36

Student 3 Confidence and Accuracy



Confidence Carl had a very high average confidence of 4.69 suggesting he was very confident in his abilities and in fact he performed on par with his confidence. Carl’s confidence was very consistent except for a few days (Figure 36). His average confidence on the days he answered the problems correctly was 4.64 and his average confidence on days he answered incorrectly was 5. Carl noted that he felt “really good” when he answered a question correctly and that he felt “lost in space” when he answered incorrectly. This is interesting because it corresponds to the fact that he rated his confidence high on days where he got the question incorrectly. Carl’s average confidence for derivatives was the highest of all problem types (Figure 37). His confidence for problems with an inverse trigonometric function was always “super duper” (5) (Figure 38).

Figure 37

Student 3 Problem Type and Average Confidence

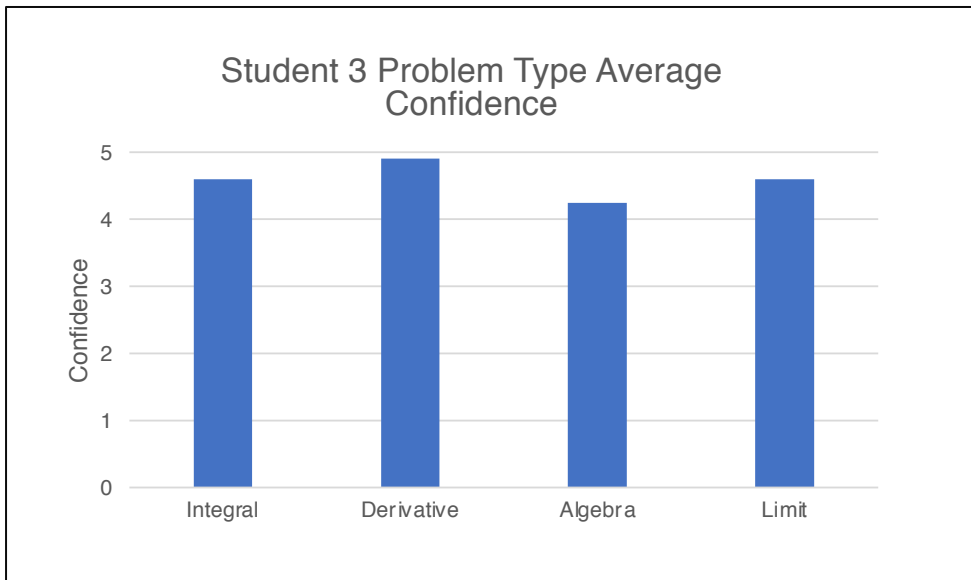
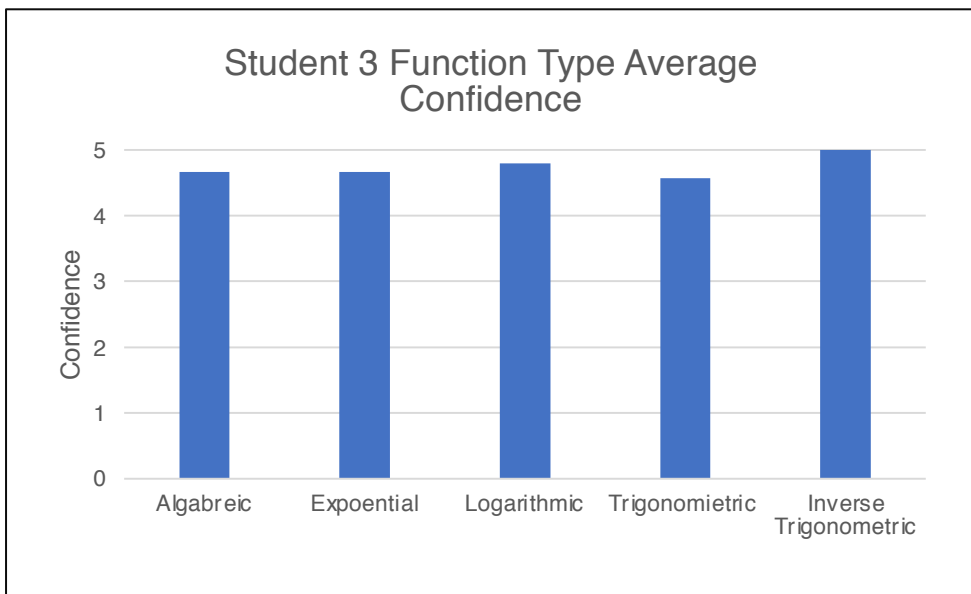


Figure 38

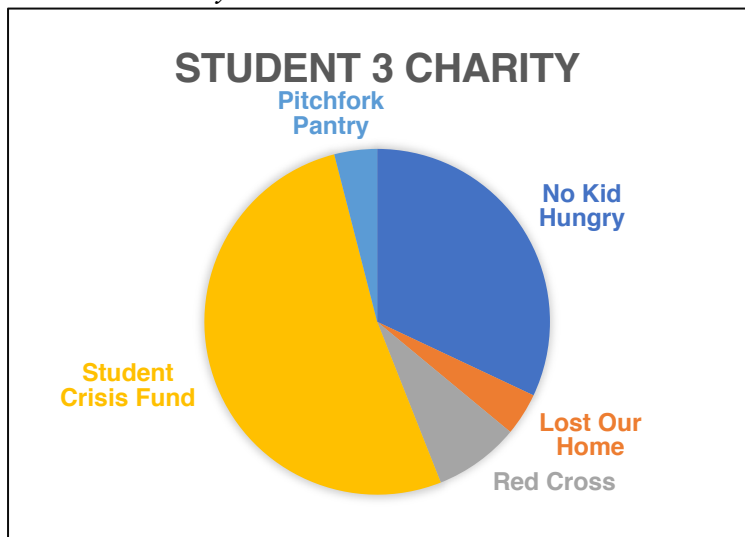
Student 3 Function Type and Average Confidence



Charity Carl chose the Student Crisis Fund the most often but voted for all of the charities at least once (Figure 39). In the extended feedback survey, he said that he thought the charity aspect of the program was “was one of the main reasons which [he] did this”. He would have liked to have helped choose the charities.

Figure 39

Student 3 Charity



Interpretative Analysis

There was an increase in Carl’s confidence when looking at his average confidence for days he answered the daily review problem incorrectly when compared to his average for when he answered correctly. The fact that Carl had a higher confidence on days when he answered incorrectly suggests he does not know where gaps in his retention may lie. This and the fact that Carl does not use the hints and try again when he answers a problem incorrectly suggests that he is not using the program to find out where these gaps lie and to figure out how he can do the problem for himself. He does view the solution whenever he answers incorrectly so he is making an attempt to figure out where he went

wrong. Carl does push himself as we can see in his attempts at the challenge problem and on 2's-Days. The fact that Carl does not use the hints and try again may show that he is not using the opportunity to find his mistakes and try again when he answers incorrectly.

Student 4 – David

Descriptive Analysis

Overview David identified as a white male who attended public school during his elementary years and private for high school). David is a returning student who has previously completed a Bachelors of Aeronautical Sciences. He is currently a sophomore studying Electrical Engineering. David completed Calculus 1 “about six years ago”. David “generally enjoy[s] math” and said that “[s]ome people just have a greater number sense. However, anyone can overcome a challenge with hard work.” David used his mobile phone to access the program. David felt he had learned and would remember “about half of” Calculus 1 content and was “not at all” confident about Calculus 2 at the beginning of the program. At the end of the program, he was “somewhat” confident about Calculus 1 and “somewhat” confident about Calculus 2 indicating an improvement in confidence in both areas. David responded that he would not have reviewed Calculus 1 skills if it were not for the KiSS program.

Participation and Accuracy David participated on 32 of the 33 KiSS days and only did not participate on Day 18 (Figure 40). He answered 22 questions correctly and nine questions incorrectly. David participated in 23 normal KiSS days, four Trivia Days, and four 2's-Days. On Day 20 David only chose to participate in the trivia portion of the day.

Figure 40

Student 4 Participation and Accuracy

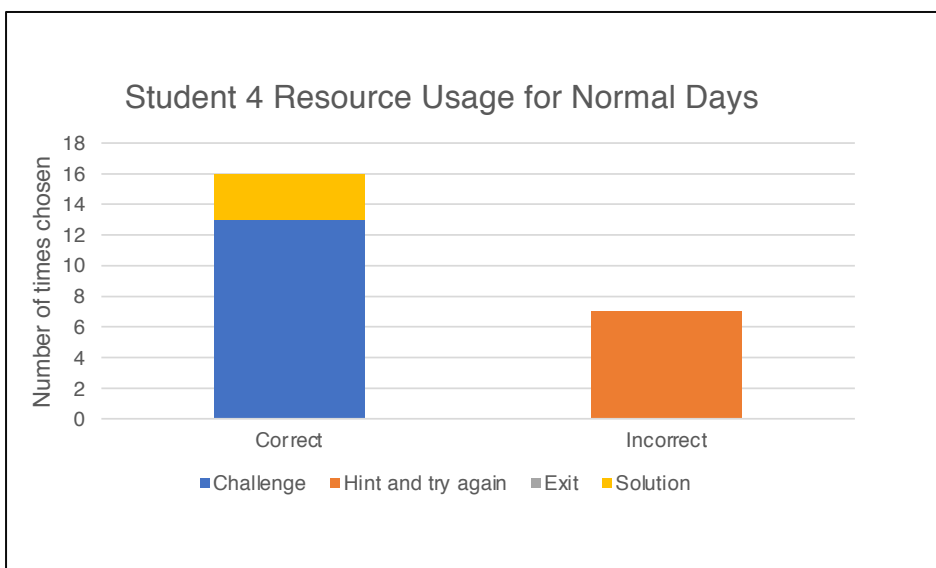
Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33				
Trivia																																					
Related Challenge																																					
Related Daily Review																																					
Challenge																																					
Second Try																																					
Daily Review																																					

Resource Usage David did the challenge problem thirteen times after answering the daily review problem correctly and on the other three times he answered correctly he viewed the solution (Figure 41). When he answered incorrectly, he always looked at the hints and tried again on normal days. After looking at the hint he got the question correct six out of eight times. In the survey David answered that he “usually didn’t” use the hints which is true if we look at his ratio of incorrect to correct problems as he could not use the hints on correct problems. As to the helpfulness of the hints he said, “yes they just helped guide [him] for what rule to use.” When asked about how he used them he said that he “read what the rule was hinting at and didn't spend much time on it.”

David had 16 opportunities to try the challenge problem but only chose to attempt it 13 times. Seven of those times he answered correctly and six times he answered incorrectly. In the survey David indicated that he would like to have the opportunity to try the challenge problem even when he answered the daily review problem incorrectly.

Figure 41

Student 4 Resource Usage for Normal Days



2's-Days David participated in four 2's-Days. On the first one he answered the daily review problem incorrectly, viewed the solution, and then tried the related daily review problem which he answered correctly. He still chose to view the solution after answering correctly. On the second, third and fourth he answered the daily review problem correctly. On the second 2's-Days David viewed the solution and completed the related daily review, which he answered incorrectly, and then chose to view the solution. On the third he attempted the challenge problem which he answered incorrectly and then selected that he wanted to view the solution and maybe try another, but he did not submit an answer to the related challenge problem. On the fourth David viewed the solution and completed the related daily review problem correctly after which he exited. David stated in the extended feedback survey that he “love[d]” 2's-Days and did the additional problem “most of the time.” He replied in the affirmative that he felt more confident completing the second problem after completing the first.

Trivia Days David participated in all five Trivia Days. On the first two and last two he chose to do calculus and trivia however on the third he chose just trivia. Even when he answered the daily review problem correctly, he did not choose to do the challenge problem. On the first day when he answered the daily review problem incorrectly, he did choose to look at the hint and try the problem again. David answered three of the five Trivia Days correctly. David did not say why he chose to do math and trivia however he did comment that he “did not like the trivia questions [as he] felt like [he] was there to do math not learn math history.”

Problem and Function Type David indicated in the entry survey that he struggled with derivatives. Furthermore, he struggled with logarithmic, inverse trigonometric, and trigonometric functions. He indicated in the exit survey that he had a confidence of “super duper” (5) for derivatives, “meh” (3) for integrals, “super duper” (5) for limits, and “somewhat” (4) for algebra and pre-calculus. Despite David’s low confidence in his ability to solve integrals, he was very accurate in solving problems with integrals in the program (Figure 42). Furthermore, although he indicated that he struggled with trigonometric functions, he answered all of them correctly (Figure 43).

Figure 42

Student 4 Problem Type and Accuracy

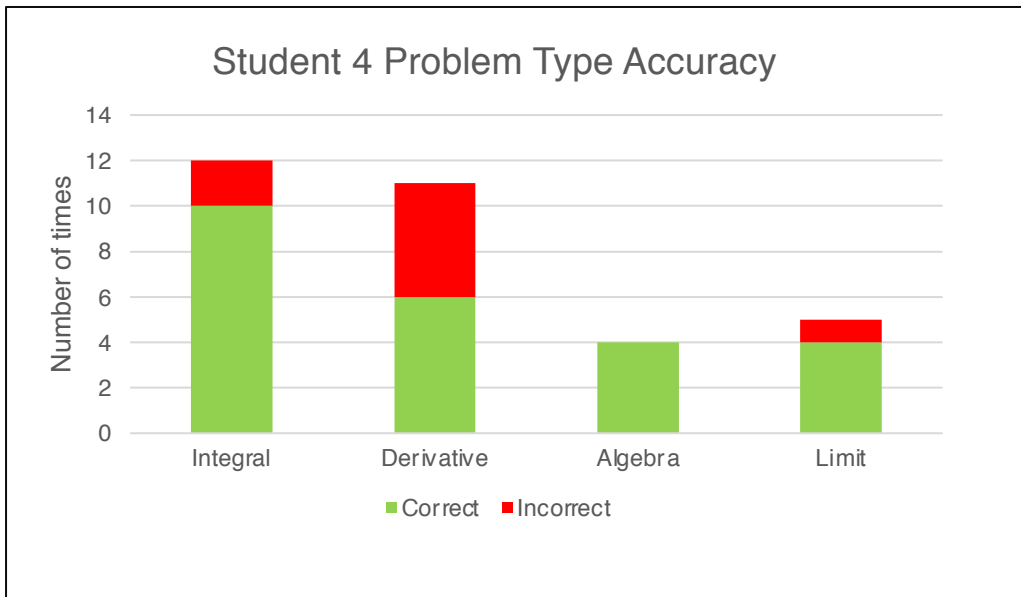


Figure 43

Student 4 Function Type and Accuracy

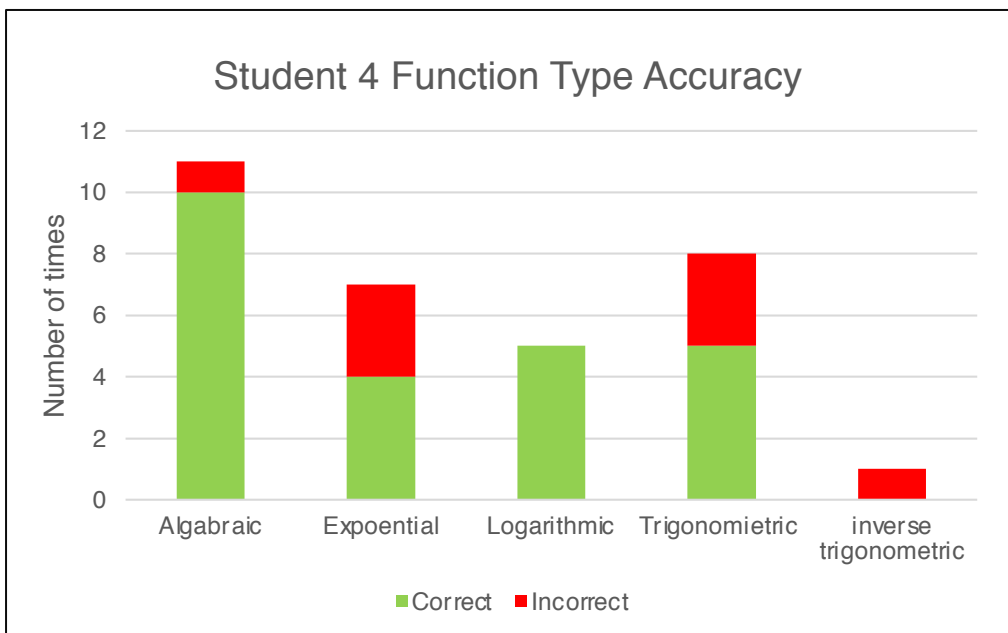
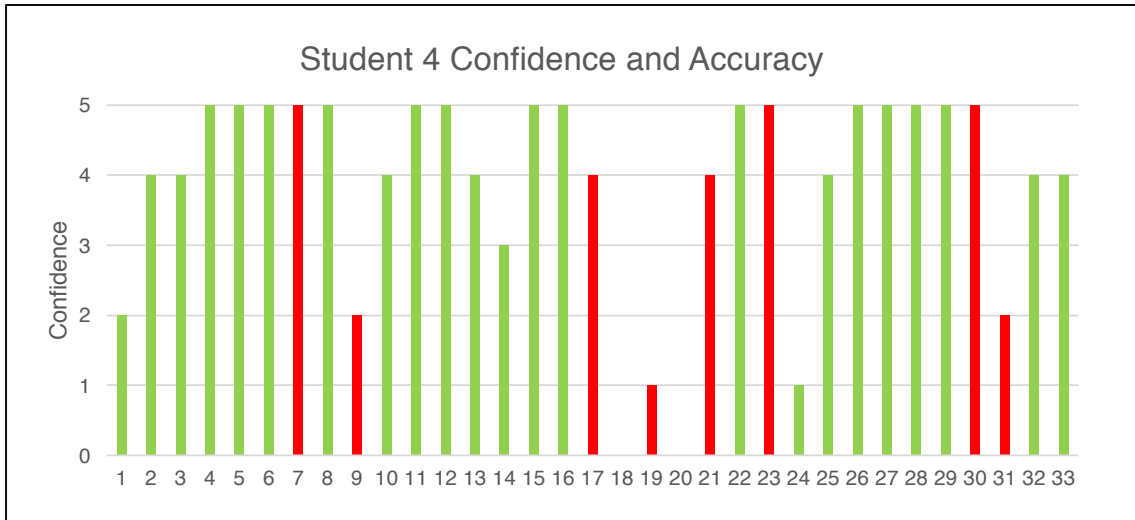


Figure 44

Student 4 Confidence and Accuracy



Confidence David had an average confidence of 4.10 across all problems; he had an average confidence of 3.5 on days where he answered incorrectly and 4.3 on days he answered correctly. He had two days of very low confidence (“not at all”). In fact, it would seem that David’s confidence followed an almost wave like pattern growing, staying constant for a few days, then falling and growing again before falling again (Figure 44). When David answered a question correctly in the KiSS program, he said that he felt he “was ready for MAT 266” and when he answered a question incorrectly, he felt “like [he] had areas of weakness but did not make [him] feel bad.” It is interesting to note that David’s confidence was highest for algebraic problems and he answered them all correctly (Figure 45) and the same goes for logarithmic problems (Figure 46).

Figure 45

Student 4 Problem Type and Average Confidence

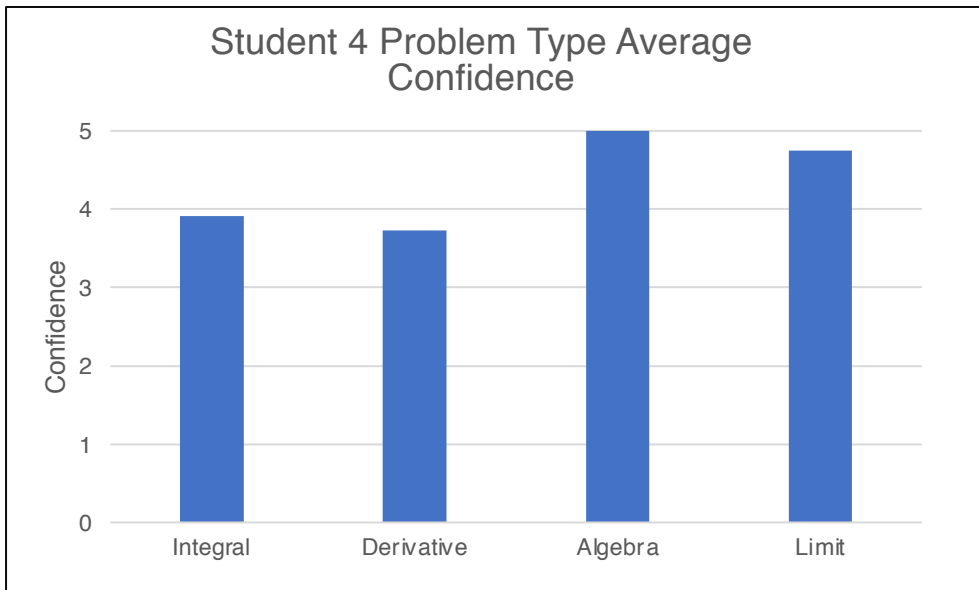
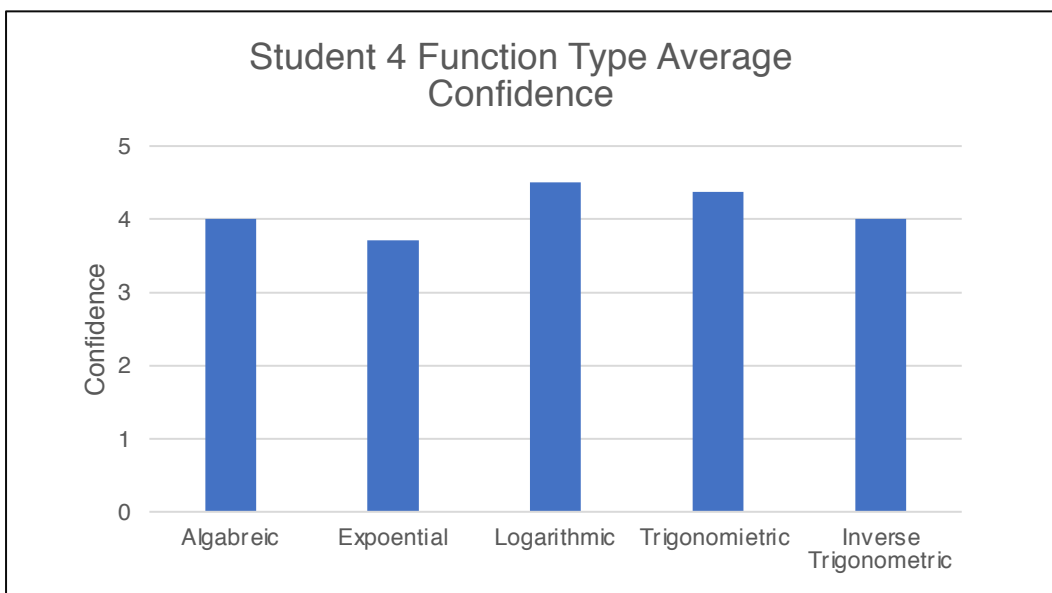


Figure 46

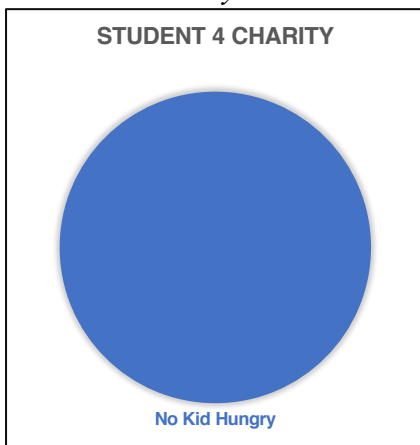
Student 4 Function Type and Average Confidence



Charity David only voted for one of the charities, namely No Kid Hungry (Figure 47). In the extended feedback survey, he said that the charity aspect “put just the right amount of stakes on the questions and made [him] want to answer every day to get money for a charity.” He did not respond as to whether or not he would have wanted to help choose the charities

Figure 47

Student 4 Charity



Interpretative Analysis

David’s confidence varied greatly throughout the program with an almost wave like pattern. The fact that his average confidence was lower on days where he answered incorrectly suggests he does have a good grasp of where he needs to continue working. He noted in the extended feedback survey that he felt different getting a question correct in class because there are “much higher stacks [sic]” in class. On the opposite end he commented similarly that getting a question wrong was not the same in the KiSS program as it was in a class because “again the stacks [sic] are much different.” From David’s comments in the extended feedback survey, it could be ascertained that his motivation to participate in the KiSS program was that he “was there to do math.” However even

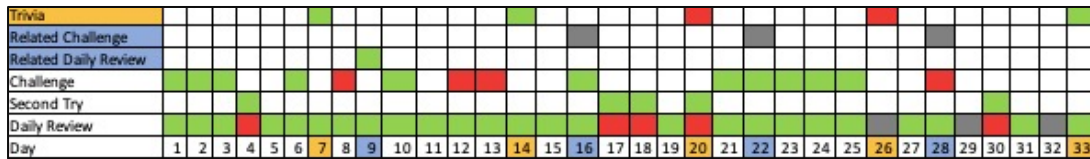
though David made this comment when asked about the trivia and said that he wasn't there to "learn math history," he always answered the trivia question and on one of the Trivia Days he even chose to only do trivia. He also mentioned in the survey that he valued the anonymity of the program.

Student 5 - Emma

Descriptive Analysis

Overview Emma identified herself as a brown South Asian Female who attended private school and a freshman studying Chemical Engineering (will be addressed using pronouns she/her/hers). Emma did not specify exactly when she took Calculus 1 but said the experience "was slow but [she] had to learn things from a college perspective way." Emma likes math because it is "pretty straight forward." Furthermore, she believes that "math is to the point and to make it that way anyone needs practice." Emma used her mobile phone to participate in the program. As for her confidence before and after the program, Emma felt before the program that she had learned and would remember "all of" the Calculus 1 content and felt "somewhat" confident about Calculus 1 after the program. As for Calculus 2 she felt "super duper" confident before and after the program. Emma would not have reviewed any Calculus 1 skills over break if it were not for the KiSS program.

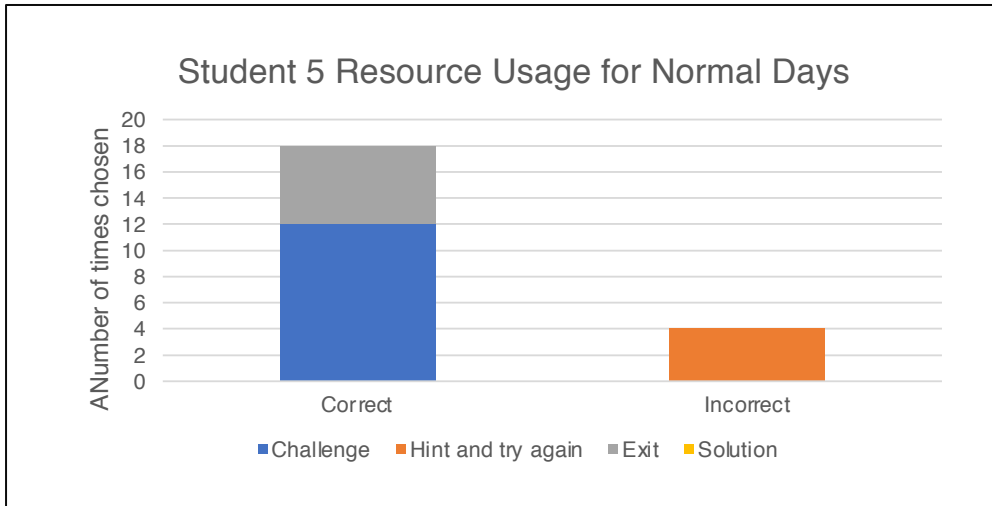
Participation and Accuracy Emma participated in a total of 30 KiSS days. She did not participate on Day 26, Day 29, or Day 32. Of those four were 2's-Days, four were Trivia Days, and 22 were regular days. She answered the daily review question correctly 25 times and incorrectly five times (Figure 48).

Figure 48*Student 5 Participation and Accuracy*

Resource Usage Emma answered the daily review problem correctly a total of 18 times. On 12 occasions her next step was to do the challenge, and on the other six she chose to exit (Figure 49). The four times Emma answered a daily review problem question incorrectly she always used the hints and tried again. She always answered the question correctly after viewing the hint. In the extended feedback survey Emma chose that she “usually didn’t” use the hints. When asked if the hints were helpful and how she used them she responded both times only with “no.” Emma had 18 opportunities to try the challenge problem and she did so on twelve of those. She answered the challenge question correctly nine times and incorrectly three times. In the survey she indicated that she would not have wanted the opportunity to try the challenge question even if she answered the daily review problem incorrectly.

Figure 49

Student 5 Resource Usage for Normal Days



2's-Day Emma participated in a total of four 2's-Days. On all of these days she completed the daily review problem correctly. On the first 2's-Day she chose to view the solution and complete the related daily review problem which she answered correctly and then exited. On the second and third 2's-Days she chose to try the challenge problem which she answered correctly. On both occasions she exited and did not take the opportunity to do the related challenge problem. On the fourth 2's-Day she also chose to do the challenge problem but answered incorrectly. She then viewed the solution with the chance to do the related challenge problem but exited after viewing the solution. In the extended feedback survey Emma noted that she was "Excited" about 2's-Days and completed the additional problem "most of the time." She replied in the affirmative that she felt more confident completing the second problem after completing the first.

Trivia Days Emma participated in all five Trivia Days. She chose to do calculus and trivia on all days except for the fourth day where she chose just trivia. Emma answered the daily review problem correctly four times on Trivia Days. On the day that

she did not, she used the hint and tried again. She answered correctly the second time. She did not use the solutions at all on Trivia Days. She answered the trivia question correctly three times and incorrectly twice. Emma did not comment on why she did both trivia and calculus review, but she said that “[she] did learn something new” from the trivia.

Problem and Function Type Emma indicated in the entry survey that she struggled with inverse trigonometric functions. In the exit survey she rated her confidence on the various problem types. She rated that she was “super duper” (5) confident about derivatives, “somewhat” (4) confident about integrals, “somewhat” (4) confident about limits, and “super duper” (5) confident about algebra and pre-calculus. It is interesting that her confidence was so high with limits as her accuracy for problems involving limits was lower than for all other problem types (Figure 50). However, in both problem type and function type her accuracy was perfect in respect to algebraic problems and functions (Figure 51).

Figure 50

Student 5 Problem Type and Accuracy

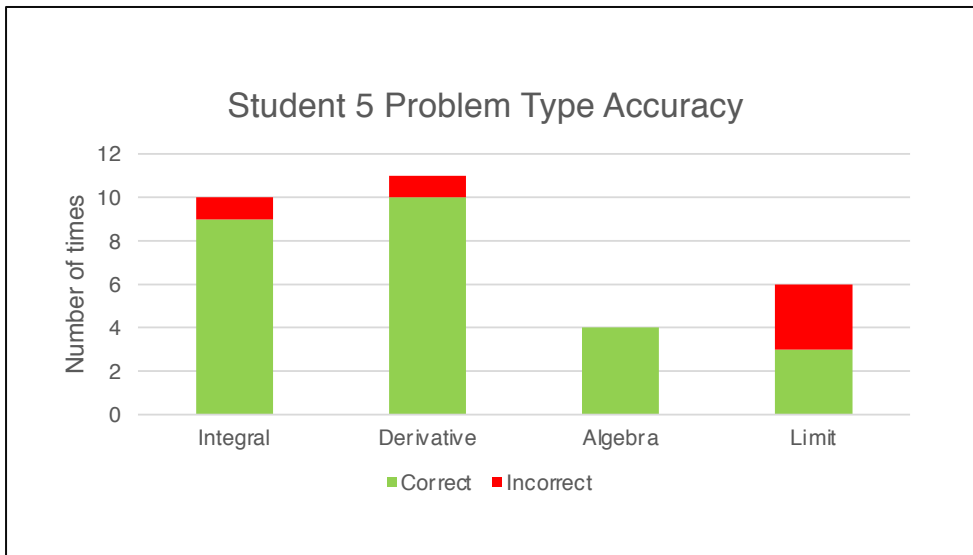


Figure 51

Student 5 Function Type and Accuracy

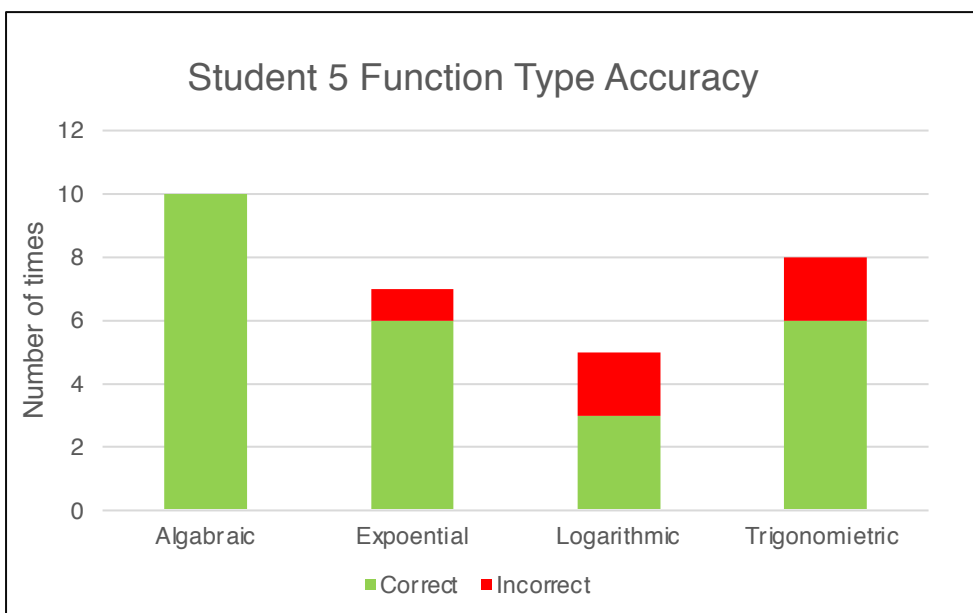
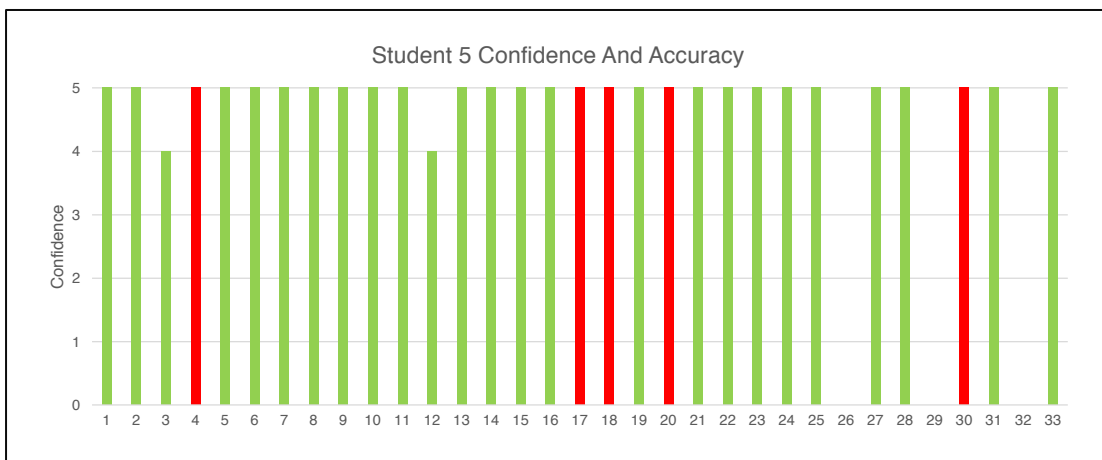


Figure 52

Student 5 Confidence and Accuracy



Confidence Emma had an average confidence of 4.93 across all the problems. Her average confidence when she answered correctly was 4.92 and when she answered incorrectly her average was 5. Emma’s confidence in the program was very consistent only wavering from a 5 twice (Figure 52). Emma felt “satisfied” when she answered a question correctly in the KiSS program and “not satisfied” when she answered a question incorrectly. When looking at the break down of problem type and average confidence, the only problem type for which her confidence was not a perfect 5 was limits (Figure 53). Similarly, for function types, her confidence was only not perfect for exponential and logarithmic functions (Figure 54).

Figure 53

Student 5 Problem Type and Average Confidence

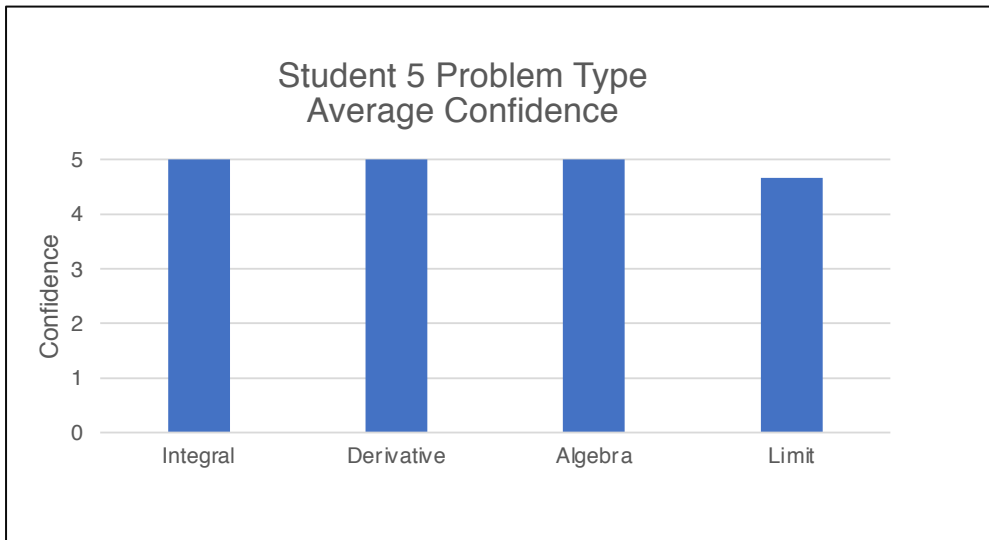
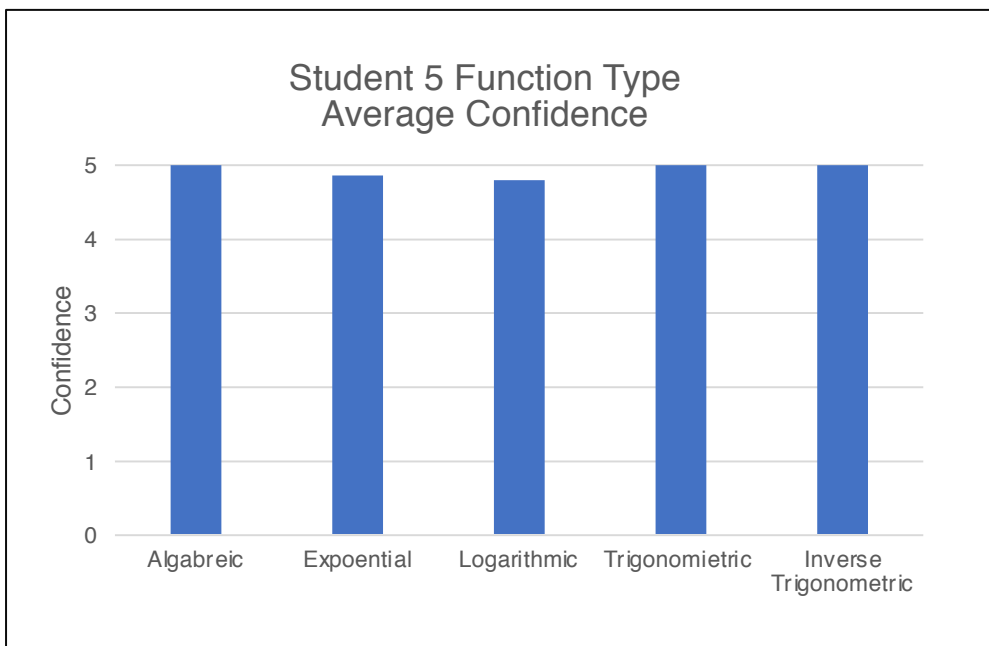


Figure 54

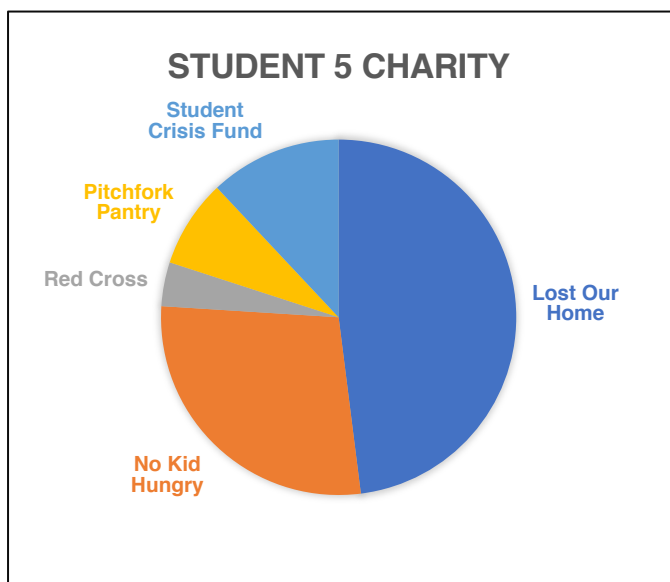
Student 5 Function Type and Average Confidence



Charity Emma chose the Lost Our Home charity the most but voted for each charity at least once (Figure 55). In the extended feedback survey Emma said that the charity aspect was “encouraging” and said in response to being asked if she would have wanted to help pick the charities that she suggested that we “can try that so that money goes equally in [sic] every charity”.

Figure 55

Student 5 Charity



Interpretative Analysis

Emma’s confidence ratings were very consistent throughout the program except for two days, however she answered both of the daily review problems correctly on those days. Both of these days involved limits. Furthermore, most of the questions she answered incorrectly were limit problems and her average confidence was lowest for limits when compared to integrals, derivatives, and algebra. In fact, it was the only one with an average below 5. It is also interesting to note that Emma always used the hint

when she answered the daily review problem correctly and always got the problem correct on her second try but said the hints were not helpful. This is odd as she always got the question correct after trying again, perhaps she just clicked through the hint to get to the point where she could try the problem again. The fact that her confidence was higher when she answered incorrectly is disconcerting as it suggests she does not have a grasp of where she needs to continue working. The fact that she mentions how she feels in terms of satisfaction could suggest that she views the KiSS program as a product or tool.

Student 6 - John

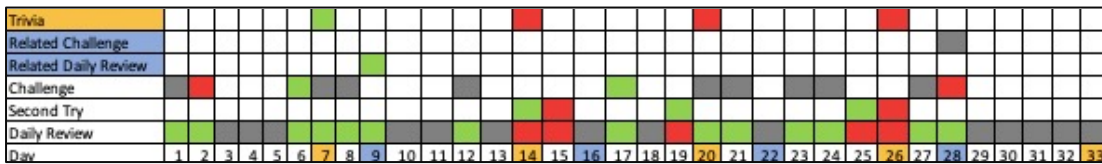
Descriptive Analysis

Overview John identified himself as a black and Asian male and is a first-generation college student. He received a public education and is a sophomore studying Mechanical Engineering. John completed Calculus 1 by taking MAT 265 at Arizona State University in the fall semester of 2020. He felt that “towards the end of the semester the concepts got challenging.” John is “indifferent to math” and believes he “can improve through hard work. If [he] find[s] the concept difficult, it means [he] will have to practice more.” John used his mobile phone as well as a laptop to complete the KiSS program. At the beginning of the program John felt he had learned and would remember “about half of” the Calculus 1 content he had seen and by the end of the program he felt “somewhat” confident in Calculus 1. As for Calculus 2 he felt “not very” confident and then “super duper” confident at the end of the program suggesting the program greatly affected his confidence in his Calculus 2 abilities. John indicated that he would have reviewed Calculus 1 skills over the break even if he had not done the KiSS program, but he did not indicate how he would have reviewed.

Participation and Accuracy John participated in 19 of the 33 KiSS days. Of those 19 days he answered the daily review problem correctly 14 times and incorrectly five times. Four of the days he participated were Trivia Days, two were 2’s-Days, and 13 were normal days. Despite responding to both the exit survey and extended feedback survey which were sent out at the end of the program, he did not participate at the end of the program (Figure 56).

Figure 56

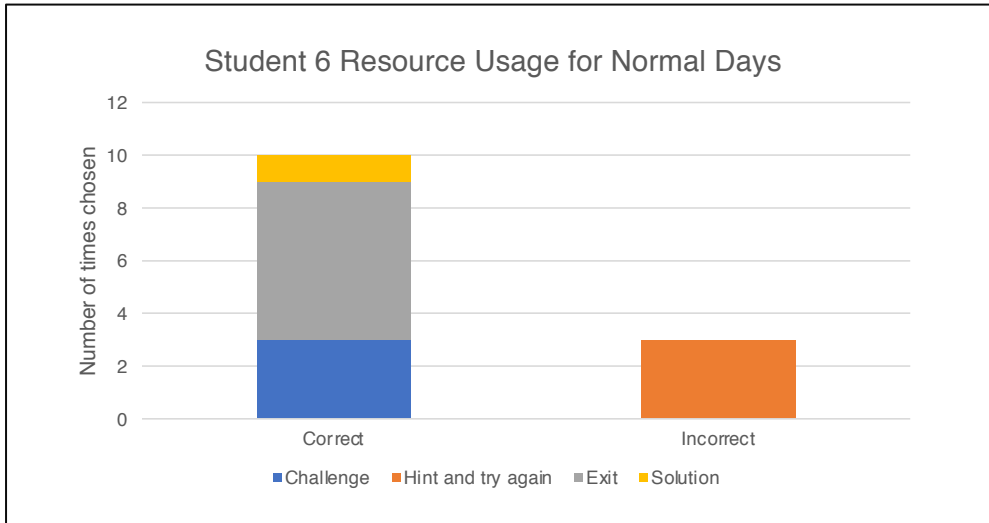
Student 6 Participation and Accuracy



Resource Usage John answered the daily review problem correctly ten times on normal days. Following that he chose to attempt the challenge problem three times, exit six times and look at the solution once (Figure 57). When he answered the daily review problem incorrectly, he always chose to view the hint and try again, and in fact on two of the three normal days on which this happened, he answered the question correctly after trying it again. When asked if he used the hints, John selected that he “might or might not have.” He did say that they were helpful, and he used them by “read[ing] part of the hint.” John had ten opportunities to try the challenge problem and he did so on three of those. He answered the challenge question correctly two times and incorrectly one time. In the survey he indicated that it would “depend” if he would want the opportunity to try the challenge question even if he answered the daily review problem correctly. He did not say on what it would depend.

Figure 57

Student 6 Resource Usage for Normal Days



2's-Days John participated in two 2's Days. On the first he answered the daily review problem correctly, chose to view the solution and try the related daily review problem which he answered correctly as well. He then exited. On the second 2's-Day that he participated in, he answered the daily review problem correctly and chose to do the challenge problem which he answered incorrectly. He then chose to view the solution with the option of trying the related challenge problem which he did not answer. In the extended feedback survey John said that he "liked" 2's-Days and completed the additional problem "sometimes." He replied in the affirmative that the first question made him feel more confident going into the second.

Trivia Days John participated in four of the five possible Trivia Days. He chose to do calculus review and trivia on all four of those days. He answered the daily review problem correctly twice and incorrectly twice. He used the hints when he answered

incorrectly. He only answered the first trivia question correctly and he answered the other three incorrectly. In the extended feedback survey John said that he did trivia and calculus review because “it is more beneficial than just trivia.” He also noted that he “likes the trivia questions. It offered something different which is cool.”

Problem and Function Type John indicated in the entry survey that he struggled with integrals and limits. Furthermore, he struggled with logarithmic and exponential functions. In the exit survey he felt somewhat (4) confident with derivatives, integrals, and limits. He said that he was “super duper” confident (5) with algebra and precalculus. While his confidence correlated to his accuracy in regard to integrals and derivatives, he answered every limit question correctly (Figure 58). Furthermore, he said that he struggled with logarithmic functions but answered every single question with a logarithmic function type correctly (Figure 59).

Figure 58

Student 6 Problem Type and Accuracy

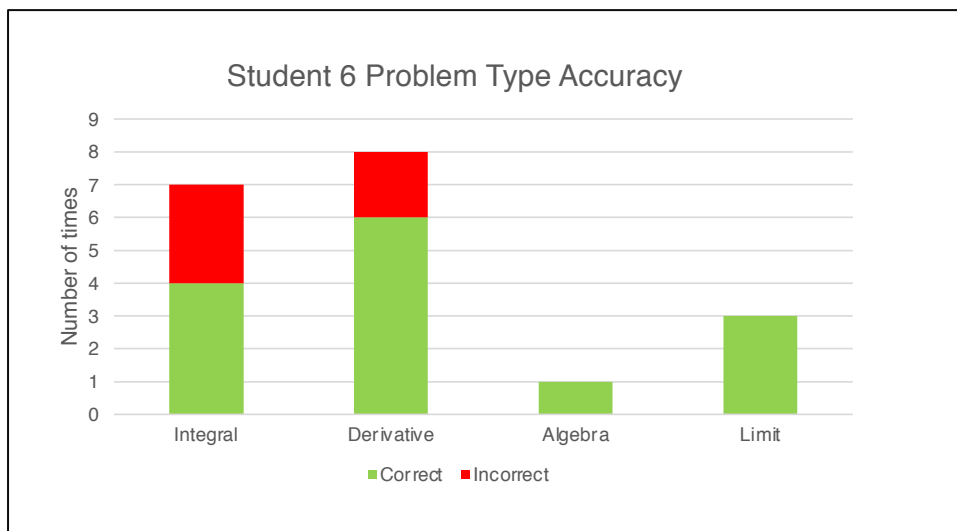


Figure 59

Student 6 Function Type and Accuracy

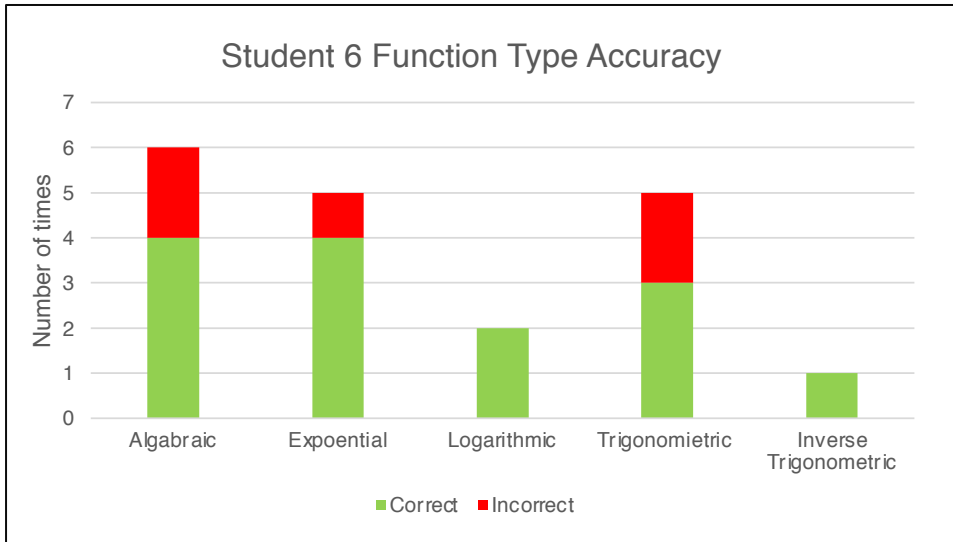
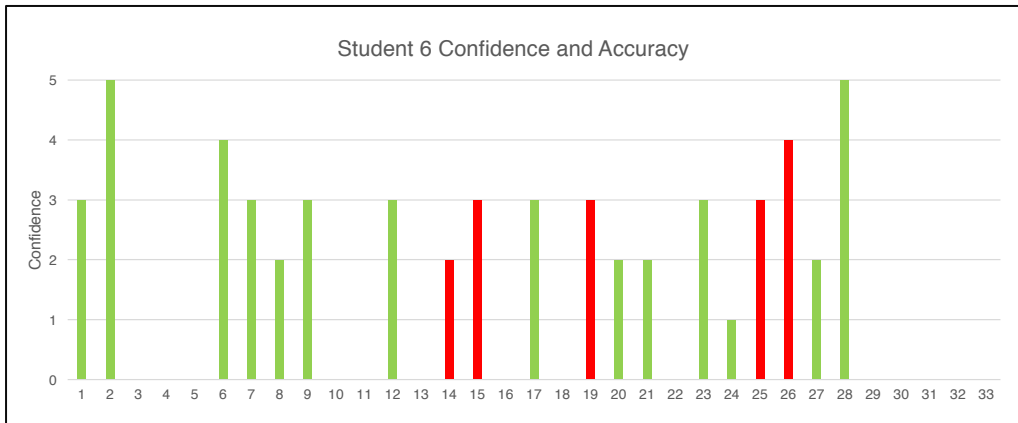


Figure 60

Student 6 Confidence and Accuracy



Confidence John had an overall average confidence of 2.95 across all problems, an average confidence on correctly answered daily review problems of 2.93, and an average confidence of 3 on incorrectly answered daily review problems. John's confidence started low, jumped up, then started decreasing and leveled out around the middle of the program slowly decreasing at the end (Figure 60) . In the surveys John

indicated that he “felt good about [him]self” when he answered a question correctly and stated he “didn’t really have much of a reaction” when he answered incorrectly. John’s average confidence on days on which the daily review problem involved algebra or pre-calculus skills was always a 5 (Figure 61). He had the highest average confidence with problems involving trigonometric functions (Figure 62).

Figure 61

Student 6 Problem Type and Average Confidence

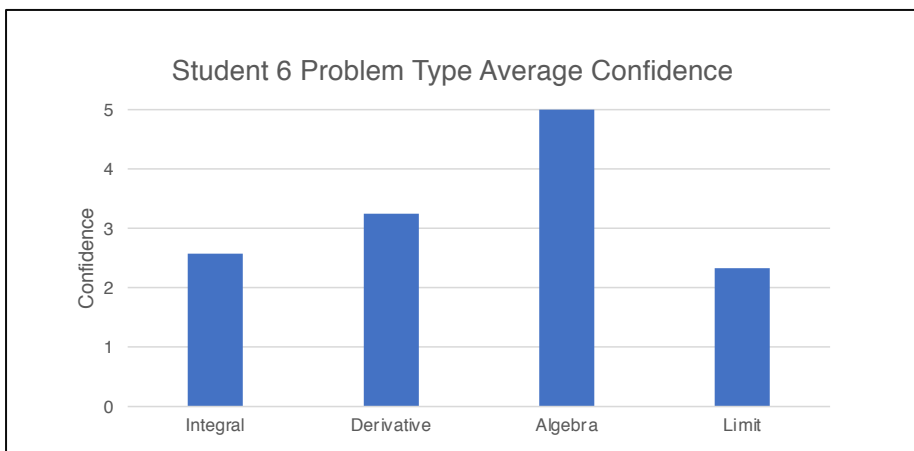
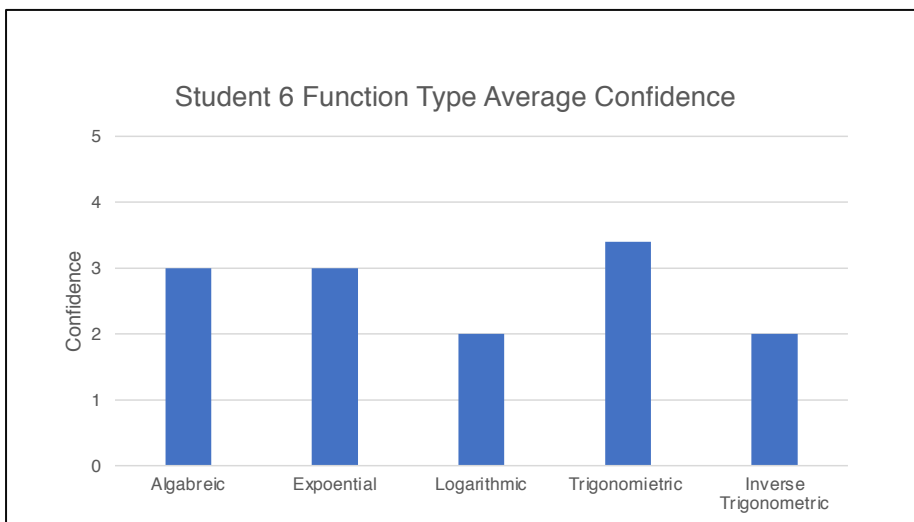


Figure 62

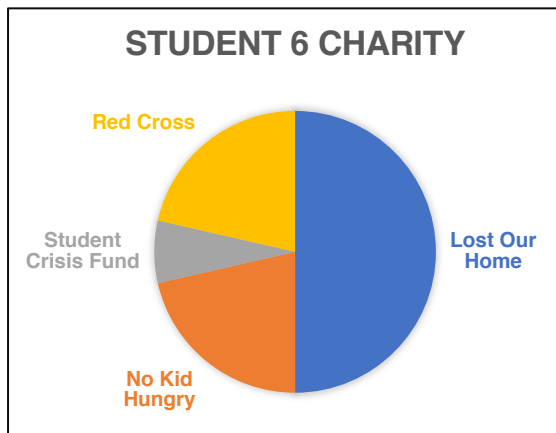
Student 6 Function Type and Average Confidence



Charity John chose the Lost Our Home charity most often and voted for all the charities except for Pitchfork Pantry (Figure 63). In the extended feedback survey John said he “loved the charity aspect. It motivated [him] to be consistent.” It is important to note that John’s participation increased after the charity update was sent out.

Figure 63

Student 6 Charity



Interpretative Analysis

John’s comments throughout the extended feedback survey suggested that getting questions correct in class meant more to him as he said that he “would be more upset” if he had answered a question incorrectly in “homework/lecture” and that he did not “really have much of a reaction” when he answered a question incorrectly in the program. If we look at the progression of John’s confidence through the program, he started with high confidence on his second problem, and then it decreased and stayed the same around average, and then increased again towards the end of the program. This perhaps suggests that John felt more comfortable with content as he practiced over break. However, he also answered more questions incorrectly in the second half of the program than he did in the first which is disconcerting given his increase in confidence. John’s confidence rating

patterns suggest he is not very confident in his abilities overall and does not have a good grasp of where he needs to improve since his confidence rating for questions, he answered incorrectly was higher than when he did not. As for resource usage John did not push himself to try the challenge problem, instead he usually chose to exit or view the solution when he answered a question correctly. Looking closely John only attempted the challenge problem in the first half of the program. After getting the daily review and challenge problem correct on Day 17, he did not do any more challenge problem on regular days. It is also important to note that Day 28 was the last day that John participated. It was also the only time after Day 17 that he tried a challenge problem as he did not complete any other challenge problems on 2's-Days between Day 17 and Day 28. After being "super duper!" confident and getting the daily review problem correct, he attempted the challenge problem. He answered the challenge problem incorrectly then chose to view the solution and then did not attempt the related challenge problem.

Student 7 - Kendall

Descriptive Analysis

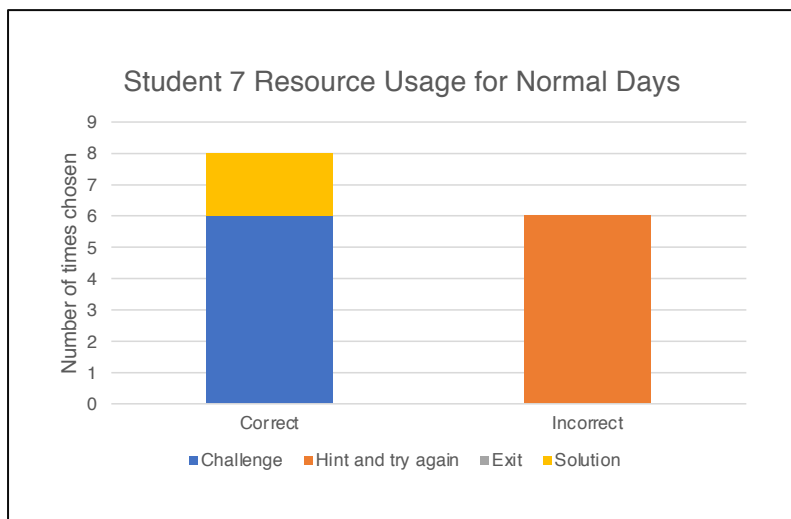
Overview Kendall identified herself as a white female who attended private school, public school, and vocational technical school throughout her academic career. She is technically a junior and is studying Astrogeology. As far as her calculus experience Kendall "took a series of Calculus classes at Shoreline Community College" in the years "2018-2020." Kendall "love[s]" mathematics. When she was younger her parents "would give [her] scrap paper and [she] would make up math problems and have [her] parents double check them." As far as her belief in what makes someone good at mathematics, she thinks it "is a sliding scale. Some is inherent knowledge other parts

the hints “all of the time.” When asked if she found the hints helpful, she responded “Very much so! If [she] was unsure [she] would use the hints. If [she] was 100% positive [she] would use the hints to see if there was a different way of thinking about the problem.” As for how she used the hints she stated that she “read over the whole hint and processed it, thinking about how it worked with how [she] was approaching the problem.”

Kendall had eight opportunities to try the challenge problem and she did so on six of those. She answered the challenge question correctly three times and incorrectly three times. In the survey she indicated that she would have wanted the opportunity to try the challenge question even if she answered the daily review problem correctly. She added that “a second chance to apply the knowledge that had been gained from an incorrect answer would have been useful.”

Figure 65

Student 7 Resource Usage for Normal Days



2's-Days Kendall participated in all four 2's-Days. On the first she answered the daily review problem incorrectly, chose to view a hint and tried again successfully answering the question correctly on her second try. She then chose to view the solution and try the related daily review problem which she answered correctly and then asked to view the solution. Her paths on the second and third 2's-Days were identical. She answered the daily review problem correctly, chose to view the solution and try the related daily review problem, which she answered correctly, and then asked to view the solution. On the last 2's-Day she answered the daily review problem correctly, chose to do the challenge problem, which she also answered correctly, then chose to view the solution with the option to try the related challenge problem which she did and answered correctly. She then viewed the solution. Kendall's response when asked about 2's-Days was "the more questions the merrier!" She selected in the survey that she did the additional problems "every time." When asked about her confidence going from the first to the second problem, she replied in the affirmative that she was more confident and that "the more [she] can work on consecutive problems, the better [she] feel[s] about the types of problems."

Trivia Days Kendall participated in four of the Trivia Days but did not participate in the first. She always chose to do trivia and calculus review. She answered two of the daily review questions on Trivia Days incorrectly where upon she viewed the hint and tried again. On the other two when she answered correctly, then viewed the solution and proceeded to trivia once and then tried the challenge problem the other time. She answered three of the four trivia questions correctly. In the extended feedback survey Kendall said she did trivia and calculus review because "while a break would have been

nice, continuing to keep [her] brain active is necessary for [her]. The trivia was just a nice bonus.” When asked how she felt about the trivia Kendall responded that she “loves trivia! Any time [she] can learn a random fact is wonderful.”

Problem and Function Type Kendall indicated that she struggled with derivatives, integrals, and limits. Furthermore, in the entry survey she indicated that she struggled with logarithmic, inverse trigonometric, trigonometric, and exponential functions. In the exit survey she indicated that she felt “somewhat” (4) confident in regard to derivatives and integrals, “meh” (3) confident in regard to limits, and “super duper” (5) in regard to algebra and pre-calculus. Kendall’s accuracy on problems involving integrals was the lowest for all problem types (Figure 66) and her accuracy on problems involving exponential function types was the lowest of all function types (Figure 67).

Figure 66

Student 7 Problem Type and Accuracy

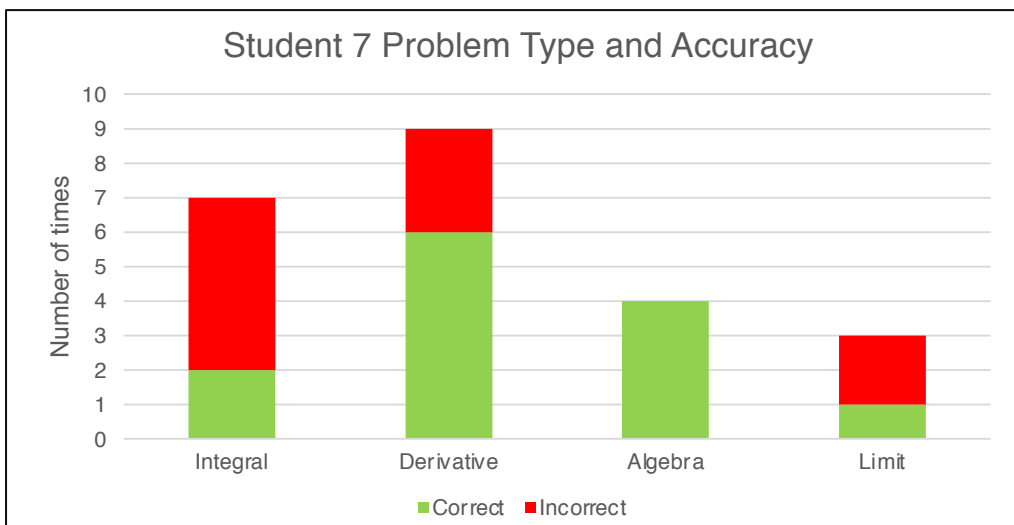


Figure 67

Student 7 Function Type and Accuracy

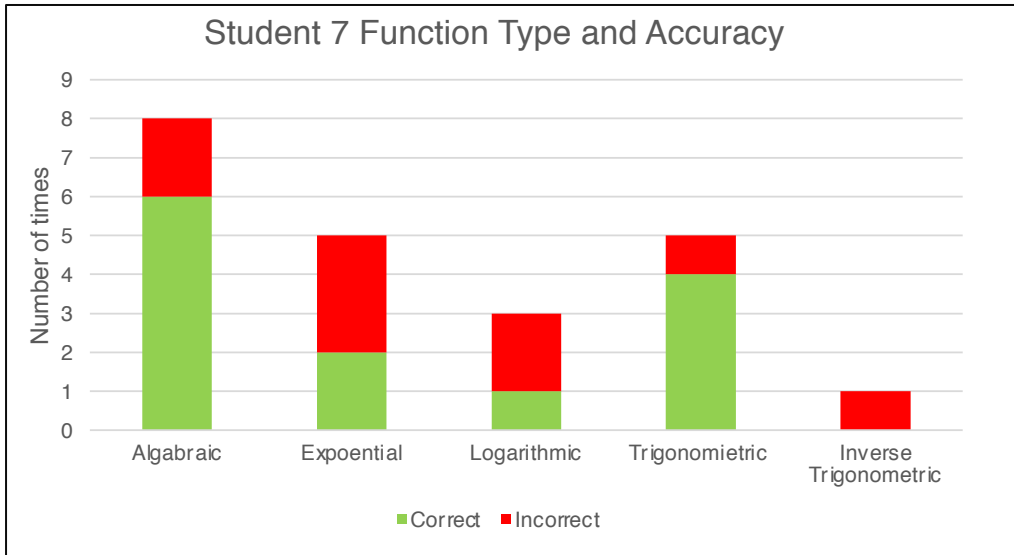
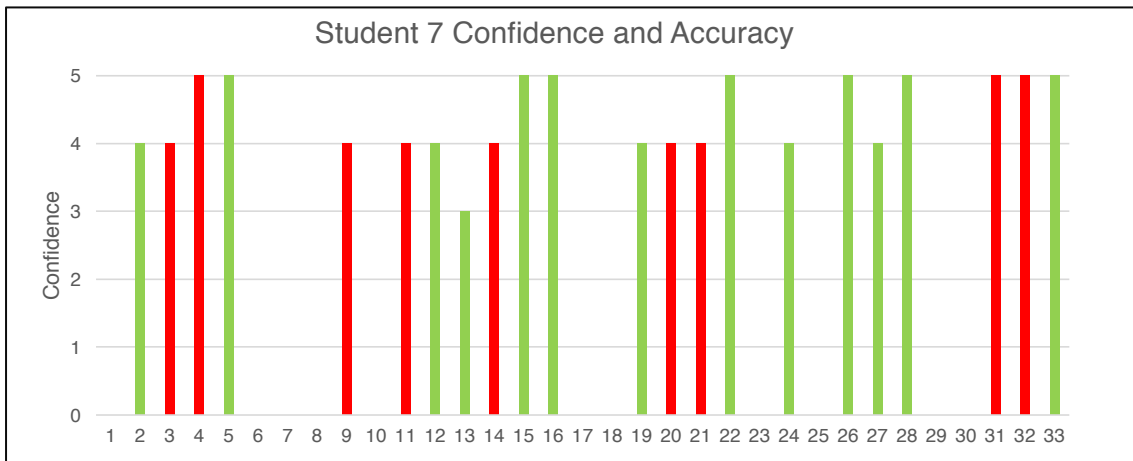


Figure 68

Student 7 Confidence and Accuracy



Confidence Kendall had an average confidence of 4.41 across all problems in the KiSS program. Her confidence on the days she answered the daily review problem correctly was 4.5 and, on the days, she answered incorrectly was 4.3. Her confidence jumped up and down throughout the program but only dropped below a 4 once (Figure 68). Kendall said that when she got a question right in the KiSS program she felt “like [her] class that [she] had already taken had paid off and [she] was learning properly.” When she answered a question incorrectly it “made [her] realize that [she] needed to focus on that area more.” Kendall always rated her confidence a 5 on days when the problem type was algebraic (Figure 69). Her average confidence was the highest for problems involving a trigonometric function (Figure 70).

Figure 69

Student 7 Problem Type and Average Confidence

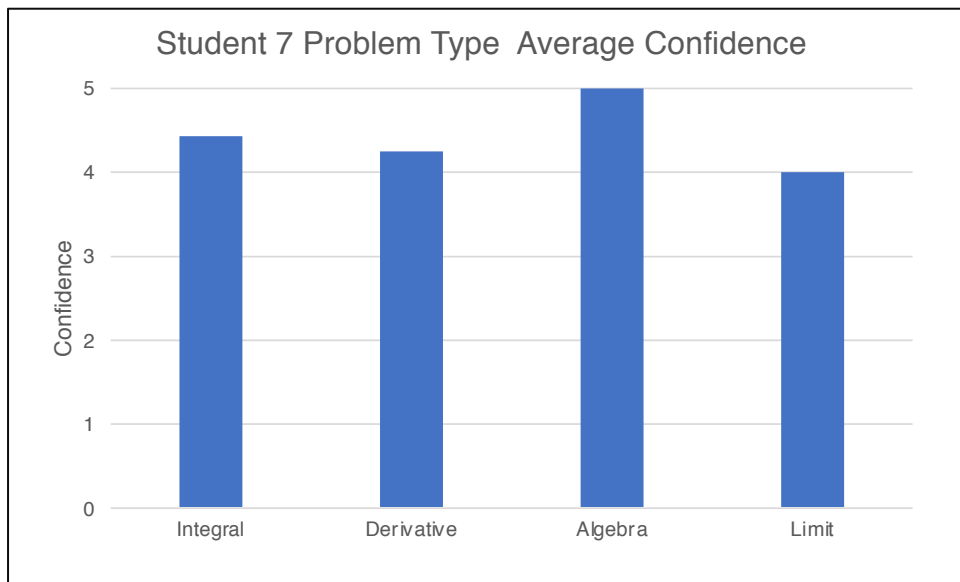
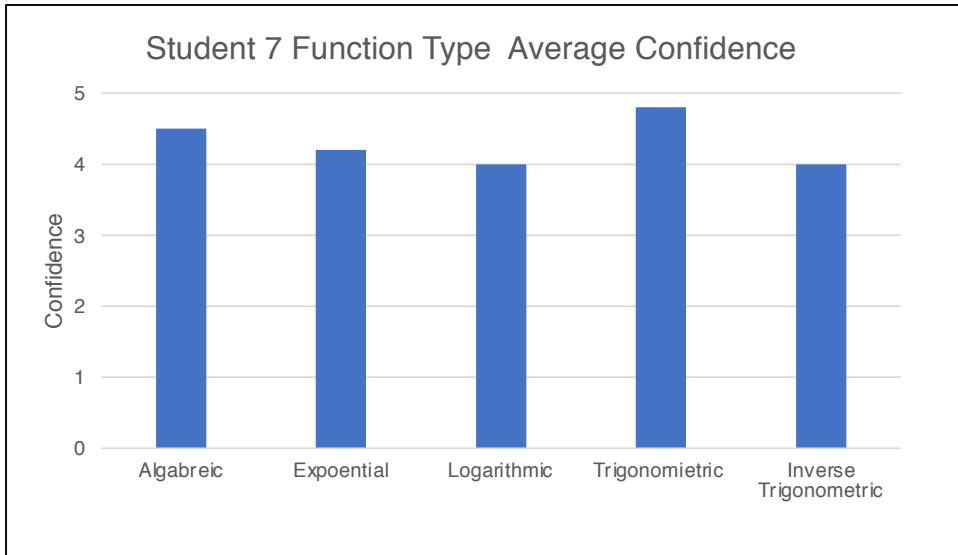


Figure 70

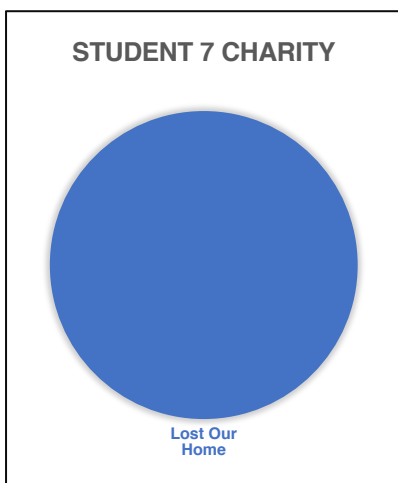
Student 7 Function Type and Average Confidence



Charity Kendall only voted for one of the charities throughout the program, namely the Lost Our Home charity (Figure 71). She said in the extended feedback survey that she “love[d] the idea” of the charity aspect and also noted that she “ ha[d] a few concerns about one of the charities chosen, but the others were great.

Figure 71

Student 7 Charity



Interpretative Analysis

Kendall always completed the challenge problem or viewed the solution when she answered a question correctly and always used the hint to try again when she answered incorrectly. Kendall had high confidence, but this did not match her accuracy. She left more comments in the extended feedback survey than any other student which was very insightful. For example, Kendall commented that doing similar problems consecutively helped her, which we can see in her participation and answers on 2's-Days, especially on the last two.

Student 8 - Liam

Descriptive Analysis

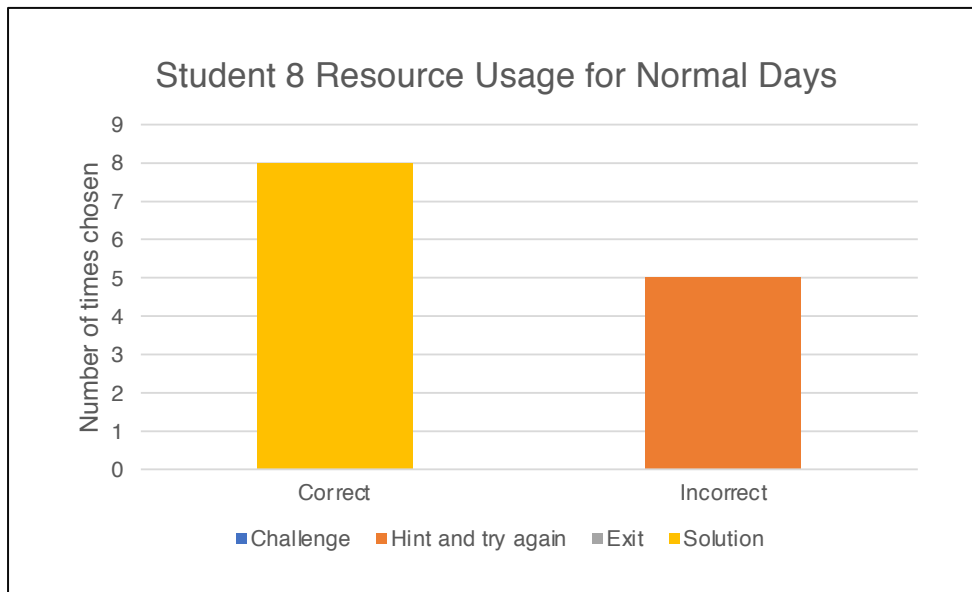
Overview Liam identified himself as a Caucasian male who attended public school. He has been “in and out of college since 2007” and has “completed the requirements for a degree in Anthropology from” Arizona State University. He is currently studying Physics. As for his calculus background he completed MAT 265 twice at Arizona State University. He mentioned that during the first time he was overwhelmed but was able to comprehend more after taking it a second time. Liam loves math “when it works out and find[s] it to be the most frustrating thing on planet earth when it doesn't. It is an incredible field and is fun to learn about, but it takes me longer, than what I consider average, to retain and understand the material.” Furthermore, Liam said that:

“Math comes easy to some and hard to others. However, with hard work and dedication it can be understood. People today just don't have the patience to look at their mistakes and try to figure out what they did wrong when they can just as

stated that he found them helpful and that he would “initially scan it quickly to see if the formula, numbers, or method [he] used [were] off somehow and then [he] would go back and read the whole hint if [he] continued to not understand it.” Liam had eight opportunities to try the challenge problem and he never did the challenge problem on a normal day. When asked if he would have wanted to try the challenge problem if he had answered the daily review problem incorrectly, he stated “not really”, and added that he thinks “if you get the question wrong then there is a discrepancy in your knowledge of the problem, and it should be redone until you get it right. Otherwise, it will only become more overwhelming.” This coincided with his use of the hint every time he answered the question incorrectly and not using the opportunity to try a challenge problem.

Figure 73

Student 8 Resource Usage for Normal Days



2’s-Days Liam participated in two 2’s-Days. His path for both was the same. He answered the daily review problem correctly, asked to see the solution with the option to

try the related daily review problem, which he answered incorrectly, and then asked to see the solution. When asked about 2's-Days Liam responded that he "enjoyed them and thought it was going to be expanded upon to three and four problems. However, 2's-Days did help [him] want to continue to refresh [his] memory on all things math." He responded that he did the additional problems "every time" and when asked about his confidence going from the first problem to the second problem, he said that "sometimes [he felt more confident]. [He] would if [he] got the first correct, otherwise, it added a little more stress."

Trivia Days Liam participated in a total of four Trivia Days. He chose to do calculus review and trivia on three of those days and just trivia on one of those days. On the three days he did both, he answered the daily review problem correctly twice and when he answered it incorrectly, he used the hint to try again. He always viewed the solution before going to the trivia. He answered two of those trivia questions correctly and two incorrectly. When asked why he chose to do both calculus review and trivia he responded that he "needed the extra help and having a boost of trivia knowledge is always fun and uplifting." He also noted that he found the trivia questions "were fantastic and very fun to learn about. [He] wished there were more."

Problem and Function Type Liam indicated in the entry survey that he struggled with derivatives and integrals. Furthermore, he struggled with logarithmic and inverse trigonometric functions. In the exit survey Liam felt "not very" (2) confident in regard to derivatives, "not at all" (1) confident in regard to integrals, and somewhat (4) confident in regard to limits and algebra and pre-calculus. This correlated with Liam's accuracy as he

answered all the algebraic and limit problems correctly (Figure 74). He also answered all problems involving trigonometric functions correctly (Figure 75).

Figure 74

Student 8 Problem Type and Accuracy

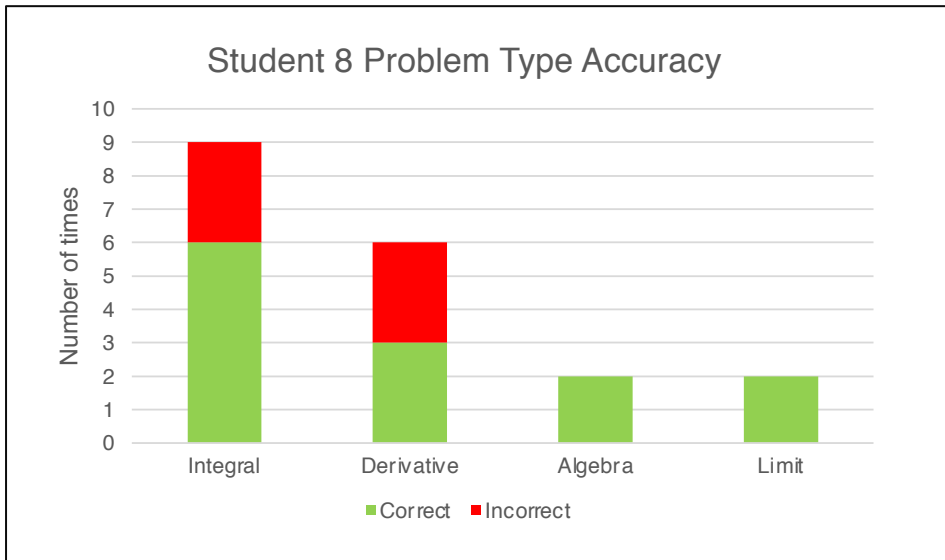


Figure 75

Student 8 Function Type and Accuracy

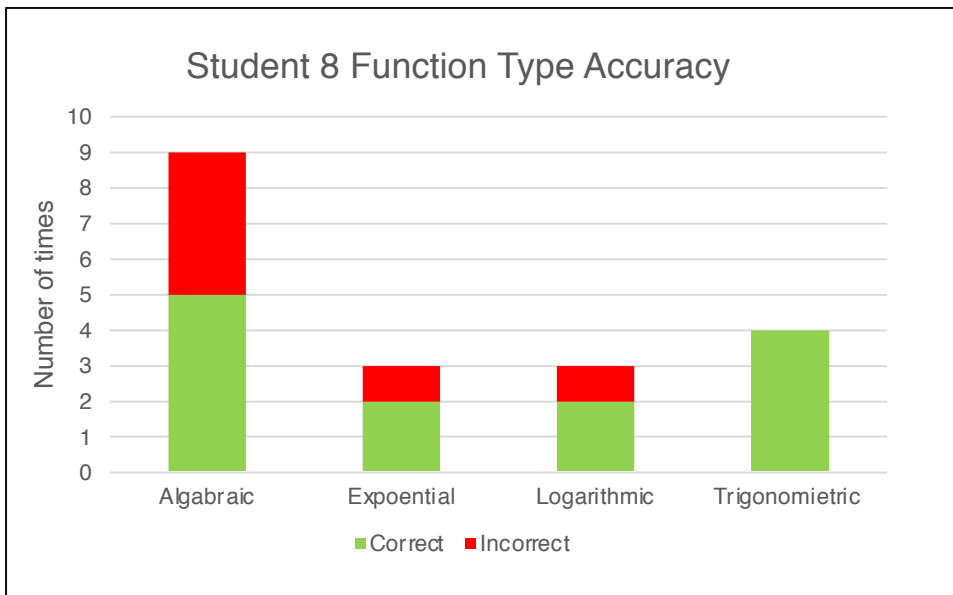
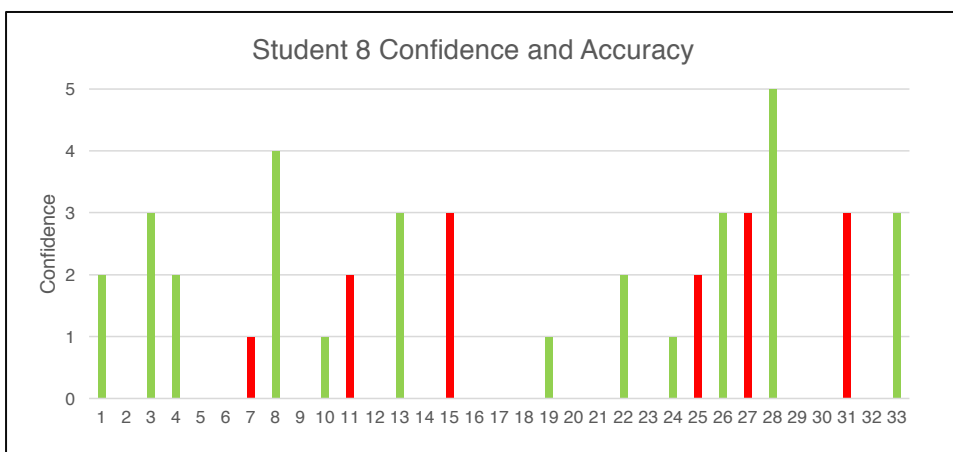


Figure 76

Student 8 Confidence and Accuracy



Confidence Liam had an average confidence of 2.44 across all the problems. On the days he answered the daily problem correctly his average was slightly higher at 2.5. When he answered incorrectly his confidence averaged 2.33. Overall Liam’s confidence was low (Figure 76). He only had a confidence rating above average twice. Liam had a very interesting response to getting a question right in the KiSS program. He said that he felt “like [he] got lucky. As it has been over two and a half year since [he] had to deal with [these] types of problems, [he] was rusty. There were a few [he] remembered which felt good and made [him] want to do more like it.” Liam said that when he answered a question wrong, he felt like “it was good and bad because [he] got it wrong, but it was also telling [him] what [he] needed to study more before [his] next class started.” When looking at the break down of Liam’s average confidence for problem type his confidence was highest for problems involving algebra and limits (Figure 77). As for function type Liam’s average confidence was highest on days where the daily review problem involved an exponential function (Figure 78).

Figure 77

Student 8 Problem Type and Average Confidence

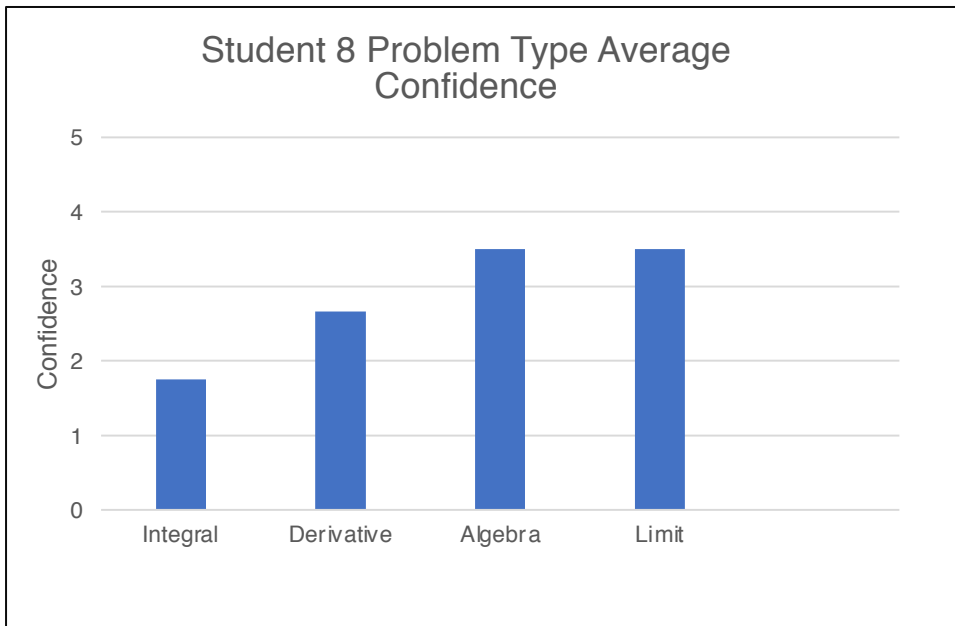
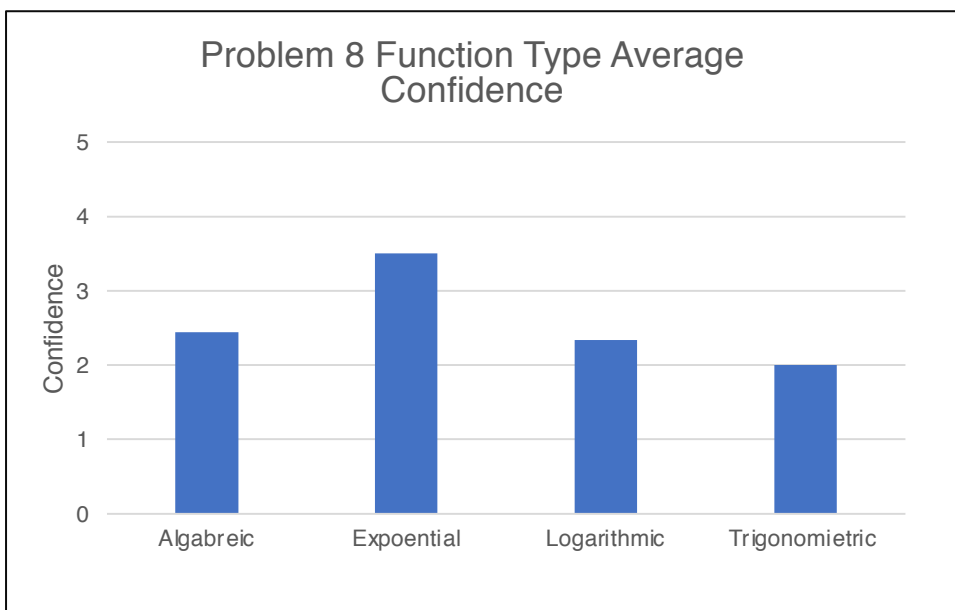


Figure 78

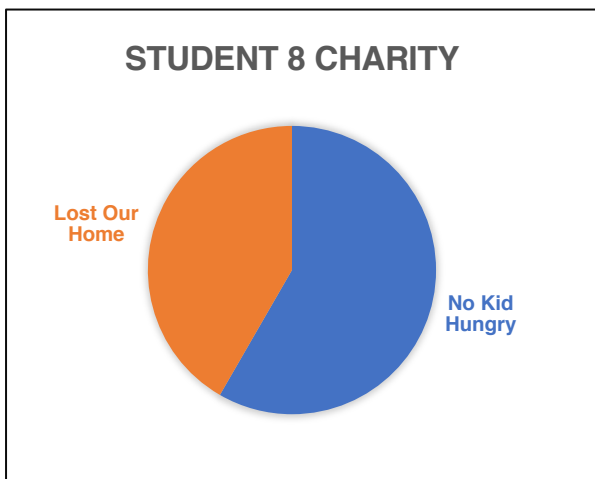
Student 8 Function Type and Average Confidence



Charity Liam switched between voting for two of the five charities throughout the program namely the Lost Our Home charity and the No Kid Hungry charity (Figure 79). In the extended feedback survey Liam said that the charity aspect “was one of the reasons [he] continued to do the problems. Absolutely loved it.” He also mentioned that he would not have wanted to help choose the charities as “the ones you had were perfect for me and it was hard to pick just one.”

Figure 79

Student 8 Charity



Interpretative Analysis

Liam did not completed any challenge problems; even on 2’s-Days he only did the related daily review problem and never any of the challenge problems. However, he used every opportunity to try the problem again when he answered the daily review problem incorrectly. Liam’s average confidence across the program was very low, 2.44, and his low accuracy and confidence may have been the reason for that he did not try any challenge problems. Liam had a reaction consistent with a growth mindset when he answered a question incorrectly. He mentioned in the extended feedback survey that “if

you get the question wrong then there is a discrepancy in your knowledge of the problem, and it should be redone until you get it right. Otherwise, it will only become more overwhelming.” So, it is possible that he was not confident enough to do the challenge problems and felt overwhelmed by them. Furthermore, Liam took Calculus 1 twice at ASU. He noted that the first time he felt “overwhelmed” but the second time he was able to “better understand the principles and how they are applied in different ways.” He acknowledges that it takes him “longer than what [he] considers average, to retain and understand the material.” Liam’s lack of confidence is also evident in that he felt like he “got lucky” when he answered a question correctly instead of acknowledging that he had the capability to answer the question correctly. However, he had a very positive outlook when he answered a question incorrectly as he was able to take from that “what [he] needed to study more before [his] next class started.”

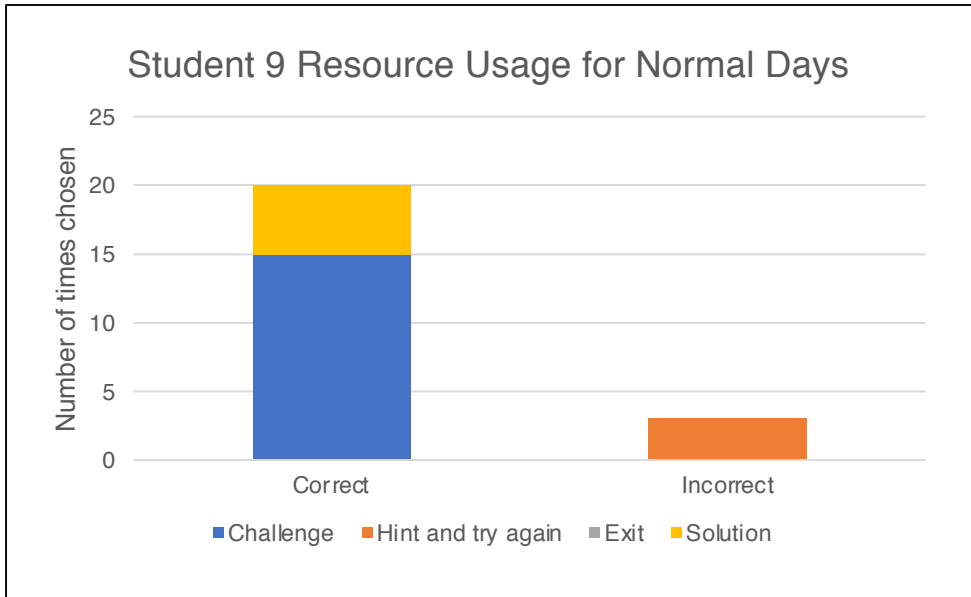
Student 9 - Michael

Descriptive Analysis

Overview Michael identified himself as a male Mexican who attended public school. He is a returning student who is a junior and he is studying Electrical Engineering. He completed Calculus 1 at the American Military University. He “is not a fan” of math but “understand[s] its importance in the world” and feels he is “good at it.” He believes that “some people are a little more naturally inclined to math, but anyone can get there if they put in the work.” Michael used his tablet as a digital notebook. He “tried to limit to doing the problem once through” without using resources other than a graphing calculator. He answered the questions on his mobile phone. In the entry survey Michael said he had learned and would remember “about half” of the material he had seen in

Figure 81

Student 9 Resource Usage for Normal Days



2's-Day Michael participated in all four 2's-Days. On all four of them he answered the daily review problem correctly. On the first 2's-Day he chose to attempt the challenge problem which he answered correctly. He then chose to view the solution and try the related challenge problem which he answered incorrectly. He finished by viewing the solution. On the second 2's-Day Michael chose to do the challenge problem which he answered correctly. He then viewed the solution and did the related challenge problem which he also answered correctly. He finished by viewing the solution. On the third 2's-Day Michael again chose to do the challenge problem. He answered it incorrectly, viewed the solution, and attempted the related challenge problem which he answered correctly. He again finished by viewing the solution. On the final 2's-Day Michael chose to do the related daily review problem instead of the challenge. He answered it correctly and viewed the solution. Michael felt that 2's-Days were "nice". The "extra opportunity

and extra challenge were nice.” He remarked that he did the additional problem “every time.” He said he did not feel a change in confidence between the first and second problems.

Trivia Days Michael participated in all five Trivia Days however on the third Trivia Day he did not complete the trivia even though he selected that he would do both calculus and trivia. He answered the daily review problem correctly on all except the last Trivia Day. He always chose to do calculus and trivia, and always did the challenge problem when he answered the daily review problem correctly. As for accuracy Michael answered three of the four trivia questions correctly. Michael noted that he chose to do both calculus and trivia because “he was doing this to get the calculus experience and the practice so just trivia wouldn’t have helped that.” He liked the trivia questions and replied that he did learn something new.

Problem and Function Type Michael indicated in the entry survey that he struggled with integrals and logarithmic functions. In the exit survey Michael was “super duper” (5) confident in regard to derivatives and algebra and pre-calculus, “somewhat” (4) confident in regard to integrals and limits. Michael answered all questions that were algebraic or involved limits correctly (Figure 82). Furthermore, he answered all questions with exponential, logarithmic, and inverse trigonometric functions correctly (Figure 83).

Figure 82

Student 9 Problem Type and Accuracy

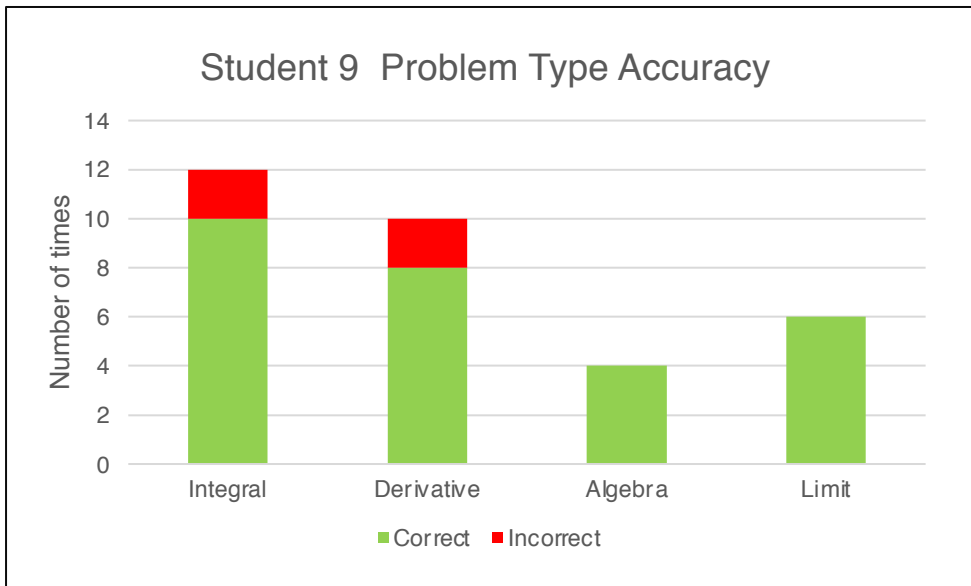


Figure 83

Student 9 Function Type and Accuracy

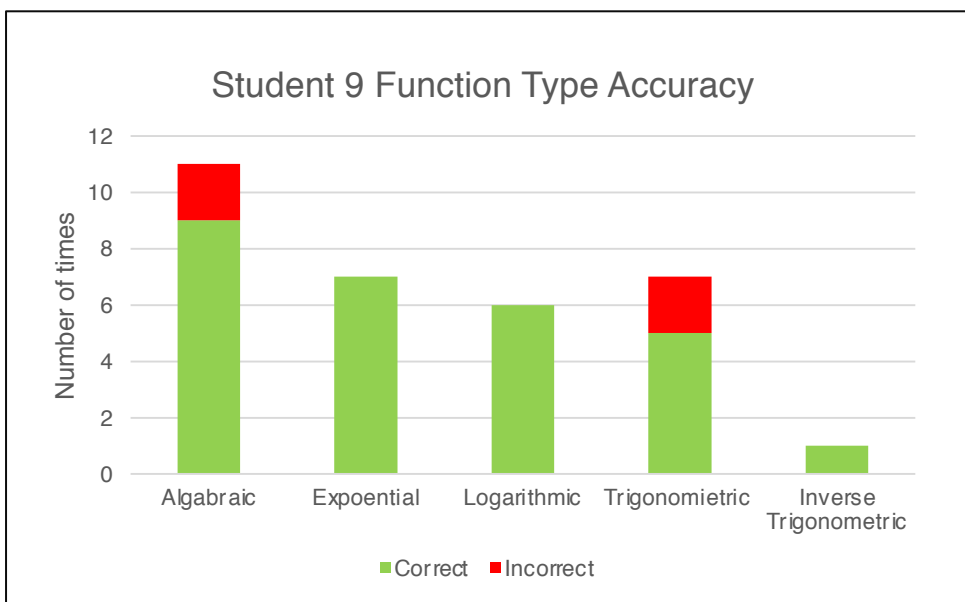
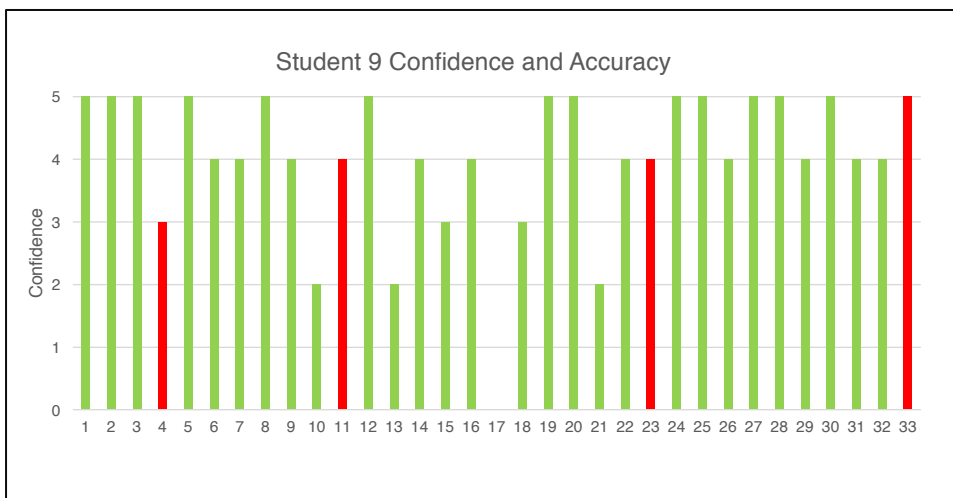


Figure 84

Student 9 Confidence and Accuracy



Confidence Michael had an average confidence of 4.16 across the entire KiSS program. His confidence on the days he answered the daily review problem correctly was 4.18 and on the days he answered the daily review problem incorrectly was 4 (Figure 84). When asked how getting a question right made him feel he responded “good. It helped [him] know that his additional learning beyond what calc 1 taught [him] because [he] was able to remember some of that stuff.” When asked how getting a question wrong made him feel “disappointed but really only because [he] didn’t get a chance to try a harder one.” Michael’s average confidence was highest for problems involving limits (Figure 85). Furthermore, his highest average confidence in regard to function type was for daily review problems involving exponential functions (Figure 86).

Figure 85

Student 9 Problem Type and Average Confidence

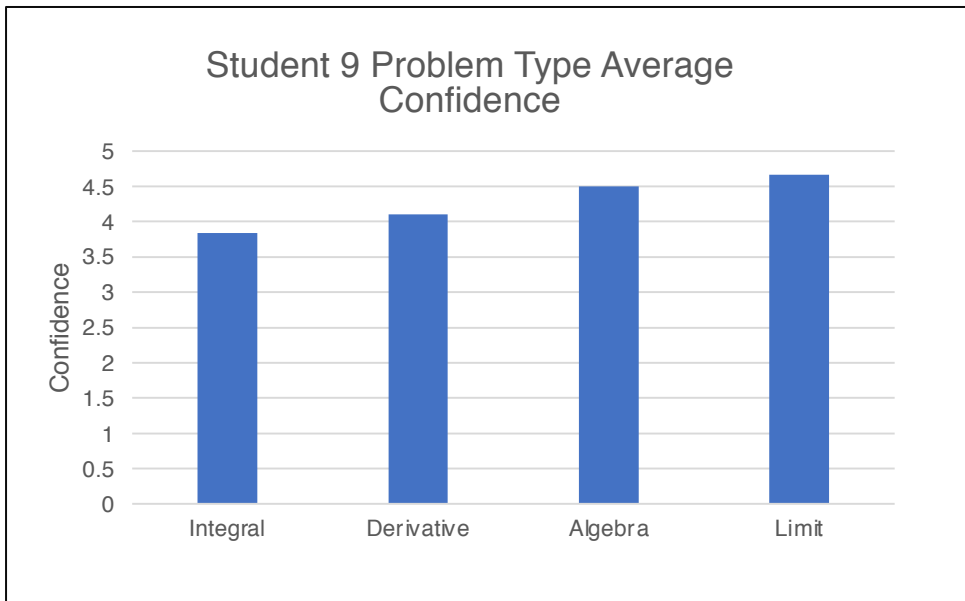
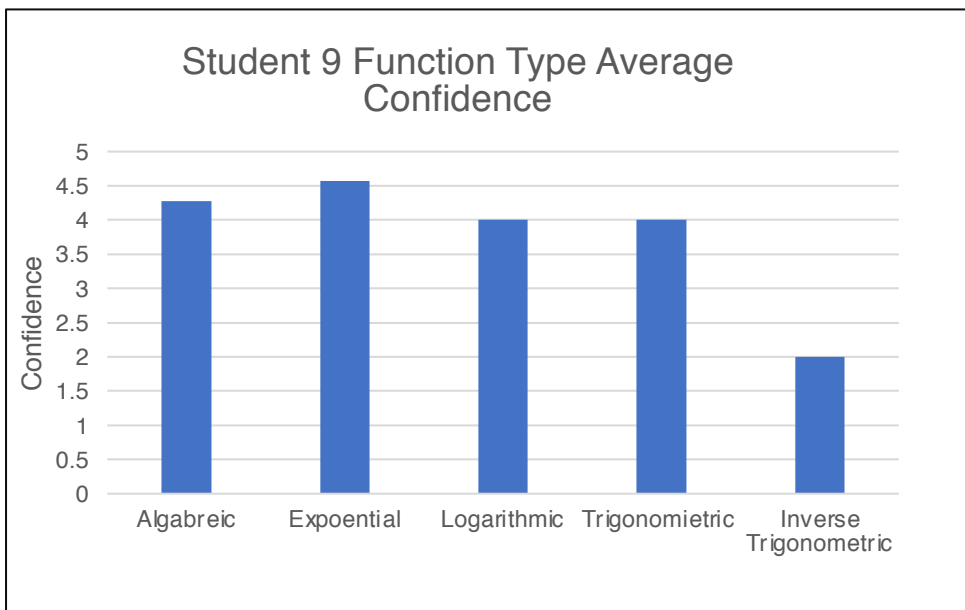


Figure 86

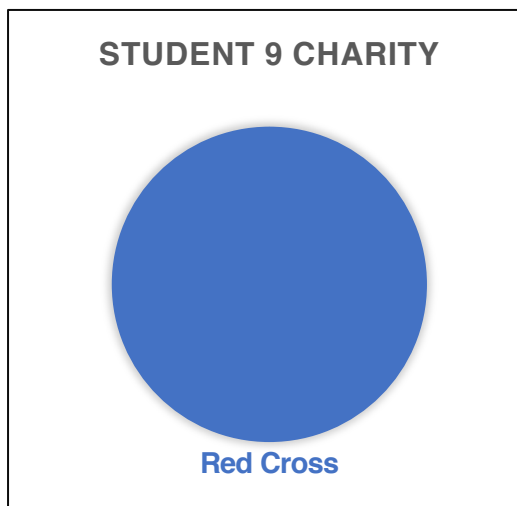
Student 9 Function Type and Average Confidence



Charity Michael only ever voted for a single charity, namely the Red Cross (Figure 87). He did not vote for any of the other charities. In the extended feedback interview Michael discussed that he found the charity aspect “nice” and that it was “a little bit more motivation to try to push through and get the right answer.” He would not have wanted to help choose the charities. He thought the choices were “good.”

Figure 87

Student 9 Charity



Interpretative Analysis

Michael mentioned in his extended feedback interview that in his previous experience with Calculus 1 he had been able to use any tool that he wanted such as Wolfram alpha or any online calculator and in fact using external resources was encouraged. He said that when he completed the daily review problems his goal was to be able to do each problem by himself without using any external tools. He would write each question down and go through it once on his own before looking to notes or other resources if he needed to. Michael answered always used the hint to try again upon which he always answered correctly on his second try. Most of the time Michael tried the

challenge problem after answering correctly but there were a few occasions where he chose to look at the solution instead. While Michael still needed the clue on a few occasions he is able to use the resource correctly. Michael's confidence also often correlated with answering a question incorrectly except for the last day. Furthermore, we can see that his confidence was sometimes low on the days leading up to answering a question incorrectly.

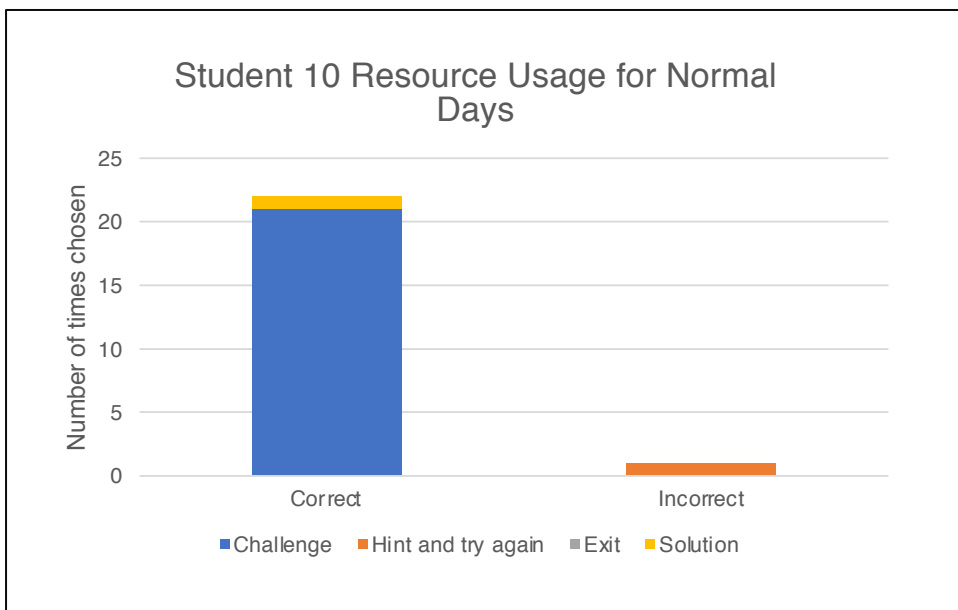
Student 10 - Nicholas

Descriptive Analysis

Overview Nicholas identified himself as a white male who received a public education. He is a returning student who is unsure of his standing at Arizona State University but believes he is between freshman and sophomore status. He has an Associates degree from another university and is currently studying electrical engineering. Nicholas completed Calculus 1 at Arizona State University in the fall. He "likes" math, and stated that "when you get it it's beautiful" but it can be "daunting." His mindset in regard to math is that he "can improve on it but [his] patience isn't always there." Nicholas used notes when completing the daily review problem and always attempted the problem by hand first. He also used the internet to verify that his answers were correct before submitting his answer. Nicholas answered the daily review problem on his mobile phone. In the entry survey Nicholas indicated that he felt he had learned and would remember "about half of" the material he had been exposed to in Calculus 1 and he felt "meh" confident going into Calculus 2. In the exit survey he indicated that he felt "somewhat" confident about both Calculus 1 and Calculus 2.

Figure 89

Student 10 Resource Usage for Normal Days



Problem and Function Type Nicholas indicated in the entry survey that he struggled with derivatives and integrals. Furthermore, he struggled with logarithmic, inverse trigonometric, and trigonometric functions. In the exit survey Michael rated that he was “somewhat” (4) confident in regard to derivatives, integrals, and limits and “super duper” (5) confident in regard to algebra and pre-calculus. Nicholas’ accuracy was only low for a single problem involving algebra (Figure 90) and a trigonometric function (Figure 91).

2’s-Day Nicholas participated in all four 2’s-Days. He answered the daily review problem for the first 2’s-Day correctly and then selected to do a challenge which he answered correctly. He then chose to view the solution and try the related challenge problem which he also answered correctly. On the second 2’s-Day Nicholas answered the daily review problem incorrectly. This was the only question he answered incorrectly

throughout the program. He viewed the hint and answered the question correctly on his second try. He then viewed the solution and completed the related daily review problem which he answered correctly. He finished that day by viewing the solution. On the third 2's-Day Nicholas answered the daily review problem correctly, chose to do the challenge problem which he answered correctly, then viewed the solution and tried the related challenge problem which he answered incorrectly. He finished by viewing the solution. On the final 2's-Day Nicholas answered the daily review problem correctly, chose to do the challenge which he answered incorrectly. He then viewed the solution and chose to try the related challenge problem which he answered correctly.

Nicholas said in his extended feedback interview that at first he responded to 2's-Days by thinking "oh man I have to sit here longer." The first question on the first 2's-Day led him to open his textbook. He also responded that he completed the additional problems "every time" and that he felt that there was less "pressure" doing the second problem. Furthermore, he noted that the second problem "followed the same pattern" with "small variations" which made him feel comfortable.

Trivia Days Nicholas participated in all five Trivia Days and he always chose to do calculus and trivia. He answered the daily problem correctly on all five days and always chose to do the challenge question which he also answered correctly. On the first two Trivia Days he chose to go straight to trivia after the challenge problem and on the last three he chose to view the solution first. Nicholas answered all of the trivia questions correctly. When asked if he completed both trivia and calculus, he said he did "everything every time." He said he did so because he thought "[he] could learn something more."

Figure 90

Student 10 Problem Type and Accuracy

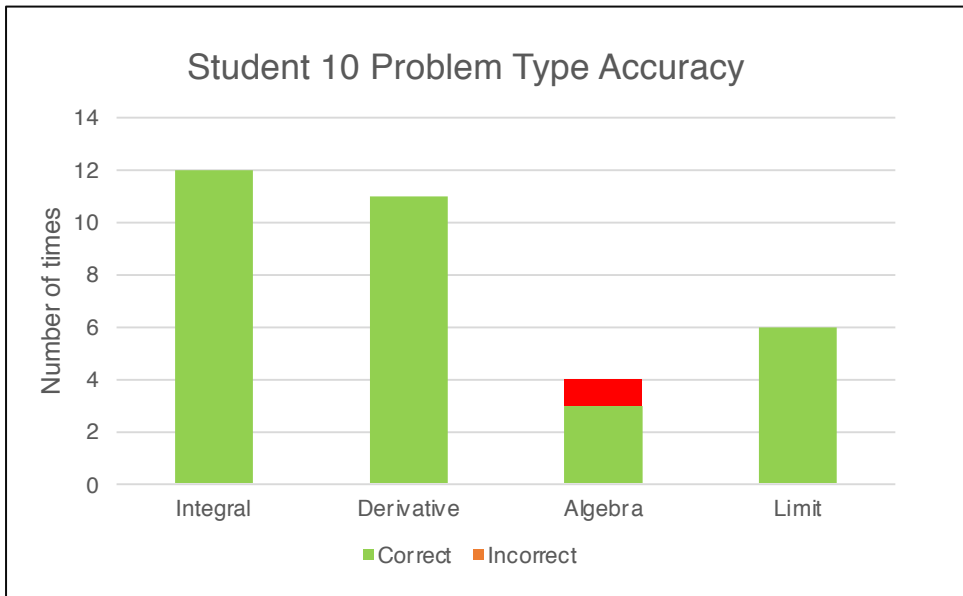


Figure 91

Student 10 Function Type and Accuracy

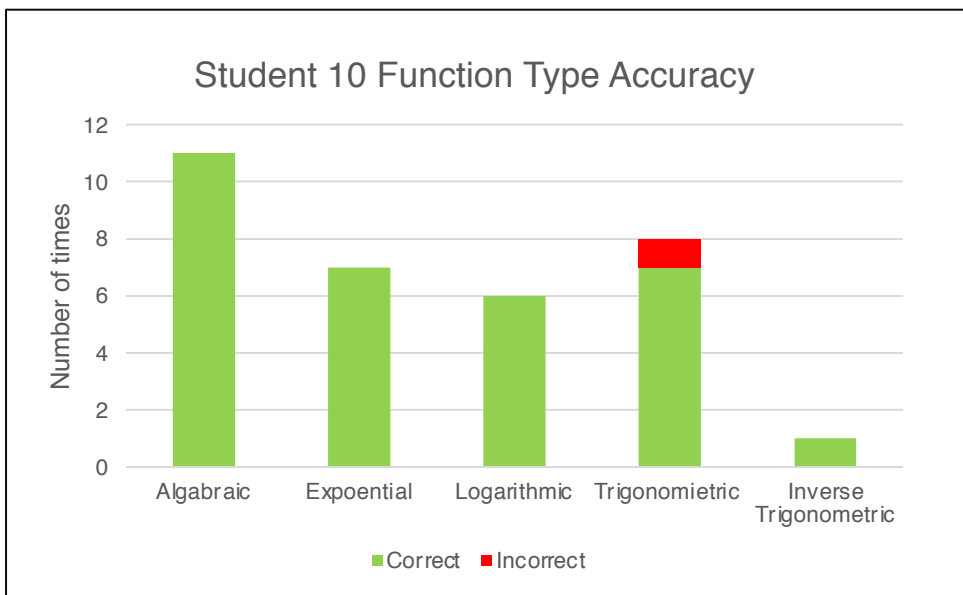
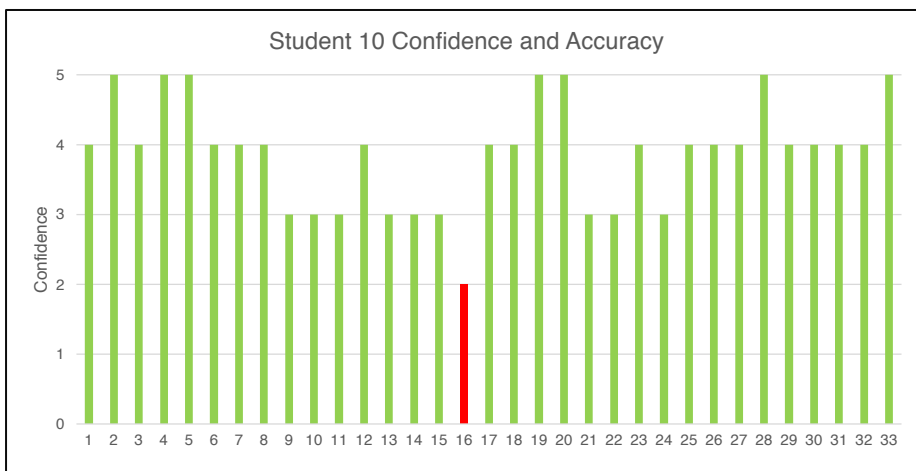


Figure 92

Student 10 Confidence and Accuracy



Confidence Nicholas averaged a confidence of 4.41 across all problems and 4.5 when he answered correctly and 4.3 when he answered incorrectly (Figure 92). When asked how he felt when he got a question correct in the KiSS program Nicholas responded that he felt like he was “feeding kids” and he noted that some of the problems felt “deceptively easy.” When asked how it felt when he got a question wrong, he responded, “pretty frustrating” and noted that sometimes he answered incorrectly due to being distracted. Nicholas’ confidence was highest for problems involving limits (Figure 93) and problems involving logarithmic functions (Figure 94).

Figure 93

Student 10 Problem Type and Average Confidence

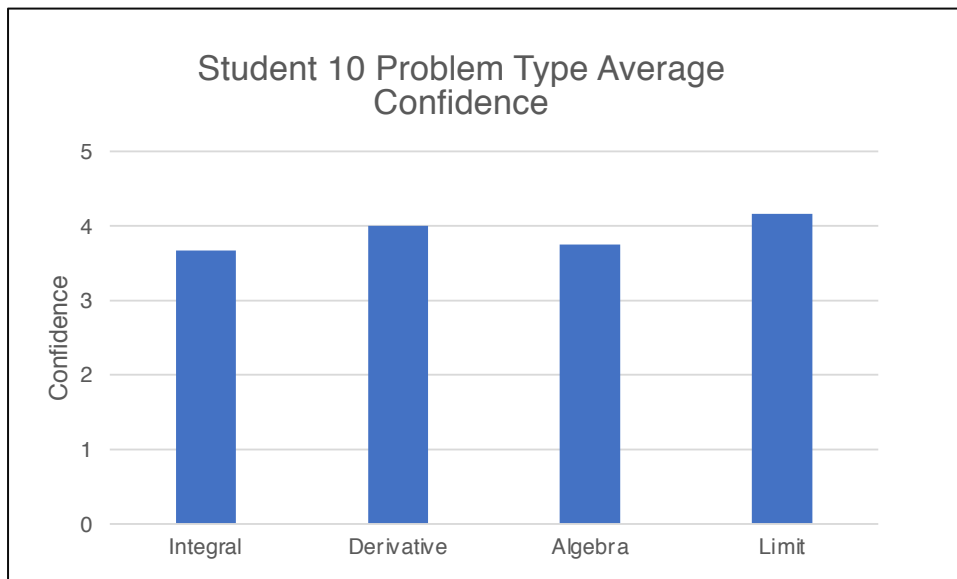
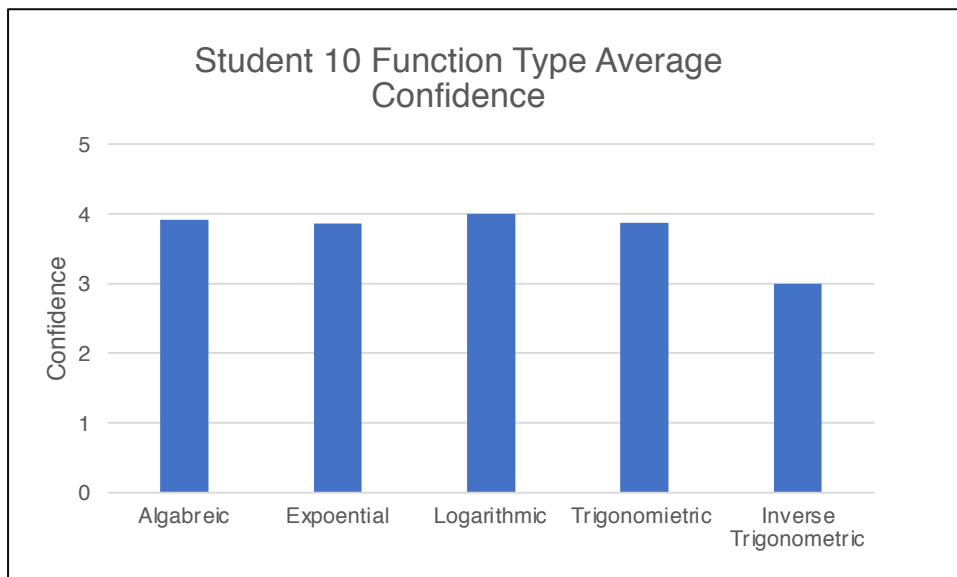


Figure 94

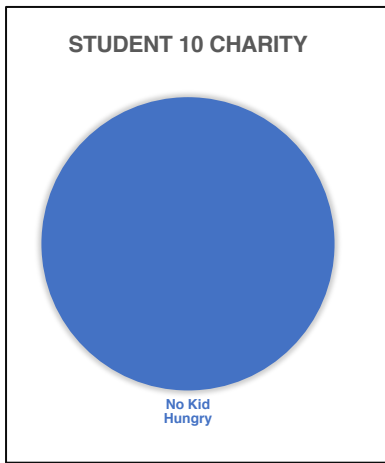
Student 10 Function Type and Average Confidence



Charity Nicholas stated in the extended feedback survey that he felt that “[he] did math right and somebody got fed” and he continuously came back to the fact that he felt “responsible.” He only voted for one charity and stated that feeding children was something very important to him as a father himself (Figure 95). He stated that he understood that the other charities may appeal to others, but they did not to him

Figure 95

Student 10 Charity



Interpretative Analysis

In his extended feedback interview Nicholas discussed how after completing a question he would use an online tool to check his work such as an integral calculator. He mentioned that he would use one with steps so that he could find his mistakes and learn from them rather than only checking the answer. Nicholas said he felt “responsible” for getting the questions correct as he felt that when he did, he was “feeding kids.” Even though Nicholas checked his answers he did answer a daily review problem incorrectly, and some challenge problems incorrectly. It is possible Nicholas used a different resource for the daily review problems than he did for the challenge problems. For all days except

for one Nicholas chose to do a challenge problem after answering correctly. The only anomaly was a day when he chose to view the solution perhaps indicating that he still was not confident with it or thought perhaps that it could be solved differently.

Chapter 4: Discussion and Conclusions

There are many possibilities for how the Keeping in School Shape program could grow while still maintaining ease of accessibility and cost effectiveness. Conducting a descriptive analysis of student feedback on the program as well as an interpretative analysis of their mathematical performance and written participation will allow for a chance to understand the best ways for the program to be enhanced.

Discussion

Descriptive Analysis

In the extended feedback survey students were asked if they thought the KiSS program could have prepared them more, and if so how. Students mostly responded that they would have liked the option to increase or decrease the number of problems. Other students responded that the program was “very adequate” and “helped [them] just fine.” One student even remarked that they were already seeing “similar style problems” in their Calculus 2 class and thus felt the program was helpful.

Students were also asked if they would have liked to see a more personalized program and if so, in what way did they think it would be beneficial to personalize the program. Nine students responded yes, and one responded maybe. The student who responded maybe stressed that they would like to see anonymity preserved if the program were changed. Other suggestions included allowing students to “select a number of

problems a day,” as well as picking “subjects they struggle with,” and the level of “difficulty.” A student also asked to have the program allow students to select the time of day that they would receive the problem. Another student requested that the program create “progress reports about each student and then give them [problems] based on the difficulty level.”

Finally, students were asked if any additional materials could have been provided to help students succeed. Requests included videos “about the rules used in the problems if [students] wanted more understanding,” as well as the ability to “[flag] a problem to receive more problems like it in the future until [a student is] confident in [their] ability to complete that problem.”

Interpretative Analysis

Multiple students in the program demonstrated that they may have difficulty discerning where their strengths and weaknesses lie. Both Carl and Emma had an average confidence rating of 5 for the problems they answered incorrectly, meaning they rated their confidence in their ability to solve the question correctly, for every problem they answered incorrectly, a 5. In contrast, their average confidence rating for questions that they answered correctly was lower. After answering the question incorrectly, Emma used the resources provided in the form of the hint to try the problem again, and she was able to get the question right every time on her second attempt. On the other hand, Carl viewed the solution every time he answered a question incorrectly. Help-seeking research stresses that a student should choose to seek help when they are incapable of answering a problem on their own (Gall, DeCooke & Jones, 1989). Both students sought help in a different way after realizing they were incapable of answering the question correctly.

While we do not know if Carl gained understanding from viewing the solutions, it would seem that, after viewing the hints, Emma was able to comprehend what she did wrong on her first try. The question becomes then, what could be included in the program to help students become more in sync with their capabilities. Students are already prompted to consider how much they know about the problem by rating their confidence while looking at the problem. However, this analysis suggests that perhaps the program needs to prompt students more. Research on metacognitive feedback in intelligent tutoring systems suggests that students who abuse or under use resources can be guided to optimize their help-seeking skills (Roll et al., 2011). For example, there could be a feedback message that appears when a student answers a question incorrectly requesting that they take time to stop and reflect on where they may have gone wrong. Furthermore, if a student chooses to view the solution, the program could suggest that the student first view the hint and try again instead.

In addition to improving resource usage, interpretative analyses also suggested ways in which existing resources can be improved. In particular, analyses of confidence and participation give insight into the different forms of support that different students need. For example, John and Liam had the lowest average confidence ratings of the ten students, and they also completed the least amount of calculus problems throughout the program. John is a first-generation student who identifies as black Asian, and Liam is a returning student. Demographic characteristics, such as race, are known to be a factor in student's perception of their own abilities (Leslie et al., 2015; Litzler et al., 2014). While both exhibited low confidence and limited participation, John answered 82% of the problems he attempted correctly whereas Liam only answered 50% of his problems

correctly. Looking at their responses to the surveys, both entered the program feeling “meh” (3) confident and exited feeling “somewhat” (4) confident in regard to Calculus 1. As for Calculus 2 John started the program feeling “not very” (2) confident and left feeling “super duper” confident. On the other hand, Liam started the program feeling “somewhat” (4) confident and left feeling “meh” (3) confident.

Liam’s extended feedback survey shows that his lack of confidence may run deeper than his ratings show since he said that answering a question correctly made him feel that he “got lucky.” Liam also never completed a challenge problem and suggested that it would be “overwhelming” to try something harder when he felt he hadn’t mastered the question at hand. For students such as Liam, more daily review problems that are not higher in difficulty could be beneficial in building confidence. We see that on 2’s-Days Liam made use of the related daily review problem so this form of support may be helpful for similar students. On the other hand, John did try some challenge problems, and he did so specifically at the beginning of the program and then again at the end of the program when he was very confident and answered the daily review problem correct on that day as well as the day before. For students like John, more support when attempting challenge problems could therefore be beneficial. For example, allowing students to see a hint and try challenge problems again could encourage more behavior consistent with a growth mindset (Dweck, 2014).

Analyses showed that there may be an association between students exhibiting a growth mindset and their motivation and goal for the program. For example, Albert participated regularly and with accuracy, but his choices did not reflect a strong growth mindset as he did not push himself to try challenge problems on normal days and did not

take every opportunity that he could on 2's-Days. While Albert's choices may be linked to his confidence, it could also be that his choices are linked to his motivation and goals for participating in the program. Albert stated in the extended feedback survey that he is "not the biggest fan" of math and that he felt "more satisfaction" answering a question correctly in class than in the KiSS program. Albert's responses indicated he is a student trying to get exactly what he needs and no more, and the fact that these are "challenge problems" may suggest to him that they are beyond what he needs to master to succeed in his next class. Albert's behavior illustrates that every student comes into the KiSS program with an individual goal; for some it will be to answer a question every day, for others it will be to get as many questions correct to support a charity, and for still others it will just be to answer a problem when they can. The role that goals play in program activity suggests that the creation of different paths for students with similar goals could help foster a growth mindset. For example, students who shy away from challenge problems simply because they are called "challenge" problems may require different phrasing so that the "challenges" are framed as additional opportunities rather than a "challenges." Furthermore, students who are participating frequently and often answering question correctly, but do not try challenge problems, could be prompted with messages praising their past participation and encouraging further effort. Then, if students do answer a challenge problem, they could be rewarded with another vote for a charity. Also, gamification in the form of leader boards or a personal point system could increase intrinsic motivation to attempt more challenge problems (Banfield & Wilkerson, 2014). Finally, while each student has a unique goal, it is important to emphasize the relevance

of KiSS problems, especially the challenge problems. This motivation could provide the necessary push to guide students towards a growth mindset.

Conclusions

In conclusion there are a few main ideas that can be taken from this analysis of the ten students analyzed in this thesis to help improve the KiSS program. First of all, the program could help students gain a better grasp of their own understanding. Resnick (1976) explored the idea that intelligence should be defined by a person's ability to discern what they do not know and find the resources to address the deficiency. Tailored feedback messages could support students making informed help-seeking decisions that lead to improved resource usage (Roll et al., 2011). To encourage students to push themselves, the program could provide more support when attempting challenge problems as well as remind students of the relevance of these challenge problems in order to further motivate students. Ultimately, each student will come to the program with a unique background and goal and understanding these is critical when designing a review program that works for all students.

Despite the useful information obtained in this thesis, there are several limitations. First, there is the possibility of selection bias. These students will likely have had either a very positive or very negative experience in the program. Furthermore, the students who participated in all three surveys will not be students who participated very little in the KiSS program and are much more likely to be students with consistent participation. Also, it is not clear if this group of students is representative of the entire cohort that participated in the KiSS WB 2020 program in terms of race, ethnicity, mathematical capabilities, etc.

Secondly, the questions asked in the surveys may have been interpreted differently than intended. In particular, there were times when students' responses to questions indicated that they did not respond to the aspect of the program we intended to question them about. To support a more rigorous analysis, survey questions need to be validated against how respondents may interpret them (Desimone & Carlson Le Floch, 2004).

Finally, two students were interviewed over Zoom while the remaining eight responded to the extended feedback questions in a written survey. The interviews allowed the author to form a more complete picture of students than is possible from analyzing their written responses. Therefore, personally interviewing every student would lead to more and deeper insight into how students experience the KiSS program.

There are many paths forward in terms of future work and the exploration of the ideas discussed in this thesis in coming implementations of the KiSS program. It would be possible to adapt the program to capture all the findings of this thesis. However, in order to support comparisons to former implementations of the KiSS program, a baseline is required. Therefore, changing some days and keeping others in the format that they currently exist is advisable. For example, on Mondays the program could allow students to choose the difficulty of their problems. The program would keep 2's-Day Tuesdays the same and on Wednesday retain a normal KiSS day as was seen in this implementation. On Thursday students could choose to do even more problems than possible on 2's-Days, and on Friday students could be presented with extra resources for their problems. The weekend implementation could remain the same. It could also be a possibility to add hints and the ability to try problems again to every problem, including the challenge

problems. This could help students who are hesitant to try the challenge problems feel like they are supported and can succeed.

Furthermore, engineering education researchers have been investigating how the individual identities of engineering students affect their performance and progress in Engineering programs (Verdín , Godwin , Kirn, Benson, & Potvin, 2018). Collaborating with engineering education researchers to continue this work and understand how various student identities can be best supported could unlock more potential for the KiSS program.

Currently the KiSS program only serves students taking Engineering Calculus sequence at Arizona State University as reflected in the logo (Figure 96). With an improved understanding of how the program can be optimized, together with insight into student identity, the KiSS program could evolve to serve students in other sequential STEM courses. The ultimate goal is to design and develop a review resource that best fits the needs of every unique student and fosters success in their studies and eventual career path.

Figure 96

Keep In School Shape over Break



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APPENDIX A
ENROLLMENT MATERIALS

A.1 Email sent to instructors who taught MAT 265 in Fall 2020

I hope the end of the semester is going well for you and your students.

It's that time of year again. I am writing to inform you of the 2020 Winter **Keeping In School Shape** program specifically designed for students finishing MAT 265 and continuing into MAT 266. Let me tell you a little about the KISS program. It was designed by Dr. van de Sande with the goal to keep students thinking about MAT 265 material over the break in between classes. The hope is that this will also help students still feeling uneasy with MAT 265 key material get some practice with it before they jump into MAT 266. Please see the attached informational flier.

Another great thing about this program is that a donation will be made to charity for participation. Students will be able to choose which charity they are championing for and at the end of break the charity that has the most votes will receive a donation. Last year, the winter break program donated \$625 to the Cancer Research Institute! This year the charities focus on Covid-19 relief efforts. Please see the charity flyer for more information.

We would greatly appreciate it if you could:

- mention this program to your students in class
- distribute the following two fliers to your classes
 - Canvas announcement
 - Email
 - Piazza/Campuswire

We would like students to see it as many times as possible. I have also included a statement that you can copy and paste into your message to the students if you wish. Please see the attached word doc.

Furthermore I would like to inquire if it would be ok for me to stop by in one of your classes over the next two weeks and mention the program. I understand that with the semester coming to a close every minute of class time is valuable, so I can show up at the very beginning and start a little before class, or at the end. I promise I won't take up too much of your time.

If you have any questions please do not hesitate to reach out to me. We really hope to get a lot of students involved to help them succeed in MAT 266.

Many Thanks,
Jana Vandenberg
Graduate Research Assistant
480.285.6241
jevanden@asu.edu

A.2 Email sent to instructors teaching MAT 266 in Spring 2021

I hope the end of the semester is going well for you and your students.

I am writing to inform you of the 2020 Winter **Keeping In School Shape** program specifically designed for students finishing MAT 265 and continuing into MAT 266. Let me tell you a little about the KISS program. It was designed by Dr. van de Sande with the goal to keep students thinking about MAT 265 material over the break in between classes. The hope is that this will also help students still feeling uneasy with MAT 265 key material get some practice with it before the jump into MAT 266.

Another great thing about this program is that a donation will be made to a charity for participation. Students will be able to choose which charity they are championing for and at the end of the charity that has the most correctly answered questions will receive a donation. Last year, the winter break program donated \$625 to the Cancer Research Institute! This year the charities focus on Covid-19 relief efforts. Please see the charity flyer for more information.

As many students have already enrolled in their classes for the spring we would greatly appreciate it if you could email the students who will be taking MAT 266 with you next semester and talk to them about this program. There are two fliers attached that can be distributed to students. I have also included a statement that you can copy and paste into your message to the students if you wish. Please see the attached word doc.

Let's help these students have the most successful MAT 266 they can! If you have any questions please do not hesitate to reach out to me.

Jana Vandenberg
Graduate Research Assistant
480.285.6241
jevanden@asu.edu

A.3 Message given to instructors to pass on to students

Keeping in School Shape Winter 2020

Looking for an easy way to stay in shape for MAT 266? Take part in the Winter 2020 Keeping in School Shape program. It's as easy as opening a text message once a day. Students will be sent one MAT 265 review question everyday straight to their phone. These problems are specifically tailored to strengthen student's abilities in key MAT 265 topics that they will use further in MAT 266. After answering the daily question, if they did so correctly, they will receive an explanation and a choice for a challenge problem. If they answered incorrectly, they could get a hint and try it again. They will also be able to view the solution.

To participate students simply need to text a code name to 904 – 878 - 8689. They will receive a response from a five digit phone number with a short survey attached.

Every time a student answers a question correctly they will be asked to vote for a charity. The charity with the most votes at the end of the program will receive a donation based on the number of votes. Please note students are in no way obligated to donate the donations come from a sponsor. Last year \$625 were donated to the National Cancer Foundation.

Students will begin receiving their question of the day on December 7th. They can sign up anytime, pick and choose which days they want to answer a question, and stop anytime.

Follow us on social media or email us to get more information:

[Instagram: @keepinginschoolshape](#)

[Facebook: @keepinginschoolshape](#)

Email: keepinginschoolshape@gmail.com

A.4 Charity poster sent with resources to students

KiSS

American Red Cross

NO KID HUNGRY

ASU Foundation
Arizona State University

Student Crisis Fund

Pitchfork Pantry

Lost Our Home
PET RESCUE
Helping people.
Saving pets.

Last winter break, the program donated \$625 to The Cancer Research Institute.

This winter the KiSS program will donate \$ for participation to non-profit COVID-19 causes.

From: Carla van de Sande

A.5 Flier for KiSS Winter Break 2020

Questions? : carla.vandesande@asu.edu

Connect with other future MAT 266 students

A program to help you stay in shape for MAT 266 and do go

- Get one MAT265 review problem per day over break!
- Answer as many questions as possible to raise money for charity
- Stop whenever you want!
- Texted to you for free!
- Multiple choice!

SIGN UP NOW!
Just pick a code name and text it to



Start Date
December 7th

904 - 878 - 8689

APPENDIX B
PROBLEM REFERENCE

B. 1 Calendar of Problems

DECEMBER 2020						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
29	30	1	2	3	4	5
6	7 $\int 5u^2 du$ $\int 5u^{-1/2} du$	8 $f(x) = e^x$ $f''(x) = ?$ $f(x) = e^{-x}$ $f''(x) = ?$	9 $\lim_{x \rightarrow \infty} \ln x = ?$ $\lim_{t \rightarrow 2} \frac{1}{3} \ln(2-3t) = ?$	10 $\int \cos x dx$ $\int_0^{\pi/2} \frac{1}{\sqrt{1-\sin^2 \theta}} \cos \theta d\theta$	11 Expand $(x+1)^2$ Expand $(\frac{3}{x}+1)^2$	12 $\frac{d}{dx} \sin(4x) = ?$ $\frac{d}{dx} \sin^2 x = ?$
13 $\int u^{3/2} du$ $\int u \sqrt{u} du$	14 $\lim_{t \rightarrow \infty} e^t = ?$ $\lim_{t \rightarrow \infty} \frac{1}{2} e^{-t^2} = ?$	15 $u = e^{5\theta}$ $u = e^{-\theta/5}$ $du = ?$ $du = ?$	16 $\int \frac{3}{x} dx$ $\int \frac{1}{4x} dx$	17 $\int \frac{x}{2} dx$ $\int dx$	18 $\lim_{x \rightarrow \infty} e^x = ?$ $\lim_{t \rightarrow \infty} \frac{1}{5} e^{-t^5} = ?$	19 $\frac{d}{dx} (1+x)^{-1} = ?$ $\frac{d}{dx} (\frac{1}{1-x}) = ?$
20 $\frac{e^x}{2} dx$ $\int_{\pi/2}^{\pi} \frac{1}{2} (e^{-\theta})^2 d\theta$	21 $u = \sqrt{x}$ $du = ?$ $u = \frac{1}{\sqrt{x}}$ $du = ?$	22 $\sin \theta = \frac{x}{r} \Rightarrow \cos \theta = \frac{\sqrt{r^2-x^2}}{r}$ $\sin^2 \theta + \cos^2 \theta = 1$	23 $u = \sin(\pi x)$ $du = ?$ $1/x = 3 \sin \theta$ $dx = ?$	24 $\lim_{x \rightarrow 0^+} \ln x = ?$ $\lim_{t \rightarrow 1} (\ln 1 - \ln t) = ?$	25 Christmas	26 $r = \cos \theta$ $dr = ?$ $r = \cos(\frac{\theta}{3})$ $dr = ?$ $\frac{dr}{d\theta} = ?$
27 $\lim_{t \rightarrow \infty} \ln t = ?$ $\lim_{t \rightarrow \infty} \frac{1}{5} (\ln 5t-1 - \ln 9) = ?$	28 $\int \frac{1}{1+x^2} dx$ $\int \frac{1}{9+x^2} dx$	29 $\cos^2 x = ?$ $\int \sin^2 x dx = ?$	30 $1/x = 3 \sin \theta$ $dx = ?$ $\int \frac{1}{\sqrt{9-x^2}} d\theta$ (Hint: $\sin^2 \theta + \cos^2 \theta = 1$)	31 $2020 + \int_0^{367} x dx$ $2020 + \int_0^{367} dx = 2021$		2 $\int_0^{\pi/2} \frac{1}{\sqrt{1-\sin^2 \theta}} \cos \theta d\theta$

A D I L
L I A T E

2
 Problem Index Number from summer 2020
★ (Hint: $\sin^2 \theta + \cos^2 \theta = 1$)

January 2021						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1 New Year's Day	2 $\int u^{-3} du$
3 $\int \sin x dx$ $\int \cos(4x) dx$	4 $\frac{d}{dx} (\ln x)$ $\frac{d}{dx} \ln(7-x)$	5 Factor $x^2 + 3x - 10$ Factor $\frac{y^6}{4} + \frac{1}{2} + \frac{1}{4y^6}$	6 $\int \frac{2}{x} dx$ $\int \frac{1}{1+x} dx$	7 $\lim_{t \rightarrow \infty} e^{-t} = ?$ $\lim_{k \rightarrow 2} \frac{1}{k^2} e^{ks} = ?$ for $k < 0$	8 $u = e^2$ $du = ?$ $u = e^{1/x}$ $du = ?$	9 $\int u^{1/2} du$ $\int \frac{1}{\sqrt{u}} du$
10 $33 = 9 + 2x$ $du = ?$ $u = \sqrt{9+2x}$ $du = ?$	11 CLASSES START	12	13	14	15	16
17	18 ML King Day	19	20	21	22	23
24	25	26	27	28	29	30
31						

B. 2 Calendar of 2's-Days

2's days DECEMBER 2020						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
29	30	1	2	3	4	5
6	7 ¹	8 ²	9 ³	10 ⁴	11 ⁵	12 ⁶
13 ⁷	14 ⁸	15 ⁹ ² DE $u = e^{\theta/2}$ $u = e^{5/\theta}$ $\frac{du}{d\theta} = ?$ $\frac{du}{d\theta} = ?$	16 ¹⁰	17 ¹¹	18 ¹²	19 ¹³
20 ¹⁴	21 ¹⁵	22 ¹⁶ ² AT $\tan \theta = \frac{x}{5} \Rightarrow \sec \theta = ?$ $1 + \tan^2 x = \sec^2 x$ $\Rightarrow \tan^2 x = ?$ $\Rightarrow \int \tan^4 x \cdot \sec^4 x \sec^2 x dx = ?$	23 ¹⁷	24 ¹⁸	25 ¹⁹ Christmas	26 ²⁰
27 ²¹	28 ²²	29 ²³ ² AT $1 + \tan^2 x = \sec^2 x$ $\Rightarrow \tan^2 x = ?$ $\Rightarrow \int \tan^4 x \cdot \sec^4 x \sec^2 x dx = ?$	30 ²⁴	31 ²⁵	1 ²⁶ New Year's Day	2 ²⁷

2's days January 2021						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1 ¹ New Year's Day	2 ²
3 ³	4 ⁴	5 ⁵ ² AT Factor $x^2 - 1$ Factor $\frac{y}{4} + \frac{1}{2} + \frac{1}{4y}$	6 ⁶	7 ⁷	8 ⁸	9 ⁹
10 ¹⁰	11 ¹¹	12 ¹²	13 ¹³	14 ¹⁴	15 ¹⁵	16 ¹⁶
17 ¹⁷	18 ¹⁸ M.L King Day	19 ¹⁹	20 ²⁰	21 ²¹	22 ²²	23 ²³
24 ²⁴	25 ²⁵	26 ²⁶	27 ²⁷	28 ²⁸	29 ²⁹	30 ³⁰
31 ³¹						


B. 3 All problems

<p>Day 1 – Normal Day</p> <p>Daily Review Problem $\int 5u^2 du$</p> <p>Challenge Problem $\int 5u^{-1/2} du$</p>	<p>Day 2 – Normal Day</p> <p>Daily Review Problem $f(x) = e^x$ $f''(x) = ?$</p> <p>Challenge Problem $f(x) = e^{-x}$ $f''(x) = ?$</p>	<p>Day 3 – Normal Day</p> <p>Daily Review Problem $\lim_{x \rightarrow \infty} \ln x = ?$</p> <p>Challenge Problem $\lim_{x \rightarrow \infty} \frac{1}{5} \ln(2 - 3x) = ?$</p>	<p>Day 4 – Normal Day</p> <p>Daily Review Problem $\int \cos x dx$</p> <p>Challenge Problem $\int_0^{\pi/2} \frac{1}{\sqrt{1 - \sin^2 \theta}} \cos \theta d\theta$</p>
<p>Day 5 – Normal Day</p> <p>Daily Review Problem Expand $(x + 1)^2$</p> <p>Challenge Problem Expand $(x + 1)^3$</p>	<p>Day 6 – Normal Day</p> <p>Daily Review Problem $\frac{d}{dx} \sin(4x) = ?$</p> <p>Challenge Problem $\frac{d}{dx} \sin^2 x = ?$</p>	<p>Day 7 – Trivia Day</p> <p>Daily Review Problem $\int u^{3/2} du$</p> <p>Challenge Problem $\int u \sqrt[4]{u} du$</p> <p>Trivia Why did Isaac Newton invent calculus?</p>	<p>Day 8 – Normal Day</p> <p>Daily Review Problem $\lim_{t \rightarrow \infty} e^t = ?$</p> <p>Challenge Problem $\lim_{t \rightarrow \infty} -\frac{1}{2} e^{-t^2} = ?$</p>
<p>Day 9 – 2's Day</p> <p>Daily Review Problem $u = e^{5\theta}$ $\frac{du}{d\theta} = ?$</p> <p>Challenge Problem $u = e^{-9/5}$ $\frac{du}{d\theta} = ?$</p> <p>Related Daily Review Problem $u = e^{\theta/2}$ $\frac{du}{d\theta} = ?$</p> <p>Related Challenge Problem $u = e^{3/9}$ $\frac{du}{d\theta} = ?$</p>		<p>Day 10 – Normal Day</p> <p>Daily Review Problem $\int \frac{3}{x} dx$</p> <p>Challenge Problem $\int \frac{1}{4x} dx$</p>	
<p>Day 20 – Trivia Day</p> <p>Daily Review Problem $\lim_{t \rightarrow \infty} \ln t = ?$</p> <p>Challenge Problem $\lim_{t \rightarrow \infty} \frac{1}{5} (\ln 5t - 1 - \ln 9) = ?$</p> <p>Trivia Where does the ∞ symbol come from?</p>		<p>Day 21 – Normal Day</p> <p>Daily Review Problem $\int \frac{1}{1+x^2} dx$</p> <p>Challenge Problem $\int \frac{1}{9+x^2} dx$</p>	

APPENDIX C
SURVEYS

C.1 Entry Survey

Q1




Which types of problems, if any, did you struggle with in MAT 265? (Check all that apply.)

- Derivatives
- Integrals
- Limits
- Algebra
- None of them

NEXT

Q2



How much MAT265 content do you feel you ACTUALLY learned and will remember after break?

none of it	some but not much of it	about half of it	almost but not all of it	all of it
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

NEXT

Q3



Which types of functions, if any, did you struggle with? (Check all that apply.)

Logs

Inverse Trig

Algebraic (like polynomials and powers of x)

Trig

Exponential

None of them

NEXT

Q4

KSS

Keep In School Shape over Break

How confident are you going into MAT266?

😞 not at all!

😐 not very

😐 meh

😊 somewhat

😄 super duper!

NEXT

Q5



How did you hear about this program (Keeping in School Shape)? (Check all that apply.)

My MAT 265 instructor

My future MAT 266 instructor

email from the School of Math

saw a flier posted on campus

saw a flier on Reddit


heard about it from someone else

other:

NEXT

Q1

0% ————— 100%



After completing the KiSS program how confident do you feel about Calc 1 content?


😄 super duper!
 😊 somewhat
 😐 meh
 😞 not very
 😡 not at all!

How much did the KiSS program help you feel confident going into MAT266?

😄 super duper!
 😊 somewhat
 😐 meh
 😞 not very
 😡 not at all!

Q2

Q3

0%  100%

KSS
Keep in School Shape over Break

How confident do you feel about each of these concepts ?
(more stars = more confident)

Derivatives ★★★★★

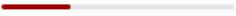
Integrals ★★★★★

Limits ★★★★★

Algebra/Pre-calculus ★★★★★

BACK **NEXT**

Q4

0%  100%



If you hadn't done the KISS program, would you have reviewed any Calc 1 skills over break?


No


Yes, I would have

BACK

NEXT

Q5

0%  100%



What kept you doing the KiSS program?
(Select ALL that apply.)

I liked the idea of doing math to benefit a good cause.

It was quick. No skin off my nose!

I wanted to impress my parents/friends by doing calculus over break.

I was bored over break and it gave me something to do.

I wanted to prepare for MAT 266.


I clicked on the link and then couldn't resist solving the daily problem.

Other/Additional comments:

BACK **NEXT**

Q6

0% 100%



How much did you like the following features of the KISS program?
(more stars = liked more)

It's from a person,
not a bot

Hints

Being able to try the
problem again

Harder problem
option

Problem solutions

Being told where I'll
see things in
MAT266

2's days

Occasional trivia
days

BACK **NEXT**

Q7

0%  100%



Which of the following options, if any, do you wish you had?
(Select ALL that apply.)

- Option to adjust the difficulty level of each daily problem
- Option to request more practice problems on each day
- Option to notify my MAT 266 instructor that I am participating
- Option to track how well I am doing over time
- Option to customize what topic the daily problem is (e.g. choose to do a problem with derivatives vs integrals)
- Option to engage with other students in the program
- Option to see how these concepts are applied in the real world
- Other/Additional comments:

BACK

NEXT

Q8

0%  100%



Can we contact you to talk about your experience with the program? If yes please give us your ASU email below!

Yes and here is my email

No

Space for any suggestions to improve the KISS program...

Q9

Please click on NEXT to submit your survey!

BACK

NEXT

0% ————— 100%



THANK YOU SO MUCH!

...and set your sights on





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C.3 Extended Feedback Survey

Extended Feedback Survey Introduction



Welcome to the survey!
Thank you for giving us your feedback!

Please note that you can stop taking the survey at any time and return to it when you wish. Your replies will be saved.

NEXT

Extended Feedback Survey Agreement



Before we begin please review the following consent information. By clicking on next you give your consent.

An Exploratory Study of Push Technology for Maintaining Proficiency and Promoting a Growth Mindset in a STEM Course

I am a graduate student in the School of Mathematical & Statistical Sciences at Arizona State University. I am working on a research study to design a program to develop an intervention (KISS) that will provide students with a daily multiple choice problem over break between Calculus 1 and Calculus 2.

I am inviting your participation in this survey. You have the right not to answer any question, and to stop participation at any time.

Your participation in this study is voluntary and is in no way connected with your MAT 266 grade. If you choose not to participate or to withdraw from the study at any time, there will be no penalty.

You must be 18 or older to participate in the study.

What you share about your experience will be used to guide the design of the next version of the KISS intervention. There are no foreseeable risks or discomforts to your participation.

Your participation will be kept confidential, and your responses will be only reported under a pseudonym. The results of this study may be used in reports, presentations, or publications but your name will not be used.

If you have any questions concerning the research study, please contact the research team at: keepinginschoolshape@gmail.com If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Chair of the Human Subjects Institutional Review Board, through the ASU Office of Research Integrity and Assurance, at (480) 965-6788.

Sincerely,

Jana Vandenberg

Graduate Research Assistant

Arizona State University

BACK

NEXT

Q1

K&SS
Keep Our Students Safe

First a little about you...

How do you identify? (gender/race/ethnicity)

Q2

Are you a first generation college student?

Q3	<p>What type of education did you have in k-12? (public, private, charter, home schooling, etc.)</p> <input data-bbox="483 321 1258 468" type="text"/>
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Q4	<p>What year in college are you? (freshman, sophomore, junior, senior, other)</p> <input data-bbox="462 903 1315 1060" type="text"/>
Q5	<p>What is your major?</p> <input data-bbox="462 1276 1315 1434" type="text"/> <p><input data-bbox="467 1602 565 1648" type="button" value="BACK"/> <input data-bbox="1221 1602 1318 1648" type="button" value="NEXT"/></p>

Q6



Tell us about your experience in Calc 1/MAT 265? Did you take it at ASU? When did you take it? How did you feel about the class?

Q7


Describe your relationship with math. Do you like it? hate it? ...

Q8

What is your mindset about math? Do you think you can improve with hard work or is math a skill you are born with? Or maybe somewhere in between? Please explain.

BACK

NEXT



Q9 What type of technology did you use to complete the daily problem? What type/brand of cell phone, laptop, tablet, etc.?

Q10 If you used a cell phone who is your provider?

Q11 Did you ever have any difficulty getting the daily problem? If yes, please explain.

BACK NEXT



Now a little bit about your Calculus KiSS Program experience...

Q12

How did getting a question right in the KiSS program make you feel?

Q13

Was this feeling different then how you feel getting a problem correct in class? For example on your homework or during lecture.

Q14

Did you read the feedback messages if you got the question right?

- All of the time
- Most of the time
- Might or might not have
- Usually didn't
- Never did
- I honestly don't remember

BACK

NEXT



Were the feedback messages you saw after answering a question right encouraging?

Q15

Was it getting the first question correct that encouraged you to try the challenge problem or something else?

Q16

BACK

NEXT



How did getting a question wrong in the KISS program make you feel?

Q17

Was this feeling different then how you feel getting a problem wrong in class? For example on your homework or during lecture.

Q18


Did you read the feedback messages if you got the question wrong?

Q19

- All of the time
- Most of the time
- Might or might not have
- Usually didn't
- Never did
- I honestly don't remember

BACK

NEXT

Q20	<div data-bbox="495 556 625 625"><p>KSS Keep it Short, Simple and Snappy</p></div> <p data-bbox="495 661 1274 745">Were the feedback messages you saw after answering a question wrong encouraging?</p> <input data-bbox="495 772 1364 835" type="text"/>
Q21	<p data-bbox="495 976 1364 1060">If you got the first question wrong would you still have wanted to see a harder question?</p> <input data-bbox="495 1087 1364 1150" type="text"/>
<p data-bbox="495 1312 600 1354">BACK</p> <p data-bbox="1291 1312 1364 1354">NEXT</p>	

Q22



Let us know what you thought about the hints... (hint hint)

Did you use the the hints?

- All of the time
- Most of the time
- Might or might not have
- Usually didn't
- Never did
- I honestly don't remember

BACK

NEXT



Did you find the hints helpful?

Please describe how you used the hints. Did you read the whole hint or just part of it? Did you write out the hint or just read over it?

BACK

NEXT

Q2
3

Q2
4



Next tell us how you felt about Trivia days and 2's-days...

Q25

Did you choose to do calculus and trivia on Sundays or just trivia? Tell us why you made that choice.

Just trivia

Text input area for response to Q25 (Just trivia).

Calculus and trivia

Text input area for response to Q25 (Calculus and trivia).


Q26


Did you like the trivia questions? Did you learn anything new by seeing the trivia?

Text input area for response to Q26.

BACK

NEXT

Q27	 <p>How did you feel about 2's-days?</p> <input type="text"/>
Q28	<p>On 2's-days did you do the additional problem?</p> <ul style="list-style-type: none"><input type="radio"/> Every time<input type="radio"/> Most of the time<input type="radio"/> Sometimes<input type="radio"/> Usually didn't<input type="radio"/> Never did<input type="radio"/> I honestly don't remember <p>BACK NEXT</p>

Q29	<div data-bbox="479 325 576 388"><p>KSS Keep a Student Engaged and Safe</p></div> <p data-bbox="462 420 1193 493">Did you feel more confident doing the second problem after completing the first?</p> <input data-bbox="462 514 1258 567" type="text"/> <div data-bbox="462 714 560 756">BACK</div> <div data-bbox="1161 714 1258 756">NEXT</div>
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Finally, a few questions about how we can improve the program...

Q30

Would you like to see a similar program during the semester?

Q31

Do you think the KISS program could have prepared you more for MAT 266? If so how?

Q32

If we could personalize this program more would that appeal to you?

Yes

Maybe

No

Q33

In what ways do you think we could personalize the program to help students succeed?

Q3
7



Would you be interested in participating in research regarding the Calculus KiSS program?

Yes

Maybe


No

If you have any other input please give it here:

Q3
8

BACK

NEXT

<p>Final Slide Extended Feedback Survey</p>	<hr/> <p>KSS <small>Keeping in School Shape</small></p>  <p>Thank you for giving us your feedback!</p> <p>ASU Arizona State University The Calculus Keeping in School Shape Program keepinginschoolshape@gmail.com</p> <p>Find us at: keepinginschoolshape@gmail.com Facebook @keepinginschoolshape Instagram @keepinginschoolshape</p>
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APPENDIX D
SURVEY REPOSSES

The transcripts and responses provided are all verbatim.

D.1.1 Student 1 Entry Survey Responses

	Responses
Q1	about half of it
Q2	Integrals,Limits
Q3	Logs,Inverse Trig,Trig
Q4	“meh”
Q5	email from the School of Math

D.1.2 Student 1 Exit Survey Responses

Q 1	Somewhat
Q 2	Somewhat
Q 3	4 3 2 5
Q 4	No
Q 5	I liked the idea of doing math to benefit a good cause., It was quick. No skin off my nose!,I was bored over break and it gave me something to do.,I wanted to prepare for MAT 266.,I clicked on the link and then couldn't resist solving the daily problem.
Q 6	5 5 5 5 5 5 5
Q 7	Option to request more practice problems on each day, Option to notify my MAT 266 instructor that I am participating, Option to track how well I am doing over time, Option to customize what topic the daily problem is (e.g. choose to do a problem with derivatives vs integrals),Option to engage with other students in the program

Q 8	Yes and here is my email
Q 9	

D.1.3 Student 1 Extended Feedback Survey Responses

Q1	Male, Southeast Asian, Sri Lankan
Q2	No
Q3	Public
Q4	Freshman
Q5	Electrical Engineering
Q6	I took it at asu during the fall semester of 2020. The class was challenging but not impossible.
Q7	I respect it and respect people that like it, but personally I,Äôm not the biggest fan.
Q8	I feel that some people are born with skill and some aren,Äôt. However I also believe those without can put in effort to at least match up with those born with it if not surpass them.
Q9	Phone
Q10	AT&T
Q11	No
Q12	Felt pretty good that I was learning/retaining knowledge
Q13	Yes as with class there slightly more satisfaction due to the fact that it counts towards your grade.
Q14	Most of the time
Q15	Yes
Q16	It was more I wanted to improve.

Q17	A little upset but more invigorated to do better next time.
Q18	Yes as there is less stress when you get it wrong in Kiss.
Q19	Most of the time
Q20	Yes
Q21	Sometimes.
Q22	Usually didn't
Q23	Yes
Q24	I read part of it and only read it over.
Q25	Calculus and trivia ; Because I felt I could learn some math and some trivia.
Q26	They were a nice change of pace.
Q27	Had no strong feelings about them.
Q28	Most of the time
Q29	No if anything the opposite usually.
Q30	Yes
Q31	
Q32	Yes
Q33	Probably hard to implement but allow students to pick subjects they struggle with.
Q34	
Q35	Very good motive to do good and check in every day.
Q36	Potentially.
Q37	Maybe
Q38	

D.2.1 Student 2 Entry Survey Responses

	Responses
Q1	some but not much of it
Q2	Derivatives,Integrals,Limits,Algebra
Q3	Logs,Inverse Trig,Algebraic (like polynomials and powers of x),Trig,Exponential
Q4	“not very”
Q5	email from the School of Math

D.2.2 Student 2 Exit Survey Responses

Q 1	somewhat
Q 2	somewhat
Q 3	4 4 5 5
Q 4	No

Q 5	I liked the idea of doing math to benefit a good cause.,It was quick. No skin off my nose!,I wanted to prepare for MAT 266.,Other/Additional comments: I am taking MAT 265 in A and MAT 266 in B this spring, so this really helped me prepare for the content I will be seeing next week! Thank you!
Q 6	5 5 5 5 5 5 5 5
Q 7	Option to request more practice problems on each day,Option to track how well I am doing over time,Option to see how these concepts are applied in the real world
Q 8	Yes and here is my email
Q 9	

D.2.3 Student 2 Exit Survey Responses

	Responses
Q1	Female/white
Q2	No
Q3	Public
Q4	Junior?
Q5	Biochemistry:)
Q6	I am currently enrolled in MAT 265 in spring A and taking MAT 266 in B
Q7	I am not a fan of math, and I think it boils down to not having a solid foundation in math. I still struggle with knowing how to study for math classes and tests to do well.

Q8	I think it can be improved with focus and determination, but also takes a certain person to really excel and naturally do math.
Q9	I would use my iPhone.
Q10	Verizon.
Q11	No problems
Q12	It made me feel like I could do well in the class.
Q13	Not really.
Q14	Usually didn't
Q15	Yes
Q16	Yes
Q17	Like I needed to learn the subject
Q18	No
Q19	Most of the time
Q20	Yes
Q21	No
Q22	Might or might not have
Q23	
Q24	
Q25	Calculus and trivia
Q26	They were fun
Q27	
Q28	Most of the time

Q29	
Q30	Yes
Q31	Maybe more problems
Q32	Yes
Q33	
Q34	
Q35	
Q36	
Q37	
Q38	

D.3.1 Student 3 Entry Survey Responses

	Responses
Q1	about half of it
Q2	Derivatives,Integrals,Limits,Algebra
Q3	Logs,Inverse Trig,Algebraic (like polynomials and powers of x),Trig,Exponential
Q4	“not very”
Q5	My MAT 265 instructor

D.3.2 Student 3 Exit Survey Responses

	Responses

Q 1	somewhat
Q 2	somewhat
Q 3	4 2 3 5
Q 4	No
Q 5	I liked the idea of doing math to benefit a good cause.,It was quick. No skin off my nose!,I wanted to prepare for MAT 266.
Q 6	5 5 5 5 5 5 5
Q 7	Option to adjust the difficulty level of each daily problem,Option to request more practice problems on each day,Option to notify my MAT 266 instructor that I am participating,Option to track how well I am doing over time,Option to customize what topic the daily problem is (e.g. choose to do a problem with derivatives vs integrals),Option to engage with other students in the program,Option to see how these concepts are applied in the real world
Q 8	Yes and here is my email
Q 9	

D.3.3 Student 3 Extended Feedback Survey Responses

	Responses
Q1	Man, Mexican, European
Q2	NO
Q3	Mexican private school which was an American school in which we had AP classes so basically a really good education.
Q4	Mexican private school which was an American school in which we had AP classes so basically a really good education.

Q5	Freshman
Q6	Electrical Engineering.
Q7	I took the AP Calc class AB. I did not master all the content.
Q8	I like it even though sometimes I finding too long.
Q9	I think you can improve with hard work.
Q10	Iphone 12 pro max.
Q11	I use Telcel its from Mexico.
Q12	No.
Q13	Really good.
Q14	It was way funner with the messages.
Q15	Never did
Q16	
Q17	No, just the fact that since there were not a lot of questions, which was good, I did not bother to do another one.
Q18	Lost in space.
Q19	Yes, I did not feel ashamed of myself.
Q20	All of the time

Q21	Yes.
Q22	yes.
Q23	Might or might not have
Q24	I do not remember what the hints were.
Q25	Calculus and trivia ; I had time so it was fun.
Q26	Yes.
Q27	Yes.
Q28	Every time
Q29	Yes.
Q30	Sure.
Q31	I do not know, so far no.
Q32	Yes
Q33	If you guys know what is coming in 266 then do the questions based on that. Like do not ask us something that is not going to be relevant.
Q34	Nothing.
Q35	I think that was one of the main reasons which I did this.
Q36	Yes, I think it would have been good to help choose the charities.
Q37	No
Q38	

D.4.1 Student 4 Entry Survey Responses

	Responses
Q1	about half of it
Q2	Derivatives
Q3	Logs, Inverse Trig, Trig
Q4	“not at all”!
Q5	email from the School of Math

D.4.2 Student 4 Exit Survey Responses

	Responses
Q 1	somewhat
Q 2	somewhat
Q 3	5 3 5 4
Q 4	No
Q 5	It was quick. No skin off my nose!, I wanted to prepare for MAT 266.
Q 6	5 5 5 5 3 5 5 1
Q 7	Option to request more practice problems on each day, Option to track how well I am doing over time, Option to customize what topic the daily problem is (e.g. choose to do a problem with derivatives vs integrals)
Q 8	Yes and here is my email
Q 9	

D.4.3 Student 4 Extended Feedback Responses

	Responses
Q1	Male/white
Q2	No
Q3	Public elementary, Private 7-12
Q4	I have completed a bachelors of aeronautical sciences with one school but am a sophomore at this school
Q5	Electrical engineering
Q6	I did not take this with ASU I took this bout 6 years ago. I also studied of winter break using the earned admission Mat 265 course.
Q7	I generally enjoy math
Q8	I think that it is something in between. Some people just have a greater number sense. However anyone can over come a challenge with hard work
Q9	I used a Samsung S9
Q10	AT&T
Q11	No
Q12	Like I was ready for Mat 266
Q13	Yes in class it is much higher stacks.
Q14	Most of the time
Q15	Yes
Q16	Yes, also it just felt like an opportunity for more practice.
Q17	Like I had areas of weakness but it did not make me feel bad.
Q18	Again the stacks are much different

Q19	Most of the time
Q20	Yes
Q21	Yes
Q22	Usually didn't
Q23	Yes they just helped guide me for what rule to use.
Q24	Just read what the rule was hinting at didn't spend much time on it
Q25	Calculus and trivia
Q26	I did not like the trivia questions I felt like I was there to do math not learn math history.
Q27	Loved them
Q28	Every time
Q29	Yes
Q30	Yes
Q31	I think it was very adequate
Q32	Maybe
Q33	Maybe not the anonymity is really nice.
Q34	Maybe links to videos about the rules used in the problems if we wanted more understanding
Q35	I put just the right amount of stakes on the questions and made me want to answer every day to get money for a charity.
Q36	
Q37	Yes
Q38	

D.5.1 Student 5 Entry Survey Responses

	Responses
--	-----------

Q1	all of it
Q2	None of them
Q3	Inverse Trig
Q4	super duper!
Q5	email from the School of Math

D.5.2 Student 5 Exit Survey Responses

	Responses
Q 1	somewhat
Q 2	super duper!
Q 3	5 4 4 5
Q 4	No
Q 5	I liked the idea of doing math to benefit a good cause.,It was quick. No skin off my nose!,I wanted to prepare for MAT 266.
Q 6	3 4 4 3 4 5 3 3
Q 7	Option to adjust the difficulty level of each daily problem,Option to notify my MAT 266 instructor that I am participating,Option to engage with other students in the program
Q 8	Yes and here is my email

Q 9	
--------	--

D.5.3 Student 5 Extended Feedback Responses

	Responses
Q1	Female/brown/south asian
Q2	no
Q3	private
Q4	freshman
Q5	Chemical Engineering
Q6	It was slow but I had to learn things from a college perspective way.
Q7	I like it cause it was pretty straight forward.
Q8	I think math is to the point and to make it that way anyone needs practice.
Q9	Samsung M31s mobile phone
Q10	AT&T
Q11	NO
Q12	Satisfied
Q13	Estatic

Q14	Most of the time
Q15	Yes
Q16	Yes
Q17	not satisfied
Q18	No
Q19	Might or might not have
Q20	yes
Q21	no
Q22	Usually didn't
Q23	no
Q24	no
Q25	Calculus and trivia
Q26	yes I did learn something new
Q27	Excited
Q28	Most of the time
Q29	yes

Q30	yes it would be awesome
Q31	I think it helped me just fine
Q32	Yes
Q33	Make progress reports about each student and then give them progressed based on the difficulty level
Q34	I can't think of anything now but I don't think additional stuff is required either
Q35	It was encouraging
Q36	I think you can try that so that money goes equally in every charity
Q37	Maybe
Q38	

D.6.1 Student 6 Entry Survey Responses

	Responses
Q1	about half of it
Q2	Integrals,Limits
Q3	Logs,Exponential
Q4	“not very”

Q5	My future MAT 266 instructor

D.6.2 Student 6 Exit Survey Responses

	Responses
Q 1	somewhat
Q 2	super duper!
Q 3	4 4 4 5
Q 4	Yes, I would have
Q 5	I liked the idea of doing math to benefit a good cause.,It was quick. No skin off my nose!,I was bored over break and it gave me something to do.,I wanted to prepare for MAT 266.
Q 6	5 4 4 5 5 5 4 5
Q 7	Option to adjust the difficulty level of each daily problem,Option to request more practice problems on each day,Option to notify my MAT 266 instructor that I am participating,Option to track how well I am doing over time,Option to customize what topic the daily problem is (e.g. choose to do a problem with derivatives vs integrals),Option to engage with other students in the program
Q 8	Yes and here is my email
Q 9	

D.6.3 Student 6 Extended Feedback Responses

	Responses
Q1	I am a Blasian(black Asian) male.
Q2	Yes, I am a first generation college student.
Q3	Public education.
Q4	Sophomore.
Q5	Mechanical Engineering.
Q6	I took MAT 265 during the fall semester of 2020. I felt like towards the end of the semester was when the concepts got challenging.
Q7	I am indifferent to math.
Q8	I can improve through hard work. If I find the concept difficult, it means I will have to practice more.
Q9	Laptop and phone. Apple brand.
Q10	AT&T
Q11	I did not.
Q12	I felt good about myself.
Q13	Yes. This is because it was during the break where I haven't used the previously learned concepts.
Q14	All of the time
Q15	Yes, it was.
Q16	Sometimes it does. It depends on the day/energy level.
Q17	I didn't really have much of a reaction.
Q18	I would be more upset if it was on a homework/lecture.
Q19	All of the time
Q20	They were helpful; not really encouraging.
Q21	It depends.
Q22	Might or might not have

Q23	Yes.
Q24	I read part of the hint.
Q25	Calculus and trivia; It is more beneficial than just trivia.
Q26	I like the trivia questions. It offered something different which is cool.
Q27	I like it.
Q28	Sometimes
Q29	Yes.
Q30	Yes I would.
Q31	It has since I can see some similar style problems in my class.
Q32	Yes
Q33	I am not sure.
Q34	I am not sure.
Q35	I loved the charity aspect. It motivated me to be consistent.
Q36	It is either more for me.
Q37	Maybe
Q38	

D.7.1 Student 7 Entry Survey Responses

	Responses
Q1	about half of it
Q2	Derivatives,Integrals,Limits
Q3	Logs,Inverse Trig,Trig,Exponential

Q4	somewhat
Q%	My future MAT 266 instructor

D.7.2 Student 7 Exit Survey Responses

	Responses
Q 1	super duper!
Q 2	super duper!
Q 3	4 4 3 5
Q 4	No
Q 5	I liked the idea of doing math to benefit a good cause.,I was bored over break and it gave me something to do.,I wanted to prepare for MAT 266.,I clicked on the link and then couldn't resist solving the daily problem.
Q 6	5 3 5 5 5 5 5 5
Q 7	Option to adjust the difficulty level of each daily problem,Option to request more practice problems on each day,Option to track how well I am doing over time,Option to customize what topic the daily problem is (e.g. choose to do a problem with derivatives vs integrals),Option to see how these concepts are applied in the real world
Q 8	Yes and here is my email
Q 9	

D.7.3 Student 7 Extended Feedback Responses

	Responses
Q1	Female, White, American
Q2	My mom dropped out of college, my grandmother graduated from community college, so I am not sure.
Q3	K was private school. Christian private from 1-6, started 7 in Christian private then moved to public halfway through. 9th was Vocational Technical school, 10-12 was normal public school.
Q4	Technically Junior due to credits.
Q5	Astrogeology
Q6	I took a series of Calculus classes at Shoreline Community College in Washington State. I enjoyed the classes, as I took the over the years of 2018-2020.
Q7	I love mathematics! When I was young my parents would give me scrap paper and I would make up math problems and solve them, then have my parents double check them.
Q8	Math is a sliding scale. Some is inherent knowledge, other parts need to be taught to be improved upon. Hard work is necessary though, and keeping your skills sharp is a great thing todo even if you don,Äôt take classes anymore.
Q9	Combination of my iPhone XR and my Apple Tablet. I use GoodNotes to write what I need to complete the problem and Desmos as my calculator if it is necessary.
Q10	AT&T
Q11	My brain crosses wires here and there due to how much I try to remember from math, so occasionally I would flip an answer backwards because I thought of it the wrong way. Overall it did help refresh my memory and uncross some wires that had gotten tangled.
Q12	Like my classes that I had already taken had paid off and I was learning properly.
Q13	Since I had been inactive in a math class since Spring 2020, getting a question right gave me much more joy due to the fact that I didn,Äôt have to look it up, but it was from memory.
Q14	All of the time
Q15	They were!
Q16	If I got the first question right, I wanted to push myself harder to see if it was a fluke or if I actually did know the material.

Q17	Made me realize that I needed to focus on that area more
Q18	Not really, just an area to focus on.
Q19	All of the time
Q20	Yep!
Q21	Yes, a second chance to apply the knowledge that had been gained from an incorrect answer would have been useful.
Q22	All of the time
Q23	Very much so! If I was unsure I would use the hints. If I was 100% positive I would use the hints to see if there was a different way of thinking about the problem.
Q24	I read over the whole hint and processed it, thinking about how it worked with how I was approaching the problem.
Q25	Calculus and trivia; While a break would have been nice, continuing to keep my brain active is necessary for me. The trivia was just a nice bonus.
Q26	I love trivia! Any time I can learn a random fact is wonderful.
Q27	The more questions the merrier!
Q28	Every time
Q29	Yes! The more I can work on consecutive problems, the better I feel about the types of problems
Q30	Yes please!!
Q31	If my school had offered something like this, I would have jumped on it.
Q32	Yes
Q33	Allow them to choose specific problem areas and number of problems a day.
Q34	Flagging a problem to receive more problems like it in the future until I am confident in my ability to complete that problem.
Q35	I love the idea!
Q36	Yes! I have a few concerns about one of the charities chosen, but the others were great.
Q37	Yes
Q38	Thank you so much for this opportunity! This helped so much with getting me ready for Semester B!

D.8.1 Student 8 Entry Survey Responses

	Responses
Q1	about half of it
Q2	Derivatives,Integrals
Q3	Logs,Inverse Trig
Q4	somewhat
Q5	My future MAT 266 instructor

D.8.2 Student 8 Exit Survey Responses

	Responses
Q 1	somewhat
Q 2	“meh”
Q 3	2 1 4 4
Q 4	Yes, I would have I used this as well as the khan academy program to help me remember the things I learned two years ago.
Q 5	I liked the idea of doing math to benefit a good cause.,It was quick. No skin off my nose!,I wanted to prepare for MAT 266.
Q 6	5 5 5 5 5 5 5 5
Q 7	Option to request more practice problems on each day,Option to track how well I am doing over time,Option to see how these concepts are applied in the real world
Q 8	Yes and here is my email

Q 9	
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D.8.3 Student 8 Extended Feedback Responses

	Responses
Q1	Male/Caucasian/American
Q2	No, my parents and grandparents have all received degrees.
Q3	Public Schooling.
Q4	Other. I have been in and out of college since 2007. I recently completed the requirements for a degree in Anthropology from ASU.
Q5	Physics.
Q6	I took MAT 265, the first time, in Spring 2018 and again in summer 2018. I had Professor Odish who is a phenomenal instructor. The first time I took it, I was overwhelmed and did not do well. The second time around I was able to better understand the principles and how they are applied in different ways.
Q7	I love it when it works out and find it to be the most frustrating thing on planet earth when it doesn't. It is an incredible field and is fun to learn about but it takes me longer, than what I consider average, to retain and understand the material.
Q8	Math comes easy to some and hard to others. However, with hard work and dedication it can be understood. People today just don't have the patience to look at their mistakes and try to figure out what they did wrong when they can just as easily find the solution on the internet. I am proof you can improve with hard work. I got a D the first time in MAT 265 and B the second time around. I feel it will be the same for MAT 266.
Q9	I received and completed the problems on my Iphone 10.
Q10	Verizon.
Q11	Never.
Q12	Like I got lucky. As it has been over two and a half years since I had to deal with those types of problems, I was rusty. There were a few I remembered, which felt good and made me want to do more like it.

Q13	Anytime I get something right is a boost of confidence. It shows that I am starting to understand the concepts and fundamentals of what is being taught.
Q14	All of the time
Q15	Yes, absolutely. I also appreciated all of the puns and wish there had been more.
Q16	It was the opportunity to keep getting things right that made me do more problems.
Q17	It was good and bad because I got it wrong, but it was also telling me what I needed to study more before my next class started.
Q18	Yes, in the sense doing the problems on my phone as a refresher wasnt going to impact my grades at all. So it was a better feeling than when in class or on homework.
Q19	All of the time
Q20	Yes, they helped provide a hint of what I needed to do and provided a different point of view on how to look at the question.
Q21	Not really, I think if you get the question wrong then there is a discrepancy in your knowledge of the problem and it should be redone until you get it right. Otherwise, it will only become more overwhelming.
Q22	Most of the time
Q23	Yes, they were very helpful.
Q24	I initially would scan it quickly to see if the formula, numbers, or method I used was off somehow and then I would go back and read the whole hint if I continued to not understand it.
Q25	Calculus and trivia; I needed the extra help and having a boost of trivia knowledge is always fun and uplifting.
Q26	Yes, they were fantastic and very fun to learn about. I wished there were more.
Q27	I enjoyed them and thought it was going to be expanded upon to three and four problems. However, 2's-Days did help me want to continue to refresh my memory on all things math.
Q28	Every time
Q29	Sometimes. I would if I got the first correct, otherwise, it added a little more stress.
Q30	Absolutely. I would even continue to do the problems during my MAT 266 course because I am finding myself going back over a lot of what I had forgotten.
Q31	I think if there was an option to increase or decrease the frequency and amount of problems given per day, I would have been more active in re-

	learning the material. However, the KISS program was nothing but helpful in getting me prepared and my shortcomings are my own.
Q32	Yes
Q33	Allow the students to select number of problems a day, time of day they would be received, and difficulty of the problems.
Q34	Video links on how to solve the problems should the student get them wrong. I personally love Khan Academy and have been using it more than the instructor videos, but it might also help you as graduate students to have a video of you solving the problem itself and breaking it down for us simpler folk.
Q35	It was one of the reasons I continued to do the problems. Absolutely loved it.
Q36	Nope, the ones you had were perfect for me and it was hard to pick just one.
Q37	Yes
Q38	I would be happy to help any way I can. As I am a believer in the "you can learn anything if you put forth the effort" mentality, I would be happy to answer any further questions regarding my past attempts at MAT 265, my study habits, or my life situations to try and help any other students who are struggling as I have.

D.9.1 Student 9 Entry Survey Responses

	Responses
Q1	about half of it
Q2	Integrals
Q3	Logs
Q4	"meh"
Q5	My future MAT 266 instructor, email from the School of Math, other:

D.9.2 Student 9 Exit Survey Responses

	Responses
Q 1	somewhat
Q 2	somewhat
Q 3	5 4 4 5
Q 4	Yes, I would have Reviewed information mostly using Khan Academy
Q 5	I liked the idea of doing math to benefit a good cause.,It was quick. No skin off my nose!,I wanted to prepare for MAT 266.
Q 6	4 3 3 5 5 5 5 5
Q 7	Option to adjust the difficulty level of each daily problem,Option to request more practice problems on each day,Option to see how these concepts are applied in the real world
Q 8	Yes and here is my email
Q 9	

D.9.3 Student 9 Extended Feedback Interview

Interviewer: Go and then let me just pull up the questions real quickly.

Participant: OK.

Interviewer: OK, here we go. So the first couple questions are just going to be a little bit about you. We've asked all the people who are giving us the extra feedback these questions. The first is how do you identify with gender, race and ethnicity?

Participant: How do I identify with gender, race and ethnicity? Male white Hispanic

Interviewer: OK, are you a first generation college student?

Participant: No

Interviewer: What type of education did you have? K through 12.

Participant: Public school.

Interviewer: Ok. What year are you in college and you can say freshman sophomore, junior, senior or other.

Participant: Junior-ish.

Interviewer: OK, returning student?

Participant: Returning student.

Interviewer: What is your major?

Participant: Electrical engineering.

Interviewer: So tell us your about your experience in calc one. If you took it at ASU. If you took it somewhere else, when did you take it and how did you feel about the class?

Participant: So I took calc one. I think it was 2017 through American Military University. And AMU is very much a degree mill. And the education I received was obvious of that. There were no limitations on the test of what you can use. They encouraged you using things like Wolfram Alpha to make life easier. So. My calc one was very much how to pass a test, not this is the how and the why we did this.

Interviewer: OK. Uhm, describe your relationship with math. Do you like it? Hate it somewhere in between?

Participant: I am not a fan of it. I do understand its importance in the world and of course engineering degree is very math heavy. However, I have found I'm always. I've always been fairly good at it, even though I don't care for it.

Interviewer: OK, what's your mindset with math? Do you think you can improve with hard work, or is math of skill you're born with somewhere in between that?

Participant: I think some people are a little bit more naturally inclined to math, but anyone can get there if they just. If they put in the work.

Interviewer: Ok. What type of technology did you use when you were completing the daily problem in this program? So did you use the cell phone, laptop, tablet?

Participant: So I would occasionally use my tablet. I used my tablet as my digital notebook. And I try to limit it to doing the problem once through without jumping on anything other than a basic graphing calculator for some of the equations. But I wanted to

make sure I actually understood the material and not go through things like Wolfram Alpha. So essentially a notebook and a basic Calculator. OK.

Interviewer: OK, and then you when you actually got the question you were answering it on your phone or were you answering it on your tablet?

Participant: That I was answering on my phone.

Interviewer: OK, and we did have some students that because of their cell phone provider they would not get the daily question on some days. So we're trying to narrow down what provider that is. So what cell phone provider do you have?

Participant: I use Verizon.

Interviewer: Verizon, OK, and did you ever have any difficulty getting the problem?

Participant: There was one day where the question at first wouldn't load. It said it was all already completed, but within a couple hours a new link was sent out.

Interviewer: OK. OK, sounds good. OK, so now a little bit more about your experience within the program. How did getting a question right in the program make you feel?

Participant: Good, it definitely helped me to know that my additional learning beyond what calc one taught me did pay off because I was able to. Remember some of that stuff, OK?

Interviewer: OK. And then was this feeling different than how you feel? Getting a problem correct in class? For example on your homework or when the teacher asks a question during lecture?

Participant: No, I'd say pretty similar OK.

Interviewer: Did you read the little feedback messages you would get if you got the question right? They usually came right after you completed the question.

Participant: I read them. I also screenshot them to save them for helping me out later.

Interviewer:

OK, and so were these feedback messages you got encouraging.

Participant: They were OK.

Interviewer: Yeah. Uhm, was it getting the first question correct? That encourage you to try the challenge problem or was it something else?

Participant: No, I think. Although when you got it wrong it didn't give you the option to do the challenge. I think I still would have tried because I just like to.

Interviewer: See where I'm at. OK, yeah, and that's the next question is if you had gotten the first question wrong, would you still have wanted to see a second, harder question?

Participant: For sure.

Interviewer: And so now on the opposite end, how did getting a question wrong in the KISS program make you feel?

Participant: Disappointed, but really only because I didn't get a chance to try harder one.

Interviewer: OK. Was this feeling different than how you felt getting a problem wrong in class?

Participant: No.

Interviewer: Did you read the feedback messages when you got the question wrong?

Participant: Yes.

Interviewer: OK, and were these encouraging?

Participant: Yes.

Interviewer: OK, so now these are some questions about the hints. Did you use the hints? If you got a question wrong?

Participant: I believed I used to hit once.

Interviewer: OK, did you find that hint helpful?

Participant: I did. It was a pretty simple thing I missed and I figured it was and it helped.

Interviewer: OK, so when you use that hint, did you just read the part that you needed? Did you read the entire hint? Did you write what the hint said down? Just describe how you interacted with that hint.

Participant: It was a smaller one, so I read the whole thing and then immediately went through and re-answered the question.

Interviewer: OK, so now we're going to talk a little bit about trivia days and Tuesdays. Did you choose to do just calculus? I'm sorry, just trivia on trivia days. Or did you choose to do calculus and trivia on trivia days?

Participant: I chose to do both.

Interviewer: You chose to do both OK, and why did you choose to do both?

Participant: I was doing this to get the calculus experience and the practice, so just trivia wouldn't have helped that.

Interviewer: OK, and did you like the trivia questions?

Participant: I did.

Interviewer: Ok, did you learn anything new?

Participant: I actually did yes.

Interviewer: Uhm, how did you feel about Tuesdays?

Participant: Those were nice. The extra opportunity the extra challenge was nice.

Interviewer: OK. And on Tuesdays, did you do the additional problem every time? Most of the time, sometimes, every time?

Participant: Every time.

Interviewer: Did you feel more confident doing the second problem after completing the first on those Tuesdays?

Participant: No, probably about the same.

Interviewer: OK. And so, these are a couple questions about how we can improve the program. Would you like to see a similar program during the semester so you get the exact same thing? It just runs through your semester?

Participant: I wouldn't be opposed to it.

Interviewer: OK, do you think the kiss program could have prepared you more for MAT 266 and if yes then how?

Participant: I think if questions were wrong a little bit more of a breakdown of pretty much the why and how to fix it in the future. I mean there was a little bit, but I think more of that would have been nice. Maybe even a link to a video covering that topic, whether it was at ASU produced something, or Khan Academy like I think that would have been helpful.

Interviewer: OK, so additional resources, video, PDF, something like that OK? If we could personalize this program more, would that appeal to you?

Participant: I think if it could be personalized based on how you were answering questions and what you're getting wrong and right, make it more difficult or easier as

needed. That would be helpful, but I also understand that that is a lot of work on the other end.

Interviewer: OK, so aside from you know what you just mentioned of making it less difficult or more difficult? Are there any other ways you think we could personalize it to help students succeed more?

Participant: Maybe a survey towards the beginning. I don't remember if there was one or not a survey towards beginning saying what you might need more help in and to start with that.

Interviewer: OK, so we did send out an entry survey and it kind of did ask it ask like ok what concepts did you struggle with in calc one? I think is how we phrased it on that survey and that was at the very beginning. So when you first said yes to the program. Uhm we haven't built the program yet to incorporate that. But that is one of the directions we're looking and going. Is taking that information and say OK this person wants to see more integral integral trig problems? And so giving that student more integral trig problems, so that's kind of what you're talking about, right?

Participant: Yeah.

Interviewer: Right OK, perfect. Uhm. So you kind of already touched on this, but what additional materials could we provide to help you succeed?

Participant: For sure, video links for Calc one, especially for some of the more I guess uncommon topics like right now. I'm actually struggling trying to remember a lot battles rule, so I've been going through Khan Academy to refresh on that. So I think some of them more. More resources video specifically on the less commonly known stuff, 'cause derivatives, derivatives. I think everyone picks up pretty quick. It's more specific rules that could be useful.

Interviewer: OK, and so now we're going to talk about the charity aspect. What did you think about that?

Participant: I thought it was nice. It was a little bit more motivation to try to push through and get the right answer.

Interviewer: OK, would you have wanted to help choose the charities and if yes, would you have been more invested if you had helped pick them?

Participant: No, I think the choices were good. I don't think I would have actually picked any different if I had the option, although I could see for some people that could be beneficial.

Interviewer: OK. Uhm, would you be interested in participating in research regarding this program?

Participant: Sure, why not?

Interviewer: OK, and do you have any other input for us at this time?

Participant: Not really, I think you pretty much covered it all.

Interviewer: OK.

Participant: Overall it was good. I enjoyed it. I liked getting that daily problem. It was nice and it was a good refresher so I wasn't completely cold going in.

Interviewer: OK, great. That is all the questions I have, so I will stop the recording.

D.10.1 Student 10 Entry Survey Responses

	Responses
Q1	about half of it
Q2	Derivatives,Integrals
Q3	Logs,Inverse Trig,Trig
Q4	“meh”
Q5	My MAT 265 instructor

D.10.2 Student 10 Exit Survey Responses

	Responses
Q 1	somewhat
Q 2	somewhat

Q 3	4 4 4 5
Q 4	No
Q 5	I liked the idea of doing math to benefit a good cause.,I wanted to prepare for MAT 266.,I clicked on the link and then couldn't resist solving the daily problem.
Q 6	5 5 5 5 5 5 5 5
Q 7	Option to adjust the difficulty level of each daily problem,Option to request more practice problems on each day,Option to notify my MAT 266 instructor that I am participating,Option to track how well I am doing over time,Option to customize what topic the daily problem is (e.g. choose to do a problem with derivatives vs integrals)
Q 8	Yes and here is my email
Q 9	

D.10.3 Student 10 Extended Feedback Interview Transcript

Interviewer: Okey dokey we are recording. There we go. And at anytime you are free to stop like it said in the consent form. If you want to stop answering the questions, you're free to do that. If you need to leave that's more than fine. We're going to start with a few questions just about you. How do you identify gender, race and ethnicity?

Participant: I'm a white male.

Interviewer: OK, are you a first-generation college student?

Participant: No

Interviewer: What type of education did you have in K through 12 with public, private, charter home schooling?

Participant: Public.

Interviewer: What year are you in college?

Participant: I don't really know. It's a great question.

Interviewer: OK, did you return to school or?

Participant: So I have I have my associates from another University, but it's kind of convoluted only because I thought they had an engineering program, but they did not. It was I was told and so when I came here, not all of my credits transferred. So somewhere between the freshman and sophomore, but I really don't know where I fall out. I never asked that question. But I have a lot of credits.

Interviewer: OK, somewhere between freshman and sophomore works.

Interviewer: What's your major?

Participant: Electrical engineering

Interviewer: OK, perfect now. Tell me about your experience with calc one. Did you take it at ASU? When did you take it? How did you feel about the class?

Participant: I took it in this last fall. I'm actually I'm weird. I like math I'm just not very good at it. But I enjoyed. It's actually one of my more enjoyable classes I've taken a long time for math. So get it.

Interviewer: Describe your relationship with math, which you kind of just did. You said you like it? But you don't feel like you're good at it?

Participant: I like it. I mean, I yes and no. It's one of the I'm assuming you're a math student. I didn't read your whole your whole email.

Interviewer: Yeah, I do have a bachelors in math and I'm working on a Masters in math, but I have a love hate relationship with. Math too so.

Participant: OK, so there we go. It's it's one of those things I like when you get it. It's beautiful, but so. Sometimes sometimes trying to get it, especially depending on how it's presented to be daunting. And yeah, and then I was. I just started Calc 2. It's like this this trigonometric substitution stuff I just I don't understand why it's even necessary. It's really cool. It exists, but.

Interviewer: Yeah.

Participant: In fact, there's calculators probably out there somewhere that can do this for you. At some point goodness. Yeah.

Interviewer: So with that in mind, what's your mindset about math? Do you think you can improve with hard work? Is it something you're born with somewhere in between that?

Participant: Uh, well I'm probably different 'cause I'm old, so I think I can improve on it, but I it's. My patience for it isn't always there so when they send the problems they really do take about half an hour to get through this wall. Right now, substitutions for Calc 1, even some of them you have to like, you know, go back and forth a lot and come on guys. They're like 3 months old and. Never on my own. Anyways, the uhm it gets it gets frustrating because I I'm active duty so I'm at work a lot and I have three kids and puppies, you know, so it's just.

Interviewer: Yeah.

Participant: So. Sometimes just putting out the effort is necessary to to really like like apply some of that stuff, it's frustrating, but I love all of it

Interviewer: Are you army? My dad was army.

Participant: No no better Navy.

Interviewer: Oh no, OK. Well we'll save that for later. Uhm okey dokey.

Interviewer: What type of technology did you use to complete the daily problem?

Participant: Well, it depends a lot of times I have. I get rid of all of my head pages, pages of notes and so I would always try to do it by hand first. But I'll tell you what. Uh, just because I have kids and one of the options where there was to feed kids, I didn't even know that was a thing. I'd often go on the internet sometimes and verify my answers were right before you submit it 'cause I wanted to make sure I could get that. I don't know how much money really is donated wherever, but I wanted to make sure. I thought it was a win win like I did math and somebody got fed look.

Interviewer: OK, yeah.

Participant: Like there's a. I don't know what it's called. I have to go search for again, so there's some integral Calculator on the Internet and it's really nice.

Interviewer: Yeah.

Participant: It breaks it down step by step, so if you get the wrong answer it'll show you like, hey, here's where you messed up, so that was neat.

Interviewer: OK, sounds good and did you get so when you actually answered the problem? Did you answer it on your phone or did you use a laptop or?

Participant: I was on my phone.

Interviewer: It was on your phone and what type of phone do you have?

Participant: iPhone.

Interviewer: OK, and did you ever have any problems getting the problem?

Participant: I think only once. I think there's only once.

Interviewer: OK.

Participant: No, no, no. It was my fault though, because I think I clicked the wrong, but I actually like to do this second problem or the extra problem.

Interviewer: OK.

Participant: I think I had to email professor is how you say her name van de Sande.

Interviewer: van de Sande

Participant: Yes. Sand OK, I did email or. Just to ask if. I could get it just so I could feel like I did it.

Interviewer: OK. And because sometimes we have students who, because of their provider, they don't get the questions. So we're trying to figure out which providers that is. What provider do you have?

Participant: AT&T

Interviewer: A T&T OK yeah. We had some people that just didn't get the question on certain days and we figured out that it had something to do with their provider blocking the question so.

Participant: Uhm? It's interesting. I mean, I I think came from what four different phone numbers I don't.

Interviewer: Yeah, so that's part of the problem that we're working on addressing.

Interviewer: OK, so now a little bit about your experience with the program. How did getting the question right in the KiSS program make you feel?

Participant: Like I was feeding kids I don't know.

Interviewer: OK.

Participant: Some of them were pretty were deceptively easy, but like like anything in math, one is too easy we look at. Like oh, I know what that is like. No wait a minute.

Interviewer: Yeah.

Participant: So some of them were pretty easy, especially at first, but. There's a couple of that I. Don't know, just. They just .. its good, it was bad.

Interviewer: OK.

Interviewer: Was this feeling different than how you feel getting a problem correct in class, like in lecture on your homework?

Participant: Uhm, I think the best feeling. Is when you finally figure out something you haven't been. But that's like that's like a unique experience. After that, it's just kind of like it's just. I wouldn't say it's better. I don't know if you ever have have any kind of even slight tendency to OCD, but like when you get something like organized right, it just feels great.

Interviewer: Yeah.

Participant: It's just I wouldn't say it feels good, so wrong answer just feels. This is being content like OK there we go, everything's in order. I feel I feel OK.

Interviewer: Did you read the feedback messages? If you got the question right.

Participant: It's a problem. Some of my I glance it and be like OK yeah so other ones like that. It's interesting math teachers and I guess I guess you'll go through this math teachers just have different ways of looking at things. There are different in the text or different or else. I'd read it, but this is not exactly the way I got to it, but interesting.

Interviewer: Oh so the solution? OK, I was talking about like in between getting the question right and doing the solution there would be like a little feedback message sometimes. Did you read those?

Participant: What like what?

Interviewer: Like they were typically. "Good job, you got this right. What do you want to do next?"

Participant: Oh yeah, oh, is it?

Interviewer: So like that little good job, you got those right?

Participant: Oh yeah.

Interviewer: OK yeah, so you did read those.

Participant: Yeah, I misunderstood you so.

Interviewer: Yeah all good and then the next question is where these encouraging when you saw them. It's OK if you don't remember exactly.

Participant: I wouldn't say that more just like. When you go to the go buy groceries, I don't know the word for this. I'm not very smart when you go buy groceries and then the the the checkout lady or person has to be politically correct. The checkout person is like hey how you doing? Fine? How about you? Fine, you know it's. Fine, you know.

Interviewer: OK, it's matter of fact.

Interviewer: Kind of, yeah.

Participant: It's it's like a matter of fact, kind of like hey here's like like like the requisite pleasantries that I have to insert because it's kind of awkward if we don't have like a transition.

Interviewer: OK.

Participant: I I didn't really think anything of it. I was just like.

Interviewer: OK, was it getting the first question correct that encourage you to try the challenge problem or something else? For you it sounds more like it was your personal drive.

Participant: It's actually a couple of things, so I I really do like math. I I do, I do and I try to get get to really like get in like like into it and so. I wanted to do it for me because I know like even though I bought and I'm looking at it, you can't see it. I bought this really nice nice little book. I kind of like it was. It's a some companion guide to calculus. It makes calculus way easy to understand, but I never have time to read. I'm like hey it's winter break I'm gonna read this sucker kind of brush up I didn't read it.

Interviewer: Yeah.

Participant: Not a little bit, so the other thing I liked most was that it kept me honest. So like hey, here's a math problem. You gotta do it. You gotta feed the kids, and that's that's.

Interviewer: OK, OK so now on the opposite side.

Participant: Kind of what what drove me.

Interviewer: How did getting a question wrong in the program make you feel?

Participant: Pretty frustrated. They did 'cause I was like some of them like. Honestly, like sometimes it's multiple choice, so like especially on your phone and I being distracted a lot I I will click on what I think is right. Kinda like it. 'cause I'm not. It's my fault as I you know you hold your phone not focused on like like there there we go you look at something else yeah wait no wait why did I click that so I get really mad at myself.

Participant: OK.

Interviewer: And so was that feeling different from getting a problem wrong in class, like in lecture on your homework.

Participant: Yes.

Interviewer: Yeah.

Participant: I felt so like I'm gonna keep coming back to this I feel responsible like I have a very very most people have very strong sense of responsibility. I can let myself. OK hey fella. I can let myself down and get past it, but I I really felt like like if I like I was part of contributing to something somebody that needed something and then. I could if I got it wrong, I was let it, they don't know, but I know in my heart that I could have done better and somebody could have benefited from that.

Interviewer: Yeah.

Participant: Its that that that part made me feel bad.

Interviewer: OK.

Participant: It's probably not what you expected. That's what worked for me.

Interviewer: No, but the I'm really excited for the charity section of this. For you. I think that would be really interesting. Uhm. Did you read the feedback messages? If you got the question wrong, so again, that's that little message before you decide.

Participant: Yes, I did.

Interviewer: Yes, OK? And then were they encouraging after you got the question wrong.

Participant: I don't like those measures I feel like encouraging or discouraging it's it's the same as before. It's kind of like OK, I get it. I done wrong.

Interviewer: OK. Uhm, if you got the first question wrong, would you still have wanted to see a harder problem, yeah?

Participant: Yes, every time I did.

Interviewer: OK, now we're going to talk about the hints. Did you use the hints?

Participant: Uhm? No, and that's a point of pride.

Interviewer: OK, so you didn't use the hints do to do. OK, so now we'll go to trivia days and Tuesdays. Did you do choose to do calculus and trivia on Sundays or just trivia and tell me why you made that choice.

Participant: I did everything every time.

Interviewer: OK.

Participant: Except for once, and I told you about that already yeah, email and get that.

Interviewer: Yeah.

Participant: So I don't know I thought it was interesting. I figure I could learn something more. Even just anecdotal stuff I I'm nerdy like that, so I like to tell my kids math jokes or interesting math math things and I'm the only dude at the parent. Whatever you take your kids to school in the summer, what is that called sign kids up for the new year? I don't know. It's alright, they will say. Here's the here's the science teacher for. Here's the whoever teacher it was like. OK, OK. I'm the I'm the one that my kids like please, Dad don't. Don't stand up and clap for the math teacher this year. But I do.

Interviewer: Love that. How did you feel about Tuesdays?

Participant: 2's-Day Tuesdays?

Interviewer: Yeah.

Participant: First time was like, oh. Man, I gotta stay here longer. But you know, it was fun. I I like getting through. It actually made me. I think, I think. The first one actually made me open my textbook. But I don't remember this at all. I don't know why. But I draw a big blank and I feel like a dummy.

Interviewer: OK. So on Tuesday, did you do the additional problem?

Participant: Yes

Interviewer: Was at every time or most of the time every time?

Participant: It was every time.

Interviewer: Uhm. Did you feel more confident during the second problem after completing the first?

Participant: Yeah, I felt I felt more like there's no pressure so you kind of like you can't and honestly the second problems were typically the exact same pattern as first problem, just a small variation. So it wasn't like it wasn't a whole new.

Interviewer: So you felt comfortable, kind of with the concept at that point.

Participant: Yeah

Interviewer: OK, so finally a few questions about how we can continue to grow and improve the program. Would you have liked to see a similar program running throughout the semester? So while you're in your MAT 266 class?

Participant: No. Wait, maybe. Maybe we're saying that question like like in parallel. Like at the same time.

Interviewer: So like that yeah, so that while you're in class, you also have the option for this program. So like it would run the same way, it's not connected to your grade for that class whatsoever. It's still like completely optional. You choose if you want to do it every day. Same exact thing just during the semester.

Participant: I'm gonna for for me. This is personal. I'm gonna say no.

Interviewer: OK.

Participant: It's only maybe maybe if I had. If the kids are all moved out and I like you know, or if I or I just no it's gonna be too much for me, it's already. Hard for me to get one class done at a time. Yeah. And making everything else.

Interviewer: Do you think the program could have prepared you more for MAT 266? The classroom now, and if so, how?

Participant: Yes, actually so so I'm glad you asked that one. I I don't know I'm gonna look at just at ASU's math progression. I don't think ASU, I didn't see anyone offers a trigonometry class. OK, not that I've seen and maybe.

Interviewer: OK.

Participant: I had a weird roundabout education, but I just wherever I go I seem to never get trigonometry ever. I mean it took Precalc. I took in fact. It's been so many years since I've done math. I went ahead just I volunteer I didn't have to, but I went I started at college algebra and then pre calc just having my my brain went back up to get back into math. Uh, and and Precal didn't pre calc. Sorry. We didn't talk about anything regarding trigonometry into like the last week of class and it was like the last four days of class. Kind of already knew which grade was and then like it was heavy. It was like some real hard trig questions and I'm like. I don't know basic trig, What do you want me to do with this? And so now now we're here in Cal Cal one. You kind of you touch on this stuff a little bit. I'm like, OK, I get the concepts. I got me one of those I don't know where it's at. Once again, look around for things you can't see. I'm sorry the little study guides at the fold out there marginally useful, like sometimes sometimes, which is garbage, but I got one for Trig, so I kind of like see see the the relationships. I'm like OK I got this I think. And now here in Cal two. Good God Oh my gosh like. Day one like hey, here's this. Here's this, you should understand these trigonometric identities and this and this and this, and I'm like. I got nothing so. I'm like I got nothing.

Interviewer: Definitely you would have wanted to see more trig support in the programs.

Participant: 1. This is as I know, as a long winded answer that's how I feel.

Interviewer: Yeah, no, I'm happy to hear that and get that feedback from you. So then if we could personalize this program more without appeal to you.

Participant: Yes so if like there's I, I mean, this program looks pretty good and well thought out, but I I don't know that it's like how far you guys are trying to grow it, but if there was, I don't know question bank and you can kind of either pick, choose your own adventure. Remember those books I'm dating myself or the if if. There was, it was intuitive somehow, like hey, you tend to get these types of questions wrong. Kind of start to focus more in this direction because this is apparently what you need. Something like that. Would be pretty cool.

Interviewer: Yeah, So what one idea we had was at the beginning. You'd get sent a questionnaire saying kind of like you. You did get an entry survey and it asked what you struggled with. Kind of. So for example, if you had chosen trig on that, we could then make sure that you got more trig questions and so for each student, we'd essentially take that entry survey and we'd personalize the program for them. So with that kind of go along with what you're saying.

Participant: That sounds awesome. It sounds ttime consuming on your guys end but

Interviewer: Yeah, well, it's. Something we're thinking of, and all the ways that we can grow the program. Uhm?

Participant: That would be awesome, and honestly, you might if you ask about Trig specifically, you might find more people are.

Interviewer: Yeah, that'd be an interesting trend to follow to see if that's something that like, you know, US education is kind of just missing out on in general.

Participant: ASU is missing out.

Interviewer: Yeah.

Participant: So.

Interviewer: So. What additional materials could we have provided to help you succeed like videos presentations? Is there anything specific you would have wanted to see?

Participant: Uh, for me, no. I mean, I think that a lot of the questions are pretty straightforward. And I don't think they're overcomplex, which was, I think was. Whoever thought about keeping basic questions was pretty smart, because if you're doing them over the Christmas break, I don't think anybody is going to buckle down for some. Of these bigger big ones.

Interviewer: Yeah.

Participant: You really have to like it, just kept your brain kind of like like, oh OK, I remember that the relationship between some stuff. So I don't know that people would stop and watch a video.

Interviewer: OK.

Participant: I don't know what your target age group is I guess. So I mean, for younger folk I. I can't. I can't imagine them. Pulling away from from I. Don't know, tik tok long enough to. To watch that video when there are schools around so.

Interviewer: OK, so now tell us what you thought about the charity aspect and you've kind of already touched on this.

Participant: I like that that's my motivation. 'cause I I do like to help people. The I I don't I don't know what the how. The options are picked. I don't know if it's a pre determined thing or or what it was. I it says match, you know it none of that matters. That's a tangent I don't want to follow

Interviewer: Don't want to follow? We're actually gonna ask about like picking the charity, so that's another question so you can touch on that there.

Participant: Cool God, I liked it. I found it. I found it motivational.

Interviewer: OK, and so would you have wanted to help choose the charities and would you have been more invested if you had helped pick them?

Participant: I think for some people, yes 'cause it's. Like honestly, I I I I this is gonna seem weird 'cause I have puppies. I'm not big into animals. I'm not. My family is so like if it's too specific like. Hey you can go, you can take care of these homeless animals. Ah, so I think I think finding something that touches people's hearts specifically is the way to win on. That, but not everybody is motivated. By that kind of stuff, but I kind of. Like, I. Have kids and I really feel for that. And you know, I've seen what happens when kids don't eat and that hurts me like it actually does. So that's an option. So yes, I'm gonna go for that. That kind of trumped everybody else but feeding bunch college kids that they could probably find a way to get a job. It would suck but they could or feed these young kids that are dependent on parents that have no money, you know.

Interviewer: Yeah.

Participant: You can no brainer but for me, but I think some people. If you have the conundrum of if you open it up to big where people can can pick anything, anything, like. I think it's just too. Hard to manage on you guys then and then it makes it makes it too much too daunting on the students in to pick one, so I guess.

Interviewer: Maybe include in that survey like hey, what would you like to see an if we see a bunch show up or we see one topic? Like if children is an overarching topic, we make sure there's one that's associated with feeding children. Something like that.

Participant: Yeah, that's probably the best way to handle kind of see could you at least kind of , I guess, solicit peoples interests. And figure out where where they're at. Other than that, yeah. What's the trouble you said about?

Interviewer: Would you be interested in participating in research regarding the Calculus Kiss program?

Participant: What would that entail?

Interviewer: So like for example, research credits, if you're a Barret student in Honors project.

Participant: I would love to. Be there but. I don't think I have the time or patience to dedicate. Towards that but.

Interviewer: Like research credit hours is a thing. I don't know how that would fit in your degree plan, but some degrees like it alot. Some use it as electives.

Participant: Oh, I see what you're saying. Oh, so it actually it could help contribute towards your your research, I suppose your degree.

Interviewer: Yeah, so there is. I'm pretty. I'm not like I said I'm not sure how it works for every degree plan, but I know that some degrees allow you to do like one credit hour of research and that's Or three credit hours. So like the size of a class and so for that semester you do research for like the length of three credit hours.

Participant:

No, that's I. I like the. Option I I know I. Look for people you know. My wife is a research scientist, so she's a lot of a lot of different research both in public and like look like you're doing. Kind of so I support it's good. I mean, it's only what learn is by doing

Interviewer: Yeah, so would you be interested in that? Or maybe no OK?

Participant: Personaly no I don't think I would do it but but I I do really support it I want it to happen, but I don't think I'm the right

Interviewer: OK.

Participant: Guy for it?

Interviewer: All good, do you have any other input you want to give me anything that wasn't included in the survey?

Participant: How about that?

Interviewer: Anything you wanted to say about the program in general?

Participant: Mmm. So. Not without getting too specific. So is van de Sande is she the one that kind of owns this program. Or is it because I happen to be going to her class? She's the one? How does that work?

Interviewer: She created the program so it's her research is this program and I'm a graduate student on her pro like research working on her research. So she created the program. I think it's been running for a few years now. I'm not quite sure how many years she's been doing it for, but it's been going and it's open to all students going from MAT 265 to MAT 266. So we send emails out to any student who was taking 266 at ASU in the fall and we send emails out to any student who is enrolled. Sorry was taking 265 and we send out any emails to any student who is enrolled in 266 in the spring. So if you for example didn't take ASU MAT 265 but you took calc one somewhere else, but you're still enrolled in 266, you would still get an email about it. So we're really looking for anyone going from calc one to Calc 2.

Participant: OK, so I'll tell you something that I don't know how to fit this in anywhere, but I did find beneficial, but I think it was just coincidental as well that I touched briefly on the way that the the answers were solved I think. That van de sande I'm sorry. I believe that's her solution and not the team solution. Is that correct?

Interviewer: I think she yeah she created all. The solutions herself.

Participant: And I say that just because I see kind of like the way that they're solved inside of the just recollecting when they were solved inside of there, and the way she's her zoom meetings go that when she's teaching. That actually kind of helped me be ready for how she presents ideas and solutions so I it might be a bit much, but depending on what your professor you're going to, if the solution was provided by the professor, you're going to be assigned to that might kind of help. I mean, that's that's kind of getting into the weeds now, and I think that's also asking a lot from a lot of people that may or may not want to participate in a research program 'cause it.

Interviewer: Yeah.

Participant: Entails work on the professor side to kind of come together. And thank you.

Interviewer: Well, 11. Thing we were thinking of doing too is asking different professors who are teaching these classes to submit problem. So at the very least, you're getting problems that your professor likes. You know that your professor has seen students traditionally struggle with, so that they know that it's getting in the program, and we know that's getting prepared. So because some teachers you know really like trig, some teachers really like integrals, so if we can ask all the ASU teachers teaching 266, you know, give us the problems. That you think are really important. We were gonna start funneling those in so that is one idea we had but I also love the way, the idea of asking you know these professors to submit solutions as well. Because you're right, you do see those like stylistic things that that teacher is very used to like do they always include the

definition in their solution, or do they always take this shortcut? So no, that's great. I really like that idea.

Participant: Yeah, and then I mean just kind of just expand on that so I I don't know it. Does J. Abrams does he still teach there?

Interviewer: I have heard that name before, but I'm not exactly sure where.

Participant: Isn't he in like half the videos in calculus one?

Interviewer: Oh yeah, that's OK. I think he does. I know that there's talk about refilming. Some of the videos. I'm not sure if it's the calc one videos, but I know that those videos are there. Yeah, I know which ones you are talking about.

Participant: So so I I watched a couple from him and Cal too and he is clearly earlier videos of him. The later videos had there in calculus one I. I think that that you came in his own because everybody has somebody different they can really. Connect with understand.

Interviewer: Yeah.

Participant: That man thinks like I do and I love it. OK. So he's presenting problem solutions like there's times I go back and try to find his stuff specifically.

Interviewer: Yeah.

Participant: That that that was making me think about the way they're presented in the the KISS program was was, was that 'cause there's just. I think we already touched on it is. Different people see it differently, so get in perspective sometimes is very valuable.

Interviewer: Yeah. OK, those are all the questions I have. I want to thank you again so much for giving us your feedback. It really is very helpful in helping us to, you know, expand this program, make it better. So that we can help more students in the future 'cause we plan to keep running. This will have another one going if anyone is taking 265 right now and taking 266 in the summer, alright, the fall will have one over summer so this is great. Thank you so so much for your feedback, yeah.

Participant: My question is, is it not? It there another one that goes from calc two to three.

Interviewer: Not yet, I. I can definitely put that down. Is. Is that something you would want to see?

Participant: I mean, yeah.

Interviewer: OK, I'll put that down.

Participant: It crosses a break, I think right now 'cause we're doing that. It's weird half semesters. It's like a weekend in between the two, so it doesn't really matter, but.

Interviewer: Are you in? Oh, you're taking A session and B session classes. 'cause those are the half semesters. I think you're frozen so I can't hear you right now. OK.

Interviewer: Now I can hear you again, sorry, my Internet was tripping.

Participant: I I lost you on the peace fingers.

Interviewer: Uh, so you were telling me I asked you if you're doing A session, and B session classes 'cause you said half semesters, so that's typically a session and be session.

Participant: Yeah I I was confused that stuff is called, it's it's it's from January to March is with this.

Interviewer: OK yeah OK yeah. Yeah, that should be in A session and then you're taking, so you'll be taking calc three like the second half of spring semester.

Participant: Yes.

Interviewer: Yes, OK, good luck. Calc Three was the hardest for me. I loved calc 2 but calc 3 was hard for me but as an engineer, engineers usually love calc three so that you'll probably like that.

Participant: We'll see this week, Terrible, so we'll see.

Interviewer: OK. Okey dokey that is all I will stop recording so that I make sure that I.

APPNEDIX E
APPROVAL DOCUMENTS

EXEMPTION GRANTED

[Carla van de Sande](#)

[CLAS-NS: Mathematics and Statistical Sciences, School of \(SMSS\)](#)

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Carla.Vandesande@asu.edu

Dear [Carla van de Sande](#):

On 2/2/2021 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	Keeping in School Shape: A Program to Encourage Review Over Academic Breaks
Investigator:	Carla van de Sande
IRB ID:	STUDY00013282
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	<ul style="list-style-type: none"> • Calculus Keeping in School Shape Program Protocol, Category: IRB Protocol; • Entry Survey, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • Exit Survey, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • Intervention Consent Form, Category: Consent Form; • Intervention Written Consent Form, Category: Consent Form; • Interview Questions, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • Interview Recorded Consent Form , Category: Consent Form; • Procedures Table, Category: Other; • Recruitment Flier, Category: Recruitment Materials;

	• Sample Intervention Problems, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions);
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The IRB determined that the protocol is considered exempt pursuant to Federal Regulations 45CFR46 (2) Tests, surveys, interviews, or observation on 2/2/2021.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

If any changes are made to the study, the IRB must be notified at research.integrity@asu.edu to determine if additional reviews/approvals are required. Changes may include but not limited to revisions to data collection, survey and/or interview questions, and vulnerable populations, etc.

Sincerely,

IRB Administrator

cc:

Jana Vandenberg