Skyline College
Annual Program Planning Self-Study

*Note: To complete this form, **SAVE** it on your computer, then send to your Division Dean/VPI as an **ATTACHMENT on an e-mail message**.*

Program Title: Mathematics **Date Submitted:** 15 April 2015

Key Findings: The mathematics program provides students with multiple pathways to meet their degree requirements, the analytic geometry based calculus sequence for STEM majors, the applied calculus sequence for business majors, the pathway to statistics for non-STEM majors, and basic skills courses. The department explores different ways to increase the number of students successfully completing their math requirements implementing systemic, curricular and pedagogical changes where needed. Although the efficiency (faculty load) of the program is very high and the faculty work closely with many learning communities to help students succeed, additional resources are required to facilitate identification and implementation of additional methods for increasing student success.

1. Planning Group Participants (include PT & FT faculty, staff, students, stakeholders)

List Names and Positions:

FT Faculty: Daisy Araica, Younga Choi, Stephen Fredricks, Jon Freedman, David Hasson, Richard Hough, Evan Leach, Cindy Moss, Tadashi Tsuchida, Phillip Williams, Soodi Zamani
PT Faculty: Najla Abrao, Ann Ban, Sue Broxholm, Arash Farahmand, Eugene Garcia, Hong Guo, Dmitriy Ivanov, Zhanna Kotsishevskaya, Ray Hoi Sun Kuan, William Kwok, Jude Loeffler, Abdel Maoujoudi, Mike Maxwell, Eric Miranda, Kayvan Momeni, Sean Nguyen, Richard Piserchio, Tom Reuterdahl, Karina Roitman, Li Wang, Miranda Wang

2. Contact Person (include e-mail and telephone):

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3. Program Information

A. Program Personnel

Identify the number of personnel (administrators, faculty, classified, volunteers, and student workers in the program:

FT Faculty: 10 PT/OL Faculty (FTE): 9.8

B. Program Mission and goals

State the goals/focus of the program and how the program contributes to the mission and priorities of the College and the District. Address how the program meets the current year's strategic priorities. (200 word limit recommended.)

Courses in mathematics provide a foundation for quantitative analysis, discovery, life-long learning and reasoning. In addition, the program contributes to the College's mission by providing

- basic skills preparation,
- courses that satisfy degree requirements,
- skills necessary to complete a number of occupational programs,
- transfer requirements,
- coursework that fosters student growth and achievement, and
- an atmosphere that celebrates cultural diversity, particularly through the MESA center which is strongly supported by the math program.

The program strives to make mathematics a bridge rather than a barrier to success. The department continues to work towards increasing success and retention rates; striving to enable more students to reach their academic goals.

4. Program/Service Area Student Learning Outcomes and Program Data

A. Summarize recent course (for instruction, including student service courses) or program (for student services and every three years, CTE programs) SLO assessment, identify trends and discuss areas in need of improvement. Please attach summary TracDat reports with assessment analysis reports and analysis for SLOs evaluated during the last two years (prior to submission deadline of April 1st). (200 word limit is recommended.)

Course	Results	Action Plan
MATH 130	77.42% of students correctly matched at least 3 of 5 graphs to scenarios. Only 45.16% of students averaged at least 3 out of 4 of the constants in the equations.	Preliminary results. Are reassessing in Spring 2015.
MATH 200	Not enough data to make a determination.	Gathering more data in Spring 2015 and will analyze and make an action plan in early fall.
MATH 201	Not enough data to make a determination.	Gathering more data in Spring 2015 and will analyze and make an action plan in early fall.
MATH 115	60% (15 of 25) of students averaged at least a 3 on the 4 pt. rubric for proofs. (07/14) This is a decrease over last summer's results. 68% (17 of 25) scored at least 3 on the 3D volume problem.	Continue to look at productive persistence to see if time on task has any affect on performance.

Revision of Student Learning Outcomes The overhaul of department SLOs is continuing into the next sequence of courses. Focusing on the same three over-arching outcomes – multiple representations, problem solving, and grit – in all classes is enabling us to better know what to do with the results.

For example, an improved rubric format is allowing us to drill down to specific tasks. Piloted over the last two years, this format will be implemented in all of the next set of classes assessed in the fall.

As we test different ways to assess grit we are ready to shift from individual pilots into department-wide assessment. One proposed change of semantics is to talk about productive persistence rather than simply grit to focus on getting somewhere with the hard work.

B. Analyze evidence of Program performance. Review and analyze productivity, student characteristics and outcomes. (200 word limit recommended.)

Success and Retention Rates Success and retention rates have remained flat over the past five years. Over this interval, retention in mathematics courses has been approximately 79% and success has been approximately 59%. Although there are pockets of higher success – for example with students in learning communities and with students taking advantage of supplemental instruction – large scale improvements remain elusive.

Underperforming Groups The data from the PRIE has indicated that success and retention rates for African-American and Hispanic students are lower than those of Asian and White students. Learning communities have been established to address the imbalance. In addition, two department initiatives – acceleration and multiple measures placement – have been seen to positively affect underperforming groups even more than students taken as a whole.

The Student Success Scorecard Skyline College is already ahead of the state on the Student Success Scorecard in mathematics remediation; 33.6% of Skyline College students who started in 2007-2008 below transfer level in mathematics completed a college-level mathematics course versus 30.6% statewide. Of particular note, 34.6% of African-American students who started in 2007-2008 below transfer level in mathematics completed a college-level mathematics course versus 17.4% statewide.

C. Explain how other information may impact Program (examples are business and employment needs, new technology, new transfer requirements, etc.) (200 word limit is recommended.)

Biotech Bay and Silicon Valley Due to the proximity of Skyline College to important hubs of technological innovation, the mathematics department is concerned that we are not encouraging enough students to pursue STEM courses, majors and careers. This is especially noticeable with regards to groups that are traditionally underrepresented in technological careers.

Integration of Technological Instruction To better prepare students for majors and careers in technological fields, the department will increase integration of common mathematical tools in its courses. Students leaving Skyline College with STEM majors should have an introduction to commonly used tools such as MATLAB and Mathematica. Interactive videos, concept tests, learning apps, and other active learning technologies are being explored in basic skills classes but require students to have mobile devices or laptops both in class and out.

5. Curricular Offerings

A. Program Curriculum and Courses. If your program does not offer curriculum, please state "N/A".

Respond to the following:

- What new courses (excluding Individual Selected Topics [665] topics and Experimental [680/880] courses) have you added to your program curriculum in the past academic year? List by Department, Course Number and Course Title.
- Note that you've added new courses to the department's three-year calendar of assessment and requested that they be added to TracDat.
- Note that you've done the following for new courses on TracDat:
    - Updated SLOs?
    - Mapped course-level SLOs to PSLOs (including relevant interdisciplinary degrees) and ISLOs?
    - Uploaded assessment method(s) (need not be specific)?

Number	Course Title	Review	Assess.
811	Fundamentals of Mathematics	8/10	Fa 13
110	Elementary Algebra	8/10	Fa 13
111	Elementary Algebra 1	8/10	Fa 13
112	Elementary Algebra 2	8/10	Fa 13
115	Geometry	8/10	Su 14
120	Intermediate Algebra	8/10	Fa 13
122	Intermediate Algebra 1	8/10	Fa 13
123	Intermediate Algebra 2	8/10	Fa 13
130	Trigonometry	8/10	Fa 14/Sp 15
150	Mathematics for Elementary Teachers	8/10	Not Offered
190	Path to Statistics	2/13	Fa 16
200	Probability and Statistics	8/10	Fa 14/Sp 15
201	Quantitative Reasoning	8/10	Fa 14/Sp 15
222	Precalculus	8/10	Fa 13
241	Applied Calculus 1	8/10	Fa 15
242	Applied Calculus 2	8/10	Fa 15
251	Calculus with Analytic Geometry 1	8/10	Fa 15
252	Calculus with Analytic Geometry 2	8/10	Fa 15
253	Calculus with Analytic Geometry 3	8/10	Fa 15
270	Linear Algebra	8/10	Fa 15
275	Ordinary Differential Equations	8/10	Fa 15

- Preliminary data from Fall 2014 insufficient for complete analysis. More data is being gathered in Spring 2015 and will be uploaded at the end of the semester.
- Math 190 assessment has been moved to Fall 2016 with the other basic skills courses.
- Courses to be assessed during Fall 2015 have had their SLOs updated on TracDat. Assessment methods will be developed during Spring 2015.
- Assessment methods for courses to be assessed in Fall 2015 will be finalized at May math meeting and uploaded to TracDat before the end of the semester.

B. Identify Patterns of Curriculum Offerings

Respond to the following:

- Identify the planning group's two-year curriculum cycle of course offerings by certificates and degrees.
- Describe the ideal curriculum cycle.
- Discuss any issues.

The Two-Year Curriculum Cycle All mathematics courses are offered every year, with most courses offered every semester. Availability of mathematics courses should not provide a barrier to timely completion of certificates, degrees or transfer. To address "Completion by Design" and to decrease entry and exit points where students have shown to be less successful, the following strategies are being employed:

- Fewer Math 111/112 and Math 122/123 courses are being scheduled therefore reducing entry/exit points
- Expansion of supplemental instruction to entry level remedial Math classes from Math 811 through Math 120
- Introduction of Math 190: Path to Statistics, which combines the algebra sequence and contextualizes content in supporting students for success in transfer level statistics
- Implementing pilot of multiple measures in the placement process to increase the level of math appropriately thus increasing the number of students reaching transfer level mathematics
- Planning of one-semester Math 110/120 accelerated class to further decrease entry and exit points. Class would be appropriate for students heading to any transfer level math course.

Issues and Possible Solutions

Full Time Faculty The percentage of classes covered by full-timers continues to be unacceptably low. While our FTEF increased by an average of 1.01 per semester from '12-'13 to '13-'14 we have not hired even the TRIO math replacement. Our one Latino full time professor is retiring just when we have been granted HSI (Hispanic Serving Institution) status and are looking to add a math component to the Puente learning community.

MESA The MESA center is heavily utilized by many STEM students, with most of the seats filled throughout the day. The space available for this valuable program should be expanded to meet the high student demand.

Hours by Arrangement The department is currently exploring ways to better implement the hours by arrangement component of many of our classes. Current plans include use of online instructional tools and the implementation of faculty-led workshops through the MESA center and the Learning Center. Department is joining the WestEd study of Khan Academy efficacy and is working with the Kahn higher ed to better utilize this free resource.

6. Response to Previous Annual Program Plan & Review

List any recommendations for the program and your responses to these recommendations based on previous Annual Program Plan and/or CTE Professional Accreditation report.

1) *SLOs:* Faculty continue to design and refine ways to assess productive persistence. Efforts will transition from individual instructor pilots to department wide implementation. Recommend that as department updates SLOs we review outlines as well.
2) *Reduced cost of Required Materials:* Lead by Cindy Moss and Sean Nguyen, math department is collaborating in modifying open source algebra materials to fit Skyline outlines. Pilots will expand in the coming school year to include more than half of the sections and free or nearly free materials will continue to be developed throughout the year to be implemented department wide in the '16-'17 school year.

7. Action Plan

Provide your action plan based on the analysis and reflections provided in the previous sections. Note: resource requests should be connected to action plans.

Respond to the following:

- Describe data and assessment results for SLO assessment on the course level (for instruction, including student service courses) or program level (for student services or every three years, career technical education programs). Analyze and reflect on SLO assessment results and other measures of Program performance.
- Analyze and reflect on other evidence described in previous sections. Identify the next steps, including any planned changes to curriculum and pedagogy.
- Identify questions that will serve as a focus of inquiry for next year.

Students Still Struggling Though preliminary, the data suggests that too many of our students are still struggling to pass our classes as well as master the skills and abilities identified in our SLOs. The department is continuing to find ways to increase the percentage of successful students in the following ways:

1) Increase the number of students placing in transfer level math through multiple measures placement pilot
2) Increase math courses and faculty involved in Learning Communities
3) Develop robust support materials for open source algebra text including online problem sets and interactive videos
4) Develop active learning activities/methodologies including Poll Everywhere clicker "concept tests" and Reading Apprenticeship practices
5) Continue to develop and organize math department WebAccess page to share best practices and resources
6) Develop methods for assessing efficacy of specific innovations

Expand Bright Spots Students in learning communities and students taking advantage of supplemental instruction are typically doing better than mainstream students. For example, the math component of the First Year Experience learning community enjoyed an 89% success rate. The ASTEP learning community had a 77.6% success rate overall, and the Career Advancement Academy had a 75% success rate overall.

In Supplemental Instruction the results are similar. Comparing students who went to SI sessions with students in the same classes who didn't, SI students were 74.4% successful compared with the 55.4% success rate of students in the same classes who did not attend SI.

This data suggests that learning communities and supplemental instruction be expanded wherever possible.

Continue to Develop Tools to Assess Grit The department has developed a combination of surveys and challenging problems to measure improvement in student determination. These need to be refined into something that can be administered in all classes by all faculty, both full time and part time.

8. Resource Identification

A. Professional Development Needs

Additional Full-Time Faculty The percentage of classes covered by full-timers continues to be unacceptably low. While our FTEF increased by an average of 1.01 per semester from '12-'13 to '13-'14 we have not hired even the TRIO math replacement. Our one Latino full time professor is retiring just when we have been granted HSI (Hispanic Serving Institution) status and are looking to add a math component to the Puente learning community.

Time to Develop Low-Cost Materials Though many members of the department are contributing to the creation of algebra materials for the new textbook there is still a lot of work to be done.

Time to Develop Integration of Technology The department has expressed a great interest in incorporating modern mathematical tools such as MATLAB and Mathematica in the STEM curriculum and active learning technology in all classes. These endeavors would require training and collaboration as well as computers and/or tablets for student use in the classroom.

B. Office of Planning, Research & Institutional Effectiveness Requests

Actions:

- List data requests for the Office of Planning, Research & Institutional Effectiveness.
- Explain how the requests will serve the Student/Program/Division/College needs.

Online vs Face to Face Faculty are interested to know how students are doing in the online format and whether online instruction in particular courses is appropriate to expand.

C. Faculty and Staff hiring, Instructional Equipment, and Facilities Requests

Complete the following table:

Annual Program Planning Resource Needs

Program: Mathematics **Date:** 15 April 2015

	Needs	How does this request align with your assessment of student outcomes?	How does this request align with your action plan?	Estimated cost for facilities and equipment
Personnel	2 Full time hires in mathematics: *replacement for TriO Mathematics instructor * emphasis on expanding math offerings in the Puente Learning Community	Success rates of Latinos in math lower than campus as a whole and there is currently no math component in the learning community that supports them	Expanding learning communities part of action plan	
Equipment	Classroom set of tablets and/or laptops	More active learning strategies and hands on activities can impact motivation and problem solving	Increasing use of technology in the classroom part of action plan	35 X $400 = $14,000
Facilities				

Course Assessment Report-- Four Column

San Mateo CCCD

SKY Dept - Mathematics

Department Assessment Coordinator: Rick Hough

Course Outcomes	Means of Assessment & Success Criteria / Tasks	Results	Action & Follow-Up
SKY Dept - Mathematics - SKY MATH 115 - Geometry - Reasoning - Use inductive and deductive reasoning to develop mathematical arguments (Created By SKY Dept - Mathematics)	**Assessment Method:** 4 pt rubric to score two standard geometric proofs **Assessment Method Category:** Exam **Success Criterion:** at least 70% score an average of at least 3 **Related Documents:** MATH115_Su14_rubric_items	02/18/2015 - 60% of students averaged at least 3 **Result Type:** Criterion not met **Reporting Cycle:** 2014 - 2015 **Related Documents:** MATH115_Su14_data	02/18/2015 - Increase engagement with other faculty teaching geometric proofs including online resources **Action Plan Category:** Engage in professional development
SKY Dept - Mathematics - SKY MATH 130 - Analytical Trigonometry - Multiple Representations - Students will analyze multiple representations, such as graphical, formulaic, numerical and verbal, of periodic functions and their applications (Created By SKY Dept - Mathematics) **Course Outcome Status:** Active	**Assessment Method:** As part of group quiz, students match scenarios to graphs. **Assessment Method Category:** Exam **Success Criterion:** At least 75% of students match at least 3 of 5. **Related Documents:** MATH130_Fa12_Alg-Ruleof4_Items Fa14_MATH130_rubric	04/01/2015 - 77.42% of students matched at least 3 of 5 **Result Type:** Criterion met **Reporting Cycle:** 2014 - 2015 **Resources Needed to Implement Action Plan:** No resources needed at this time **Related Documents:** Fa14_MATH130_scores	04/01/2015 - Continue to guide students in rule of 4 **Action Plan Category:** Other
SKY Dept - Mathematics - SKY MATH 130 - Analytical Trigonometry - Problem Solving - Students will successfully analyze and solve trigonometry problems. (Created By SKY Dept - Mathematics) **Course Outcome Status:** Active	**Assessment Method:** As part of a group exercise, students will write correct formulas for the given graphs/scenarios **Assessment Method Category:** Exam **Success Criterion:** At least 75% of students will score at least an average of 3 out of 4 on the rubric **Related Documents:** Fa14_MATH130_rubric MATH130_Fa12_Alg-Ruleof4_Items	04/01/2015 - 45.16% of students averaged at least 3. Breaking down the different parts, students averaged 3.23 on the vertical shift, 2.97 on the amplitude, 2.77 on the horizontal shift, and 2.71 on the period **Result Type:** Criterion not met **Reporting Cycle:** 2014 - 2015 **Resources Needed to Implement Action Plan:** Time to collaborate. Professional development on teaching methodologies in math. Time to	04/01/2015 - Collaborate to find ways to increase student fluency with understanding how trig functions relate to periodic scenarios and graphs. **Action Plan Category:** Engage in professional development

Course Outcomes	Means of Assessment & Success Criteria / Tasks	Results	Action & Follow-Up
		gather/create more support resources for students. DLAs for example? **Related Documents:** Fa14_MATH130_scores	