Chabot College
Program Review Report
2015 -2016

Year 3 of
Program Review Cycle

Mathematics

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___ *YEAR THREE*

A. What Have We Accomplished?

Complete Appendices A (Budget History), B1 and B2 (CLO's), C (PLO's), and D (A few questions) prior to writing your narrative. You should also review your most recent success, equity, course sequence, and enrollment data at http://www.chabotcollege.edu/ProgramReview/Data2013.cfm.
http://www.chabotcollege.edu/ProgramReview/Data2014.asp

In year one, you established goals and action plans for program improvement. This section asks you to reflect on the progress you have made toward those goals. This analysis will be used by the PRBC and Budget Committee to assess progress toward achievement of our Strategic Plan and to inform future budget decisions. It will also be used by the SLOAC and Basic Skills committees as input to their priority-setting process. In your narrative of two or less pages, address the following questions:

- What program improvement goals did you establish?
- Did you achieve the goals you established for the three years? Specifically describe your progress on goals you set for student learning, program learning, and Strategic Plan achievement.
- What best practices have you developed? Those could include pedagogical methods, strategies to address Basic Skills needs of our students, methods of working within your discipline, and more.
- Are these best practices replicable in other disciplines or areas?
- What were your greatest challenges?
- Were there institutional barriers to success?
- Cite relevant data in your narrative (e.g., efficiency, persistence, success, FT/PT faculty ratios, CLO/PLO assessment results, external accreditation demands, etc.).

Our goals from year 1 were to help students meet their educational math requirements in an efficient manner by working with local high schools, by creating pathways for students, by redesigning our courses, by increasing the number of workshops offered, by increasing the size of the math lab, and by forming cohorts. These goals are to support the Strategic Plan Goal of "Increas[ing] the number of students that achieve their educational goal within a reasonable time by clarifying pathways and providing more information and support."

Working with high schools

We have created a policy to accept Early Assessment Program (EAP) test scores, part of high school juniors' standardize test results, to place students directly into transfer-level math courses (College Algebra, Statistics, or Geom/Trig) in lieu of the Chabot Math Assessment and to provide options for students with conditional scores to maintain their eligibility. This directly connects the students' high school achievement with their placement at Chabot above intermediate algebra, to reduce the amount of remediation. Among students who took the Chabot Math Assessment between March and August of 2013, 48% of those who reported having taken calculus in high school and 74% of those who reported having taken College

Algebra/Precalculus in high school assess no higher than intermediate algebra; 28% and 31% of the respective groups assess into intermediate algebra. Accuplacer has been known to under-assess students, and the acceptance of EAP scores may help students who just need

Pathways

Creating pathways for students allows students to move through their programs more efficiently. We tried multiple strategies.

Student Programs

We worked with chemistry, biology, computer science and engineering disciplines to develop a schedule for students who have STEM (Science, Technology, Engineering, and Math) majors over the winter break. We created a schedule so that a student can complete his or her requirements in three years if he or she is starting at Calculus 1. The schedule coordinates the required classes that students need to avoid conflict for students and complements the need of other pathways. Math now offers six sections MTH 43 that fit the coordinated schedule created for allied-health students.

We added a new associate degree to our program called Transfer Module Curriculum in Mathematics. The students seeking TMC Math degree are required to complete some specific math courses and the total number of units needed is only 60 units. The students with this degree are assured of a place in math or math related majors in the California State University system.

The FYE has allowed us to start 35 of our STEM students at MTH 55 their first semester at Chabot. Many students put off their math until the end, so encouraging students to begin early has definite positive effects, as courses like physics computer science have math prerequisites.

The nursing program has begun using MTH 122 as remediation for their students not passing the Test of Essential Academic Skills (TEAS), a standardized test used by nursing program in the admissions process. It uses a computer learning and assessment system to allow students to individualize a program based on their particular skill set, rather than retaking a math course. It has been well-received by the nursing students who need it.

Course Redesign

To provide more relevant math curriculum for the liberal arts students, our new course MTH 53 *Intermediate Algebra and Data Analysis*, first piloted in Spring 2011, removes the algebraic mechanics that only STEM students need and emphasizes interpretation of the mathematical results and data modeling. Combining the content from both beginning and intermediate algebra courses, MTH 53 condenses these students' algebra requirement from two 5-unit courses to one 6-unit course, to satisfy the AA math requirement and be eligible for certain transfer-level courses, particularly Statistics.

The overall success rate for MTH 53 between Fall 2011 and Spring 2014 is 35%, where as it is 43% for MTH 65 and 46% for MTH 55/54(L) combined. While a 35% success rate at first may appear significantly lower than the other rates, keep in mind two things. First, students who take MTH 53 are likely to be weaker math students because this course is not suitable for students who need calculus as part of their education plan, so having a lower success rate isn't indicative of effectiveness of the course. Second, the multiplicative effect of going through two

courses puts the success rate for completing a beginning algebra followed by an intermediate algebra course at 0.43*0.46 ≈ 20%. This low rate doesn't even take into account that students don't all persist from one course to the next at 100%. Thus, we see that MTH 53 has definite positive effects on moving students towards completing their math requirement, as it has higher throughput rate through an algebra curriculum at 35% and at the same time saves the students a semester of time and fees for class.

Working with Other Subdivisions

We worked with the physics instructors to create a new physics sequence, Physics 3A and 3B, that will allow students to take one less math course and one less physic course to meet their physics requirement for the health sciences. The sequence has been submitted to the curriculum committee for approval.

Through the Hayward Promise Neighborhood (HPN) Grant, Doris Hanhan worked with faculty in the Early Childhood Department to develop a four day workshop to educate future preschool teachers about important Math concepts for preschool-age children, including Number Sense, Algebra and Functions, Measurement, Geometry and Mathematical Reasoning. It's part of HPN's "cradle to career" effort. In this joint Math/ECD workshop, future preschool teachers learned about the five Math foundations in detail, developed hands on Math projects, discovered Math concepts in everyday activities such as reading and singing, and learned to recognize how a project IS mathematical even if numbers aren't involved. Doris assisted with the development of the curriculum for the workshop and activities for preschool children that integrate the five Math foundations. The effort created Math kits that use everyday household products to pass along to the parents. The goals are to improve preschool teacher knowledge of Math, reinforce Math concepts both at preschool and at home so that children build their Math skills early on in their lives.

B. What's Next?

This section may serve as the foundation for your next Program Review cycle, and will inform the development of future strategic initiatives for the college. In your narrative of one page or less, address the following questions. Please complete Appendices E (New Initiatives) and F1-8 (Resources Requested) to further detail your narrative and to request resources.

Note: Chabot is in the process of creating our next Educational Master Plan which will last between six and ten years (under discussion). Educational Master Plans are generally large enough in scope to be flexible. They are used in particular at the District Level to guide in facility and community planning. (Program Review will not be the only way that we communicate our needs to the writing team)

- What goals do you have for future program improvement?
- What ideas do you have to achieve those goals?
- What must change about the institution to enable you to make greater progress in improving student learning and overall student success?
- What recommendations do you have to improve the Program Review process?

Program Review Process Improvement

In general, I will note that, for Year 3 of Program Review, it makes little sense for us to complete it in October, as there is no time for really examining the result from Year 2, which implemented whatever was funded through Year 1's request. In some cases, Year 2 is a coordination year (say you got funding to create a curriculum), in which case the data comes in over Year 3, not yet available for Year 3 evaluation. There's clearly a bit more to be thought out about the Program Review timeline.

Thus, I have found it difficult to limit my narrative here to one page and expand more in Appendix E for new initiatives because we have not had time yet as subdivision to think through what specific resources are needed and what goals to establish for the potential initiatives Appendix E requires. Hopefully, the headings in what follows makes it easier to plow through a long narrative.

Student Programs/Services

Schedule and Capacity

In creating a course offering for students based on a schedule that avoids conflict across the discipline within our division, the rotation of math singleton courses at night was disrupted. We need to examine that again to make sure we are serving the night students as well. This will be part of the effort to document best scheduling parameters of or courses that include the how and when the courses are offered. The coordinated schedule also called for offering two sections of MTH 1 at the same time.

To help students get through programs, we need to examine our program capacity. We need to determine how many beginning classes to offer the first semester to guarantee full

classes at the end of the program. We also need to consider how many students will be starting the pathway each year.

Our next goal within the division may be to create a schedule for our STEM students coming to Chabot starting in a math class below Calculus 1 by building upon the FYE.

Assessment, Diagnostic, and Placement

With changes in our MTH 65-55 sequence, we will have to revisit the Chabot Math Assessment test to make sure that that it aligns with the course content. However, what's more important is having the diagnostic capability to let students know their area of strength and weakness. Since the placement is by a cutoff score, students do not know what are the skills that they need to review before starting the semester to optimize their learning. Accuplacer currently has a diagnostic module that is not activated. We will work with the Assessment Center to find out more about it.

We will also explore diagnostic tools by other vendors, with the additional feature of linking remediation to the diagnostic result. This will be helpful for students, as it allows them to prepare themselves before starting a math course at Chabot. Creating a streamline for students to assess early, remediate, and reassess in time for registration will help them progress better. MTH 122 serves the remediation function to allow for reassessment before the mandated six-month wait time, but it is not at a scale to be made available for all students who assess.

Among students who took the Chabot Math Assessment between March and August of 2013, 48% of those who reported having taken calculus in high school and 74% of those who reported having taken College Algebra/Precalculus in high school assess no higher than intermediate algebra! How much of the high remediation rates even among students who took lots of math is due to lack of quality instruction or to students' needing a review before assessment remains to be teased out. Nonetheless, if Chabot as an institution can support integrating math assessment, remediation, and reassessment, even before students begin taking classes, then it would help students make faster progress toward completing their math requirement, as well as teasing out the question proposed above. This is popularly known as a version Math Jam.

Working with high school/adult school

There is a big challenge in the transition from high/adult school to college for students who take minimum amount of high school math. Though the high school exit exam (CAHSEE) nominally tests algebra, passing it is not indicative of mastery of beginning algebra. In fact, only 12 out of 80 questions on the CAHSEE are in the algebra standards.[1] With a low cutoff score to pass the CAHSEE, there is high probability that a student with a high school diploma but only took the minimal amount of math to graduate will have to start at beginning algebra at Chabot

[1] http://www.cde.ca.gov/ta/tg/hs/cahsee03mathbluprnt.asp

(MTH 65 or 53) or lower. This is discouraging to students because it appears to them that they are repeating what they have done in high/adult school, when in fact there is a gap in expected achievement level. The exit point from high/adult school often does not match the entry point.

To compound the difficulty on these students, Chabot classes cover the material twice as fast as high school classes, and for many students, a number of years have lapsed since their last math class. Thus, it is important to work with high schools so that their students understand how different math is here. Further, they need to understand that they really cannot just expect to walk into a community college and start without preparation. There are preparations involved, and math assessment/placement is one of them. We will need support to liaise with high/adult schools to make this aspect of transition as smooth as possible. We will also need to give them the information about the different math pathways here at Chabot so they know what to look forward to when they get here.

STEM Support

Another long-term goal is envisioning what a STEM Center would look like and the support it needs. Currently, we have mostly math drop-in tutoring by student tutors and math faculty. On a very limited basis, we also have science faculty staffing the tutoring center, but support in other disciplines is very limited. Do we want to and how do we expand this tutoring help for students? What other function does STEM Center serve—academic counseling (dedicated counselors), student workshops, career/internship opportunities? How can we expand MESA services to more general STEM student? To support current and future functions of the STEM Center, we need to have full-time and part-time classified support to manage and upkeep the physical center, to coordinate tutor and faculty tutoring schedules, etc.

In Fall 2014, we offered 15 sections of MTH 43 Statistics, the largest number of sections by far of the transfer-level math courses, even larger in number than the 13 combined sections of all calculus courses and of courses with a calculus prerequisite offered in this term. Yet, we have a shortage of faculty and student tutors to help statistics students. We need to find a way to train faculty to be able to help students in statistics. As the statistics faculty explore different methods of teaching the same content, the tutor training should also involve exposing stats tutors to curriculum that they did not experience. Hiring full-time faculty with training or strong background in statistics can support filling MTH 43 sections with qualified instructor and help with training of tutor and of faculty interested in expanding into teaching statistics.

In addition to academic programs, how do we as a division support STEM-related CTE fields? For her sabbatical, Anita Wah has done some research about stackable courses/certificates/programs that help students progress as they weave between education and career, with each step of education qualifying the student for the next career advancement/opportunity. Connecting practical math in CTE fields to the school math required in academic programs would be a place where Math can collaborate with others.

Curriculum

There are many ideas to explore in revisiting/enhancing the math curriculum.

STEM Pathway

We have just made changes in curriculum to MTH 65/55 (traditional Beginning and Intermediate Algebra) and to MTH 20 (precalculus). They are being implemented this year, so we will evaluate them next year.

To help student move through the STEM pathway, Math is working on piloting eight-week sessions of MTH 20 and MTH 1 (Calculus 1), both offered in sequence in the semester. We are working with Donna Gibson through MESA to develop an application process, as we don't believe an accelerated version is necessary the best delivery for all students. Besides offering workshops and tutors, we are considering pairing a core stem course (e.g. CHEM 1A) with the intensive math offering and having student sign contract that they will not take other courses at the same time.

It is a bit ironic that, while the liberal arts algebra curriculum emphasizes modeling and interpretation to be more relevant, these are the same skills that STEM students need in order to apply mathematics in science and engineering yet the STEM sequence mostly concentrates on algebraic skills. One long term goal Math has in the next five to ten years is to investigate how modeling and interpretation, long the emphasis in MTH 54 and MTH 53, can be effectively incorporated into the curriculum. Rather than to depend on commercial publishers to provide the right textbook, we may need to develop materials in-house. We may employ lesson study techniques to test out the materials we produce. These are aspects where we will need support for reassigned time for coordination or stipend/F-hour rate for developing material in a form for large scale dissemination.

Postponing Split in Pathways

Another idea for the curriculum is to consolidate the pathways in the beginning. A version of this idea funnels all students assessed at the beginning algebra level to take MTH 53. Since MTH 53 spans content from beginning and intermediate algebra, the students would complete their AA requirement and be eligible for transfer-level statistics. Then the challenge is to rethink what a curriculum would look like that prepares students to be ready for calculus in three semesters after MTH 53. This stacked curriculum has the advantage of all students starting at the same place, so students who need algebra remediation and are undecided if STEM is the field for them can begin making progress in math without making a choice early on. Another advantage is that we can be sure that students in the new curriculum are all interested in STEM and willing to put in the work for it, not just taking the course not relevant to them for the sole purpose of meeting the math requirement.

Basic Skills

Math will also need to take some long term view about the basic skills courses at the MTH 103/104 level. It has been previously documented that students who assess into a course

have higher success rate than those completing the prerequisite course, and we wish to explore ways to close that gap. One possibility is to create a problem-solving course to engage more of students' critical thinking before they enter algebra. We need to work out how that can be integrated into the course sequence without extending remediation too long.

Currently, the basic skills curriculum is set up to benefit those who need a quick review, not to teach concept development, as it is not possible to cover grades K-6 in one semester of MTH 103 Basic Math, which misses much of the Probability & Statistics and Geometry in the sixth grade Common Core State Standards (CCSS). There is also much redundancy between MTH 103 and MTH 104 Prealgebra; part of the reason is that students need the review, but they need the review after just having it the previous semester probably because they do not have the conceptual underpinning in the first place. We need to study this issue more, perhaps with the help of the Adult School faculty through AB86 Mid Alameda County Consortium.

Math also feels that we need to set some limit as to how far back to offer remediation. We feel that students who need more concept development than what we currently offer perhaps should be served by Adult School, as providing Adult Basic/Secondary Education (ABE/ASE) is part of their mission. We can explore offering their ABE/ASE classes here at Chabot so students can take other Chabot classes while they complete their math remediation.

Math is considering turning basic skills courses into non-credit, as a way to reduce the number of units that count against a student's financial aid 90 unit limit and also to widen the adjunct pool for those classes to candidates with bachelor's degree. We will explore how we may still get full apportionment for non-credit courses under the Career Development and College Preparation (CDCP) category.

Hiring full-time faculty with particular interests in basic skills and developmental education, not just someone who can staff unfilled sections, would bring much to address the issues above.

Academic Literacy

While academic literacy is across discipline and courses, we are thinking of specifically MTH 43 here, as statistics problems and projects involve more intensive reading- and writing than most other math classes. Students must read technical text to produce appropriate data summary and to understand the study design for proper analysis. Students must also interpret statistical test results in the context of the study and communicate them effectively in writing. For Spring 2014, the success rates in Math 43 are shown below, by the highest successfully English course completed by Fall 2014.

		Success		Non-success		Withdrawal		**Total**	
		Num	Pct	Num	Pct	Num	Pct	Num	Pct
MTH 43	ENGL 1A/4/7	274	**70%**	63	**16%**	52	**13%**	389	**100%**
	ENGL 102/101A/101B	35	**53%**	12	**18%**	19	**29%**	66	**100%**
	No English	87	**68%**	16	**13%**	25	**20%**	128	**100%**
	Total	396	**68%**	91	**16%**	96	**16%**	583	**100%**

The 70% success rate for the group of students having completed at least one transfer-level English course is significantly higher than the 53% for the group of students having completed at least one developmental English course (p = 0.0025). We suspect that the No English group has similar success rate as the ENGL 1A/4/7 group because they are probably students who have already graduated from another college and are here just to take statistics. Since MTH 43 is a bottleneck course, supporting students in this area would help them complete their education goal tremendously. Since English courses typically do not focus on technical reading and writing, support in academic literacy in statistic may also improve the success rates of those who have completed one transfer-level English course. Hiring a math faculty with experience and interest in quantitative and academic literacy would add to our efforts as we venture into this area. The same faculty would also likely contribute to the curricular content of MTH 53.

Appendix A: Budget History and Impact

Audience: *Budget Committee, PRBC, and Administrators*
Purpose: *This analysis describes your history of budget requests from the previous two years and the impacts of funds received and needs that were not met. This history of documented need can both support your narrative in Section A and provide additional information for Budget Committee recommendations.*
Instructions: *Please provide the requested information, and fully explain the impact of the budget decisions.*

Category	2013-14 Budget Requested	2013-14 Budget Received	2014-15 Budget Requested	2014-15 Budget Received
Classified Staffing (# of positions)			3	1
Supplies & Services		921	10920	921
Technology/Equipment			5000	5000
Other	2000	1000	10500	35
TOTAL	**2000**	**1921**	**26420**	**5956**

1. How has your investment of the budget monies you did receive improved student learning? When you requested the funding, you provided a rationale. In this section, assess if the anticipated positive impacts you projected have, in fact, been realized.

We have been receiving minimal budget money. They mostly go to supplies for daily classroom instruction, such as chalk, markers, erasers, rulers, etc.

The $35 under *Other* is for the entry fee for the AMATYC Math Contest, for which our students have performed well generally. We have ranked as high as 18th out of 186 community colleges recently in 2010-2011, so this contributes to showcasing or students' talents.

2. What has been the impact of not receiving some of your requested funding? How has student learning been impacted, or safety compromised, or enrollment or retention negatively impacted?

Not receiving $10000 in Supplies & Services for software and maintenance for a scantron machine to support SLO work turned out to be ok, as Institutional Research Office has stepped in to support our needs. Thus, the $5000 request for a scantron is no longer needed, but we are wondering if that money can be to used to compensate IR for supplies and clerical support related to SLO.

The impact of not receiving money for having a math retreat is that part-time and some full-time faculty do not know the changes that are occurring in the math discipline such as changes in the pathways, changes in course content, and changes in textbooks. We also do not get feedback from the part-time faculty about how their courses are going or the textbooks they are using. This affects our students as many times faculty do not use the correct edition of a text or the latest course outline when teaching math courses.

Not being able to go to Student Success Conference and math professional conference cuts off the faculty from ideas and innovations outside our conclave.

Appendix B1: Student Learning Outcomes Assessment Reporting Schedule

I. Course-Level Student Learning Outcomes & Assessment Reporting (CLO-Closing the Loop).

A. **Check One of the Following:**

Yes, CLO-CTL were completed for one or more courses during the current Year's Program Review. ***Complete Appendix B2*** *(CLO-CTL Form) for each course assessed this year and include in this Program Review.*

B. Calendar Instructions*:*

List all courses considered in this program review and indicate which year each course Closing The Loop form was submitted in Program Review by marking ***submitted*** *in the correct column.*

Course *List one course per line. Add more rows as needed.	**This Year's Program Review** *CTL forms must be included with this PR.	**Last Year's Program Review**	**2-Years Prior** *Note: These courses **must** be assessed in the next PR year.
Math 122	**X**		
Math 103	**X**		
Math 104	**X**		
Math 65	**X**		
Math 53	**X**		
Math 54	**X**		
Math 55	**X**		
Math 57	**X**		
Math 43	**X**		
Math 37	**X**		
Math 36	**X**		
Math 33	**X**		**X**
Math 31	**X**		

Math 20	**X**		
Math 16	**X**		
Math 15	**X**		
Math 1	**X**		
Math 2	**X**		
Math 3	**X**		
Math 4	**X**		
Math 6	**X**		
Math 8	**X**		

Appendix B2: "Closing the Loop" Course-Level Assessment Reflections.

Course	**ALL**
Semester assessment data gathered	**Spring 2014**
Number of sections offered in the semester	**82 sections combined**
Number of sections assessed	**79 sections assessed**
Percentage of sections assessed	**96.3%**
Semester held "Closing the Loop" discussion	**Fall 2014**
Faculty members involved in "Closing the Loop" discussion	**9**

Form Instructions:

- Complete a separate Appendix B2 form for each Course-Level assessment reported in this Program Review. These courses should be listed in **Appendix B1: Student Learning Outcomes Assessment Reporting Schedule.**
- ***Part I: CLO Data Reporting***. For each CLO, obtain Class Achievement data in aggregate for all sections assessed in eLumen.
- ***Part II: CLO Reflections***. Based on student success reported in Part I, reflect on the individual CLO.
- ***Part III: Course Reflection.*** In reviewing all the CLOs and your findings, reflect on the course as a whole.

PART I: COURSE-LEVEL OUTCOMES – DATA RESULTS

CONSIDER THE COURSE-LEVEL OUTCOMES INDIVIDUALLY *(THE NUMBER OF CLOS WILL DIFFER BY COURSE ★)*	*Defined Target Scores* (CLO Goal)*	*Actual Scores** (eLumen data)*
(CLO) 1: (Critical Thinking) Analyze mathematical problems critically using logical methodology.	**See SLO Attachments (p19-38)**	**See SLO Attachments (p19-38)**
(CLO) 2: (Communication) Communicate mathematical ideas, understand definitions, and interpret concepts.	**See SLO Attachments (p19-38)**	**See SLO Attachments (p19-38)**
(CLO) 3: (Development of the Whole Person) Increase confidence in understanding mathematical concepts, communicating ideas and thinking analytically.	**See SLO Attachments (p19-38)**	**See SLO Attachments (p19-38)**

★ **If more CLOs are listed for the course, add another row to the table.**

*** Defined Target Scores**: What scores in eLumen from your students would indicate success for this CLO? (Example: 75% of the class scored either 3 or 4)

****Actual scores:** What is the actual percent of students that meet defined target based on the eLumen data collected in this assessment cycle?

PART II: COURSE- LEVEL OUTCOME REFLECTIONS

A. COURSE-LEVEL OUTCOME (CLO) 1:

1. How do your current scores match with your above target for student success in this course level outcome?

See SLO Attachments (p19-38)

2. Reflection: Based on the data gathered, and considering your teaching experiences and your discussions with other faculty, what reflections and insights do you have?

See SLO Attachments (p19-38)

B. COURSE-LEVEL OUTCOME (CLO) 2:

1. How do your current scores match with your above target for student success in this course level outcome?

See SLO Attachments (p19-38)

2. Reflection: Based on the data gathered, and considering your teaching experiences and your discussions with other faculty, what reflections and insights do you have?

See SLO Attachments (p19-38)

C. Course-Level Outcome (CLO) 3:

1. How do your current scores match with your above target for student success in this course level outcome?

See SLO Attachments (p19-38)

2. Reflection: Based on the data gathered, and considering your teaching experiences and your discussions with other faculty, what reflections and insights do you have?

See SLO Attachments (p19-38)

PART III: COURSE REFLECTIONS AND FUTURE PLANS

1. What changes were made to your course based on the previous assessment cycle, the prior *Closing the Loop* reflections and other faculty discussions?

See SLO Attachments (p19-38)

2. Based on the current assessment and reflections, what course-level and programmatic strengths have the assessment reflections revealed? What actions has your discipline determined might be taken as a result of your reflections, discussions, and insights?

See SLO Attachments (p19-38)

3. What is the nature of the planned actions (please check all that apply)?

X – Curricular
X – Pedagogical
☐ Resource based
☐ Change to CLO or rubric
☐ Change to assessment methods
X – Other: _ See SLO Attachments (p19-38)

_____

Appendix C: Program Learning Outcomes

Considering your feedback, findings, and/or information that has arisen from the course level discussions, please reflect on each of your Program Level Outcomes.

Program: _Math AS _

- **PLO #1:** (Critical Thinking) Analyze mathematical problems critically using logical methodology.
- **PLO #2:** (Communication) Communicate mathematical ideas, understand definitions, and interpret concepts
- **PLO #3**: (Development of the Whole Person) Increase confidence in understanding mathematical concepts, communicating ideas and thinking analytically.

What questions or investigations arose as a result of these reflections or discussions?

See SLO Attachments (p19-38)

What program-level strengths have the assessment reflections revealed?

See SLO Attachments (p19-38)

What actions has your discipline determined might be taken to enhance the learning of students completing your program?

See SLO Attachments (p19-38)

Program: _Math AA _

- **PLO #1:** (Critical Thinking) Analyze mathematical problems critically using logical methodology.
- **PLO #2:** (Communication) Communicate mathematical ideas, understand definitions, and interpret concepts
- **PLO #3**: (Development of the Whole Person) Increase confidence in understanding mathematical concepts, communicating ideas and thinking analytically.

What questions or investigations arose as a result of these reflections or discussions?

See SLO Attachments (p19-38)

What program-level strengths have the assessment reflections revealed?

See SLO Attachments (p19-38)

What actions has your discipline determined might be taken to enhance the learning of students completing your program?

See SLO Attachments (p19-38)

Student Learning Outcomes for the Math Subdivision

After going through the SLO process in the Fall 2011, it was obvious that the process was broken—the data gathered was not meaningful, with its biased accumulation, its limited scope, and nearly empty results.

Faculty used different questions to assess the same CLO; the assessments were given at varying times during the semester; no consistent grading guidelines were followed.

Even if we discard the highly regarded and cherished notion of academic freedom and had the professors using a unified set of problems and a uniform grading rubric, the scope of the CLOs is rather limiting. To assess a student's performance based on limited select problems only addresses a small portion of the course's curriculum—easily less than 20% of the total expected learning outcomes listed in the course outline. It would be analogous to evaluating the effectiveness of a hospital's triage department by assessing correct usage of a blood pressure cuff.

The Mathematics subdivision met in Spring 2012. We decided to discard the previous method and its data. We needed to have a different method of assessment. Goals of the new method include:

- ***Broad scope.*** Mathematics contains fundamental concepts threaded through several courses. We cannot focus on one topic's instruction found in one course. There needs to be a way to look at this globally.

- ***Easy to administer and evaluate.*** Many of the concerns about the process we had set up was that the assessment had too much of a negative impact on teaching the course—vital class time is being used for assessment not linked to grades. Also, instructors were spending additional time grading and tabulating results. Anything to get time back to instruction would be vital.

- ***Useful data.*** The data gathered should paint a snapshot of the course—not a small percentage of the course's material.

- ***Respect Academic Freedom***. This process should not interfere with the foundations of instructor/student relationship—Academic Freedom. The focus needs to be on the course and not the instructor.

- ***Integration.*** There needs to be full integration between the established SLOs for math (CLOs, PLOs, and CWLGs) with Curriculum, Program Review, and Budget Requests.

While alternate solutions were being explored, an interim process was established. While we could not use the meaningless data from the previous CLO cycle, we still felt that we needed to comply with the goal of Student Learning Outcomes. We established a monthly meeting where faculty shared teaching best practices on a variety of topics (e.g., Generalizations, Graphing,

Utilizing Technology, Transition from Trig to Pre-calculus, etc.). These conversations proved beneficial and should be part of the new process.

The New Process:

PLOs and CLOs.

For each degree (AA and AS) as well as each of our courses the learning outcomes will be changed to:

1) (Critical Thinking) Analyze mathematical problems critically using logical methodology.

2) (Communication) Communicate mathematical ideas, understand definitions, and interpret concepts.

3) (Development of the Whole Person) Increase confidence in understanding mathematical concepts, communicating ideas and thinking analytically.

While these are clearly meant for the PLO level, they can also be used at the course level using material from the course outline. There will be more than one question that will target each of these three CLOs.

The reason for doing this is that by focusing on one topic from one course presents rather useless information to build a course of action for improvements. For example, gathering data on whether or not an algebra student can factor a trinomial does not address the root cause of what might be happening. By using multiple questions for each outcome, we have a variety of questions to pull from to assess those CLOs

These PLOs and CLOs could easily be shared with students. Our communicated statement could be: "Student Learning Outcome: Students will analyze mathematical problems critically using a logical methodology, communicate these ideas, understand definitions, and increase their confidence in interpreting, understanding, and communicating mathematical concepts." This could be placed on syllabi or on our website.

The Assessment:

Students will complete a twelve question multiple choice self-assessment survey. Ten questions will be problems based on the courses outcomes from the course outline—with at least two questions based on communicating information. Instead of asking students to perform the task and having instructors evaluate the data, for each problem, the student's choices are:

A. I know immediately what to do, and I know I will get this answer 100% right.
B. I think I can get this if I really think about it, and most likely do well on this problem.

C. I could do this problem if I had my notes or textbook; I don't know how well I will do.
D. If I had aid of a tutor while working on this problem, I could probably do it.
E. I have no idea how to do this problem.

Two other questions will target the confidence of the student:

Question 11.) Based on your performance in the class, what grade do you anticipate receiving?

Question 12.) Your confidence in math:

A. Has improved when you compare it to the beginning of the semester.
B. Is about the same as it was at the beginning of the semester.
C. Has gotten worse since the beginning of the semester.

By making this shift from evaluating completed problems to self-assessment offers a different perspective on the learning process. It also allows for uniform assessment across all sections of a course, by removing discrepancies in which questions are used and how they are graded between instructors. (A sample survey is in Appendix A o p26.)

Gathering the Data.

A simple mechanism is to be used to collect the student response; a common "bubble in" form used during class will ensure that a significant number of students will participate, while minimizing the impact to class time.

During the assessment process in Sp 14, the surveys took at most 10 minutes to complete in each section—significantly minimizing the impact to class time. 79 of the 82 sections completed the survey. Math 33 is only taught in the Fall; it will be assessed in Fall 14. MTH 122 was administer by e-mail with poor result, so it will be reassessed in Fall 14.

The inputting of the data was done using a reader with appropriate software, saving time over grading. Instructors deposited the completed forms in the division office, to be scanned. The data will not only show students' results, but also which sections have participated. This will ensure compliance to a significant sample size.

IR's group scanned the surveys to provide an Excel spreadsheet with student answers.

For each student, his or her individual median score is determined. That student's score for each question is compared to his or her individual median. If the question yielded a score less than or equal to the median minus one, then the question is deemed to be a low outlier. By comparing the ten responses in this manner, we are essentially asking the student where his or her weaknesses are. It is the spread of the scores that help identify the lower outliers—not if the student over or under estimates his or her performance or if the student scores each question with the exact same answer. (See Appendix B on p28 for sample computation.)

For each question a percentage of students with that question as a low outlier is determined, and the questions are ranked for each class. This ranking is what is used in the Closing the Loop discussions. The results from Spring 2014 are included in Appendix C on p29.

Closing the Loops

After all courses are assessed and the data has been tabulated and ranked, we met twice to identify topics, trends, and behaviors to work on for all our courses. The first meeting (on 9/2/14) focused on Course Level Outcomes, and the second one (on 9/24/14) focused on Program Level Outcomes—but during the robust discussions, it was hard to separate the two levels as we discovered that CLO and PLO results are intrinsically integrated.

The discussion was not limited to the survey alone, but included our insight from our experiences as math instructors. We analyzed our data using diverse lenses—curriculum, budget, program level, pathway level, course level, etc. These identified topics/action items below will be the subject of our Monthly Meeting of Mathematical Minds (M4) for the next three years.

It is our opinion that the results from our survey are indicators of issues and should not be used as a sole source of the discussion.

For our first meeting of M4—which also doubled as our PLO discussion—our focus was on program level outcome results. In addition to coming up with a list of program and curriculum topics, we dove right in to start working on issues that came from our SLO results.

First, we evaluated the disconnect between the students' perceived performance and their actual performance in 103, 104, 65, 55, 53, and 37 courses. We compared these program level courses results with the content from the course level and we found that students struggled with foundational concepts—concepts that carry them through to the next course in the sequence. With the majority of our faculty teaching the higher level courses, we do not have enough full time faculty to fully support the broad spectrum of math classes. We are stretched thin. We need additional full time faculty to close this gap in spectrum support. It is feared that with our shrinking number of full time faculty, that we could not effectively implement changes resulting from our SLO discussions for all courses, thus making any discussion surrounding learning outcomes moot.

Another Program Level discussion also surrounded the topics from the 103, 104, 65, 55, 53, and 37 courses. Most topics that appeared at the top of the respective lists are foundational in nature with connections to prerequisites. Our discussion also brought up the validity of our placement exams—are they placing the student in the appropriate class? We decided to investigate not only the validity of the exams but if there were other placement exams in the market. We will follow up in a future M4 discussion to discuss the results.

A third discussion from that meeting was when we noted that Math 53 has a very low success rate. Students feel that they are performing higher than what they are actually doing. But then

those students who do continue in the subsequent Math 43 class are succeeding at a much higher rate. We posed a question: is there a problem with Math 53 or is the low success rate a natural result when compared with the success rates for students taking the 2 semester 65/55 sequence? We decided to table this discussion for a future meeting as well as more data would need to be gathered.

Please note: it would be highly cumbersome to superficially solve all these problems in one or two Closing the Loop discussions. The discussions for addressing each of the list of topics/issues will be spread out over the next few years so that we can devote an adequate amount of time for each topic. Our next M4 meeting will address using technology as an aid to instruction for our algebra students.

The following are topics/issues that will be discussed at future M4 meetings:

Program Level

- Multiple New Full Time Faculty Members
- Technology as a Tool for Instruction
- Placement Exam Revision

Curriculum

- Math 36/37 into 20 Transitions
- Math 20 to prepare for Math 1, 2, 3, 4, 6, and 8.
- Converting Math 103/104 into Non-Credit
- Using results to compare old 65/55 to new 65/55 sequence.
- Success in 53/43 vs. 65/55/43 compared to 53 vs. 65/55

Pathway Level (Topics Spanning Across Several Courses)

- Definition of Functions
- Inverse Functions and their Domains and Ranges
- Polar Coordinates
- Visualizing Topics
- Interpretations / Applications

Course Level (Topics Limited to One or Two Courses)

- Percents
- Variation
- Pt-Slope Equations
- Taylor Series
- Binomial Distribution

Follow Up Assessments:

When subsequent assessments are done we can compare the two results. We will know that we were successful if the problem no longer is identified high in the ranking of low outlier percentages. If it does remain, then we know that we did not achieve the goal; further analysis will need to be done. This might include adjustment to the actual questions used on the assessment.

Confidence in Math

The goal of the SLO process is to identify gaps and work to close them as a team. The Math subdivision has identified this process as a way of determining areas for improvement. This method does provide additional insight not found through traditional direct assessment—a student's confidence in the material. A lack of confidence in math is one of fundamental issues we face; now here is another method for quantifying it. See Appendices E p, F, and G (p36-38) for the results.

Validating the Indirect Method

Some questions have come up regarding the validity of the data, since it is using an indirect method; the data does not come from a direct assessment of student understanding.

For Spring 2014, Robert Yest compared his student's final exam solutions (from his Beginning Algebra, Intermediate Algebra, Pre-Calculus, Calculus I, and Discrete Math courses) to the SLO results for each of the five courses. Since the nature of the final exam questions was intrinsically different from the SLO questionnaire, it would not make sense to compare numbers quantitatively. Instead, a qualitative ranking was created based on the percentage of students who had some conceptual mistake on the final exam. The two rankings were compared, and in the five courses there is a strong similarity between the corresponding rankings. The results are attached in Appendix D on p34.

We believe that our students understand their gaps in knowledge. Listening to them offers us nearly the same results as if we directly tested them and yet offers additional information regarding confidence not found in an exam. We do not believe that our Closing the Loop discussions would have been any different.

In Conclusion

The math division believes that this process is the best process to balance—and still meet—the objectives we had set for ourselves when we overhauled our system.

This assessment is incredibly easy to administer. Between 5 to 10 minutes of unsupervised class time was generally needed. Many instructors multitasked by having the students fill out the survey as the instructor was passing back items. There was no time spent on grading assessments, as there was no grading. The only post assessment resource used was our IR department scanning the bubble forms. 79 out of all 82 sections completed the survey, an incredibly strong turnout.

The data is robust that we can continually mine for topics for improvement in instruction. The Post Closing the Loop process is continual; its format is flexible so that we can address identified program, pathway, curriculum, and course specific issues in depth and in a manner where suggested changes can be rolled out effectively and efficiently. We see the problem using a global view, and act on it locally.

The process is deeply integrated with the course outline of record while definitively mapped to the Course Learning Outcomes, Program Learning Outcomes, and finally College Wide Learning Goals.

Finally, we believe that this system balances the multi-faceted—sometimes contradictory—demands of the Student Learning Outcomes in a way that puts the focus back into improving instruction. It minimizes the cumbersome and time-consuming administrative aspects of what was being done in prior versions, allowing us to create a venue for sharing ideas and starting conversations. These conversations are ongoing, evolving, thriving, and not static.

Appendix A:

Mathematics 55 • Intermediate Algebra

Course Assessment Survey

For the questions 1–10, you are asked if you can do the problem, or if not, what level of support would you need. You are not asked to work out the answer. This is an anonymous survey; your instructor will not know your choices. Also, your instructor will not be evaluated on these results. Your honest opinion is vital to the success of this survey.

Use the following scale for each question. Mark your answers on the answer sheet provided.

A. I know immediately what to do, and I know I will get this answer 100% right.

B. I think I can get this if I really think about it, and most likely do well on this problem.

C. I could do this problem if I had my notes or textbook, and I don't know how well I will do.

D. If I had aid of a tutor while working on this problem, I could probably do it.

E. I have no idea how to do this problem.

———————————————

1. Solve $3x^2 - 11x + 5 = 0$ using the quadratic formula.

2. Solve the inequality $|2x - 5| \le 7$

3. Determine the inverse of the one to one function $f(x) = \frac{1}{x - 3}$.

4. Divide and simplify $\frac{2 + 5i}{4 - 3i}$.

5. Solve the equation $\sqrt{2x - 5} + x = 10$

6. A town's population is 12,000 and growing at a rate of 6% per year. How long will it take for the town's population to reach 15,000?

7. Describe in your own words the definition of a function.

8. Sketch the graph of $f(x) = \left(\frac{1}{2}\right)^x$

9. Express the domain of $f(x) = \log_3(x - 2)$ in interval notation.

10. Rationalize the denominator for $\frac{2x}{\sqrt[3]{18x^7y^2}}$.

———————————————

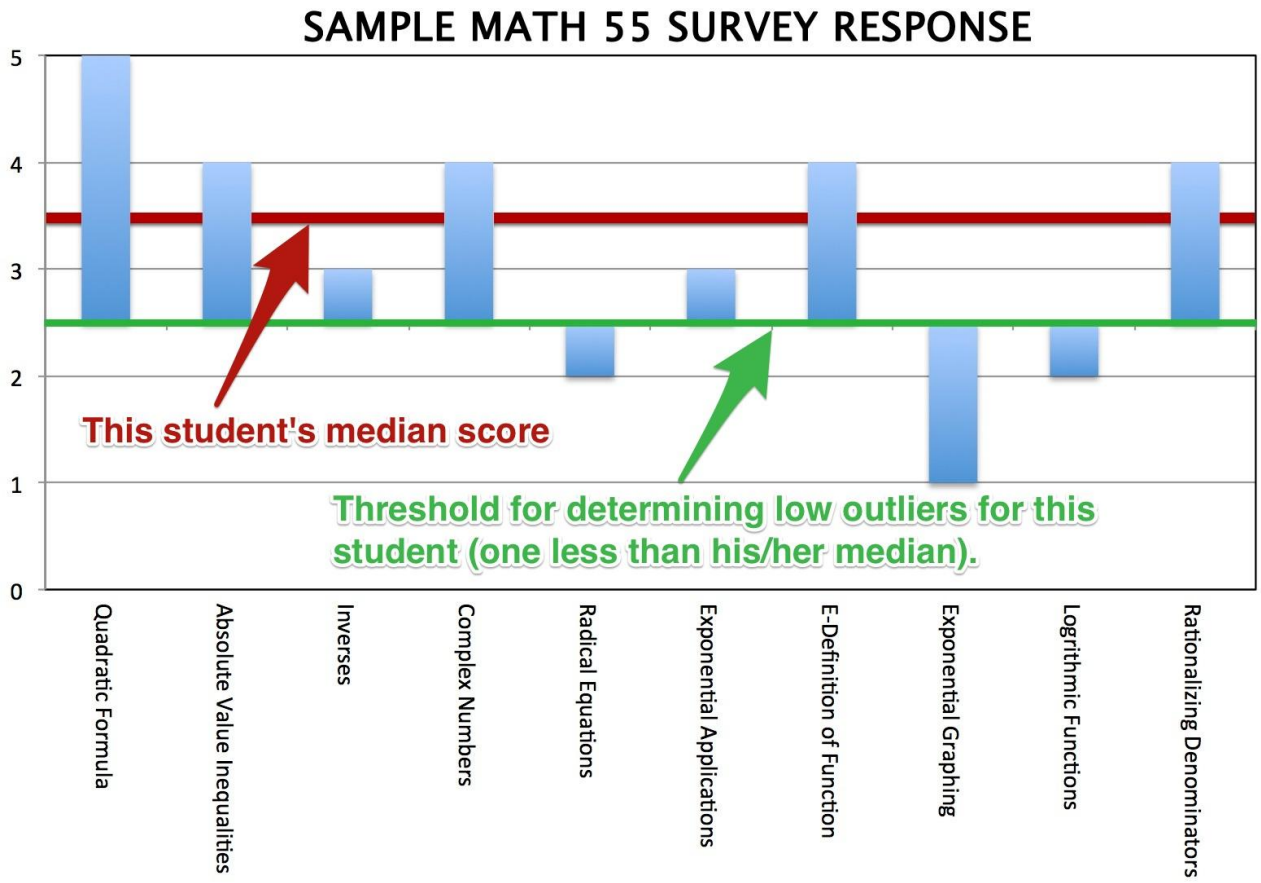
For questions #11 and #12 answer the question with the appropriate response.

11. Based on your performance in the class, what grade do you anticipate receiving?

12. Your confidence in math:

A. Has improved when you compare it to the beginning of the semester.
B. Is about the same as it was at the beginning of the semester.
C. Has gotten worse since the beginning of the semester.

Appendix B:


SAMPLE MATH 55 SURVEY RESPONSE
5
4
3
2
1
0
This student's median score
Threshold for determining low outliers for this student (one less than his/her median).
Quadratic Formula
Absolute Value Inequalities
Inverses
Complex Numbers
Radical Equations
Exponential Applications
E-Definition of Function
Exponential Graphing
Logrithmic Functions
Rationalizing Denominators

Appendix C:

Results for Student Learning Outcomes for Math 2014

Course	Survey Qstn #	Type of Question	# of Low Outliers	Total Students	Percent (**)
37	10	Graph a Polar Equation	53	100	53.00%
37	4	Finding Areas of Plane Regions	36	100	36.00%
37	8	* Domains & Ranges of Inverse Trig Fns	32	100	32.00%
37	6	Solving Trigonometric Equations	24	100	24.00%
37	5	Graphing Trigonometric Functions	22	100	22.00%
37	7	* Finding Trig Function Values w/ Identities	22	100	22.00%
37	1	Triangle Congruence Proofs	18	100	18.00%
37	9	Law of Sines and Law of Cosines	12	100	12.00%
37	3	Solving Triangles Using Right Trangle Thms	5	100	5.00%
37	2	Angle Measures Using Basic Theorems	3	100	3.00%
20	10	Converting Polar Equations	35	86	40.70%
20	5	Polar Graphing	33	86	38.37%
20	3	Right Triangle Geometry	27	86	31.40%
20	7	* Range of 1-1 Functions	27	86	31.40%
20	4	* Translations and Transformaitons	26	86	30.23%
20	6	Polynomial Graphing	25	86	29.07%
20	1	Log Equations	20	86	23.26%
20	8	Sequences	14	86	16.28%
20	9	Series	11	86	12.79%
20	2	Polynomial Factoring	4	86	4.65%
1	1	* Epsilon Delta	66	87	75.86%
1	6	* Mean Value Theorem	40	87	45.98%
1	10	Volumes	31	87	35.63%
1	7	Concavity	19	87	21.84%
1	9	* Riemann Sum	19	87	21.84%
1	5	Implicit Differentiation	16	87	18.39%
1	2	Continuity	14	87	16.09%
1	8	Integral	3	87	3.45%
1	4	Computation of Derivative	2	87	2.30%
1	3	Definition of Derivative	1	87	1.15%
2	5	Taylor Series	50	84	59.52%
2	2	* Natural Logarithm (Calculus) Definition	37	84	44.05%
2	8	Inverse Trigonometric Derivatives	25	84	29.76%
2	9	Interval of Convergence	22	84	26.19%

2	7	Polar Area	20	84	23.81%
2	1	* Geometric Series Convergence	11	84	13.10%
2	4	Trigonometric Integrals	11	84	13.10%
2	10	Improper Integral	10	84	11.90%
2	6	L'Hopital's Rule	8	84	9.52%
2	3	Integration by Parts	2	84	2.38%
3	9	Divergence Theorem	32	58	55.17%
3	10	* Line Integral Applications	27	58	46.55%
3	5	Optimization	23	58	39.66%
3	4	* Gradient Properties	21	58	36.21%
3	8	Green's Theorem	12	58	20.69%
3	6	Volumes	7	58	12.07%
3	1	3D Geometry	5	58	8.62%
3	7	Spherical Integration	5	58	8.62%
3	2	Tangent Vectors	3	58	5.17%
3	3	Partial Derivatives	3	58	5.17%
4	10	Laplace Transformations	16	25	64.00%
4	1	* Existence and Uniqueness Theorem	15	25	60.00%
4	4	Exact DE	12	25	48.00%
4	6	* Definition of Fundamental Set	8	25	32.00%
4	9	Power Series Solutions	7	25	28.00%
4	3	First Order Linear DE	3	25	12.00%
4	8	Higher Order Linear Differential Equaitons	3	25	12.00%
4	2	Verifying Solutions	1	25	4.00%
4	7	Variation of Parameters	1	25	4.00%
4	5	IVP	0	25	0.00%
6	9	Orthonormal Bases	18	34	52.94%
6	5	Rank and Nullity of a Matrix	11	34	32.35%
6	8	Linear Transformations	11	34	32.35%
6	10	Eigenvectors and Eigenvalues	9	34	26.47%
6	7	* Definition of Vector Spaces	8	34	23.53%
6	6	Column Spaces	5	34	14.71%
6	1	Gauss-Jordan Elimination Method	4	34	11.76%
6	4	* Linear Independence	3	34	8.82%
6	2	Inverse Matrices	1	34	2.94%
6	3	Determinant	1	34	2.94%
8	4	* Countability	13	26	50.00%
8	6	Modular Arithmetic	12	26	46.15%
8	7	* Proof by Contradiction	11	26	42.31%
8	3	Sets	10	26	38.46%
8	10	Counting Techniques	10	26	38.46%
8	9	Discrete Probability	5	26	19.23%

8	2	Symbolic Logic	4	26	15.38%
8	5	Euclidean Algorithm	3	26	11.54%
8	8	RSA Encription	3	26	11.54%
8	1	Rules of Inference	0	26	0.00%
103	3	Graphing Fractions	26	49	53.06%
103	10	* Proportions	26	49	53.06%
103	8	Simplification of Fractions	24	49	48.98%
103	7	Percents	17	49	34.69%
103	9	* Contrasting Different Measurments	10	49	20.41%
103	1	Words to Decimal Conversion	8	49	16.33%
103	5	Decimal Division	8	49	16.33%
103	6	Rounding	6	49	12.24%
103	2	Adding Fractions	4	49	8.16%
103	4	Decimal Subrtraction	3	49	6.12%
104	5	Application of Roots	65	143	45.45%
104	8	Volume	55	143	38.46%
104	4	Circular Computations	47	143	32.87%
104	10	* Simplifying vs. Evaluating	38	143	26.57%
104	7	Percents	34	143	23.78%
104	9	* Interpretaion of Computations	30	143	20.98%
104	2	Evaluating Expressions	25	143	17.48%
104	3	Linear Equations	9	143	6.29%
104	1	Order of Operations	8	143	5.59%
104	6	Square Roots	7	143	4.90%
65	9	Percents	91	192	47.40%
65	5	Solving System of Equations	78	192	40.63%
65	6	Equations of Lines from Points	55	192	28.65%
65	10	* Vertical Slopes	49	192	25.52%
65	4	Simplifying Rational Expressions	46	192	23.96%
65	8	Graphing Lines	40	192	20.83%
65	7	* Explain "Canceling"	35	192	18.23%
65	2	Algebra of Polynomials	29	192	15.10%
65	3	Factor Trinomials	11	192	5.73%
65	1	Linear Equations	7	192	3.65%
55	9	Logrithmic Functions	127	280	45.36%
55	6	Exponential Applications	119	280	42.50%
55	7	* Definition of Function	84	280	30.00%
55	8	Exponential Graphing	81	280	28.93%
55	3	Inverses	66	280	23.57%
55	10	Rationalizing Denominators	61	280	21.79%
55	4	Complex Numbers	43	280	15.36%
55	5	Radical Equations	39	280	13.93%

55	2	Absolute Value Inequalities	11	280	3.93%
55	1	Quadratic Formula	4	280	1.43%
31	9	Exponential Models	26	93	27.96%
31	5	* Determining Domains	25	93	26.88%
31	2	Binomial Expansion	23	93	24.73%
31	8	* Quadratic Modeling	23	93	24.73%
31	3	Logarithmic Equations	22	93	23.66%
31	4	Graphing of Rational Functions	22	93	23.66%
31	1	* Interpret Graphs	20	93	21.51%
31	6	Geometric Series	18	93	19.35%
31	10	Rational Inequalities	18	93	19.35%
31	7	Rational Equations	6	93	6.45%
15	7	Exponential Models	25	46	54.35%
15	8	Using Derivatives To Sketch A Graph	18	46	39.13%
15	5	Related Rates	16	46	34.78%
15	10	* Intermediate Value Theorem	15	46	32.61%
15	4	Differentiation Rules For Exp And Logs	11	46	23.91%
15	9	* Continuity At A Point	11	46	23.91%
15	1	Evaluate Limits	9	46	19.57%
15	6	Cancavity And Inflection Points	5	46	10.87%
15	2	Equations Of Tangent Lines	3	46	6.52%
15	3	Find Derivatives Using Differentiation Rules	2	46	4.35%
16	8	Continuous Random Variable Probabilities	4	6	66.67%
16	9	Optimization Problems	4	6	66.67%
16	10	Related Rates	4	6	66.67%
16	7	Taylor Series Representation	3	6	50.00%
16	2	Improper Integral	2	6	33.33%
16	4	Double Intervals	1	6	16.67%
16	6	Separable Differential Equations	1	6	16.67%
16	1	Integration By Parts	0	6	0.00%
16	3	Partial Derivatives	0	6	0.00%
16	5	Differentiate A Trigonometric Functions	0	6	0.00%
54	10	Variation	33	59	55.93%
54	3	Applications of System of Equations	26	59	44.07%
54	5	Rates	20	59	33.90%
54	8	* Choosing an Appropriate Model	14	59	23.73%
54	6	Exponential Models	13	59	22.03%
54	4	Interpretation of Functional Models	8	59	13.56%
54	1	* Interpret Linear Models	7	59	11.86%
54	2	Equations for Parallel Lines	5	59	8.47%
54	7	Exponential Equations	5	59	8.47%

54	9	Quadratic Graphing	5	59	8.47%
53	10	Variation	46	97	47.42%
53	4	Empirical Rule for Normal Distributions	38	97	39.18%
53	1	Geometry and Measurement	32	97	32.99%
53	3	* Interpreting the Slope of a Line	21	97	21.65%
53	5	Dimensional Analysis	20	97	20.62%
53	9	Exponential Models	19	97	19.59%
53	6	Linear Models for Real Situations	18	97	18.56%
53	7	Function Notation	12	97	12.37%
53	8	Scatterplots	7	97	7.22%
53	2	Mean and Median	5	97	5.15%
43	5	* Linear Regression	146	357	40.90%
43	7	Binomial Distribution	106	357	29.69%
43	10	Hypothesis Testing	96	357	26.89%
43	3	* Interpreting Plots	94	357	26.33%
43	9	Confidence Intervals	91	357	25.49%
43	8	Normal Distribution	61	357	17.09%
43	4	Using Box Plots	52	357	14.57%
43	1	* Types of Studies	45	357	12.61%
43	2	Finding Measures ofCcenter and Spread	42	357	11.76%
43	6	Conditional Probability	34	357	9.52%

Key:

* – Questions requiring the student to provide an explanation over solving a problem.
** – Percent of students having the question as a low outlier—defined as a topic with a student score at least one unit below the student's individual median.

Appendix D:

Select Student Self Evaluation vs. Final Exam Performance

Math 1	SLO Score	Final Exam
* Epsilon Delta	75.86%	
* Mean Value Theorem	45.98%	71%
Volumes	35.63%	82%
Concavity	21.84%	53%
E-Riemann Sum	21.84%	47%
Implicit Differentiation	18.39%	29%
Continuity	16.09%	29%
Integral	3.45%	41%
Computation of Derivative	2.30%	24%
Definition of Derivative	1.15%	18%

Math 20	SLO Score	Final Exam
Converting Polar Equations	40.70%	67%
Polar Graphing	38.37%	78%
Right Triangle Geometry	31.40%	33%
* Range of 1-1 Functions	31.40%	67%
* Translations and Transformaitons	30.23%	28%
Polynomial Graphing	29.07%	33%
Log Equations	23.26%	33%
Sequences	16.28%	
Series	12.79%	
Polynomial Factoring	4.65%	22%

Math 55	SLO Score	Final Exam
Logrithmic Functions	45.36%	60%
Exponential Applications	42.50%	73%
* Definition of Function	30.00%	47%
Exponential Graphing	28.93%	53%
Inverses	23.57%	40%
Rationalizing Denominators	21.79%	33%
Complex Numbers	15.36%	27%
Radical Equations	13.93%	40%
Absolute Value Inequalities	3.93%	13%
Quadratic Formula	1.43%	13%

Math 65	SLO Score	Final Exam
Percents	47.40%	86%
Solving System of Equations	40.63%	71%
Equations of Lines from Points	28.65%	64%
* Vertical Slopes	25.52%	
Simplifying Rational Expressions	23.96%	57%

Graphing Lines	20.83%	43%
* Explain "Canceling"	18.23%	
Algebra of Polynomials	15.10%	14%
Factor Trinomials	5.73%	29%
Linear Equations	3.65%	14%

Math 8	SLO Score	Final Exam
* Countability	50.00%	65%
Modular Arithmetic	46.15%	65%
* Proof by Contradiction	42.31%	71%
Sets	38.46%	47%
Counting Techniques	38.46%	59%
Discrete Probability	19.23%	47%
Symbolic Logic	15.38%	24%
Euclidean Algorithm	11.54%	18%
RSA Encription	11.54%	
Rules of Inference	0.00%	18%

SLO Scores are from the SLO Results Report and represent all sections of the course. Final Exam percentages are the proportion of students from (Robert Yest's Spring 14 sections only) who had some conceptual mistake/issue with the problem on the Final Exam.

Note: Blank Final Exam percentages mean that no specific question for that topic was asked on the Final Exam.

Appendix E:

Student's Self-Assessment

	Expected Grade					
Course	# Students	A	B	C	D	F
37	96	19.8%	38.5%	32.3%	5.2%	4.2%
20	85	27.1%	27.1%	32.9%	9.4%	3.5%
1	87	18.4%	41.4%	29.9%	9.2%	1.1%
2	80	22.5%	38.8%	36.3%	1.3%	1.3%
3	56	37.5%	33.9%	26.8%	1.8%	0.0%
4	24	41.7%	33.3%	16.7%	8.3%	0.0%
6	32	59.4%	28.1%	9.4%	3.1%	0.0%
8	26	15.4%	57.7%	23.1%	3.8%	0.0%
31	91	20.9%	41.8%	29.7%	5.5%	2.2%
15	45	20.0%	37.8%	35.6%	4.4%	2.2%
16	6	33.3%	33.3%	16.7%	0.0%	16.7%
54	59	6.8%	35.6%	44.1%	6.8%	6.8%
53	90	11.1%	31.1%	41.1%	11.1%	5.6%
43	343	31.8%	37.9%	25.7%	2.9%	1.7%
55	275	18.5%	34.2%	42.2%	4.0%	1.1%
65	186	10.8%	38.2%	43.0%	6.5%	1.6%
103	47	19.1%	42.6%	31.9%	0.0%	6.4%
104	137	19.0%	34.3%	34.3%	9.5%	2.9%

- Students were asked what grade they thought they would get.

Appendix F:

Student's Self Assessed Success vs. Actual Success

Course	SLO*	Actual	Difference
37	74.48%	62.18%	**12.30%**
20	70.59%	67.65%	2.94%
1	74.71%	74.19%	0.52%
2	79.38%	86.67%	-7.29%
3	84.82%	84.13%	0.69%
4	83.33%	80.00%	3.33%
6	92.19%	94.59%	-2.41%
8	84.62%	92.31%	-7.69%
31	77.47%	75.61%	1.86%
15	75.56%	72.22%	3.33%
16	75.00%	66.67%	8.33%
54	64.41%	57.45%	6.96%
53	62.78%	47.68%	**15.10%**
43	82.51%	81.48%	1.03%
55	73.82%	64.84%	8.98%
65	70.43%	54.65%	**15.78%**
103	77.66%	60.49%	**17.17%**
104	70.44%	65.96%	4.48%

* SLO success is measured by the number of “A” and “B” students + 50% of the students who marked a C

Appendix G:

Student's Confidence

	Confidence in Math			
Course	# Students	Improved	Same	Worse
37	95	71.6%	18.9%	9.5%
20	84	46.4%	41.7%	11.9%
1	87	66.7%	24.1%	9.2%
2	83	72.3%	21.7%	6.0%
3	56	69.6%	23.2%	7.1%
4	25	80.0%	12.0%	8.0%
6	33	75.8%	21.2%	3.0%
8	26	88.5%	7.7%	3.8%
31	93	62.4%	30.1%	7.5%
15	46	78.3%	17.4%	4.3%
16	6	33.3%	50.0%	16.7%
54	59	62.7%	28.8%	8.5%
53	93	61.3%	23.7%	15.1%
43	348	74.4%	18.7%	6.9%
55	275	68.7%	24.7%	6.5%
65	185	68.6%	23.2%	8.1%
103	47	72.3%	27.7%	0.0%
104	134	67.9%	23.9%	8.2%

* Students were asked their confidence in math improved, remained the same, or worsened.

Appendix D: A Few Questions

Please answer the following questions with "yes" or "no". For any questions answered "no", please provide an explanation. No explanation is required for "yes" answers :-)

1. Have all of your course outlines been updated within the past five years? No

2. Have you deactivated all inactive courses? (courses that haven't been taught in five years or won't be taught in three years should be deactivated) No

3. Have all of your courses been offered within the past five years? If no, why should those courses remain in our college catalog? No. We want to keep the workshops active with the hope that we will eventually get more FTEF to offer the workshops again.

4. Do all of your courses have the required number of CLOs completed, with corresponding rubrics? If no, identify the CLO work you still need to complete, and your timeline for completing that work this semester. No. MTH 122 still needs to be completed. They will be developed by Ming Ho and assessed by the end of Fall 2014.

5. Have you assessed all of your courses and completed "closing the loop" forms for all of your courses within the past three years? If no, identify which courses still require this work, and your timeline for completing that work this semester. No. MTH 122's "closing the loop" will be done after the CLO assessment in Fall 2014.

6. Have you developed and assessed PLOs for all of your programs? If no, identify programs which still require this work, and your timeline to complete that work this semester. YES.

7. If you have course sequences, is success in the first course a good predictor of success in the subsequent course(s)? In some cases yes, in others no. If we let success in the subsequent course be 70% or better within two years, then for the following sequences we need improvement: Mth 104 > 65, Mth 65 > 55,54(L)

8. Does successful completion of College-level Math and/or English correlate positively with success in your courses? If not, explain why you think this may be. Yes.

Appendix E: Proposal for New Initiatives (Complete for <u>each</u> new initiative)

Audience: *Deans/Unit Administrators, PRBC, Foundation, Grants Committee, College Budget Committee*
Purpose: *A "New Initiative" is a new project or expansion of a current project that supports our Strategic Plan. The project will require the support of additional and/or outside funding. The information you provide will facilitate and focus the research and development process for finding both internal and external funding.*

How does your initiative address the college's Strategic Plan goal, or significantly improve student learning?

This is a continuation from the last program review. Please refer to it to see how it fit in the overall scheme of activities.

"House" centered on the theme of students who want to enter careers in STEM– astronomy, biology, chemistry, engineering, mathematics, physics etc. The development of houses centered on student interest areas is one of the initiatives that has arisen out of PRBC to support students by providing more packaged academic and student services that directly relate to their goal.

Planning group would include faculty from biology, chemistry, computer science, physics, engineering, mathematics, English, communications and counseling as well as classified staff and students.

What is your specific goal and measurable outcome?

Provide students who are interested in STEM careers with a community of faculty, staff, administrators and students who are all supporting the achievement of transfer to a four year institution in the STEM fields to continue their studies and become scientists, engineers and mathematicians by providing opportunities to explore their interest, develop learning and laboratory skills, excel in their classes and transfer to a four year institution

Outcomes:

- increase number of students earning associates degrees
- increase number of students applying to transfer programs
- increase engagement of students with the campus community
- increase the number of personal contacts with students – provided by faculty, staff, and peer mentors
- increase the number of students who successfully complete mathematics, engineering and science courses
- decrease the bottlenecks in the series of courses (even out capacity/demand ratio)
- provide students with opportunities to learn about a variety of careers in STEM and with opportunities for internships/work experience

What is your action plan to achieve your goal?

Activity (brief description)	**Target Completion Date**	**Required Budget (Split out personnel, supplies, other categories)**
Offer new introductory STEM course	5/2015	- 4 CAH for teaching course - $500 supplies
Expand capacity of pathway with second STEM cohort starting in Fall 2015, continue pathway development; Develop pathway activities that will allow students to explore educational/career goals other than transferring in a STEM major.	5/2015	- 3 CAH reassigned time for house faculty lead - 3 CAH reassigned time for counseling faculty lead - $500 stipends for others involved in planning (10-15 people?) - $500 for outreach activities - $1000 for tutors and mentors
Teach the tutor training class and interview tutors at the second level. Coordinate between the between disciplines and the full-time IA running the STEM Center. The requested CAH is to be divided within the Division among the disciplines.		- 4 CAH

How will you manage the personnel needs?

☐ New Hires: ☐ Faculty # of positions _____ ☐ Classified staff # of positions _____

☐ Reassigning existing employee(s) to the project; employee(s) current workload will be:

- ☒ Covered by overload or part-time employee(s)
- ☐ Covered by hiring temporary replacement(s)
- ☐ Other, explain _____

At the end of the project period, the proposed project will:

- ☐ Be completed (onetime only effort)
- ☒ Require additional funding to continue and/or institutionalize the project (obtained by/from):_____

Will the proposed project require facility modifications, additional space, or program relocation?

☐ No ☐ Yes, explain: _____

Will the proposed project involve subcontractors, collaborative partners, or cooperative agreements?

☐ No ☐ Yes, explain: _____

Do you know of any grant funding sources that would meet the needs of the proposed project?

☐ No ☐ Yes, list potential funding sources:

Appendix F1: Full-Time Faculty/Adjunct Staffing Request(s) [Acct. Category 1000]

Audience: *Faculty Prioritization Committee and Administrators*
Purpose: *Providing explanation and justification for new and replacement positions for full-time faculty and adjuncts*
Instructions: *Please justify the need for your request. Discuss anticipated improvements in student learning and contribution to the Strategic Plan goal. Cite evidence and data to support your request, including enrollment management data (EM Summary by Term) for the most recent three years, student success and retention data , and any other pertinent information. Data is available at http://www.chabotcollege.edu/ProgramReview/Data2013.cfm.*

1. Number of new faculty requested in this discipline: __4_

STAFFING REQUESTS (1000) FACULTY PLEASE LIST IN RANK ORDER

Faculty (1000)			
Position	**Description**	**Program/Unit**	**Division/Area**
1. Non calculus based math faculty Coordinator- replace retired faculty	To teach and support non-calculus based math courses at the basic skills and college level	Mathematics	Science- Mathematics
2. Faculty to teach statistics – replace retired faculty	To teach statistics to meet the demand from the Health Science students and business disciplines	Mathematics	Science- Mathematics
3. Faculty to replace retired faculty and support reassigned time.	To teach all mathematics courses	Mathematics	Science- Mathematics
4. Faculty to replace retired faculty and support reassigned time.	To teach all mathematics courses	Mathematics	Science- Mathematics

Rationale for your proposal. Please use the enrollment management data. Data that will strengthen your rationale include FTES trends over the last 5 years, FT/PT faculty ratios, recent retirements in your division, total number of full time and part-time faculty in the division, total number of students served by your division, FTEF in your division, CLO and PLO assessment results and external accreditation demands.

Between Spring 2004 and Fall 2015, the math subdivision will have a net loss of 4.5 full-time faculty. All our transfer students need to take a college level math course. All our AA/AS students need to have math proficiency, which means that most students have to pass our MTH 55, 54,

or 53 course. We need faculty members who can have interests in and lead the division for the liberal arts pathway. Not all mathematicians have a strong background in statistics or interest in quantitative reasoning at the precollegiate level. Hiring faculty with qualifications to complement existing expertise will be crucial in sustaining the effort in alternative curriculum and in quality statistics courses.

English and math are the largest subdivision on campus, and every student needs to complete English and math. However, the proportion of sections taught by full-time faculty in math has been lower than that in English every semester over the last six semesters.

Semester	S12	F12	S13	F13	S14	F14
% Math	51.1	45.6	47.7	46.1	41.0	45.6
% English	54.0	51.8	48.2	52.4	47.9	47.5

Time frame	**Average / Actual**	**Full-time FTEF % to Part-time FTEF %**
Spring 2009 thru Spring 2012	Average	53.5% to 46.5%
Summer 2011 to Spring 2012	Actual	48.7% to 51.3%
Summer 2012 to Spring 2013	Actual	45.6% to 54.4%
Summer 2013 to Spring 2014	Actual	48.5% to 51.5%

The above table shows the trend of FT/PT FTEF ratio over the last several years, and the tables on the next two pages compare the changes in that ratio between the academic years 2009-10 and 1013-14 for both the whole college and the math department. They reveal the following key points:

1. Above numbers reflect that four FT Math faculty retired between 2009-10 and 2013-14. The above does NOT account for: (a) that we were allowed to hire only one new FT faculty member in 2014-15, and (b) that 1.5 additional retirement/workload reduction will be in effect effective July 2015.
2. Between 2009-10 and 2013-14, the FT/PT ratio in Math has dropped from 61.85% to 48.51% (a drop of 13.3%). In 2013-14, the FT/PT ratio in math was 9.5% lower than that of the college as a whole; fewer than half of Chabot math classes were taught by full time faculty.
3. In 2013-14, the Chabot Math Department generated over 12.1% of Chabot FTES, but yet was allowed to carry only 8.6% of the full time faculty.
4. At 592 WSCH/FTEF, Math is one of the most productive departments on campus. We are actually too productive, because we generally achieve WSCH/FTEF above 550 when we are highly impacted and turning students away. (When students are forced to attend other colleges because they can't get their math class at Chabot, both FTES and productivity levels are driven down in other disciplines across campus.) Ultimately, it does not serve the college for us to be unable to offer an adequate number of math sections.

MATH at Chabot: Change in FT/PT Ratio since 2009-10

	ACADEMIC YEAR 2009-10			ACADEMIC YEAR 2013-14		
	Chabot Total	MATH only	Math % of Total	Chabot Total	MATH only	Math % of Total
FTES	10,996.9	1,331.6	12.11%	9,553.6	1,151.3	12.05%
WSCH/FTEF	550.03	576.39	104.8%	507.23	592.6	116.8%
T o t a l FTEF* ***Semester FTEF**	611.48	70.75	11.6%	576.22	59.25	10.3%
Full-time FTEF >>	301.7	36.63	**12.1%**	270.51	23.16	**8.6%**
Overload FTEF >>	72.7	7.13	9.8%	63.57	5.58	8.8%
FT + Overload	374.4	43.76	11.7%	334.08	28.74	8.6%
Part-time FTEF	237.08	26.99	11.4%	242.14	30.51	12.6%

	2009-10		Math difference from TOTAL	2013-14		Math difference from TOTAL
	Chabot Total	Math Only		Chabot Total	Math Only	
Pct. of FTEF that is FT for LOAD only	49.34%	51.77%	2.4%	46.95%	39.09%	-7.9%
Percentage of FTEF that is FT for LOAD or FT for <u>Overload</u>	**61.23%**	**61.85%**	0.6%	**57.98%**	**48.51%**	**-9.5%**

Summary by Academic Year - Actual

Chabot College Summer 2009 thru Spring 2014

				---------Enrollment---------			----------FTEF----------						
	# Pri Sec	%	Capacity	Census	%	FT	OL	PT	Total	WSCH	FTES	WSCH/FTEF
2009-2010	2,633	45.01%	90,129	91,198	101%	301.70	72.70	237.08	611.48	336,331.00	10,996.89	550.03
2013-2014	2,683	45.86%	83,125	76,990	93%	270.51	63.57	242.14	576.22	292,279.00	9,553.58	507.23
Report Aca Yr Avg	*2,658*	*90.87%*	*86,627*	*84,094*	*97%*	*286.11*	*68.14*	*239.61*	*593.85*	*314,305.00*	*10,275.24*	*529.27*

Summary by Academic Year - Actual

Chabot College Summer 2009 thru Spring 2014

Math Department ONLY

				---------Enrollment---------			----------FTEF----------						
	# Pri Sec	%	Capacity	Census	%	FT	OL	PT	Total	WSCH	FTES	WSCH/FTEF
2009-2010	227	54.57%	9,160	9,006	98%	36.63	7.13	26.99	70.75	40,782.00	1,331.62	576.39
2013-2014	189	45.43%	6,549	7,284	111%	23.16	5.58	30.51	59.25	35,114.00	1,151.32	592.60
Report Aca Yr Avg	*208*	*100.00%*	*7,855*	*8,145*	*104%*	*29.90*	*6.36*	*28.75*	*65.00*	*37,948.00*	*1,241.47*	*583.78*

2. Statements about the alignment with the strategic plan and your student learning goals are required. Indicate here any information from advisory committees or outside accreditation reviews that is pertinent to the proposal.

Hiring faculty with interest in quantitative literacy and statistics will help staff courses like MTH 53/54/43 and enhance the quality of instruction in those courses through their single commitment to our institution and curriculum instead of having to move between colleges. These courses are important courses to move our students through. MTH 53/54 provide alternative algebra curriculum for liberal arts students, and MTH 43 serves as the transfer-level course not just for math requirement but also for programs in business and allied-health fields. We have also had difficulty filling MTH 103/104 sections this Fall 2014 because of retirement. These classes are indispensable for students to complete their degree and transfer goals.

There is more than just teaching a class that a full-time instructor does. If we are to offer our students the best education we can, we need more full-time instructors to be members of the various committees that keep this college running smoothly and meet all of the state's requirements.

As faculty retire the responsibilities of the college have fallen on fewer and fewer faculty. We need more faculty support as we transition into a college that is creating new pathways and houses.

As the institution launches different initiatives through grant and state funding like (Equity, SSSP, AB86), often there is a math component to it, which may require faculty reassign time. The institution cannot expect Math to be involved with various projects if that means we do not have enough faculty left to fill sections.

Appendix F2: Classified Staffing Request(s) including Student Assistants [Acct. Category 2000]

Audience: *Administrators, PRBC*
Purpose: *Providing explanation and justification for new and replacement positions for full-time and part-time regular (permanent) classified professional positions (new, augmented and replacement positions). Remember, student assistants are not to replace Classified Professional staff.*
Instructions: *Please justify the need for your request. Discuss anticipated improvements in student learning and contribution to the Strategic Plan goal, safety, mandates, and accreditation issues. Please cite any evidence or data to support your request. If this position is categorically funded, include and designate the funding source of new categorically-funded position where continuation is contingent upon available funding.*

1. Number of positions requested: __3.5___

STAFFING REQUESTS (2000) CLASSIFIED PROFESSIONALS

PLEASE LIST IN RANK ORDER

Classified Professional Staff (2000)			
Position	Description	Program/Unit	Division/Area
1. Coordinator for MESA	Manages the MESA program	Mathematics	Science-Mathematics
2. Supervisor/IA for the STEM Center (formerly known as the Math Lab)	Manages and supervises the STEM Center: Scheduling tutoring and faculty hours for drop-in tutoring, screening potential tutors, maintaining equipment and following up with maintenance request, tutoring students	Mathematics	Science-Mathematics
3. Supervisor/IA for the STEM Center (formerly known as the Math Lab) (Half-time)	Manages and supervises the STEM Center: Scheduling tutoring and faculty hours for drop-in tutoring, screening potential tutors, maintaining equipment and following up with maintenance request, tutoring students	Mathematics	Science-Mathematics

4. Custodian I	We need someone to clean the chalk boards and white boards and their trays, dust the rooms, sweep the floors, and clean the hallways daily. We also need someone to keep the restrooms clean.	Mathematics	Science-Mathematics

STAFFING REQUESTS (2000) STUDENT ASSISTANTS

PLEASE LIST IN RANK ORDER

Student Assistants (2000)			
Postion	Description	Program/Unit	Division/Area
Student Assistant	Help Administrative assistant	Mathematics	Science-Mathematics

2. Rationale for your proposal.

It is not cost-efficient to have a full-time instructor be dedicated to doing managerial functions when a supervisor could perform the same tasks at a lower cost.

We need someone to be in the science-math student center at all times it is open. There is no one to supervise the maintenance of the computers or to order supplies. We need a supervisor to manage the tutor and faculty schedules. There are times when the center has to be closed because no faculty are available to be at the center. Our students need to have a place that they can depend on to get help and to have computers running with updated software. Having 1.5 position for this position also allows us to extend our hours.

There are so few custodians that necessary cleaning is not getting done. We need to have our boards cleaned every day. This is the main medium that the math faculty use to communicate to their students. We need to have the restrooms cleaned thoroughly at least once a week. Having mold growing around the sinks is not healthy.

Because we have such a large number of members in our division, it is difficult for the administrative assistant to get all the paper work done in a timely manner. If she had a student assistant who could interact with students and faculty, Chasity would be able to complete her daily tasks and also work on some other division projects like the division and discipline websites.

3. Statements about the alignment with the strategic plan and program review are required. Indicate here any information from advisory committees or outside accreditation reviews that is pertinent to the proposal.

There is never enough money to go around. Why spend it on faculty when a supervisor can do the same job. Our students need our instructors in the classroom. If our students are to be successful they need reliable places to go to for help, like the STEM Center. Our students deserve to be in a clean and healthy environment. They cannot be successful in their classes if they are cannot attend because they are sick.

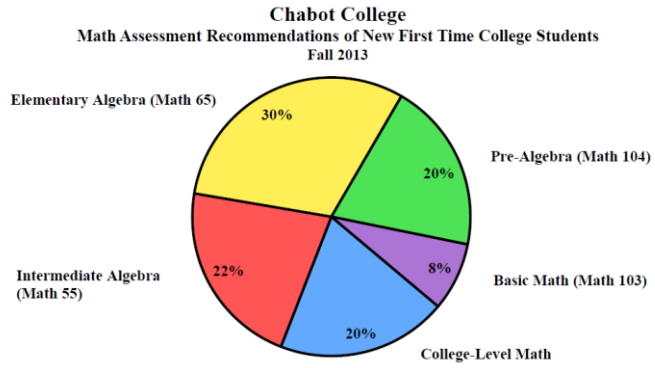
Appendix F3: FTEF Requests

Audience: *Administrators, CEMC, PRBC*
Purpose: *To recommend changes in FTEF allocations for subsequent academic year and guide Deans and CEMC in the allocation of FTEF to disciplines. For more information, see Article 29 (CEMC) of the Faculty Contract.*
Instructions: *In the area below, please list your requested changes in course offerings (and corresponding request in FTEF) and provide your rationale for these changes. Be sure to analyze enrollment trends and other relevant data at*[*http://www.chabotcollege.edu/ProgramReview/Data2013.cfm*](http://www.chabotcollege.edu/ProgramReview/Data2013.cfm)*.*

COURSE	CURRENT FTEF (2014-15)	ADDITIONAL FTEF NEEDED	CURRENT SECTIONS	ADDITIONAL SECTIONS NEEDED	CURRENT STUDENT # SERVED	ADDITIONAL STUDENT # SERVED
MTH 104	3.25	1.00	13	4	455	140
MTH 65	4.00	1.67	12	5	420	175
Mth 41	0.00	0.20	0	1	0	35

The class size of 35 is used to compute the number of sections.

According to the Chabot College Student Characteristic preliminary census report for Fall 2014[2], there were 2,154 new students. Using the same percentages as Fall 2013,[3] 64% of the new students plan on transferring and 10% plan on obtaining an AA/AS degree without transferring for a total of about 1600 students that will have to take at least one math course at Chabot. Using the chart below[4] as an approximation to future recommendations, we can estimate the number of new students who will need to take a math class, shown in the table following the chart. Because many courses are prerequisites for other math courses and other discipline courses, student should start taking their math courses in their first semester to guarantee that they will complete their goal in two years.



[2] http://www.chabotcollege.edu/ir/StudentCharacteristics/CC_StCh_F14_Census.pdf
[3] http://www.chabotcollege.edu/ir/StudentCharacteristics/EdGoalsbyStudentTypeF13(c).pdf
[4] http://www.chabotcollege.edu/ir/StudentCharacteristics/AssessmentRecsNewStudsFall13.pdf

Estimate of the Number of New Students who will need Math Course

Course	Number of students	Number of Sections
Mth 103	128	3.7
Mth 104	320	9.1
Mth 65 or Mth 53	480	13.7
Mth 55 or Mth 54	352	10.1
College Level Math	320	9.1
Total new students who need a math course for transfer or AA/AS degree	1600	

The chart below indicates the number of successful students in Fall of 2012 who did not enroll in the following sequential class by Summer 2014 (two years later). Using this data we can estimate the number of students per semester that will not be able to enroll into the next math course.

Estimate of number of successful students in Fall 2012 who did not register into the next math course by Summer 2014

From	To	Number of students successful in "From" in F12	Percentage not enrolling in "To" by Sum14	Approx. number of students	Approx. number of sections
Mth 103	Mth 104	78	27%	21.06	0.6
Mth 104	Mth 65	132	27%	35.64	1.0
Mth 65	Mth 55/54/54L	205	20%	41	1.2
Mth 55/54/54L	Mth 31/33/37/40/43	345	26%	89.7	2.6

The next chart estimates the number of students who will need to repeat the course again. This data is based on the number of students who were non-successful or withdrew from the course in Spring 2013. We will use this data as an estimate for future semesters. Since students can choose between 65 or 62 (now 53) and Mth 55 or Mth 54, I choose to combine the numbers so that the discipline can choose to determine how many sections of each should be offered as we fine tune our pathways.

As noted earlier in Appendix F1, att 592 WSCH/FTEF, Math is one of the most productive departments on campus. We are actually too productive, because we generally achieve WSCH/FTEF above 550 when we are highly impacted and turning students away. (When students are forced to attend other colleges because they can't get their math class at Chabot, both FTES and productivity levels are driven down in other disciplines across campus.) Ultimately, it does not serve the college for us to be unable to offer an adequate number of math sections.

Number of Students who will need to repeat the course due to non-success or withdrawal in Spring 2014[5]

Course	Non-success	Withdrawal	Total	Approx. number of sections
MTH 103	32	28	60	1.7
MTH 104	64	51	115	3.3
MTH 53	79	31	321	5.3
MTH 65	122	89		
MTH 54	20	20	362	5.3
MTH 55	154	168		
MTH 43	90	96	186	5.3

The next chart summarizes the above data giving an estimate of the number of sections needed for the basic skills courses and statistics for the year 2014-2015. Except for the new students, the above data is for each semester, so each number of sections was doubled.

Course	Number of Sections for New Students	Number of Sections for Successful Students who did not enroll in following course	Number of Sections for Repeating students –unsuccessful or withdrew in prior semester	Total Sections
MTH 103	3.7		3.4	7.1
MTH 104	9.1	1.2	6.6	16.9
MTH 53/65	13.7	2.0	18.3	34.1
MTH 55/54	10.1	2.3	20.7	33.1
MTH 43	9.1	5.1	10.6	24.9

In the above estimate for the number of sections for MTH 43,

- The number of sections for new students is for college-level courses, not just MTH 43. For this chart. However, we don't believe this is too much of an overestimate, since MTH 43 is required of nursing, business, sociology, and psychology majors and we currently offer only a couple of sections at most that are alternative to MTH 43 for liberal arts majors.
- The number of sections for successful students who did not enroll in the following course is actually for college-level courses. However, we don't believe this is too much of an overestimate for the same reason expressed in the last bullet. Further, the persistence data for MTH 53 is not included, thus further lowering the overestimate.

We are a discipline that serves many areas on campus including chemistry, biology, engineering, architecture, physics, and business. If we do not offer the classes needed for these disciplines, then the students are kept from continuing in their major until they fulfill the math prerequisite or requirement.

Three of our courses were targeted as bottleneck courses, MTH 43, MTH 55, and MTH 65. Students need these courses to get their AA/AS degrees or to transfer. We would like to offer MTH 41

[5] http://www.chabotcollege.edu/programreview/Data/A_CourseSuccess_Data/2011-2014/Science_&_Mathematics/MTH_Courses_11-14.pdf

to support those students who wish to become elementary school teachers, as it satisfies their requirement at CSU East Bay.

We need more FTEF to meet the needs of our new students plus classes for our current students who have not been able to get the class in the past. We would like to go back to offering our students a variety of options of math classes to meet their educational goals.

Not listed, but we would like in the future, is more FTEF for workshops as a support for our students.

Appendix F4: Academic Learning Support Requests [Acct. Category 2000]

Audience: *Administrators, PRBC, Learning Connection*
Purpose: *Providing explanation and justification for new and replacement student assistants (tutors, learning assistants, lab assistants, supplemental instruction, etc.).*
Instructions: *Please justify the need for your request. Discuss anticipated improvements in student learning and contribution to the Strategic Plan goal. Please cite any evidence or data to support your request. If this position is categorically funded, include and designate the funding source of new categorically-funded position where continuation is contingent upon available funding.*

1. Number of positions requested:

2. If you are requesting more than one position, please rank order the positions.

Position	Description
1. Math Lab Tutors (67 hours)	Drop in tutoring in Rm. 3906
2. PATH Center Tutors (57 hours)	1 on 1 and small groups in 2351.
3.Math/Science Student Center Supervisor prefer two – three part-time employees to ease scheduling problems	The person(s) in this position would supervise the Math/Science Student Center. This would involve being responsible for the daily operations of the center, maintaining equipment and computers, being responsible for tutors, answering students' questions, and creating required reports for students, college administration, and state organizations.
4. Counselor We need approximately 27 hours of time to create the SEPs for 100 students.	The counselor would help with creating SEPs for our STEM students as they enter Chabot.

3. Rationale for your proposal based on your program review conclusions. Include anticipated impact on student learning outcomes and alignment with the strategic plan goal. Indicate if this request is for the same, more, or fewer academic learning support positions.

Math Lab Tutors: Data from the office of institutional research has shown that students have better persistence and success rate when they regularly attend and use the math lab. The math lab traditionally has used 67 hours of student tutoring. Currently, we are working with several understaffed time slots in the math lab. Also, we have recently been privileged to add back sections of math classes that were cut from the schedule in recent years. This has increased the demand of tutoring and even fully staffed hours in the math lab currently have a difficult time meeting all of the students learning demands.

PATH Center Tutors: In the math lab, tutors can generally only work with each individual student for 5 to 10 minutes at a time and then they need to move on to the next student. The PATH center gives an opportunity for students who need more in depth help to work with their

tutor for 1 hour at a time. Data from the office of institutional research has shown that students have better persistence and success rate when they regularly attend and use the PATH Center. It is common for there to be wait lists to get access to tutors in PATH. So, if we could up the number of tutoring hours available, this would be very helpful to our students. This is particularly true in the subject of Statistics (MTH 43).

It would be more efficient to hire a supervisor position for the Science/Math Student Center (formerly the math lab). This position would allow someone on the premises to take care of the hiring, scheduling, training, and supervising of the tutors, to maintain the computers and printers, and to answer students' questions. Currently there is a faculty member who in charge of the lab, but he or she is not on the premises. Many days can go by before the printer or computer gets fix. Faculty sign up to work in the lab for a few hours a week. A lot of time is spent doing scheduling every semester. We do not always have a faculty member in the lab during college hour, because of other faculty commitments. If an instructor is ill, we cannot always find a replacement for the math lab. This would also free up a full-time faculty member to work on other discipline matters.

If we are going to get our students on the correct pathway, we need to have a counselor fill out an SEP plan before they register for classes. If they don't get the correct classes, they can easily be delayed a year in meeting their educational goal. Having a counselor(s) dedicated to our STEM students on orientation day would get our students on the right path.

Appendix F5: Supplies & Services Requests [Acct. Category 4000 and 5000]

Audience: *Administrators, Budget Committee, PRBC*
Purpose: *To request funding for supplies and service, and to guide the Budget Committee in allocation of funds.*
Instructions: *In the area below, please list both your current and requested budgets for categories 4000 and 5000 in priority order. Do NOT include conferences and travel, which are submitted on Appendix M6. Justify your request and explain in detail any requested funds beyond those you received this year. Please also look for opportunities to reduce spending, as funds are very limited.*

Supplies Requests [Acct. Category 4000]

Instructions:

1. **There should be a separate line item for supplies needed and an amount.**
   For items purchased in bulk, list the unit cost and provide the total in the "Amount" column.
2. **Make sure you include the cost of tax and shipping for items purchased.**

Priority 1: Are ***critical requests required to sustain a program*** (if not acquired, program may be in peril) or to meet mandated requirements of local, state or federal regulations or those regulations of a accrediting body for a program.

Priority 2: Are ***needed requests that will enhance a program*** but are not so critical as to jeopardize the life of a program if not received in the requested academic year.

Priority 3: Are requests that are ***enhancements, non-critical resource requests*** that would be nice to have and would bring additional benefit to the program.

needed totals in all areas	2014-15 Request		2015-16 Request					
Description	Requested	Received	Amount	Vendor	Division/Unit	Priority #1	Priority #2	Priority #3
Supplies	920	920	920		Math		X	

Contracts and Services Requests [Acct. Category 5000]

Instructions:

1. **There should be a separate line item for each contract or service.**
2. **Travel costs should be broken out and then totaled (e.g., airfare, mileage, hotel, etc.)**

Priority 1: Are ***critical requests required to sustain a program*** (if not acquired, program may be in peril) or to meet mandated requirements of local,
state or federal regulations or those regulations of a accrediting body for a program.

Priority 2: Are ***needed requests that will enhance a program*** but are not so critical as to jeopardize the life of a program if not received in the requested academic year.

Priority 3: Are requests that are ***enhancements, non-critical resource requests*** that would be nice to have and would bring additional benefit to the program.

augmentations only

Description	Amount	Vendor	Division/Unit	Priority #1	Priority #2	Priority #3

Appendix F6: Conference and Travel Requests [Acct. Category 5000]

Audience: *Staff Development Committee, Administrators, Budget Committee, PRBC*
Purpose: *To request funding for conference attendance, and to guide the Budget and Staff Development Committees in allocation of funds.*
Instructions:*Please list specific conferences/training programs, including specific information on the name of the conference and location. Note that the Staff Development Committee currently has no budget, so this data is primarily intended to identify areas of need that could perhaps be fulfilled on campus, and to establish a historical record of need. Your rationale should discuss student learning goals and/or connection to the Strategic Plan goal.*

Description	Amount	Vendor	Division/Dept	Priority #1	Priority #2	Priority #3	Notes
Math Retreat	3500		Math	X			The retreat gives the faculty time to share ideas and concerns as well as be updated on what changes have been made to curriculum and textbooks. Most of the money is to pay part-time faculty to participate
Annual CMC3 Conference or other math professional conference	4000		Math		X		This conference is the main math conference for two-year colleges. Faculty learn about the latest in technology, what other colleges are doing, new trends in pedagogy and great practices/lessons for the classroom.
Student Success Conference	3000		Math		X		Conference will be held in Southern CA this year, so will funds for travel, hotel and meals. and registration.

Appendix F7: Technology and Other Equipment Requests [Acct. Category 6000]

Audience: *Budget Committee, Technology Committee, Administrators*
Purpose: *To be read and responded to by Budget Committee and to inform priorities of the Technology Committee.*
Instructions: *Please fill in the following as needed to justify your requests .If you're requesting classroom technology, see http://www.chabotcollege.edu/audiovisual/Chabot%20College%20Standard.pdf for the brands/model numbers that are our current standards. If requesting multiple pieces of equipment, please rank order those requests. Include shipping cost and taxes in your request.*

Instructions:

1. For each piece of equipment, there should be a separate line item for each piece and an amount. Please note: Equipment requests are for equipment whose unit cost exceeds $200. Items which are less expensive should be requested as supplies. Software licenses should also be requested as supplies.

For bulk items, list the unit cost and provide the total in the "Amount" column.

2. Make sure you include the cost of tax and shipping for items purchased.

Priority 1: Are ***critical requests required to sustain a program*** (if not acquired, program may be in peril) or to meet mandated requirements of local, state or federal regulations or those regulations of a accrediting body for a program.

Priority 2: Are ***needed requests that will enhance a program*** but are not so critical as to jeopardize the life of a program if not received in the requested academic year.

Priority 3: Are requests that are ***enhancements, non-critical resource requests*** that would be nice to have and would bring additional benefit to the program.

Description	Amount	Vendor	Division/Unit	Priority #1	Priority #2	Priority #3

Appendix F8: Facilities Requests

Audience: *Facilities Committee, Administrators*
Purpose: *To be read and responded to by Facilities Committee.*
Background: *Following the completion of the 2012 Chabot College Facility Master Plan, the Facilities Committee (FC) has begun the task of re-prioritizing Measure B Bond budgets to better align with current needs. The FC has identified approximately $18M in budgets to be used to meet capital improvement needs on the Chabot College campus. Discussion in the FC includes holding some funds for a year or two to be used as match if and when the State again funds capital projects, and to fund smaller projects that will directly assist our strategic goal. The FC has determined that although some of the college's greatest needs involving new facilities cannot be met with this limited amount of funding, there are many smaller pressing needs that could be addressed. The kinds of projects that can be legally funded with bond dollars include the "repairing, constructing, acquiring, equipping of classrooms, labs, sites and facilities." Do NOT use this form for equipment or supply requests.*
Instructions: *Please fill in the following as needed to justify your requests .If requesting more than one facilities project, please rank order your requests.*

Brief Title of Request (Project Name): Creation of study areas for MESA and STEM study groups.

Building/Location:

Description of the facility project. Please be as specific as possible.

Furniture (including cubicle partitions), white boards, new paint, etc. to create study spaces for study groups for the Mesa program, STEM Center, and for our STEM students in room 3902.

What educational programs or institutional purposes does this equipment support?

The Mesa program, Stem Center, and the Science-Math Houses.

Briefly describe how your request relates specifically to meeting the Strategic Plan Goal and to enhancing student learning?

This room would give students a place to hold their study groups. This would be a way for us to support our students outside the classroom.