



# FULLERTON COLLEGE

ELEVATING.  
EXCELLENCE.

## Instructional Programs

### 2017-2018 Self-Study

#### Three-Year Program Review Template Mathematics Program

#### Mathematics & Computer Science

#### Statement of Collaboration

The program faculty listed below collaborated in an open and forthright dialogue to prepare this Self Study. Statements included herein accurately reflect the conclusions and opinions by consensus of the program faculty involved in the self-study.

#### Participants in the Self-Study

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#### Authorization

After the document is complete, it must be signed by the Principal Author, the Department Coordinator, and the Dean prior to submission to the Program Review Committee.

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Dean

12/7/17  
Date

## 1.0 Mission and Goals

The College's Mission, Vision, Core Values and Goals drive all college activities. The Program Review committee would like to understand the connection of your program to the College's Mission, Vision, Core Values and Goals. Summarize how your program supports each area.

**Mission:** The Fullerton College Math Program continues to embody the spirit of Fullerton College's Mission Statement as it explores new student pathways through degree programs, updates degree options, and develops programs to support student learning, foster an inclusive environment, and help students develop as leaders and engaged community members.

The Math Program has long provided a rich assortment of courses for students to take to attain the college-level proficiencies they need for the different pathways they may take towards their diverse degree, certificate, or transfer goals, including the Science, Technology, Engineering, and Mathematics (STEM) pathway, the Liberal Arts Math pathway, the Business Calculus pathway, and the Elementary Teaching pathway, among others. Since the 2014-2015 Program Review cycle, the Math Program has streamlined its Basic Skills offerings, implementing innovative new classes to allow motivated students who place into Basic Skills classes to reach college-level math classes within one semester of starting at Fullerton College.

The Program is also responding to an exploding demand for Statistics classes by adding sections and developing a new Pre-Statistics Basic Math class offering. For the past two years the Math Program has participated in the Pathways Transition Initiative (PTI) grant, allowing students with low Placement Test scores to place into college-level Liberal Arts Math and Statistics classes through a "multiple measures" placement process and monitoring if they can succeed in these classes through additional academic support. The Math Program has also articulated with the Automotive Department to learn how it can better meet the needs of students pursuing Automotive certificates. The Math Program has added the Associate in Science-Transfer (AS-T) and Associate in Arts-Transfer (AA-T) degrees to guarantee transfer to the California State University (CSU) system to students who complete the course work described in the curriculum. The Math Program has updated its course descriptions to conform with the Course Identification Numbering System (C-ID) project of the CSU to standardize curriculum across California. All these recent improvements to the Math Program attest to a forward-looking Program, adjusting nimbly to changes in demands on the Program.

To support students academically, the Math Program continues to run the Math Lab dedicated to math studies and tutoring. The Math Lab now supports college-level classes as well as Basic Skills classes. The Math Program has additionally been working with the Student Diversity Success Initiative (SDSI) and the Fullerton College Math Institute for Learning Enhancement Success (FC MILES) to reduce the achievement gap. The Program offers its courses through various learning environments, with face-to-face, online, and hybrid courses, to reach students with different learning styles. The Math Program has had robust participation in the Fullerton College Supplemental Instruction (FCSI) program, with more professors participating and more sections being supported by the program every semester. It has also maintained an on-going participation in the school's Transfer Achievement Program (TAP). These measures all demonstrate the commitment of the Math Program to student success.

The Math Department also gives students many opportunities to become responsible leaders, with interested students pursuing roles as Supplemental Instruction Facilitators, and Math Lab and FC MILES tutors. The Program's Math Colloquium gives students an opportunity to prepare a professional math talk and experience presenting it to an audience, complete with a Questions & Answers segment. Throughout the Program, professors are experimenting with flipped classrooms, collaborative learning activities, and other group-

learning experiences that allow all students to become more active and responsible learners. These opportunities allow students to develop their leadership skills while pursuing their coursework.

The Math Program also works to connect its students with the larger community. Some professors work with the Fullerton College Career and Life Planning Center to incorporate career research or informational interviews with professionals into course work. Some professors have guest speakers from industry visiting classrooms. Honors classes allow students to develop their own research papers, working with the Research Librarians and other support staff to develop their research question and interact with the databases available to the College. The Math Program participates every spring with a “Fun with Numbers” station in the Kindercaminata program, which sees hundreds of local Kindergartners visiting the campus. All these actions help Fullerton College math students become more engaged with the larger community.

**Vision:** The Math Program supports the Fullerton College vision, which hopes to transform lives and inspire positive changes in the world. The entire Math Faculty is driven by a love and passion for the “austere beauty” of math and its unique way of looking at and describing the world. The discipline which math studies require can inspire students to realize they can achieve anything they put their mind to, even fields that initially seem daunting. Study of math can have intrinsic interest, appealing to students because it describes truths students can verify for themselves, but it also has extreme utility, as it develops the language that is used by all fields, especially the science and technology fields that are so rapidly transforming our society.

In that the Math Program meets students at whatever level of math understanding they possess, works to increase that level, seeks to connect students to the rich past of the field while pointing to its possible future uses, it is always transforming lives and inspiring positive changes in the world.

**Core Values:** The Math Department embodies each of Fullerton College’s core values as it pursues its work. It fosters the values of community and partnership as it participates in the college-wide Honors, Teacher Prep, FCSI, TAP, SDSI, and FC MILES programs. The Math Colloquium invites mathematicians from many local universities to speak on our campus, connecting the Fullerton College math student to the larger community of math learners. Individual instructors in the Program have students interacting with off-campus professionals or have guest speakers come onto campus. All these activities support the values of community and partnership.

Diversity and equity are supported intrinsically, with students from a great diversity of backgrounds working together and side-by-side as they study the universal language of mathematics. Math Program support for diversity and equity is more explicitly demonstrated by participation in the SDSI and FC MILES initiatives, and close work with the Disability Support Services (DSS) office to enact student accommodations.

The Math Program continues to stress excellence and integrity as leading values, offering students a broad range of course offerings, allowing students to excel at whatever level of math they arrive at. For math majors, the Program offers access to a rich curriculum, the Math Colloquium, a growing list of scholarship opportunities, and participation in national math contests and tests, giving the Program a strong reputation, even when compared to four-year universities.

The Math Program is also built on the idea of growth, helping students progress and attain knowledge and understanding they didn’t have before. The Program, however, is also growing itself, responding to changing demands with new courses, new degrees, new student pathways, and new instructional delivery methods, embodying the values of growth and innovation.

The Math Program supports the values of inclusivity and respect whether interactions include students, faculty, or the larger college community. It participates in shared decision-making with strong involvement in the campus Student Learning Outcome (SLO), Staff Development, and Curriculum committees. The Math Program also has a large contingent of senators in the Academic Senate and representation in the Executive Board of United Faculty, demonstrating commitment to inclusivity and respect.

Finally, the Math Program accepts its responsibility to provide a quality education to students, help improve their lives, help with the quantitative reasoning that will help them interact with the world and make it a better place.

**College Goals:** The Math Program is completely committed to the college's goals, which are also seen as the Program's goals.

The promotion of student success is pursued through the many student support programs the Math Program is active in, from TAP to FCSI, from the Math Lab to improved student placement, from new course offerings to new teaching methodologies, student success is foremost in the intentions of the Math Program.

Assuring that all students enjoy success, the above-mentioned support services demonstrate the Program's commitment to student equity and reducing the achievement gap. Participation in the SDSI and FC MILES programs, which are specifically designed for historically underperforming groups, further supports the college goal of equity.

Finally, the college goal of pursuing connections with community is supported by the Math Program's work with neighboring institutions through the Colloquium and Math Club, local businesses through informational interviews and guest speakers, and future students through the Kindercaminata.

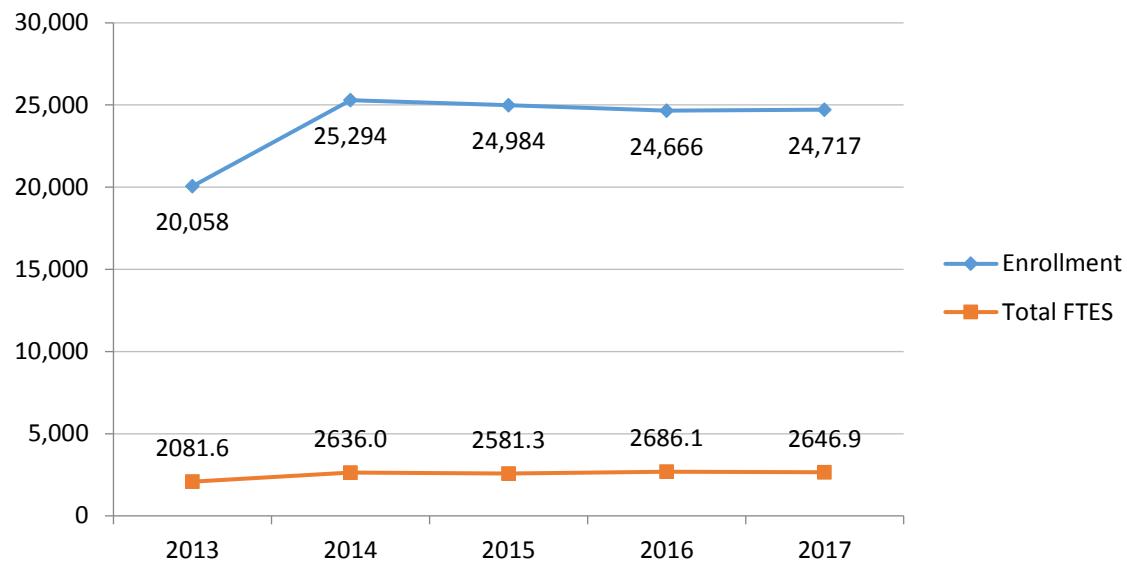
## 2.0 Program Data & Trends Analysis

### 2.1 Key Performance Indicators (KPI)

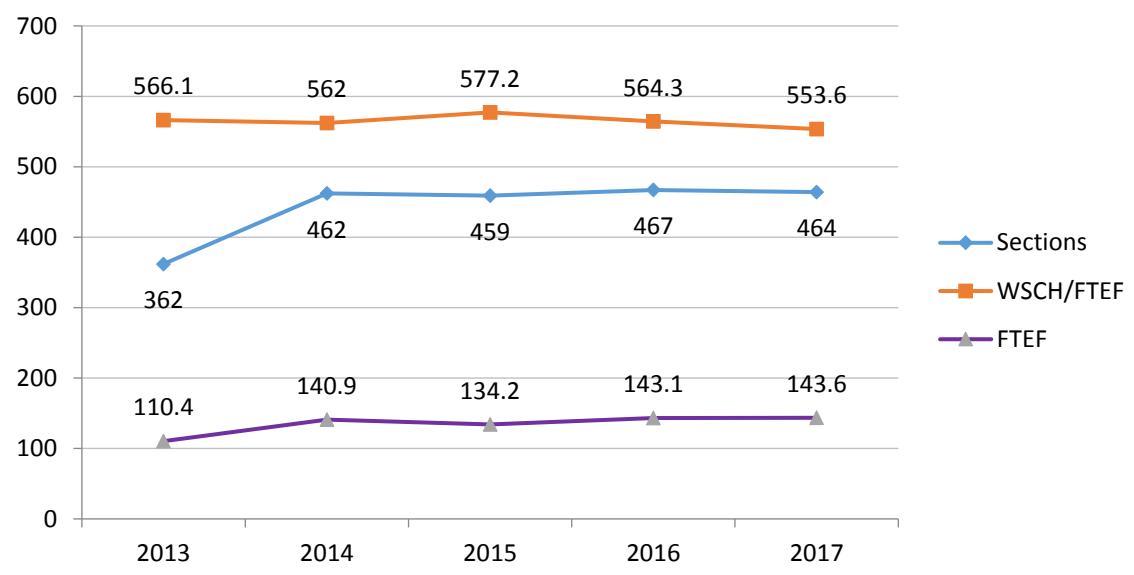
For each KPI listed below, analyze and report your findings and describe what they mean.  
(Attach 5-year longitudinal data from Office of Institutional Research and Planning (OIRP) to Appendix.)

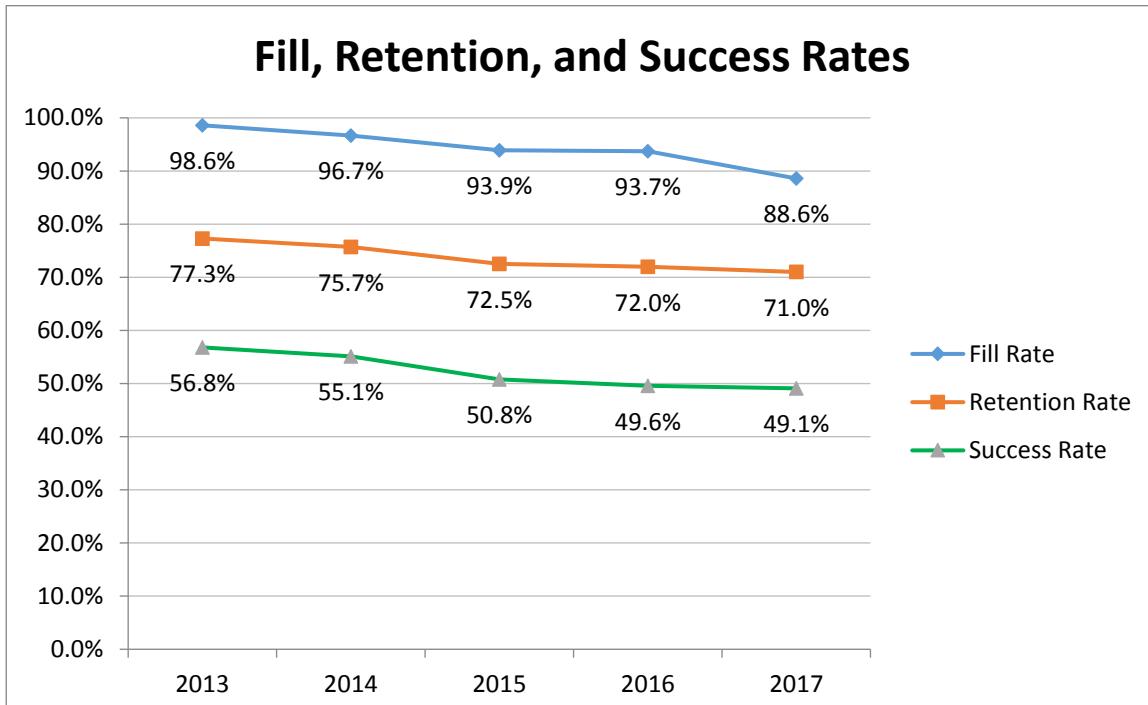
KPI	Findings
Enrollment	Enrollment increased about 26% (from 20,058 to 25,294) between 2013 and 2014, then remained stable (varying only 2%) through 2017.
Total FTES	Changes in total FTES since 2013 mimic changes in enrollment, showing an overall increase of about 27%. However, while resident FTES generation follows enrollment trends, nonresident FTES generation has increased every year, with an overall increase of about 80%.
Sections	The number of sections offered increased almost 28% between 2013 and 2014 and has remained stable since then.
FTEF	Total FTEF follows the same pattern as enrollment, FTES, and sections offered, from a low of 110.4 in 2013 to a high of 143.6 in 2017.
Fill Rate	Fill rates at census have decreased from 98.6% in 2013 to 88.6% in 2017.
WSCH/FTEF	These values range from a high of 577.2 in 2015 to a low of 553.6 in 2017.
Retention	Retention rates have decreased from 77.3% in 2013 to 71% in 2017, with the steepest decline between 2014 and 2015.
Success	Success rates have suffered a similar decrease from 56.8% in 2013 to 49.1% in 2017.

## Enrollment and Total FTES



## Sections, Total FTEF, and WSCH/FTEF





## 2.2 Peer Institution Comparison

Complete the table below.

How does your program compare with peer institutions? Provide a *narrative* of your comparison. (Peer institutions are colleges or programs identified by the Office of Institutional Research and Planning (OIRP)).

### Degrees Awarded

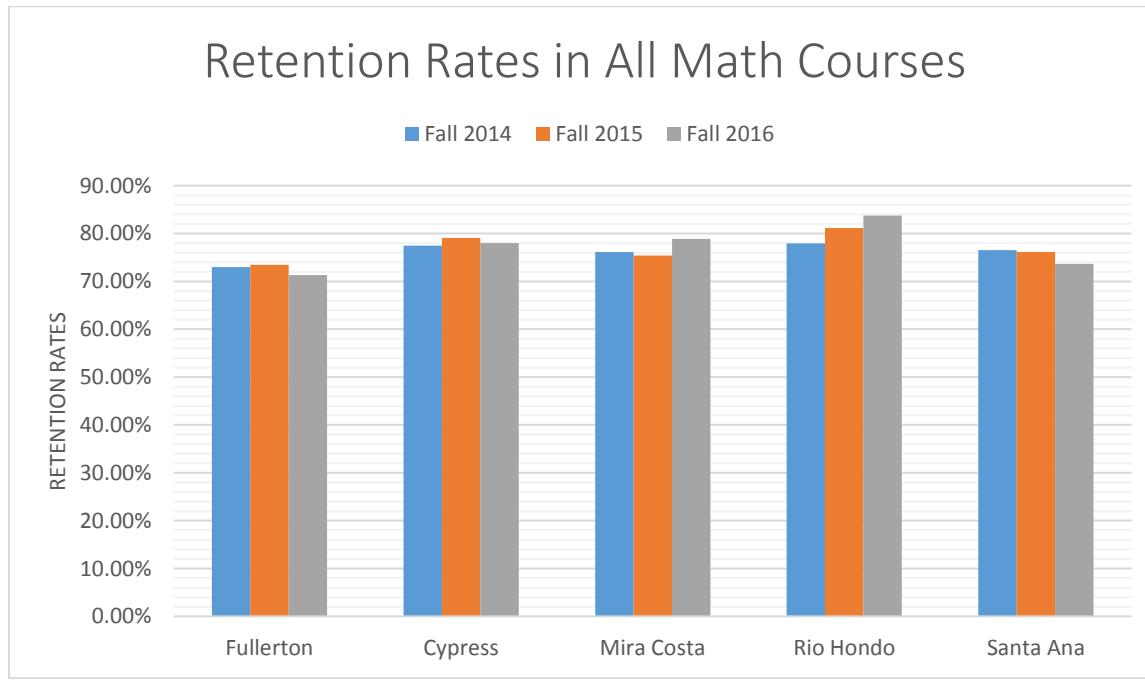
	Annual 2014-2015	Annual 2015-2016	Annual 2016-2017
<b>Fullerton Total</b>	<b>37</b>	<b>30</b>	<b>29</b>
Associate in Science for Transfer (A.S.-T) Degree	7	10	12
Associate of Science (A.S.) degree	30	20	17
<b>Cypress Total</b>	<b>7</b>	<b>24</b>	<b>26</b>
Associate in Science for Transfer (A.S.-T) Degree	7	24	26
<b>Mira Costa Total</b>	<b>20</b>	<b>21</b>	<b>7</b>
Associate in Science for Transfer (A.S.-T) Degree	19	21	7
Associate of Arts (A.A.) degree	1	0	0
<b>Rio Hondo Total</b>	<b>18</b>	<b>19</b>	<b>14</b>
Associate in Science for Transfer (A.S.-T) Degree	18	19	14
<b>Santa Ana Total</b>	<b>27</b>	<b>30</b>	<b>34</b>
Associate in Science for Transfer (A.S.-T) Degree	n/a	20	23
Associate of Science (A.S.) degree	8	9	11
Certificate Requiring 30 to less than 60 units	19	1	0

The above data clearly indicates that Fullerton College awards more total degrees in math than any of the peer institutions over the last three years. Similar to the other institutions the proportion of degrees that are AS-T, rather than AA or AS, is increasing.

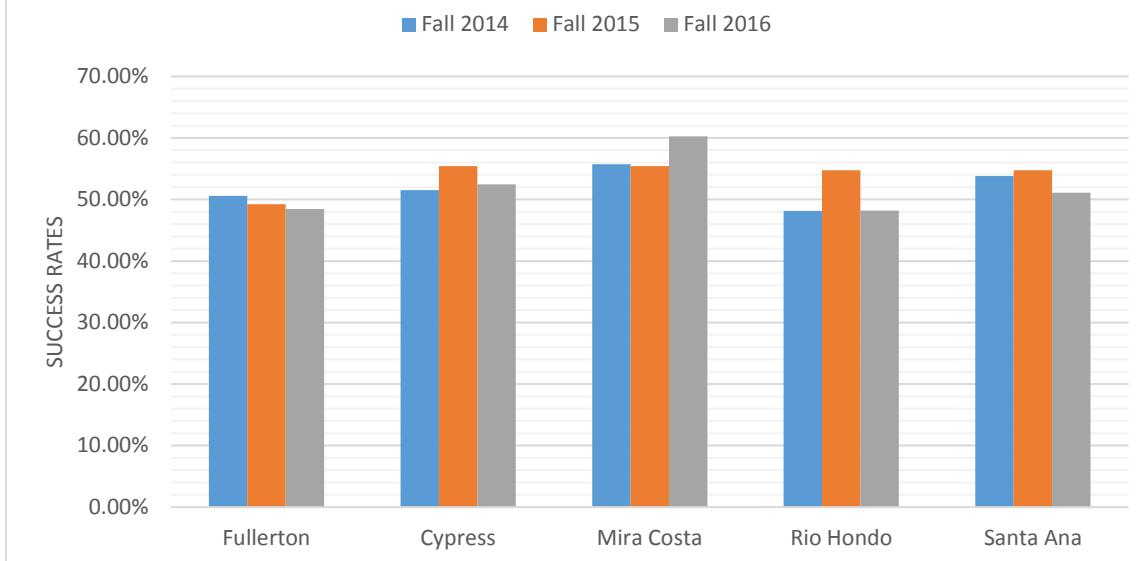
## Retention and Success Rates

Credit Courses (includes all sections of all of our courses, except MATH N01)

	Fall 2014 Retention Rate	Fall 2014 Success Rate	Fall 2015 Retention Rate	Fall 2015 Success Rate	Fall 2016 Retention Rate	Fall 2016 Success Rate
<b>Fullerton Total</b>	<b>73.02%</b>	<b>50.60%</b>	<b>73.45%</b>	<b>49.22%</b>	<b>71.30%</b>	<b>48.43%</b>
Online	61.06%	38.51%	59.21%	27.76%	60.42%	33.33%
Non online	73.68%	51.26%	74.12%	50.23%	71.87%	49.21%
<b>Cypress Total</b>	<b>77.45%</b>	<b>51.54%</b>	<b>79.07%</b>	<b>55.43%</b>	<b>78.01%</b>	<b>52.48%</b>
Online	71.35%	37.30%	68.92%	42.57%	69.84%	42.33%
Non online	77.70%	52.12%	79.38%	55.83%	78.33%	52.88%
<b>Mira Costa Total</b>	<b>76.13%</b>	<b>55.72%</b>	<b>75.40%</b>	<b>55.44%</b>	<b>78.89%</b>	<b>60.24%</b>
Online	64.40%	38.67%	63.03%	39.76%	68.52%	45.72%
Non online	78.66%	59.41%	77.62%	58.26%	81.92%	64.48%
<b>Rio Hondo Total</b>	<b>77.92%</b>	<b>48.16%</b>	<b>81.17%</b>	<b>46.30%</b>	<b>83.73%</b>	<b>48.17%</b>
Online	57.84%	31.42%	62.60%	21.20%	67.23%	25.50%
Non online	87.01%	55.75%	88.40%	56.07%	87.18%	52.91%
<b>Santa Ana Total</b>	<b>76.53%</b>	<b>53.82%</b>	<b>76.13%</b>	<b>54.77%</b>	<b>73.66%</b>	<b>51.12%</b>
Online	68.75%	45.54%	65.65%	43.51%	60.80%	39.20%
Non online	76.71%	54.01%	76.42%	55.08%	74.36%	51.77%



# Success Rates in All Math Courses



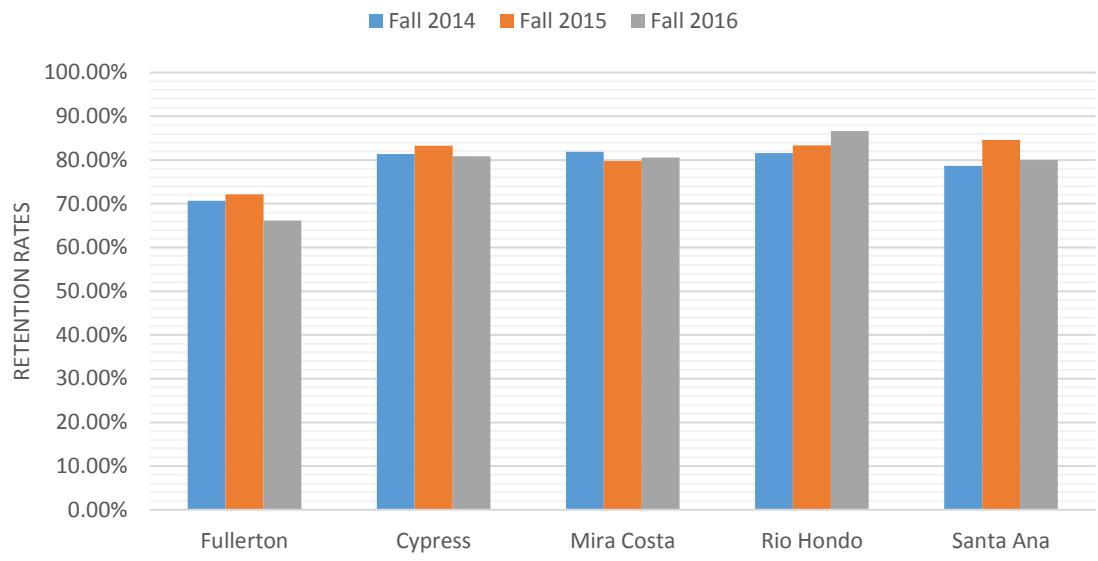
The bar graphs visually demonstrate that our retention and success rates for all credit courses over the past three years are comparable to those of our peer institutions. The difference between in-person and online retention and success rates will be discussed later in this section.

## Retention and Success Rates

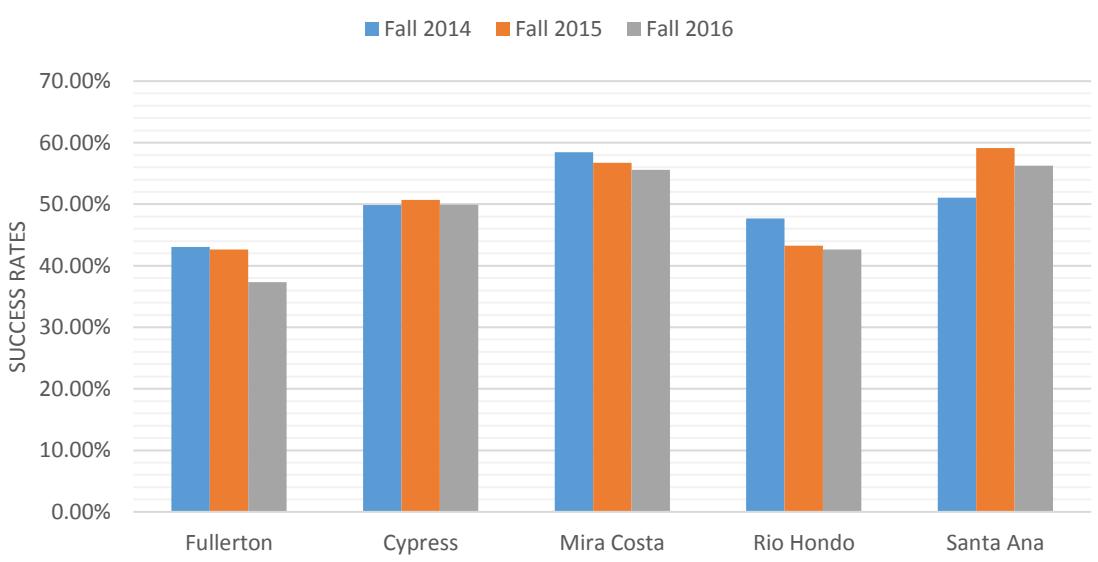
### Basic Skills Courses

	Fall 2014 Retention Rate	Fall 2014 Success Rate	Fall 2015 Retention Rate	Fall 2015 Success Rate	Fall 2016 Retention Rate	Fall 2016 Success Rate
<b>Fullerton Total</b>	<b>70.65%</b>	<b>43.06%</b>	<b>72.13%</b>	<b>42.65%</b>	<b>66.12%</b>	<b>37.34%</b>
Online	55.94%	36.71%	60.87%	30.83%	61.62%	37.37%
Non online	72.55%	43.89%	73.43%	44.02%	66.60%	37.33%
<b>Cypress Total</b>	<b>81.34%</b>	<b>49.89%</b>	<b>83.25%</b>	<b>50.69%</b>	<b>80.88%</b>	<b>49.93%</b>
Online	n/a	n/a	n/a	n/a	n/a	n/a
Non online	81.34%	49.89%	83.25%	50.69%	80.88%	49.93%
<b>Mira Costa Total</b>	<b>81.85%</b>	<b>58.43%</b>	<b>79.74%</b>	<b>56.74%</b>	<b>80.60%</b>	<b>55.57%</b>
Online	68.58%	41.39%	67.24%	49.14%	74.68%	48.73%
Non online	86.26%	64.09%	82.70%	58.55%	83.96%	59.46%
<b>Rio Hondo Total</b>	<b>81.59%</b>	<b>47.70%</b>	<b>83.38%</b>	<b>43.28%</b>	<b>86.65%</b>	<b>42.64%</b>
Online	65.85%	40.15%	70.27%	29.90%	82.67%	36.65%
Non online	89.72%	51.60%	91.65%	51.74%	87.67%	45.02%
<b>Santa Ana Total</b>	<b>78.70%</b>	<b>51.04%</b>	<b>84.62%</b>	<b>59.12%</b>	<b>79.97%</b>	<b>56.27%</b>
Online	66.67%	44.44%	n/a	n/a	n/a	n/a
Non online	78.93%	51.16%	84.62%	59.12%	79.97%	56.27%

## Retention Rates in Basic Skills Math Courses



## Success Rates in Basic Skills Math Courses

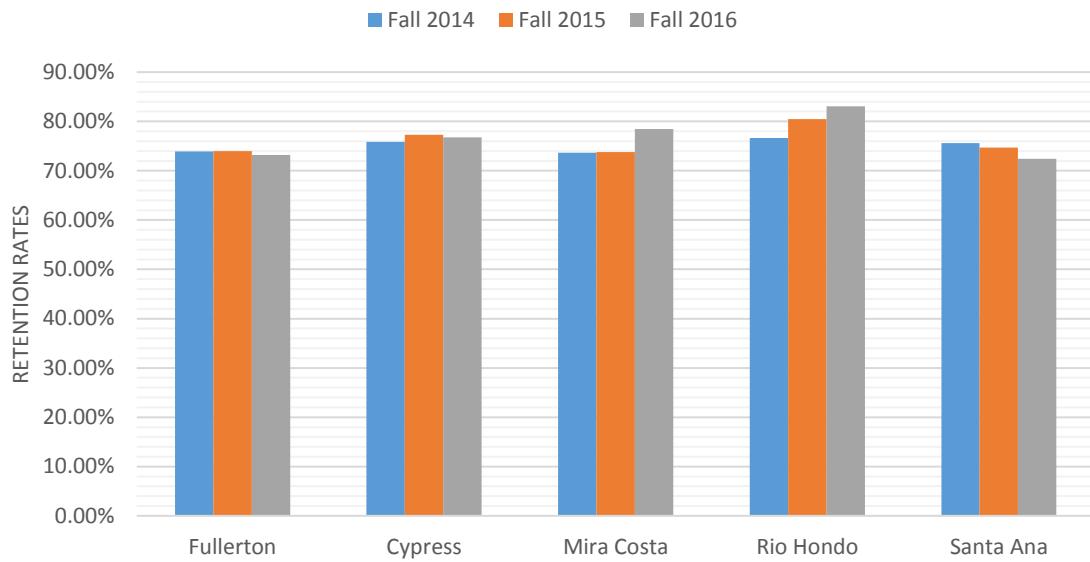


Over the last three years, Fullerton College has experienced lower retention and success rates in Basic Skills courses than our peer institutions. This is an area in which we would like to see improvement. While the difference between online and non-online retention rates in Basic Skills courses is similar to that of our peer institutions, the difference between our online and non-online success rates is relatively small.

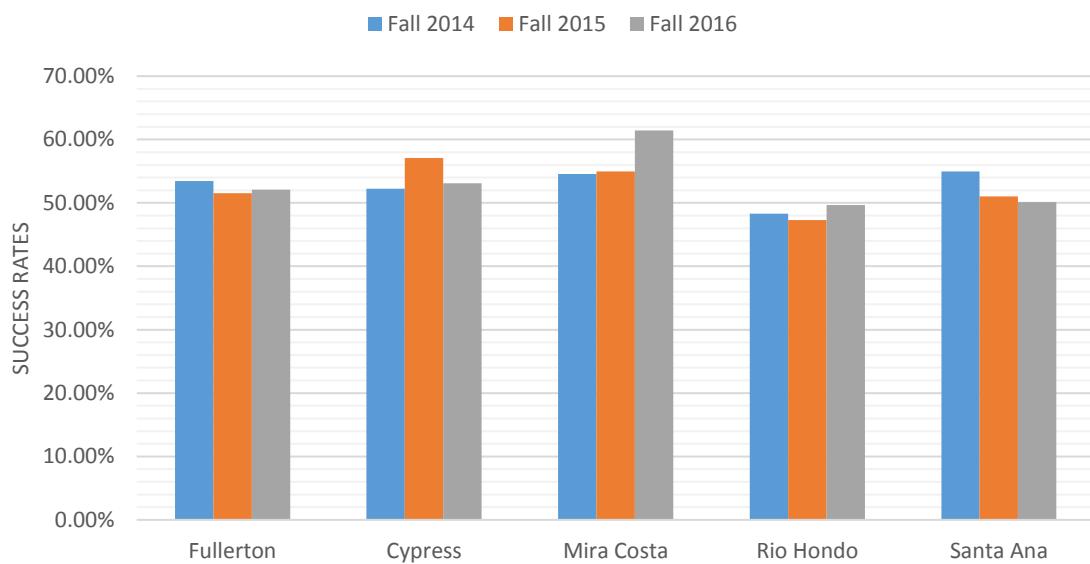
**Retention and Success Rates  
Degree Applicable Courses**

	Fall 2014	Fall 2014	Fall 2015	Fall 2015	Fall 2016	Fall 2016
	Retention Rate	Success Rate	Retention Rate	Success Rate	Retention Rate	Success Rate
<b>Fullerton Total</b>	<b>73.92%</b>	<b>53.47%</b>	<b>74.01%</b>	<b>51.55%</b>	<b>73.17%</b>	<b>52.11%</b>
Online	69.02%	41.30%	56.49%	22.73%	59.40%	29.91%
Non online	74.06%	53.82%	74.44%	52.26%	73.68%	52.94%
<b>Cypress Total</b>	<b>75.84%</b>	<b>52.22%</b>	<b>77.27%</b>	<b>57.11%</b>	<b>76.80%</b>	<b>53.11%</b>
Online	71.35%	37.30%	68.92%	42.57%	69.84%	42.33%
Non online	76.10%	53.10%	77.65%	57.76%	77.20%	53.73%
<b>Mira Costa Total</b>	<b>73.64%</b>	<b>54.54%</b>	<b>73.79%</b>	<b>54.96%</b>	<b>78.46%</b>	<b>61.43%</b>
Online	61.33%	36.67%	60.85%	34.90%	65.54%	44.26%
Non online	75.77%	57.62%	75.85%	58.16%	81.51%	65.48%
<b>Rio Hondo Total</b>	<b>76.67%</b>	<b>48.32%</b>	<b>80.46%</b>	<b>47.27%</b>	<b>83.05%</b>	<b>49.67%</b>
Online	54.76%	28.07%	58.68%	16.75%	58.90%	19.48%
Non online	86.14%	57.08%	87.55%	57.21%	87.07%	54.69%
<b>Santa Ana Total</b>	<b>75.61%</b>	<b>54.99%</b>	<b>74.69%</b>	<b>51.03%</b>	<b>72.44%</b>	<b>50.12%</b>
Online	69.41%	45.88%	65.65%	43.51%	60.80%	39.20%
Non online	75.77%	55.23%	74.99%	54.37%	73.20%	50.84%

## Retention Rates in Degree Applicable Math Courses



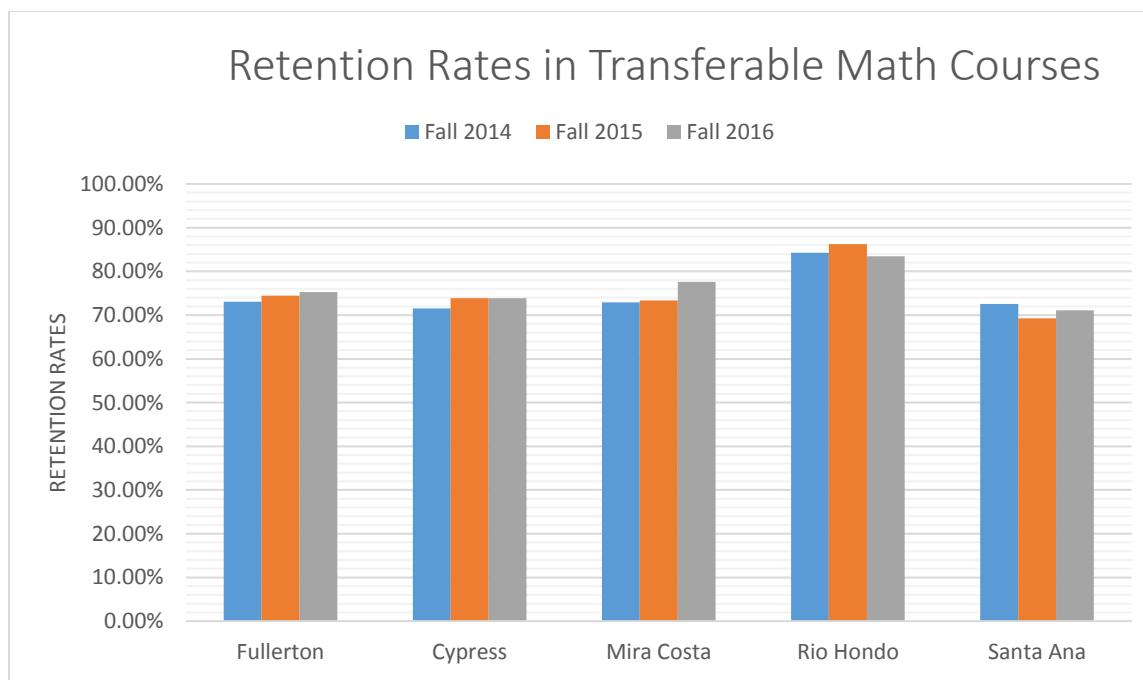
## Success Rates in Degree Applicable Math Courses

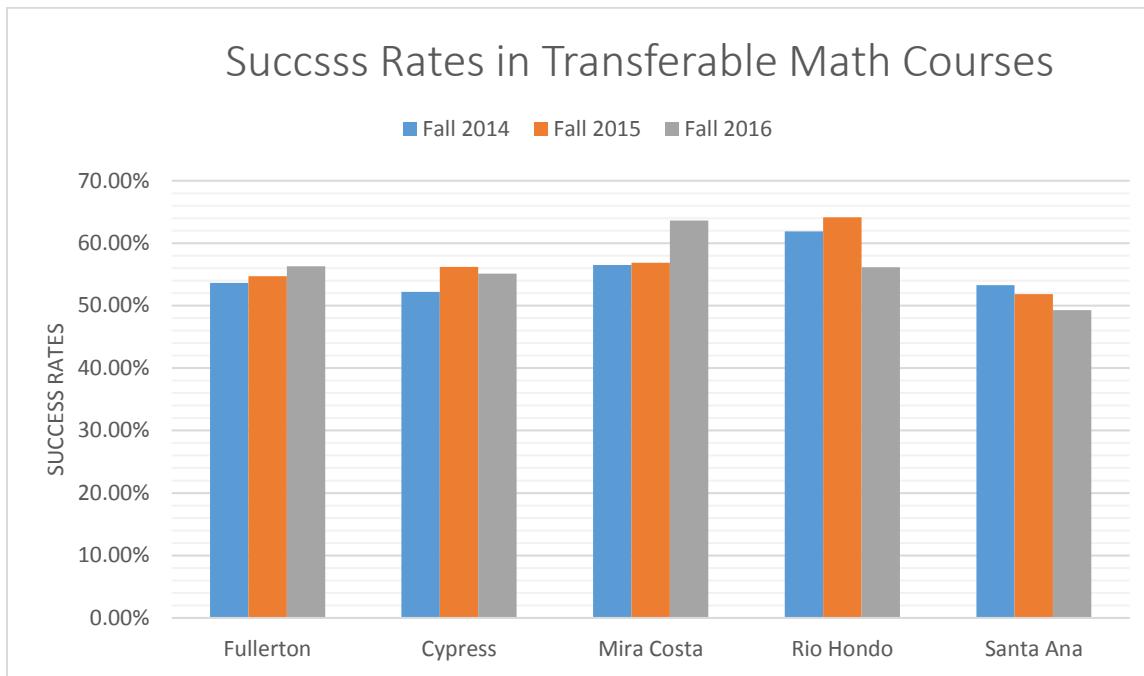


The aggregate data for degree applicable courses indicates our retention and success levels are comparable to those of the chosen peer institutions. Similar to the other institutions, there are higher retention and success rates for in-person instruction than for online instruction. This indicates that additional resources are required to provide training that will improve instructors' online delivery of courses.

**Retention and Success Rates**  
**Transferable Courses**

	Fall 2014	Fall 2014	Fall 2015	Fall 2015	Fall 2016	Fall 2016
	Retention Rate	Success Rate	Retention Rate	Success Rate	Retention Rate	Success Rate
<b>Fullerton Total</b>	<b>73.06%</b>	<b>53.62%</b>	<b>74.45%</b>	<b>54.70%</b>	<b>75.24%</b>	<b>56.31%</b>
Online	n/a	n/a	n/a	n/a	69.77%	60.47%
Non online	73.06%	53.62%	74.45%	54.70%	75.29%	56.27%
<b>Cypress Total</b>	<b>71.52%</b>	<b>52.21%</b>	<b>73.90%</b>	<b>56.20%</b>	<b>73.88%</b>	<b>55.11%</b>
Online	71.43%	42.86%	69.64%	41.96%	69.53%	45.31%
Non online	71.52%	52.79%	74.15%	57.01%	74.16%	55.73%
<b>Mira Costa Total</b>	<b>72.91%</b>	<b>56.52%</b>	<b>73.34%</b>	<b>56.88%</b>	<b>77.57%</b>	<b>63.64%</b>
Online	59.73%	42.28%	60.91%	40.33%	61.80%	45.09%
Non online	73.99%	57.69%	74.87%	58.92%	80.79%	67.42%
<b>Rio Hondo Total</b>	<b>84.27%</b>	<b>61.88%</b>	<b>86.26%</b>	<b>64.13%</b>	<b>83.48%</b>	<b>56.14%</b>
Online	52.50%	35.00%	56.96%	30.38%	59.18%	32.65%
Non online	85.40%	62.83%	88.17%	66.34%	84.23%	56.86%
<b>Santa Ana Total</b>	<b>72.59%</b>	<b>53.29%</b>	<b>69.24%</b>	<b>51.84%</b>	<b>71.12%</b>	<b>49.28%</b>
Online	62.22%	48.89%	63.49%	44.44%	59.26%	43.70%
Non online	72.80%	53.38%	69.40%	52.05%	71.72%	49.57%





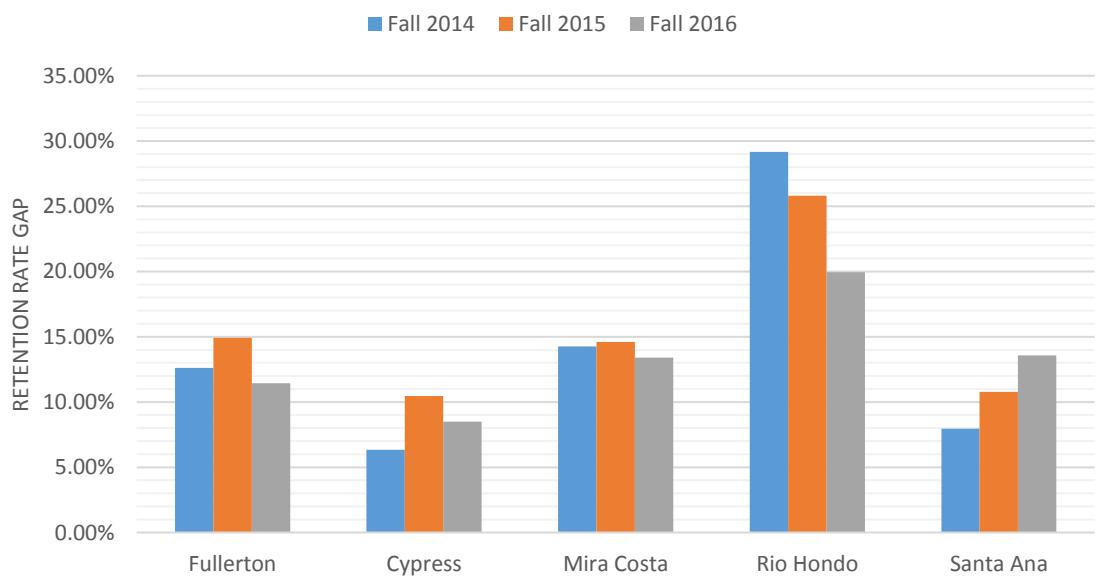
For transferable courses, the aggregate retention and success rates are on the whole comparable to peer institutions. Also, although retention and success rates for online courses are generally lower than for non-online courses, Fullerton College exhibits a higher success rate in the online transferable courses.

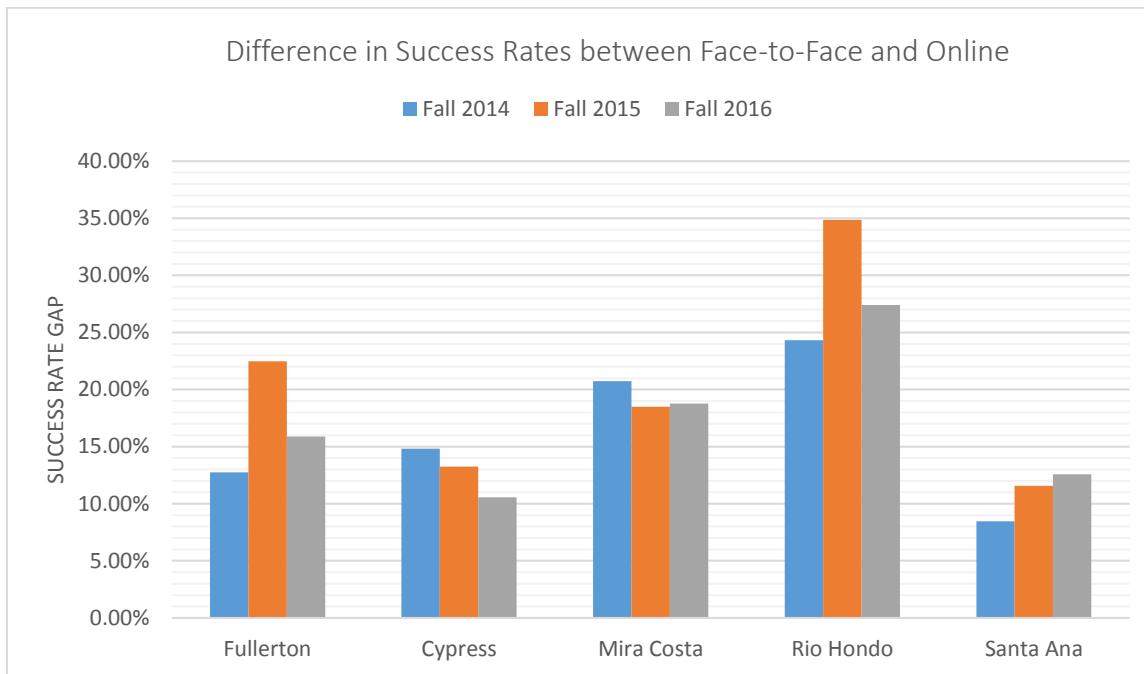
## Retention and Success Rates

### Difference between all face-to-face and all online credit courses

	Fall 2014	Fall 2014	Fall 2015	Fall 2015	Fall 2016	Fall 2016
	Retention Rate	Success Rate	Retention Rate	Success Rate	Retention Rate	Success Rate
Fullerton Total	73.02%	50.60%	73.45%	49.22%	71.30%	48.83%
Online	61.06%	38.51%	59.21%	27.76%	60.42%	33.33%
Non Online	73.68%	51.26%	74.12%	50.23%	71.87%	49.21%
<b>Fullerton Difference</b>	<b>12.62%</b>	<b>12.75%</b>	<b>14.91%</b>	<b>22.47%</b>	<b>11.45%</b>	<b>15.88%</b>
Cypress Total	77.45%	51.54%	79.07%	55.43%	78.01%	52.48%
Online	71.35%	37.30%	68.92%	42.57%	69.84%	42.33%
Non Online	77.70%	52.12%	79.38%	55.83%	78.33%	52.88%
<b>Cypress Difference</b>	<b>6.35%</b>	<b>14.82%</b>	<b>10.46%</b>	<b>13.26%</b>	<b>8.49%</b>	<b>10.55%</b>
Mira Costa Total	76.13%	55.72%	75.40%	55.44%	78.89%	60.24%
Online	64.40%	38.67%	63.03%	39.76%	68.52%	45.72%
Non Online	78.66%	59.41%	77.62%	58.26%	81.92%	64.48%
<b>Mira Costa Difference</b>	<b>14.26%</b>	<b>20.74%</b>	<b>14.59%</b>	<b>18.5%</b>	<b>13.4%</b>	<b>18.76%</b>
Rio Hondo Total	77.92%	48.16%	81.17%	46.30%	83.37%	48.17%
Online	57.84%	31.42%	62.60%	21.20%	67.23%	25.50%
Non Online	87.01%	55.75%	88.40%	56.07%	87.18%	52.91%
<b>Rio Hondo Difference</b>	<b>29.17%</b>	<b>24.33%</b>	<b>25.80%</b>	<b>34.87%</b>	<b>19.95%</b>	<b>27.41%</b>
Santa Ana Total	76.53%	53.82%	76.13%	54.77%	73.66%	51.12%
Online	68.75%	45.54%	65.65%	43.51%	60.80%	39.20%
Non Online	76.71%	54.01%	76.42%	55.08%	74.36%	51.77%
<b>Santa Ana Difference</b>	<b>7.96%</b>	<b>8.47%</b>	<b>10.77%</b>	<b>11.57%</b>	<b>13.56%</b>	<b>12.57%</b>

Difference in Retention Rates between Face-to-Face and Online





When analyzing the data for retention and success rates for all online courses versus all non-online courses, the difference at Fullerton College is larger than at some peer institutions and smaller than at others. This demonstrates the need to provide our department faculty with more opportunities for training and support specific to the teaching of math in distance education environments.

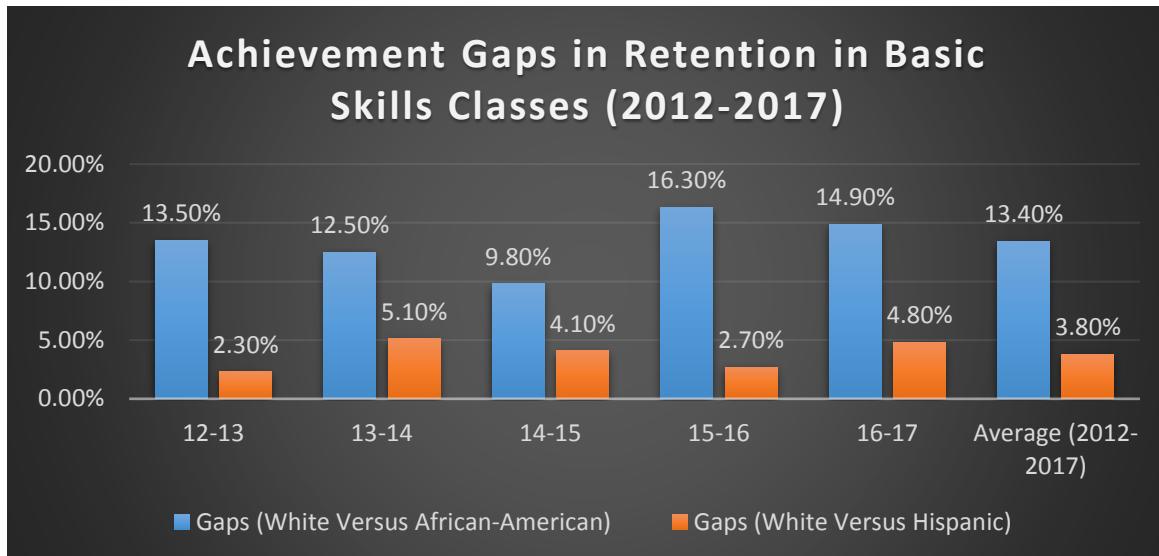
### **2.3 Achievement Gap**

Indicate achievement gap for each of the groups listed below. (Attach to Appendix the Success and Retention by Ethnicity Data as identified by the Office of Institutional Research and Planning.)

Group	% Retention				% Success			
	Basic Skills		Transfer-Level		Basic Skills		Transfer-Level	
<b>Males</b>	12-13	76.00%	12-13	76.90%	12-13	51.00%	12-13	59.80%
	13-14	72.50%	13-14	78.00%	13-14	48.20%	13-14	60.10%
	14-15	71.90%	14-15	72.50%	14-15	45.80%	14-15	52.10%
	15-16	69.00%	15-16	74.00%	15-16	39.90%	15-16	54.80%
	16-17	66.30%	16-17	75.50%	16-17	34.40%	16-17	56.30%
<b>Females</b>	12-13	77.00%	12-13	80.80%	12-13	53.70%	12-13	64.00%
	13-14	74.50%	13-14	79.40%	13-14	50.20%	13-14	62.80%
	14-15	71.70%	14-15	74.50%	14-15	47.50%	14-15	57.80%
	15-16	70.00%	15-16	75.90%	15-16	43.30%	15-16	59.20%
	16-17	66.30%	16-17	76.40%	16-17	39.90%	16-17	58.70%
<b>Asian-American</b>	12-13	79.90%	12-13	81.90%	12-13	62.80%	12-13	69.80%
	13-14	79.40%	13-14	82.30%	13-14	58.70%	13-14	69.90%
	14-15	77.70%	14-15	77.70%	14-15	57.40%	14-15	62.80%
	15-16	78.80%	15-16	79.90%	15-16	59.40%	15-16	65.00%
	16-17	76.00%	16-17	82.80%	16-17	54.10%	16-17	67.70%

<b>African-American</b>	12-13	65.00%	12-13	73.00%	12-13	36.10%	12-13	49.30%
	13-14	65.00%	13-14	76.20%	13-14	35.90%	13-14	57.50%
	14-15	65.10%	14-15	69.20%	14-15	39.90%	14-15	47.20%
	15-16	55.40%	15-16	70.50%	15-16	24.10%	15-16	47.80%
	16-17	54.70%	16-17	70.20%	16-17	27.20%	16-17	45.20%
<b>Filipino</b>	12-13	76.40%	12-13	79.70%	12-13	52.70%	12-13	64.60%
	13-14	80.40%	13-14	80.90%	13-14	53.40%	13-14	67.70%
	14-15	79.00%	14-15	75.50%	14-15	53.40%	14-15	58.10%
	15-16	75.10%	15-16	78.00%	15-16	54.70%	15-16	59.60%
	16-17	75.60%	16-17	75.80%	16-17	50.00%	16-17	58.90%
<b>Hispanic</b>	12-13	76.20%	12-13	77.10%	12-13	50.30%	12-13	56.70%
	13-14	72.40%	13-14	76.20%	13-14	46.50%	13-14	55.70%
	14-15	70.80%	14-15	70.90%	14-15	43.90%	14-15	49.00%
	15-16	69.00%	15-16	72.00%	15-16	39.00%	15-16	51.00%
	16-17	64.80%	16-17	72.60%	16-17	36.70%	16-17	51.60%
<b>Native American (American Indian/Alaska Native)</b>	12-13	56.70%	12-13	76.50%	12-13	50.00%	12-13	47.10%
	13-14	78.60%	13-14	85.70%	13-14	50.00%	13-14	71.40%
	14-15	62.10%	14-15	71.40%	14-15	37.90%	14-15	50.00%
	15-16	57.60%	15-16	65.00%	15-16	45.50%	15-16	55.00%
	16-17	75.00%	16-17	83.30%	16-17	50.00%	16-17	66.70%
<b>Other Non-White (Two or More)</b>	12-13	76.80%	12-13	79.40%	12-13	55.50%	12-13	65.90%
	13-14	71.60%	13-14	80.60%	13-14	49.20%	13-14	63.70%
	14-15	70.50%	14-15	75.40%	14-15	43.80%	14-15	58.70%
	15-16	68.00%	15-16	70.60%	15-16	43.00%	15-16	55.90%
	16-17	67.40%	16-17	78.90%	16-17	44.60%	16-17	60.00%
<b>Pacific Islander (Native Hawaiian/Pacific Islander)</b>	12-13	65.50%	12-13	76.00%	12-13	24.10%	12-13	48.00%
	13-14	56.30%	13-14	62.50%	13-14	35.90%	13-14	56.30%
	14-15	65.50%	14-15	59.40%	14-15	24.10%	14-15	40.60%
	15-16	59.00%	15-16	71.40%	15-16	41.00%	15-16	42.90%
	16-17	68.30%	16-17	63.60%	16-17	25.00%	16-17	51.50%
<b>White</b>	12-13	78.50%	12-13	79.60%	12-13	58.10%	12-13	64.50%
	13-14	77.50%	13-14	80.60%	13-14	57.70%	13-14	63.70%
	14-15	74.90%	14-15	75.30%	14-15	55.20%	14-15	59.10%
	15-16	71.70%	15-16	77.10%	15-16	48.10%	15-16	62.40%
	16-17	69.60%	16-17	78.10%	16-17	47.70%	16-17	62.60%
<b>Unknown</b>	12-13	78.20%	12-13	75.00%	12-13	n/a	12-13	62.30%
	13-14	74.20%	13-14	72.20%	13-14	n/a	13-14	61.60%
	14-15	70.20%	14-15	74.20%	14-15	n/a	14-15	55.40%
	15-16	66.90%	15-16	73.40%	15-16	n/a	15-16	58.30%
	16-17	61.00%	16-17	77.70%	16-17	n/a	16-17	57.00%
<b>Range (Max-Min)</b>	12-13	79.9- 56.7= 23.2%	12-13	81.9- 73= 8.9%	12-13	62.8- 24.1= 38.70%	12-13	69.8- 47.1= 22.70%
	13-14	80.4- 56.3= 24.1%	13-14	85.7- 62.5= 23.2%	13-14	58.7- 35.9= 22.80%	13-14	71.4- 55.7= 15.70%

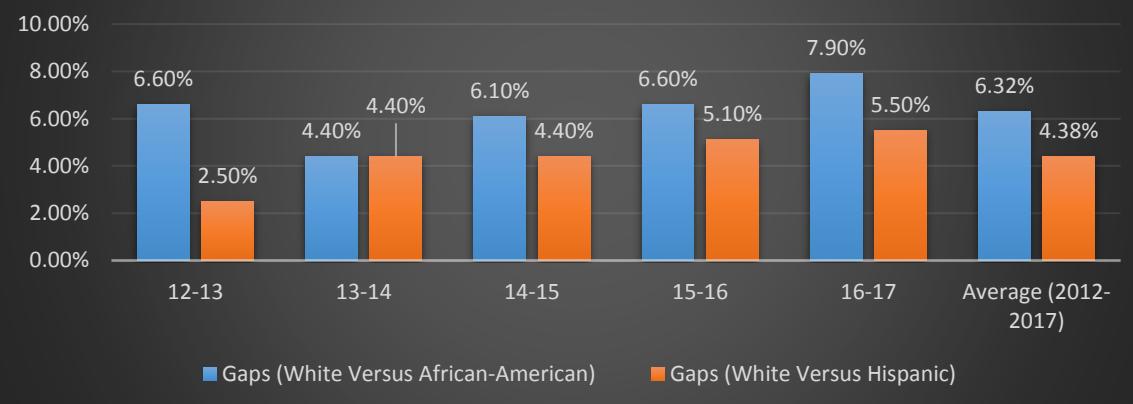
	14-15	79- 62.1= 16.9%	14-15	77.7- 59.4= 18.3%	14-15	57.4- 24.1= 33.30%	14-15	62.8- 40.6= 22.20%
	15-16	78.8- 55.4= 23.4%	15-16	79.9- 65= 14.9%	15-16	59.4- 24.1= 35.30%	15-16	65-42.9= 22.10%
	16-17	76- 54.7= 21.3%	16-17	83.3- 63.6= 19.7%	16-17	54.1- 25= 29.10%	16-17	67.7- 45.2= 22.50%
	Average (SU12-S17)	21.78%	Average (SU12-S17)	17.00%	Average (SU12-S17)	31.84%	Average (SU12-S17)	21.04%



In the last five years retention rates for White students in Basic Skills (see above) were on average 13.4% higher than those for African-American students and only 3.8% higher than those for Hispanic students. In 2015-2016, the gap between White and African-American students peaked at 16.3%, which could be explained by our offering of MATH 41, a new 6-unit combined intermediate algebra course.

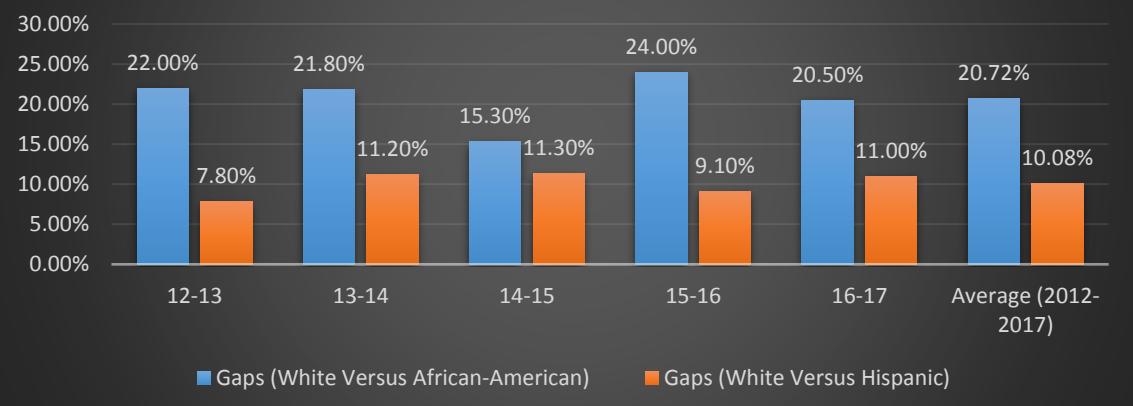
Data show that a lot of under-represented students take online classes for various reasons. In an effort to increase both retention and success and close the achievement gap, some faculty have decided to use ALEKS, a learning system that uses artificial intelligence to assess student competency in a course. A small number of instructors teaching online and hybrid sections of MATH 20 and MATH 40 received an online teaching certificate (OTC), which became available in Fall 16. We believe that the gaps will decrease as more instructors get OTC and participate in other training programs that are math-specific.

## Achievement Gaps in Retention in Transfer-Level Classes (2012-2017)



In the last five years retention rates for White students in Transfer-Level classes (see above) were on average 6.32% higher than those for African-American students and only 4.38% higher than those for Hispanic students. In Spring 2015, Fall 2015, and Spring 2016, we offered exam review sessions to our students in MATH 120, MATH 129, MATH 130, MATH 141, MATH 142, MATH 150A, MATH 150B, and MATH 250A. We haven't had any review sessions available to students taking transfer-level classes since Fall 2016. This might be the reason why the gaps were the widest in 2016-2017. Many instructors teaching transfer-level classes participate in the supplemental instruction program and work in the Math Lab. Instructors' participation in initiatives that have been proved to reduce the achievement gap is one of the reasons why there was no significant increase in the gaps. The future of our participation in the SI program is uncertain due to the program's limited funds. That is why we would like to have instructor-led discussion sessions in some of our transfer-level classes.

## Achievement Gaps in Success in Basic Skills Classes (2012-2017)



In the last five years success rates for White students in Basic Skills classes (see above) were on average 20.72% higher than those for African-American students and 10.08% higher than those for Hispanic students. In 2015-2016, the gap between White and African-American students peaked at 24%, which could be explained by our offering of MATH 41, a new 6-unit combined intermediate algebra course.

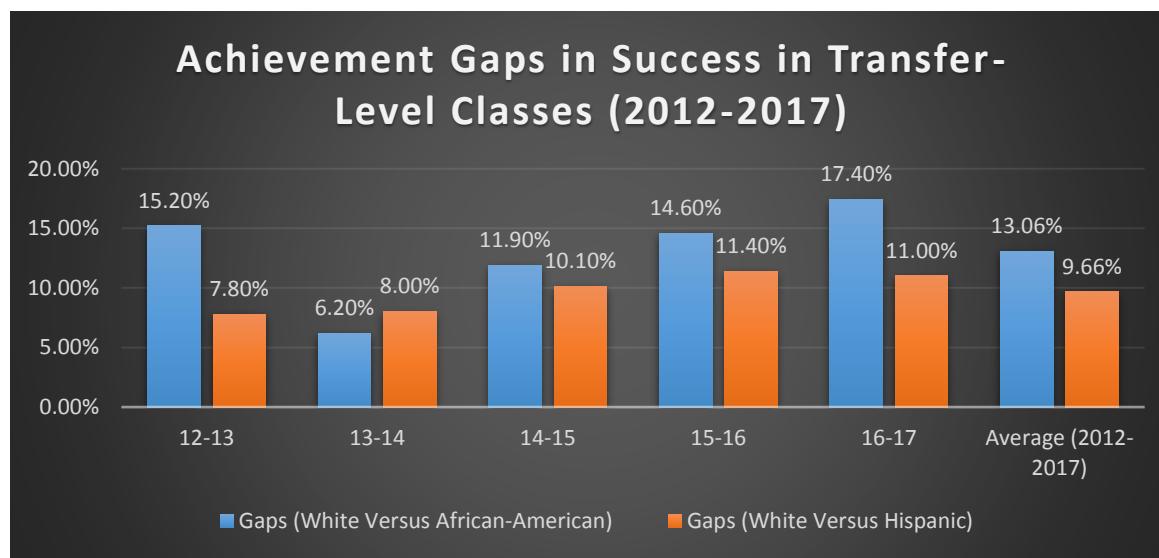
Success Rates in MATH 41 by Ethnicity		
Group	15-16	16-17
African-American	21.10%	27.80%
Hispanic	36.60%	34.80%
White	55.60%	49.10%

Unlike faculty teaching ENGL 99, an accelerated course similar to our MATH 41, MATH 41 instructors didn't have any training. We believe that availability of training on accelerated/co-requisite models specifically for math faculty would help us to reduce the achievement gap. Other reasons for the gaps in success are

- 1) we have online sections of MATH 20 and MATH 40, which have had low success and retention rates for the past five years.
- 2) MATH 15 has become an advisory for MATH 20 in 2014. The table below shows a decline in success rates in MATH 20 for each ethnic group in 2012-2016.

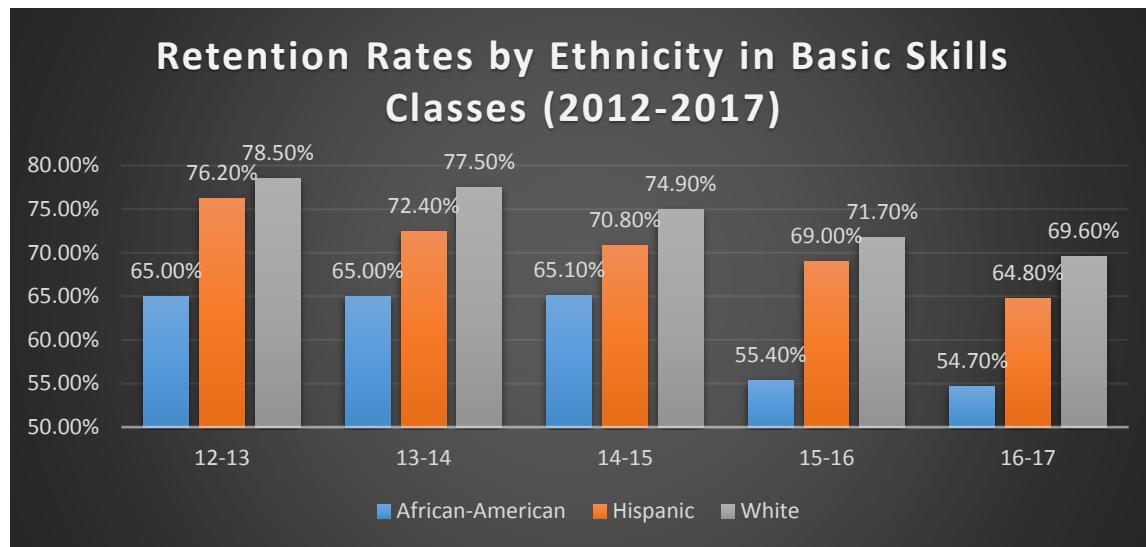
Success Rates in MATH 20 by Ethnicity					
Group	12-13	13-14	14-15	15-16	16-17
African-American	38.70%	37.30%	36.00%	21.60%	26.70%
Hispanic	50.60%	43.50%	37.70%	37.50%	32.90%
White	60.50%	57.10%	49.40%	41.00%	43.20%

Data show that a lot of underrepresented students take online classes for various reasons. In an effort to increase both retention and success and close the achievement gap, we feel a strong need to develop training models that are more specific to teaching math. Our goal is to create effective and uniform teaching practices that can be utilized by all faculty teaching online classes. We believe that the gaps will decrease as more instructors complete training programs that are math-specific.



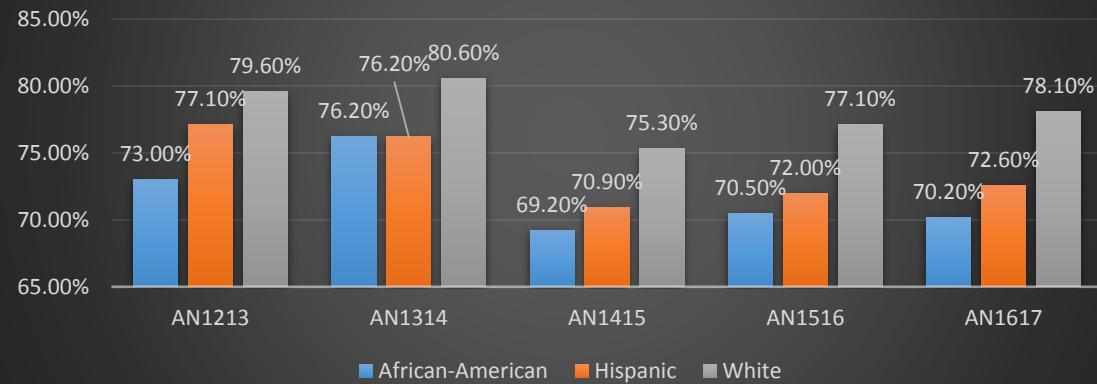
In the last five years success rates for White students in Transfer-Level classes (see above) were on average 13.06% higher than those for African-American students and 9.66% higher than those for Hispanic students. The widest gap in success between White and African-American students occurred in 2016-2017, which could be explained by the cancellation of exam review sessions for MATH 120, 129, 130, 141, 142, 150A, 150B, and MATH 250A in Fall 2016. Many instructors teaching MATH 141 and above request SI sessions for their classes.

Having SI might be one of the reasons why the increase in the gaps between White and Hispanic students during 2014-2017 was less significant. The future of our participation in the SI program is uncertain due to the program's limited funds. That is why we propose in this program review report to have instructor-led discussion sessions in some of our transfer-level classes. Starting with Fall 2017, the class size for both MATH 151 (formerly MATH 150A) and MATH 152 (formerly MATH 150B) was reduced to 30 students, making all of our Calculus classes now have a maximum size of 30 students. We believe that having a smaller number of students per class will allow instructors to interact more with students, which should reduce the gaps in both success and retention. Moreover, many students taking transfer-level classes, including African-American and Hispanic students, succeeded largely because of the quality tutoring in the Math Lab. While we take pride in the Math Lab program, we also believe that students can benefit more from having roaming tutors in the Math Lab. Currently, we have only stationary tutors. Roaming tutors will provide a more direct and personal tutoring environment for students, including those unwilling to approach the stationary tutors. The extra support that roaming tutors provide will help reduce the achievement gaps.



Retention rates for African-American students remained steady in 2012-2015 (see above) at approximately 65% and then dipped by almost 10%. Retention rates for Hispanic students have decreased by 2.9% on average over the period of the last five years. These trends could be explained by making MATH 15 an advisory for MATH 20 in 2014 and offering MATH 41 since Fall 2016. We have retained fewer White students in the last five years for the same reasons. We anticipate that retention rates in basic-skills classes will increase and the achievement gap will narrow after we start offering pre-statistics. However, we will need training for faculty teaching accelerated courses and online and hybrid sections of MATH 20 and MATH 40, as well as roaming tutors in the Math Lab.

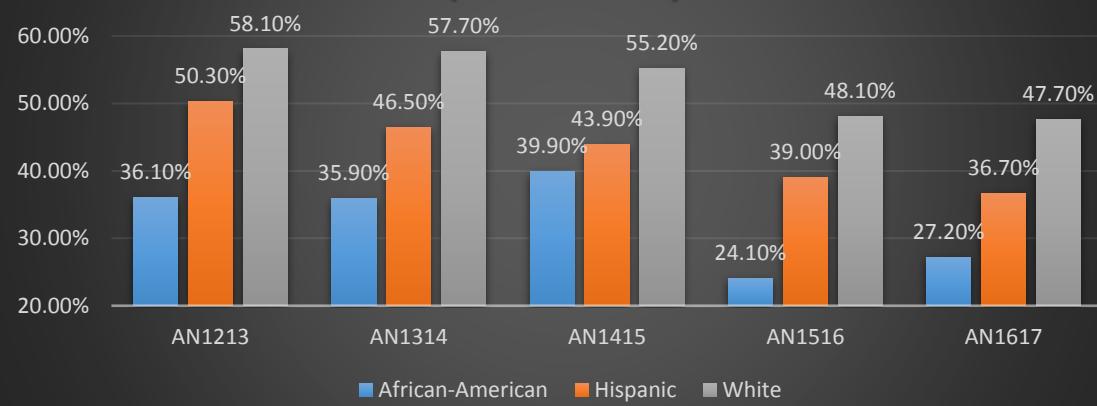
## Retention Rates by Ethnicity in Transfer-Level Classes (2012-2017)



*\*(note AN1213 refers to academic year 2012-2013, etc.)*

Retention rates for African-American students remained steady in 2014-2017 (see above) at approximately 70%. Retention rates for Hispanic students have increased by 1.2% on average over the period of the last two years. These trends could be explained by our active participation in the SI program. Also, we offered several boot camps to STEM majors, held exam review sessions in Spring 2015, Fall 2015, and Spring 2016, and provided tutoring for all transfer-level classes in the Math Lab.

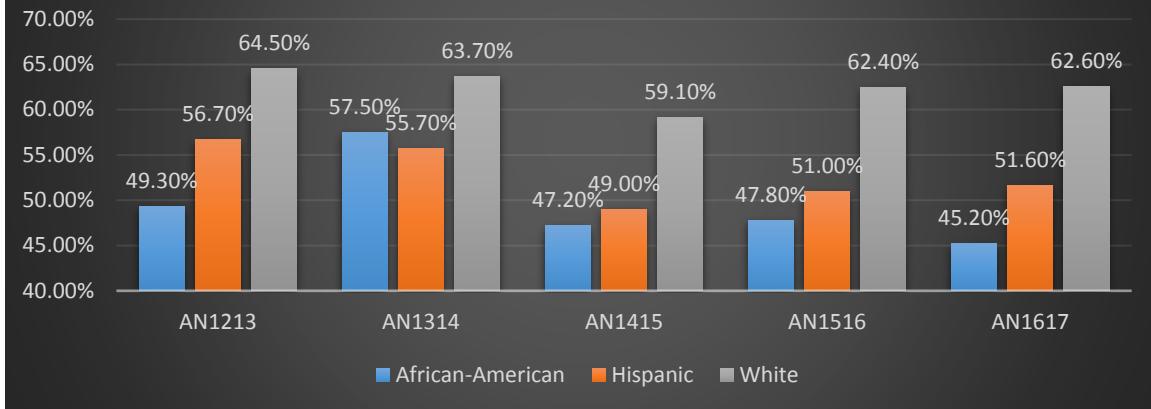
## Success Rates by Ethnicity in Basic Skills (2012-2017)



*\*(note AN1213 refers to academic year 2012-2013, etc.)*

Success rates for African-American students remained steady in 2012-2014 (see above) at approximately 36%, then increased by 4%, then dropped by almost 15% in 2015-2016, and then increased by 3.1% in 2016-2017. Success rates for Hispanic students have decreased by 3.4% on average over the period of the last five years. These trends could be explained by making MATH 15 an advisory for MATH 20 in 2014 and offering MATH 41 since Fall 2016. Success rates for White students have gone down in the last five years for the same reasons. We anticipate that success rates in basic-skills classes will increase and the achievement gap will narrow after we start offering pre-statistics. However, we will need training for faculty teaching accelerated courses and online and hybrid sections of MATH 20 and MATH 40, as well as roaming tutors in the Math Lab.

## Success Rates by Ethnicity in Transfer-Level Classes (2012-2017)



*\*(note AN1213 refers to academic year 2012-2013, etc.)*

Success rates for Hispanic students first decreased by 1% in 2013-2014, then decreased further by 6.7% in 2014-2015, (see above) and then increased by 0.8% on average during the last two years. The trend for success rates for African-American students is a sharp increase by 8.2% in 2013-2014, a significant drop by 10.3% in 2014-2015, an insignificant increase by 0.6% in 2015-2016, and a small drop by 2.6% the following year. The trends for White and Hispanic students are almost identical, which means that instructors can effectively teach these two groups of students. To increase the success rate of African-American students in our transfer-level classes, we offered our support to UMOJA and Incite programs. We believe that availability of roaming tutors in the Math Lab, continued participation in the SI program, instructor-led discussion sessions, smaller class sizes in Calculus I and Calculus II, and support classes for College Algebra and Statistics (see section 2.5) will lead to further growth of success rates for Hispanic students, our largest ethnic group, and narrowing of the achievement gap for African-American students.

### 2.4 Program Effectiveness

Since your previous Program Review Self-Study, what significant changes have occurred that impact the effectiveness of your program?

--See Section 2.5 below

**2.5** Describe any laws, regulations, trends, policies, procedures or other influences that have an impact on the effectiveness of your program. Please include any other data (internal or external) that may be relevant to student achievement, learning, and trends within your Basic Skills, CTE, or Transfer Education programs.

For the last several years, there have been numerous trends and changes that affect basic skills math courses and sequences.

### Acceleration

The traditional approach for students who are unprepared for transfer level math has been to require them to pass a sequence of basic skills courses to improve their knowledge of the needed entry skills. But faculty both state and nationwide have realized that this approach has created a barrier to a student's achievement of their academic goals by requiring a long pathway fraught with potential drop-out points. The trend has thus become to create accelerated pathways to transfer level math.

For example, in 2013 a Fullerton College student that placed into MATH 15 would need to pass three courses (MATH 15, 20 and 40) before reaching transfer level math. Because they had to persist through enrollment in and successful completion of all three courses, only about 14% of students starting in MATH 15 in 2013 reached transfer level math.

To try to improve this rate, the Math Department revised the requisites for MATH 15 and MATH 20 effective 2014 to change the prerequisite to an advisory. But although this has resulted in a minor improvement in the above percent of students placing in MATH 15 who reach transfer level math by taking MATH 20 and MATH 40 (16.4% in 2016), it is not a substantial improvement.

In alignment with the nationwide trend of acceleration, in 2015 the Math Department began offering a new combined beginning and intermediate algebra course, MATH 41 (6 units), that has no required prerequisite. This course was designed to allow a student to reach transfer level math in only one semester. About 43% of students enrolled in MATH 41 achieve that goal in one semester. This is a substantial (220%) improvement over the success rate of the previous three-course route to transfer level math.

## **Alternate Pathways to Statistics**

Math faculty groups in California have been trying for years to gain acceptance for pathways to statistics other than a traditional intermediate algebra course. The content of intermediate algebra is designed to prepare students for STEM courses, not the unique content and style of statistics. But CSU and UC until recently have required a prerequisite of intermediate algebra for all general education math courses including statistics.

However, in 2015 UC updated their guidelines for transferable statistics courses. These updated UC guidelines allow for statistics courses with prerequisites other than intermediate algebra. In fact, they encourage pre-statistics courses as better preparation than intermediate algebra would be.

In just the past few months, the CSU system has finally signaled acceptance of alternative pathways to statistics through EO 1100 issued August 2, 2017. This executive order, which will be effective Fall 2018, radically changed the CSU policy on courses for CSU GE Area B4. Among other things, the order specifically states that "intermediate algebra is no longer required as an explicit prerequisite to courses meeting Area B." This has cleared one of the last barriers to offering a dedicated pre-statistics course at Fullerton College.

The Math Department has proposed a new course MATH 024 F Pre-statistics for Fall 2018. This is a 6-unit course with no required prerequisite that is specifically designed to prepare students for transfer-level statistics courses. It will also be aligned with the trend of acceleration by creating a new pathway for non-STEM students to reach transfer level math in one semester. All Fullerton College statistics courses (MATH 120/120H, SOSC 120, PSY 161/161H) have curriculum revisions in progress effective Fall 2018 to allow MATH 024 F as an alternate prerequisite.

MATH 024 F will be a course with unique content and methodology. For this course to successfully meet the needs of pre-statistics students, we will need to provide a much higher level of training and support for faculty teaching this course, particularly adjunct faculty. We need to have a lead teacher for this course who is provided with reassigned time or professional expert pay to train and mentor faculty, and design shared course materials to be made available to all faculty teaching the course.

## **Concurrent Support Models**

A very recent development is AB 705 which was passed by the state legislature on September 14, 2017. This legislation has the potential to require a complete upheaval and overhaul of what courses we can make available to students who are not prepared for transfer level math. One of the stipulations of the legislation is that community colleges are prohibited from requiring students to enroll in remedial coursework that lengthens their time to complete a degree, unless data analysis shows those students are highly unlikely to succeed in transfer-level coursework. This may mean that as of Fall 2018, students with lower proficiency in basic skills may be permitted to enroll in transfer level math.

Although the state chancellor's office has yet to analyze and issue instructions to community colleges in how to respond to this legislation, we expect that our ability to require students to enroll in pre-transfer level prerequisite courses may be severely limited. Students may have the right to enroll in transfer level math courses whether or not they have the entry skills faculty believe are needed to succeed.

One model to address students' need for remediation of skills without requiring prerequisite courses is to instead require them to enroll in concurrent support courses together with, rather than prior to, their transfer level math course. The Math Department has proposed two such support courses beginning Fall 2018: MATH 026 F Support for Statistics, and MATH 031 F Support for College Algebra. These are 2-unit non-degree credit non-transferable courses. The intent is for students identified through the matriculation process as not fully prepared for Statistics or College Algebra to enroll in the appropriate support course together with their transfer-level course to provide just-in-time remediation and increase their chances of success.

This model is a radical departure from the one we have used for decades. It will require careful planning and preparation of materials, faculty training, and ongoing mentoring of adjunct faculty. The Math Department will need to identify a lead teacher for each support course to create and share materials, and provide training and mentoring for other faculty. Because of the time involved, the lead teacher will need reassigned time or professional expert pay to compensate the large amount of time required for this level of involvement.

According to a November 2016 report by the Public Policy Institute of California, 87% of Latinos and African American students are placed into at least one remedial class, compared with 74% of White students and 70% of Asians. Since under-represented groups are disproportionately placed into remedial classes, creating success in the new model has the potential to improve this disproportionate impact and make progress toward closing the achievement gap.

### **2.6 Provide any other data that is relevant to your self-study.**

### **3.0 Strengths, Weaknesses, Opportunities, Challenges (SWOC)**

Based on your analysis in 2.1 through 2.6, answer the following questions:

#### **3.1 What are the strengths of your program?**

- The Math Department adjusts rapidly to demands for innovative courses needed to align with CSU EO 1100 and AB 705 by creating MATH 024, 026, 0 31 (fast tracking through curriculum) and continuing to offer MATH 041. MATH 024, 026 and 031 will launch Fall 2018. With these new accelerated/co-requisite course models, math specific training will be needed to increase student success and retention and close the achievement gap.
- There is an ongoing demand for math courses to meet the changing needs of students which requires maintaining classroom control for scheduling, acquiring more classrooms and hiring additional full time faculty.
- The Math Department offers courses in various settings such as traditional on campus, hybrid, online, accelerated and short term courses to create flexible pathways of different ways of learning for students' success and retention.
- The Math Department schedules most classes at various times of the morning, afternoon, and evening, and on various days (including Friday only and Saturday only) so that students have complete access to our courses. Maintaining our current number of classrooms is imperative and we must acquire more classrooms to meet scheduling needs.
- The Math Lab is a huge resource for our students and one that other schools often try to model. The Math Lab has expanded tutoring to all levels of math creating a greater need for more tutors and instructors on duty.
- The Math Department's full time faculty have undertaken several initiatives to increase student success and retention, access to classes and bridge the achievement gap. The Math Department has a long standing relationship with the Transfer Achievement Program (TAP) and Fullerton College Supplemental Instruction (FCSI) which provides Supplemental Instruction (SI) facilitators for transfer level classes. FCSI participation has increased student success and retention in our courses. Math faculty also work with and support Student Diversity Success Initiative (SDSI) and Fullerton College Math Institute for Learning Enhancement Success (FC MILES).
- The Math Department has a robust Math Club, Math Colloquium and 2-unit stacked Math Seminar course including three Honors courses, in which students gain valuable training on unsolved problems in math, how to engage in research, LaTeX typesetting of high quality student theses and collaborative articles by faculty and students, and problem-solving. The Department has institutionalized monthly external guest speakers on various math research topics that can be understood by a wide range of students with various math backgrounds. Colloquia/Math Club meetings are currently averaging 20-30 student participants every Thursday 4:30-6:35pm and a pre-Seminar Math Club meeting begins at 4pm.
- The Math Department supports student talks and presentation/poster preparation using LaTeX typesetting packages such as Beamer, ShareLaTeX, and Overleaf. Two students, Alma Pineda

and Kimberly Lopez, are giving talks on open research problems at the 2017 National Joint Meetings of the American Mathematical Society and the Mathematical Association of America in January. Approximately 30-50 student presentations and theses on math research topics are generated each year by the Department. The student math research community at FC is very strong, though support for faculty involvement with them is limited at present.

- Several Math Department faculty attended, and one faculty member was a co-organizer and co-founder of the Math Research Experiences in Community Colleges Conference, which was first held in March 2017 at Cal State Northridge. FC's students gave more talks than any other institution that participated. In fact, FC has been a leading contributor of student presentations at conferences since 2009 though funding for faculty mentoring of these students is limited.
- The Math Department (under the ENGAGE in STEM grant) offered problem solving seminars and informal learning seminars on a frequent basis, but since the loss of the funding from the grant, these seminars have been limited to a few AMATYC Student Math League Competition Practice Sessions on Fridays and at the Colloquia, as well as one to two Putnam Competition practices along with the hosting of the competitions. These competitions are valuable for students as they teach the importance and power of persistence in problem-solving which is much more crucial than talent for success in math.
- World-class and regional mathematicians from neighboring universities and from afar regularly come to Fullerton College and give talks to students and the community at large through the Math Colloquium. A weekly Learning Seminar is offered to teach and discuss complex math topics. The vibrant activities of the seminars, colloquiums and math competitions fill up an activities calendar on Thursdays and many Fridays, though the loss of the ENGAGE in STEM grant's support has curtailed some of these activities.
- Students from FC are doing very well in the competitions. In 2016-17, Stephen Yoo won the National Championship in the AMATYC competition, and FC has ranked as high as sixth nationally over the years and is often in the top ten nationally, out of the nearly 200 community colleges nationwide that compete.
- Despite the fact that the Putnam exam is very challenging and is mostly hosted by four-year schools, FC students have scored positively every year since 2009, which the exception of 2012. In 2014, Eva Zhang ranked in the top 1200 of all students in the US and Canada in this competition (quite good for a community college student) and the following year, Hahn Vo ranked in the top 945. It is important for students to get experience solving challenging problems, as this is the key to success in STEM careers.
- Math faculty have an attitude of openness and willingness to try new things to help students succeed.
- Fullerton College awards more degrees (AS-T, AA, AS) than surrounding colleges.
- When students persist and succeed in online courses, they succeed at higher rates in subsequent classes than students in face-to-face classes.

### **3.2. What are the weaknesses of your program?**

- Instability with placement exams over the past few years has made effective student placement difficult. Our current placement exam is not accurate and, even though we use multiple measures to assess student placement, students are often misplaced (some too high, some too low). With the limitations imposed by AB 705, students may end up in math classes that are not appropriate for their skill level.
- Online and hybrid class success and retention rates would be greatly improved with math specific training for faculty as well as appointing a lead teacher for online, hybrid and flipped classes. There is a need to create math specific effective and uniform teaching practices that can be utilized by all faculty teaching online and hybrid classes. Having a lead teacher for each category (online, hybrid, flipped) is necessary to maintain continuity.
- There is a limited offering of online and hybrid courses to the working adult population which relies heavily on those alternative methods.
- Faculty/staff equipment and technology are lacking and outdated which impedes the quality and effectiveness of their ability to teach courses. Tablets (iPads, Microsoft Surface Pros), laptops, color printers, a 3D printer, wireless dongles, headsets with microphones, and Camtasia licenses for creating instructional videos are a few examples of the equipment and technology needed.
- Low Basic Skills success rates would be drastically improved with funding for boot camps, review sessions, lead teachers for MATH 24, 26, 31, 41, roaming tutors in the Math Lab, and a class set of Chromebooks and/or iPads for students in the classroom.
- There is a lack of classrooms to accommodate the growing needs of the Math Department in response to AB 705. We must maintain control of all current classrooms, regain control of classrooms in the 600 building we have lost and acquire more classrooms.
- Funding is lacking to provide roaming tutors, group tutoring, and workshops in the Math Lab to properly assist students.

### **3.3 What opportunities exist for your program?**

- Changes in CSU policy EO1100 and AB 705 provide an opportunity for different placement models to close the achievement gap and increase the number of students enrolling in transfer level courses. We need classrooms for new support courses (MATH 26, 31) and accelerated courses (MATH 024, 041) as well as lead teachers for each course.
- We have an opportunity to offer boot camps and review sessions to improve student success and retention and close the achievement gap if we are given the funds to offer them.
- We have an opportunity to meet student demand for roaming tutors in the Math Lab if we are given the funds to do so.

- Offering Pre-statistics (MATH 024) is an opportunity to continue meeting growing student demand for statistics and increasing student success in college level math.
- We have an opportunity to offer math-specific training for instructors teaching online, hybrid, accelerated and flipped classes provided we are funded to do so.
- We have the opportunity to transform lives and inspire positive change in the world.

### **3.4** What challenges exist for your program?

- In response to CSU policy EO1100 and AB 705, we need to help students without historical prerequisites succeed in transfer level courses through boot camps, review sessions, lead teachers for MATH 024, 026, 031, 041, training and lead teachers for online, hybrid and flipped classes, instructor led discussions, roaming tutors in the Math Lab, classroom sets of Chromebooks and/or iPads for students, upgraded classroom demo stations and Wi-Fi, and additional full time faculty.
- Developing an effective co-requisite model (MATH 026, 031) to replace the sequence of remedial courses that currently make up the bulk of our offerings will be a challenge. These new courses will be structured differently than our existing curriculum and will require that teachers be introduced to alternative materials and methods.
- Increasing student success and retention will be challenging in light of AB 705 which dictates that we are prohibited from requiring students to enroll in remedial coursework that lengthens their time to complete a degree.
- The instability of the placement exams exacerbates the difficulty of properly placing students in the appropriate math class.
- The lack of college readiness among students is a challenge. We must encourage students to have a growth mindset versus a fixed mindset.
- Serving an increasing number of students in the Math Lab and reducing student frustration with the wait time to get help is a serious challenge.

## 4.0 Student Learning Outcomes (SLO) Assessment

4.1 List your program level SLOs and complete the expandable table below.

	Program Student Learning Outcomes (PSLOs)	Date Assessment Completed	Date(s) Data Analyzed	Date(s) Data Used For Improvement	Number of Cycles Completed
1.	Analyze a mathematical function, relation, equation, operation, or graph to determine its solution or properties. (Linked to ISLO #2A, 2B, 2D)	Fall – Spring 2016	Fall 2016 – August 2017	Fall 2016 – present	3
2.	Determine and use an appropriate method to solve a mathematical problem. (Linked to ISLO #2A, 2B, 2D)	Fall – Spring 2016	Fall 2016 – August 2017	Fall 2016 – present	3

4.2 Assessment: Complete the expandable table below.

Program Student Learning Outcomes Assessment for Instructional Programs at Fullerton College			
Intended Outcomes	Means of Assessment & Criteria for Success	Summary of Data Collected	Use of Results
1. Analyze a mathematical function, relation, equation, operation, or graph to determine its solution or properties.	<p>PSLO #1 was assessed through CSLOs:</p> <p>*MATH 150AF SLO #3 (analyze a function for continuity, relative extrema, intervals of increasing/decreasing, concavity, and/or points of inflection) - one question answered correctly was deemed to meet the outcome using a 6/8-point rubric.</p> <p>*MATH 250AF SLO #1 (analyze a vector-valued function and produce the associated vector-valued or scalar functions that describe the motion which it defines) – one question answered correctly was deemed to meet the outcome using a 3/4-point rubric.</p> <p>All sections of each course were assessed, whether taught by fulltime or part-time faculty. Faculty of each course wrote questions to assess each CSLO. These common questions</p>	<p>65.8% of 292 MATH 150AF students met SLO #3, and 58.8% of 68 MATH 250AF students met SLO #1. A weighted average of 64.5% of students met this PSLO <math>((.658(292) + .588(68))/(292+68) = .645)</math></p>	<p>Faculty met to discuss the results of assessment. Discussion primarily pertained to teaching methodologies, with instructors sharing ideas about improving understanding of the material. There is a need for more communication between the coordinators and instructors in order to create supporting activities to improve student mathematical writing. Focusing on student collaboration in class will be helpful as well. The sharing of supplemental worksheets among instructors would be helpful. To address reported deficiencies in algebra skills, providing students with algebra review materials (just-in-time remediation) was discussed.</p>

	were incorporated into each teacher's final exam. Each instructor assessed their own students' work, and input the results in eLumen. The data was aggregated and reported to program faculty for analysis and discussion.		
2. Determine and use an appropriate method to solve a mathematical problem.	<p>PSLO #2 was assessed through CSLOs:</p> <p>*MATH 150AF SLO #2 (analyze a function to determine an appropriate method of differentiation, and apply the method to determine the derivative) - one question answered correctly was deemed to meet the outcome using a 3/4-point rubric.</p> <p>*MATH 150BF SLO #2 (analyze an integral to determine an appropriate method of integration and apply that method to determine the antiderivative) – correctly identifying an appropriate method and solving two out of three integrals was deemed to meet the outcome.</p> <p>*MATH 250AF SLO #3 (construct and evaluate double integrals in both rectangular and polar coordinates in order to solve applied problems involving area, mass, volume, and other physical phenomena) – students were asked to find the mass of a planar lamina and were deemed to meet the outcome using a 3/4-point rubric.</p> <p>All sections of each course were assessed, whether taught by fulltime or part-time faculty. Faculty of each course wrote questions to assess each CSLO. These common questions were incorporated into each teacher's final exam. Each teacher assessed their own students' work, and input the</p>	<p>60.6% of 292 MATH 150AF students met SLO #2, 77.2% of 64 MATH 150BF students met SLO #2, and 72.1% of 68 MATH 250AF students met SLO #3. A weighted average of 64.3% of students met this PSLO <math>((.606(292) + .772(64) + .721(68))/ (292+68+68) = .643)</math></p>	<p>Faculty met to discuss the results of assessment. Discussion primarily pertained to teaching methodologies, with instructors sharing ideas about improving understanding of the material. Much of the discussion pertained to creating and sharing assignments to help students master problem solving. Emphasizing mathematical writing demonstrating written-out solutions was discussed. Teachers considered the pros and cons of providing review and supplementary worksheets for students, particularly on more difficult material.</p>

	results in eLumen. The data was aggregated and reported to program faculty for analysis and discussion.		
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**4.3** What percentage of your program level SLOs have ongoing assessment? Comment on progress/lack of progress.

100% of our program level SLOs have ongoing assessment. The PSLOs are formally assessed through the core courses of the degree programs, MATH 151, MATH 152, and MATH 251 (Formerly MATH 150AF, MATH 150BF, and MATH 250AF). Three cycles have been completed, including data collection and analysis, reflection by faculty on results, and implementation of instructional and program improvement strategies.

Although PSLOs speak only to the math degree programs, the Math Program in its interpretation as “a discipline and as an organized sequence or grouping of courses leading to a defined objective such as the acquisition of selected knowledge or skills, or transfer to another institution of higher education” is much broader and has many other purposes other than awarding an AS degree in Math. Virtually every Fullerton College student needs math classes to meet his or her transfer or degree goals. Basic skills math courses support students’ efforts to remediate their basic skills and prepare to succeed in college-level courses. MATH 040 F, MATH 041 F, and MATH 043 F, though not transferable, meet the associates’ degree general education requirement. A variety of transferable math courses meet the CSU GE and IGETC math requirement. Even the core courses of the math degrees are needed by many more students in other STEM programs. Therefore, it is appropriate for us to speak throughout the remainder of Section 4 to assessment of the SLOs of all math courses, since the Math Program is much broader than just the math associate degrees.

Math SLO assessment is a continuous endeavor that is conducted on a cyclical basis so that every semester there are some math courses being assessed. Every course is assessed at least once every three years. Discussions take place at department meetings throughout the semester, so that all math faculty participate in and benefit from the reflections process.

**4.4** How has assessment of program level SLOs led to improvements in student learning and achievement?

As mentioned above, it is appropriate for us to speak throughout the remainder of Section 4 to assessment of the SLOs of all math courses, since the Math Program is much broader than just the math associate degrees.

Math SLO assessment is a continuous endeavor that is conducted on a cyclical basis so that every semester there are some math courses being assessed. Discussions on all results take place at one department meeting each semester. These discussions have led to numerous adaptations and improvements to assessment, curriculum, teaching methodologies, assignments, faculty communication and collaboration, and Math Program support systems.

Many of these improvements are already in place; some are in the process of implementation; and some need campus or monetary support to implement. The list of improvements and changes to the Math Program based on SLOA reflection include:

1. Assessment Process
  - a. Allow SLOs to be embedded at the beginning of the final exams rather than presented on a separate page
  - b. Revisit and possibly change certain SLO topics

- c. Rewrite assessment questions for clarity
  - d. Involve more faculty members in writing/selecting SLOA questions
  - e. Use rubric-based SLOA questions
  - f. Require students to show work on multiple-choice SLOA questions
2. Curriculum
- a. Restructure the schedule of the course to dedicate more time to SLO topics
  - b. Consider adding an extra hour to some courses, particularly the Calculus sequence. Options include:
    - i. Add an additional in-class hour
    - ii. Add one required hour of lab or instructor-led discussion
    - iii. Provide optional SI (supplemental instruction) sessions (need money to hire SI facilitators and to pay faculty stipends for coordinating with facilitators)
3. Teaching Methodologies
- a. Provide math-specific training for faculty teaching online and hybrid classes
  - b. Incorporate more review throughout the course
  - c. Emphasize a particular topic with low SLOA results throughout the course. Options include:
    - i. Provide more in-depth discussions on the topic
    - ii. Dedicate more time to class activities on the topic
    - iii. Implement periodic checks on the topic throughout the semester
    - iv. Have students identify common errors on the topic throughout the semester
  - d. Incorporate in-class activities in both group and individual settings containing SLO topics
4. Class Assignments
- a. Give assignments throughout the semester that reflect the format of SLOA questions
  - b. Provide SLO review assignments throughout the course
  - c. Provide students with worksheets that help them identify common errors on the SLO topics
  - d. Enhance students' skills on utilizing the graphing calculator and/or technology appropriate at certain math levels (for instance, MATH 043, 120 and above)
5. Staff Assignments
- a. Make certain a consistent set of faculty members (both full-time and adjunct) who are committed to teach certain math levels (for instance, MATH 041, 043, and 142) multiple semesters in order to fully become accustomed to the courses
  - b. Designate (and fund) a lead full-time faculty to be the point of contact for all distance education questions
6. Faculty Communication and Collaboration
- a. Share SLOA results and ideas for improvement with adjunct instructors
  - b. Share classroom worksheets, materials, and Directed Learning Activities with all faculty
  - c. Jointly create assignments specific to SLO topics for all faculty members to incorporate
  - d. Attach a flier to the Course Coverage sheet given to adjunct instructors asking them to emphasize particular SLO topics that had a low success rate
7. Math Program Support Systems
- a. Use the Math Lab as a space for storing Directed Learning Activities
  - b. Make a database of review resources (e.g. Khan Academy videos) for students to use on their own for review (need professional expert pay for research and design of database)
  - c. Purchase access codes to ALEKS (an adaptive online learning program), or a similar system, for faculty to provide to students in need of remediation to meet SLOs (need money to purchase the codes)
  - d. Expand Math Lab space and staffing to provide needed out-of-class help and student support (need more space, and more money for staffing)

#### **4.5 How has assessment of program-level SLOs led to improvements in transfer or certificate/degree awards?**

The number of Math AS and AS/T degrees awarded decreased from 37 in 2014-15 to 30 in 2015-16. But equally important to math degrees awarded is the fact that math courses impact virtually all transfer students and all degree programs at Fullerton College. Without meeting the math requirement, no student can be GE certified for transfer and no student can earn an associate degree.

Through the reflection process that completes each SLO cycle, math faculty continually adjust and improve instruction, teaching methodologies, assignments and curriculum. These continuous improvements help more students succeed in their math courses, bringing them one step closer to their transfer or degree goals.

#### **4.6 What challenges remain to make your program level SLOAs more effective?**

The Math Program SLOA process is now well-established and regularly used for continuous quality improvement. Ongoing, pervasive dialogue about student learning takes place every semester. Program faculty members continuously use SLOA results to improve instruction and support student learning.

Many of the improvements listed in Section 4.4 above have already been implemented or are in process of implementation. The challenges that remain are to gain the needed campus support and money to implement the remaining interventions and improvements:

1. Adding additional instruction of course material:
  - a. Offer boot camps, review sessions, content-specific workshops, and final exam review sessions for courses (SAP #2) – this option would require professional expert pay for instructors to develop and hold these sessions
  - b. Pilot instructor-led discussions (SAP #5) which then could lead to additional class hours – this option would require campus and district support through the curriculum process
2. Make a database of review resources (e.g. Khan Academy videos) for students to use on their own for review - need professional expert pay for research and design of database
3. Purchase access codes to ALEKS (an adaptive online learning program) or a similar system for faculty to provide to students in need of remediation to meet SLOs – need money to purchase student access codes
4. Math Lab expansion to provide needed out-of-class help and student support: Since the Math Lab became open to all students taking a math course, it has become extremely full. There are often lines for tutors and not enough space for students. It is clear that the current Math Lab space and funding level is woefully inadequate to meet the need for student support.
  - a. More space is needed, which could be accomplished by:
    - i. Dedicating additional rooms to the Math Lab
    - ii. Reverting control of Room 611L to the Math/CS Division as was originally planned and promised during the previous remodel of this area
    - iii. For the future, incorporate additional Math Lab space into the next 600 building remodel

More money is needed in the budget for Math Lab “roaming tutors” to augment the current staffing in order to provide sufficient out-of-class help and student support (SAP #6)

## **5.0 Evaluation of Progress Toward Previous Goals/SAP's** (Future program review templates for this section will identify “previous goals” as “previous *strategic action plans*” -- SAP’s.)

**5.1** List the goals from your last self-study/program review.

**5.2** Describe the level of success and/or progress achieved in the goals listed above.

**5.3** How did you measure the level of success and/or progress achieved in the goals listed above?

**5.4** Provide examples of how the goals in the last cycle contributed to the continuous quality improvement of your program.

**5.5** In cases where resources were allocated toward goals in the last cycle, how did the resources contribute to the improvement of the program?

**5.6** If funds were not allocated in the last review cycle, how did it impact your program?

<b>2014 Strategic Action Plan</b>	<b>Level of Success</b>	<b>How was level of success measured?</b>	<b>How did goals contribute to the continuous quality improvement of the program?</b>	<b>How did any resources contribute to the improvement of the program?</b>
Increase Math Lab faculty hours by 25 additional hours per week	<b>Abandoned.</b> In place of increased faculty presence, we have increased the number of tutoring hours to meet demand especially during prime time.	N/A	N/A	The Division was able to allocate funds to increase the Math Lab tutoring budget to permit the hiring of tutors for 20 hours' additional coverage per week. These tutors have been invaluable in providing services to students during primetime. More specific information about this SAP will be included in the 2018 Math Lab Program Review.

Increase FC student retention, success and persistence by providing Math Lab services for STEM students by returning Room 611L to the Math Division or designating an area in the Natural Sciences proposed Campus STEM Resource Center. This will also increase opportunities for students to get support for their learning needs and feedback on problem-solving and mathematical writing.	<b>Abandoned.</b> Due to an upcoming re-model of the 600 building it is unlikely that any modifications to the 600 building will take place.	N/A	N/A	N/A
Increase supplemental enrichment and community building, rigor, depth, retention, persistence in problem-solving, and success, as well as mathematical writing skills, for students in MATH 150A and 150B, by reducing class size to the Mathematical Association of America's guideline/recommended class size of fewer than 30 students.	<b>Unknown.</b> Class size in all Calculus classes has been reduced to 30 effective fall 2017.	Success rates in MATH 151 and MATH 152 (class size 30) will be compared to those in 150A and 150B (class size 35, most sections offered as multiples at 53).	Unknown at this time.	N/A
The Math Program will strengthen its ties with feeder high schools and transfer institutions in Orange County and with the community.	<b>Successful.</b>	Even though the college did not receive grant funding to continue the <i>Engage in STEM</i> program, there is a campus commitment to support STEM students with designated classes for STEM cohorts and other interventions. This includes stronger recruitment of STEM students from feeder high schools. In fall	The STEM cohort and the opportunities provided by the Math Seminars are just two examples of powerful recruiting tools to strengthen ties with local feeder districts.	Additional campus resources and a commitment to the STEM First Year Experience were vital in its success. The campus was able to hire a designated STEM counselor who has primary responsibility to recruit, mentor and support students in the STEM cohort.

		2017, there are approximately 50 students in the STEM cohort, primarily first semester students recruited from feeder high schools.		
Expand emerging educational technology use by students and faculty in math courses.	<b>Successful.</b> Division faculty have incorporated numerous technologies into classes. ALEKS, MyMathLab, and others are used throughout the curriculum.	We will work with OIRP to measure the course success rates of those who students who are exposed to newer technologies vs. those that are in more traditional courses.	Faculty are reporting success in classes where these interventions (especially ALEKS) are being incorporated.	Very few additional resources were required for this SAP.
The Math Program will pilot instructor-led Supplemental Instruction sessions at the proposed Math Success Center for STEM students in room 611L (or designated area in the Natural Sciences proposed Campus STEM Resource Center) to increase student facility with problem-solving and also computational technology helpful in gaining better understanding in STEM-oriented math courses, particularly, MATH 150A-295	<b>Modified.</b> The department participates in the college's SI program, and SI is provided in numerous sections of courses at all levels of the curriculum.	The Math Department is heavily involved in the campus SI program. We offer courses with traditional SI attached (such as TAP), and many other sections have optional SI. We have not yet developed a system for the instructor-led SI that was proposed.	SI's program review will likely measure the success of the program and its effectiveness in increasing student success measures.	No division resources were needed for this SAP.
Increase retention, success, persistence and narrow achievement gaps for as many groups of students as possible in basic skills courses and transfer level courses taken by students after they take a basic skills course at Fullerton College.	<b>Successful.</b>	Equity funded boot camps, summer workshops for incoming STEM and prospective teachers and other activities have been focused on the achievement gap. In addition,	Lessons learned in the PTI project will help in the development of more far-reaching activities necessitated by the passage of AB 705.	Funding from the PTI grant (and other sources) was instrumental in moving forward with these initiatives.

		<p>starting in fall 2016 we have participated in the Pathways Transformation initiative which places qualified students directly into transfer-level courses with additional support.</p>		
<p>The Math Program will host ten AMATYC Practice Sessions during the 2015-16 school year and Round 1 and Round 2 of the local AMATYC competition, in order to build student interest and achievement in math as well as improve student test-taking skills. The Math Program will also encourage participation in the Putnam competition by offering two practice sessions in Nov 2015 prior the annual Putnam Competition on the first Saturday in Dec. Special emphasis will be placed on recruiting participants among women, Hispanic students, and African American students, in particular, among all groups that are traditionally underrepresented in mathematical science and in math competitions, in particular.</p>	<b>Successful.</b>	<p>In fall 2017, 35 students participated in the AMATYC SML. Over the past several years Fullerton College students have done exceedingly well in this contest, culminating in 2016-2017 when Seung Jo (Stephen) Yoo was national champion.</p> <p>In 2016, 12 Fullerton College students participated in the Putnam Competition.</p>	<p>The practices and competition itself have strengthened a sense of inclusion among students, and students who engage in competitions increase in persistence and growth mindset which is important for success in higher math.</p>	<p>The Division allocates \$3,000 per year to fund the math seminars, and the division's participation in these national competitions.</p>
<p>The Math Program continues to strive toward the goal of building a stronger sense of community among students and faculty by enrichment through extracurricular math so that performance of students, especially from</p>	<b>Ongoing</b>	<p>The Math Department mentors approximately 30-40 student presentations on research-level math each year and talks are given</p>	<p>The strengthened enrichment program in the Math Department, as it gradually reaches a higher percentage of the student population rather</p>	<p>The Division allocates \$3,000 per year to fund the math seminars, and the division's participation in these national competitions.</p>

underrepresented groups for which there is an achievement gap, is increased, along with persistence and success.		at Colloquia by FC and external guest speakers, strengthening ties between FC students and the universities they may transfer to.	than only the best students, fosters a sense of self-improvement and persistence in math not only for traditionally elite students but students of diverse backgrounds and skill levels in math.	
Continue to expand enrichment opportunities for students in a way that promotes stronger interest in math as a career path and in a way that increases student retention, persistence and success in difficult math courses.	<b>Successful.</b>	In January 2018, two Hispanic students, Alma Pineda and Kim Lopez, will be the first FC students to give a poster session on mathematical research at a National Joint Meeting of the American Mathematical Society and the Mathematical Association of America. Many of our students are showing remarkable initiative in creating presentations and writing in mathematical science.	Students who would have fallen through the cracks in times when little or no enrichment was a part of our program beyond the classroom are more engaged in positive thinking about challenging math, rather than straying from it. Persistence is the number one goal of our program and enriched activities are a critical component of increasing this persistence in regular courses. More students should engage in some form of enrichment in math.	The Division allocates \$3,000 per year to fund the math seminars, and the division's participation in these national competitions.
Continue to increase the number of full-time faculty members	<b>Successful.</b>	The Math Department hired three faculty in spring of 2015, two in spring of 2016 and two in spring of 2017.	Fulltime faculty play a vital role in the division's initiatives.	All faculty are engaged in multiple student success initiatives such as TAP, the GSI program, SI, PTI.

## **6.0 Strategic Action Plans (SAP) [formerly called Goals (6) and Requests for Resources (7)]**

Using the tables below, list the strategic action plans (SAPs) for your program. These plans should follow logically from the information provided in the self-study. Use a separate table for each SAP.

*SAPs* for this three-year cycle:

<b>STRATEGIC ACTION PLAN # 1</b>		
Describe Strategic Action Plan: (formerly called short-term goal)	Maintain control of all current classrooms for which the Math/CS Division has primary responsibility: 611C, 615, 616, 617, 618, 623, 624, 1901, 1902, 1903, 1904, 1957, 1958, 1959, 1960, 719; and regain control of 620, 621, 622A, 622B, 626, and Computer Lab (room 611L). In addition, to meet demand we request ownership of 724 and 728.  <b>Discussed in Sections: 3.1, 3.2, 3.3, 4.6 and 5.6</b>	
List College goal/objective the plan meets:	College Goals: Goal #1: Fullerton College will increase student success.  Objectives: 1.1: Address the needs of under-prepared students.	
Describe the SAP: (Include persons responsible and timeframe.)	In order to meet the demand for math classes, especially during prime time periods, we are in desperate need of more classroom space. By fall 2018, the division will be offering numerous co-requisite courses taught in conjunction with our existing transfer-level curriculum. While the reduction of basic skills offerings will free up some space, we may try to limit the class sizes of our co-requisite courses to provide more opportunity for one-on-one support. Thus, we foresee a need for additional classroom space. In addition, we continue to offer the entire Calculus sequence as single sized classes, which fill up many rooms. Rooms on the second floor of the 600 building would be perfect for the addition co-requisite courses since they are mostly single sized classrooms.  The deans for the respective divisions would work to accomplish this action plan.	
What <i>Measurable Outcome</i> is anticipated for this SAP?	Additional classroom space would lead to an increase in course offerings to meet student demand.	
What specific aspects of this SAP can be accomplished without additional financial resources?	No funds would be required.	
If additional financial resources would be required to accomplish this SAP, please complete the section below. Keep in mind that requests for resources must follow logically from the information provided in this self-study.		
Type of Resource	Requested Dollar Amount	Potential Funding Source
Personnel		

Facilities		
Equipment		
Supplies		
Computer Hardware		
Computer Software		
Training		
Other		
<b>Total Requested Amount</b>	<b>\$0</b>	

STRATEGIC ACTION PLAN # 2		
Describe Strategic Action Plan: (formerly called short-term goal)	<p>Offer boot camps, review sessions, content specific workshops, and final exam review sessions to increase sense of community and success rates.</p> <p><b>Discussed in Sections: 2.3, 4.6, 3.2, 3.3, and 3.4</b></p>	
List College goal/objective the plan meets:	<p>College Goals:</p> <p>Goal #1: Fullerton College will increase student success.</p> <p>Goal #2: Fullerton College will reduce the achievement gap.</p> <p>Objectives:</p> <p>1.1: Address the needs of under-prepared students.</p> <p>1.2: Increase course retention and success.</p> <p>1.6: Increase the persistence rate of students.</p> <p>2.2: Increase retention rate of Hispanic and African-American students by at least 2%.</p> <p>2.3: Increase success rate of Hispanic and African-American students by at least 2%.</p> <p>2.4: Increase persistence rate of Hispanic and African-American students by at least 2%.</p>	
Describe the SAP: (Include persons responsible and timeframe.)	<ul style="list-style-type: none"> <li>• Boot camps offered prior to the start of the semester will prepare students for the expectations of upcoming coursework.</li> <li>• Workshop topics may include, but are not limited to: course specific topics, note-taking skills, test-taking, time management, and math anxiety.</li> <li>• Review sessions will be held throughout the semester.</li> <li>• Boot camps, workshops, and review sessions will be led by Math faculty, as decided upon by the Math Department</li> </ul>	
What Measurable Outcome is anticipated for this SAP?	<ul style="list-style-type: none"> <li>• Increased retention and success rates</li> <li>• Increased persistence rate in math courses</li> <li>• Increased retention and success rates for Hispanic and African-American students in math courses</li> <li>• Increased persistence rate of Hispanic and African-American</li> </ul>	

	students in math courses	
What specific aspects of this SAP can be accomplished without additional financial resources?	In order to hold the boot camps, workshops, and review sessions, faculty would need access to rooms with sufficient seating for participating students. This SAP cannot be accomplished without funding for the instructors involved, using professional expert pay.	
If additional financial resources would be required to accomplish this SAP, please complete the section below. Keep in mind that requests for resources must follow logically from the information provided in this self-study.		
Type of Resource	Requested Dollar Amount	Potential Funding Source
Personnel	Approximately 200 hours per year at \$55 per hour professional expert pay	College Funds
Facilities		
Equipment		
Supplies	Copies for printed handouts Estimated cost of \$250	Possible Equity Funding
Computer Hardware		
Computer Software		
Training		
Other		
<b>Total Requested Amount</b>	<b>About \$11,250 per year</b>	

STRATEGIC ACTION PLAN # 3	
Describe Strategic Action Plan: (formerly called short-term goal)	Appoint lead teacher(s) for each “new” course – MATH 24 (Pre-Statistics), MATH 26 (Support for Statistics, taken concurrently with MATH 120), MATH 31 (Support for College Algebra, taken concurrently with MATH 141), MATH 41 (Combined Elementary and Intermediate Algebra), and other support courses planned – with reassigned time or professional expert pay to design course material, lead training workshops, and mentor faculty (including adjuncts) assigned to teach each new class.  <b>Discussed in Sections: 1.0, 2.3, and 2.5</b>
List College goal/objective the plan meets:	College Goals: Goal #1: Fullerton College will promote student success. Goal #2: Fullerton College will reduce the achievement gap.  Objectives: 1.1: Address the needs of under-prepared students. 1.2: Increase course retention and success. 1.5: Increase the persistence rate of students.  2.2: Increase retention rate of Hispanic and African-American students by at least 2%. 2.3: Increase success rate of Hispanic and African-American

	<p>students by at least 2%.</p> <p><b>2.4: Increase persistence rate of Hispanic and African-American students by at least 2%.</b></p>	
Describe the SAP: (Include persons responsible and timeframe.)	<p>The Math Department will seek volunteers and then appoint a full-time faculty member to lead each course. Preparation of materials and planning for training will take place and ongoing mentoring of faculty teaching the courses will continue through the next two or three school years. As curriculum is developed for other support courses, lead teachers will be appointed for those as well.</p> <p>Linda Shideler will meet with the "lead teachers" to share the materials she has and what she has learned about the co-requisite support model. Laura Loney will lead MATH 24, Pre-Statistics, and Scott Malloy will lead MATH 26, Support for Statistics.</p>	
What <i>Measurable Outcome</i> is anticipated for this SAP?	<ul style="list-style-type: none"> <li>• Compared to other courses in the Math Program, higher retention, success, and persistence rates are expected in these courses with "lead" teacher support</li> <li>• Increased retention and success rates in courses taken following success in MATH 41</li> <li>• Increased retention and success rates for Hispanic and African-American students in math courses with "lead" teacher support</li> <li>• Increased persistence rate for Hispanic and African-American students in math courses with "lead" teacher support</li> </ul>	
What specific aspects of this SAP can be accomplished without additional financial resources?	This plan is highly dependent on funding.	
If additional financial resources would be required to accomplish this SAP, please complete the section below. Keep in mind that requests for resources must follow logically from the information provided in this self-study.		
Type of Resource	Requested Dollar Amount	Potential Funding Source
Personnel	\$35 per hour Prof. Expert (Project Coordinator) Pay times 50 hours times 4 instructors = \$7,000 \$55 per hour Prof. Expert Pay times 8 hours times 6 semesters times 4 instructors = \$10,560	College Funds
Facilities		
Equipment		
Supplies		
Computer Hardware		
Computer Software		
Training		
Other		
<b>Total Requested Amount</b>	<b>\$17,560</b>	

STRATEGIC ACTION PLAN # 4	
Describe Strategic Action Plan: (formerly called short-term goal)	The Math Department will provide math-specific distance education training for instructors and will develop Division/Department requirements and policies regarding distance education.  <b>Discussed in Sections: 2.2, 2.3, 3.2, 3.3, 3.4, and 4.4</b>
List College goal/objective the plan meets:	College Goals: Goal # 1: FC will increase student success.  Objectives: 1.2: Increase course retention and success
Describe the SAP: (Include persons responsible and timeframe.)	The Math Department will elect a Distance Education coordinator who will be responsible for creating and implementing a math-specific training course which will include pedagogy, best practices, technology training, and Ed Code compliance requirements for Department/Division faculty who teach online or hybrid courses. The course will last one semester and will require trainees to demonstrate proficiency in pedagogy and use of technology. Trainees will be expected to commit a minimum of 4 hours per week which includes on-campus and online training as well as completing "assignments." After training, a committee of instructors will develop Department standards for teaching online/hybrid classes.  Timeline: <ul style="list-style-type: none"> <li>• Year 1: coordinator attends conferences for training and develops and implements the training course for the first cohort of instructors</li> <li>• Year 2: Committee develops Department standards for distance education courses and second cohort of instructors completes the training course</li> <li>• Year 3: Department standards go into effect; coordinator monitors adherence to standards; training course open to adjunct faculty</li> </ul>
What <i>Measurable Outcome</i> is anticipated for this SAP?	<ul style="list-style-type: none"> <li>• Increase course retention and success</li> <li>• Increase instructor proficiencies in teaching distance education classes</li> </ul>
What specific aspects of this SAP can be accomplished without additional financial resources?	Department/Division policies regarding distance education courses can be developed without funding, however, the training is necessary for faculty to first understand what elements are needed in a model distance education course, which will then lead to the development of appropriate policies that will be beneficial to both instructors and students.
If additional financial resources would be required to accomplish this SAP, please complete the section below. Keep in mind that requests for resources must follow logically from the information provided in this self-study.	

Type of Resource	Requested Dollar Amount	Potential Funding Source
Personnel	<ul style="list-style-type: none"> <li>Units of reassigned time per semester for the Division Distance Education Coordinator - \$8,000</li> <li>Stipend or PE pay for the trainees (possible equivalent credit units for salary advancement) for approx. 15 trainees @ \$1,000 = \$15,000</li> </ul>	College Funds
Facilities		
Equipment	<ul style="list-style-type: none"> <li>Headsets for all training course participants (as needed) – 15 x \$50 = \$750</li> <li>Webcams for all training course participants (as needed) – 15 x \$75 = \$1,125</li> </ul>	Instructional Equipment/Supplies
Supplies		
Computer Hardware	<ul style="list-style-type: none"> <li>2 – 3 Microsoft Surface Pro laptops for check-out – 2 x \$1,750 = \$3,500</li> </ul>	Instructional Equipment/Supplies
Computer Software	<ul style="list-style-type: none"> <li>Camtasia for the Surface Pro laptops – 2 x \$130 = \$260</li> </ul>	Instructional Equipment/Supplies
Training	<ul style="list-style-type: none"> <li>Conferences/workshops for training for the Coordinator: \$2,000</li> <li>Hiring guest speakers (trainers) for workshops: \$2000</li> </ul>	Staff Development Funds
Other		
<b>Total Requested Amount</b>	<b>\$24,635</b>	

## STRATEGIC ACTION PLAN # 5

Describe Strategic Action Plan: (formerly called short-term goal)	<p>The Math Program will pilot instructor-led discussion (ILD) sessions, with professional expert pay or lab rate pay, outside of class time to support classroom instruction as an alternative to Supplementary Instruction. If successful, this may turn into additional class hours.</p> <p><b>Discussed in Sections: 1.0, 2.3, 3.1, 4.4, and 5.0</b></p>
List College goal/objective the plan meets:	<p>College Goals:</p> <p>Goal #1: Fullerton College will promote student success.</p> <p>Goal #2: Fullerton College will reduce the achievement gap.</p> <p>Objectives:</p> <ul style="list-style-type: none"> <li>1.1 Address the needs of under-prepared students.</li> <li>1.2 Increase course retention and success.</li> <li>1.4 Increase the number of transfers.</li> <li>1.6 Increase the persistence rate of students.</li>   <li>2.2 Increase retention rate of Hispanic and African-American students by at least 2%.</li> <li>2.3 Increase success rate of Hispanic and African-American students by at least 2%.</li> <li>2.4 Increase persistence rate of Hispanic and African-American students by at least 2%.</li> </ul>
Describe the SAP: (Include persons responsible and timeframe.)	<ul style="list-style-type: none"> <li>• The instructor led discussion (ILD) sessions will be held and coordinated with classes to ensure maximal participation.</li> <li>• The sessions will be led by Math faculty teaching courses and will focus on mathematical writing, problem-solving strategies, study skills and habits.</li> <li>• The instructors will be paid at the laboratory rate or professional expert pay. This will be money well spent because of the following reasons:       <p>Students' perspectives:</p> <ol style="list-style-type: none"> <li>1. It breaks down the wall that some students build between students and professors.</li> <li>2. A chance to discuss ideas how to tackle difficult problems.</li> <li>3. Serves as a self-assessment of how much students really learn the materials.</li> <li>4. Students get to ask questions relating to what they are working on at the moment.</li> <li>5. Students get to work on their problems before coming to a discussion, which is more relevant to the students.</li> <li>6. Less stress for students because they do not feel being "put on the spot".</li> </ol> <p>Professors' perspectives:</p> <ol style="list-style-type: none"> <li>1. Get an idea how students are doing before a big test.</li> <li>2. A chance to be students' guide instead of just being their professor.</li> <li>3. Students and professors get to discuss of solving problems freely without the pressure of covering lessons.</li> <li>4. Professors can address difficulties that students will be</li> </ol> </li> </ul>

	<p>facing solving certain problems.</p> <ul style="list-style-type: none"> <li>• Instructor led discussions will require campus and district support through the curriculum process.</li> <li>• The time frame is during the 2018 to 2021 school years.</li> </ul>	
What <i>Measurable Outcome</i> is anticipated for this SAP?	<ul style="list-style-type: none"> <li>• An increase in retention and success, during the 2018-21 school years, in basic skill and transfer level math courses (2%).</li> <li>• Also anticipated are increases in retention and success for students coming from underrepresented groups in math (2%).</li> <li>• We anticipate higher retention rates and higher success rates among Hispanic students and also among African-American students in these courses (2%).</li> </ul>	
What specific aspects of this SAP can be accomplished without additional financial resources?	<ul style="list-style-type: none"> <li>• The only aspect of this SAP that can be accomplished without additional financial resources is returning Rooms 620, 622A and B, 621, 626 and/or other similarly sized classrooms and Room 611L to the Math/CS Division.</li> </ul>	
If additional financial resources would be required to accomplish this SAP, please complete the section below. Keep in mind that requests for resources must follow logically from the information provided in this self-study.		
Type of Resource	Requested Dollar Amount	Potential Funding Source
Personnel	32 weeks times 2 weekly 2 hour ILD sessions. Paid at \$55/hr for 3 years = \$42,240	College Funds
Facilities		
Equipment		
Supplies		
Computer Hardware		
Computer Software		
Training		
Other		
<b>Total Requested Amount</b>	<b>\$42,240</b>	

## STRATEGIC ACTION PLAN # 6

Describe Strategic Action Plan: (formerly called short-term goal)	<p>Offer more support, interventions and services to our students by using alternate models in the Math Lab. Hire additional tutors to serve as “roaming” tutors to augment the traditional model of tutoring service. Acquire space for additional interventions, such as group tutoring, workshops, SI etc.</p> <p><b>Discussed in Sections: 1.0, 3.0, 4.4, 4.6 and 5.6</b></p>
List College goal/objective the plan meets:	<p>College Goals:</p> <p>Goal #1: Fullerton College will increase student success.</p> <p>Goal #2: Fullerton College will reduce the achievement gap.</p> <p>Goal #3: Fullerton College will strengthen connections with the community</p> <p>Objectives:</p> <p>1.1: Address the needs of under-prepared students.</p> <p>1.2: Increase course retention and success.</p> <p>1.3 Increase the number of degrees and certificates awarded.</p> <p>1.4 Increase the number of transfers</p> <p>1.6: Increase the persistence rate of students.</p> <p>2.2: Increase retention rate of Hispanic and African-American students by at least 2%.</p> <p>2.3: Increase success rate of Hispanic and African-American students by at least 2%.</p> <p>2.4: Increase persistence rate of Hispanic and African-American students by at least 2%.</p> <p>3.1 Strengthen our contacts with Alumni</p> <p>3.2 Strengthen partnerships with local feeder high schools and universities.</p>
Describe the SAP: (Include persons responsible and timeframe.)	<p>The Math Department would like to hire more tutors (both faculty and student) in the Math Lab to offer more support and tutoring for students and to augment the traditional model of tutoring service, by providing roaming tutors. We would like to acquire space for interventions such as group tutoring, workshops, supplemental instruction and active learning seminars.</p> <p>The Math Lab Program Review supports this Strategic Action Plan and one of the challenges mentioned in the Math Lab Program Review states:</p> <p>The main challenges for the Math Lab are to gain the needed campus support and funding to implement expansion in order to provide out-of-class help and support for all math students. Since opening to all levels of math, the lab has seen a steady and high flow of students throughout the entire day and the demand for tutoring has created</p>

	<p>longer lines and wait time. This is evidence that the services of the Math Lab are in high demand. Oddly, in a period of campus growth, the staffing level of the Math Lab has actually decreased since 2012, and is currently staffed at the level it was 20 years ago. It is abundantly clear that the current Math Lab space and funding level is woefully inadequate to meet the needs of our students.</p> <p>The Math Lab needs more space to provide individualized tutoring, group tutoring and collaborative work areas, and present review sessions to ensure that we offer the support to all students that enables them to be successful in their math course. This could be accomplished by:</p> <ul style="list-style-type: none"> <li>• Dedicating additional rooms to the Math Lab</li> <li>• Reverting control of Room 611L to the Math and Computer Science Division, as was originally planned and promised during the previous remodel of this area</li> <li>• Dedicating an area for math in the Natural Sciences proposed Campus STEM Resource Center</li> <li>• Incorporating additional Math Lab space into the next classroom office building or possibly dedicating space in the 600 building when remodeling.</li> </ul> <p>More money is also needed in the budget for Math Lab staffing to provide sufficient out-of-class help and student support.</p>	
What <i>Measurable Outcome</i> is anticipated for this SAP?	<ul style="list-style-type: none"> <li>• Higher retention, success, and persistence rates are expected at all levels in the Math Program</li> <li>• Increased student use in the Math Lab</li> </ul>	
What specific aspects of this SAP can be accomplished without additional financial resources?	All aspects of this SAP require additional financial resources.	
If additional financial resources would be required to accomplish this SAP, please complete the section below. Keep in mind that requests for resources must follow logically from the information provided in this self-study.		
Type of Resource	Requested Dollar Amount	Potential Funding Source
Personnel	<p>1 instructor and 2 student tutors per hour the Math Lab is open. Instructor Cost: at Lab pay approx. \$40/hr for 70 hrs/wk for 37 wks/yr for 3 yrs = \$310,000</p> <p>Student Tutors Cost: \$12/hr for 70/wks for 37 wk/yr for 3 yrs - \$186,480</p>	College Funds
Facilities	Additional room	
Equipment		

Supplies		
Computer Hardware		
Computer Software		
Training		
Other		
<b>Total Requested Amount</b>	<b>\$496,480</b>	

STRATEGIC ACTION PLAN # 7		
Describe Strategic Action Plan: (formerly called short-term goal)	<p>Purchase class sets of 53 Chromebooks and/or iPads for student use in classrooms, along with necessary ancillaries. Fund training for the use of these newer technologies.</p> <p><b>Discussed in Sections: 3.2 and 4.4</b></p>	
List College goal/objective the plan meets:	<p>College Goals:</p> <p>Goal #1: Fullerton College will promote student success.</p> <p>Goal #2: Fullerton College will reduce the achievement gap.</p> <p>Objectives:</p> <ul style="list-style-type: none"> <li>1.1: Address the needs of under-prepared students.</li> <li>1.2: Increase course retention and success.</li> <li>1.3 Increase the number of degrees and certificates awarded.</li> <li>1.4 Increase the number of transfers</li> <li>1.6: Increase the persistence rate of students.</li> </ul> <p>2.1: Address the needs of English language learners.</p> <p>2.2: Increase retention rate of Hispanic and African-American students by at least 2%.</p> <p>2.3: Increase success rate of Hispanic and African-American students by at least 2%.</p> <p>2.4: Increase persistence rate of Hispanic and African-American students by at least 2%.</p> <p>2.5: Increase the number of students from underrepresented groups participating in STEM activities.</p>	
Describe the SAP: (Include persons responsible and timeframe.)	<ul style="list-style-type: none"> <li>• Purchase class sets of Chromebooks and/or iPads and charging cart.</li> <li>• Or install secure charging station in a classroom that would be designated for courses requiring in-class technology</li> <li>• A staff member would be paid to train instructors how to use the Chromebooks and/or iPads in a group setting. For example, how to prevent students from visiting other websites or from using other apps.</li> </ul>	
What <i>Measurable Outcome</i> is anticipated for this SAP?	<ol style="list-style-type: none"> <li>1. Increase student success rates in classes using online homework software (like MyMathLab) while in class. Students will be able to work in groups or individually, in class with the</li> </ol>	

	<p>instructor's help.</p> <p>2. Increase student retention by providing technology that they otherwise would not be able to afford.</p>	
What specific aspects of this SAP can be accomplished without additional financial resources?	None.	
If additional financial resources would be required to accomplish this SAP, please complete the section below. Keep in mind that requests for resources must follow logically from the information provided in this self-study.		
Type of Resource	Requested Dollar Amount	Potential Funding Source
Personnel	\$1,000 / semester for coordination – 2 x \$1,000 = \$2,000	College Funds
Facilities		
Equipment	Charging Cart with 30 unit capacity – 2 x approx. \$500 each = \$1,000	Instructional Equipment
Supplies		
Computer Hardware	Chromebooks – 53 x \$600 = \$31,800 iPads – 53 x \$1527 = \$80,931	Instructional Equipment
Computer Software	Office 365 Software – 53 x \$70 = \$3,710	Instructional Equipment/Supplies
Training		
Other		
<b>Total Requested Amount</b>	<b>\$119,441</b>	

<b>STRATEGIC ACTION PLAN # 8</b>	
Describe Strategic Action Plan: (formerly called short-term goal)	Support the equipment and technology needs of faculty and staff.  <b>Discussed in Sections: 1.0, 3.2, 3.3 and 3.4</b>
List College goal/objective the plan meets:	College Goals: Goal #1 Fullerton College will promote student success.  Objectives: 1.1: Address the needs of underprepared students. 1.2: Increase course retention and success.
Describe the SAP: (Include persons responsible and timeframe.)	<ul style="list-style-type: none"> <li>• 10 iPads, 10 Microsoft Surface Pros, and 5 laptops, or similar devices, for instructor use</li> <li>• 27 inch iMac with trackpad</li> <li>• 4 color laser printers to increase the effectiveness of class handouts.</li> </ul>

	<ul style="list-style-type: none"> <li>• A 3D-printer for creation of models and visualizing mathematical objects.</li> <li>• Wireless dongles to connect tablets and laptops to the projector so the instructor can move around the class more freely and increase participation.</li> <li>• Headsets with microphones and USB microphones for online teaching.</li> <li>• Camtasia licenses for creating instructional videos.</li> <li>• Money for subscription services such as Socrative or Quizlet</li> <li>• Whiteboards for offices. This would help collaboration and discussion of course content with students during office hours.</li> <li>• A subscription to Overleaf to allow students and faculty to collaborate on mathematical documents written in LaTeX.</li> <li>• Other technological accessories for instructor use in the classroom or for online classes.</li> </ul>	
What <i>Measurable Outcome</i> is anticipated for this SAP?	An increase in success and retention rates in FC Math courses.	
What specific aspects of this SAP can be accomplished without additional financial resources?	None.	
If additional financial resources would be required to accomplish this SAP, please complete the section below. Keep in mind that requests for resources must follow logically from the information provided in this self-study.		
Type of Resource	Requested Dollar Amount	Potential Funding Source
Personnel		
Facilities		
Equipment	Printers 4 x \$650 = \$2,600 3D printer - \$3,500	Instructional Equipment
Supplies	Wireless Dongles – 15 x \$35 = \$525 Headsets- 15 x \$50 = \$750 Whiteboards – 10 x \$280 = \$2,800	Instructional Supplies
Computer Hardware	iMacs w/ trackpads – 5 x \$1,928 = \$9,640 iPad Pros – 10 x \$1,530 = \$15,300 MS Surface Pros – 10 x \$1,750 = \$17,500 HP Laptop – 5 x \$1,060 = \$5,300	College Funds/Instructional Equipment
Computer Software	Camtasia – 15 x \$130 = \$1,950	Instructional Supplies

Training		
Other	Socrative - \$60/yr Quizlet - \$35/ yr Overleaf - \$240/yr	Instructional Supplies
<b>Total Requested Amount</b>	<b>\$60,200</b>	

STRATEGIC ACTION PLAN # 9		
Describe Strategic Action Plan: (formerly called short-term goal)	<b>Classroom technology</b> Upgrade 4 demo stations to provide more consistency in their operation, along with better Wi-Fi support for classrooms  <b>Discussed in Sections: 2.3, 3.2 and 3.4</b>	
List College goal/objective the plan meets:	College Goal: Goal #1: Fullerton College will promote student success.  Objectives: 1.1: Address the needs of under-prepared students. 1.2: Increase course retention and success.	
Describe the SAP: (Include persons responsible and timeframe.)	Standardize classroom technology by <ul style="list-style-type: none"> <li>• Improve the Wi-Fi connection in remote classrooms used by the Math Program.</li> <li>• Update screen control systems at demo stations.</li> <li>• Upgrade the pull-down projection screens.</li> <li>• Install additional electrical outlets closer to the demo stations.</li> <li>• Upgrade at least 1 room to accommodate student technology needs such as electrical outlets at every desk.</li> <li>• Upgrade sound jacks in all computers.</li> <li>• Install iPad and tablet USB cables at all demo stations.</li> </ul>	
What <i>Measurable Outcome</i> is anticipated for this SAP?	<ul style="list-style-type: none"> <li>• Reliable projection technology and internet access for mobile devices, uniform across all classrooms used by the Math/CS Division.</li> <li>• Increased retention and success rates.</li> </ul>	
What specific aspects of this SAP can be accomplished without additional financial resources?	Probably none.	
If additional financial resources would be required to accomplish this SAP, please complete the section below. Keep in mind that requests for resources must follow logically from the information provided in this self-study.		
Type of Resource	Requested Dollar Amount	Potential Funding Source
Personnel		

Facilities		
Equipment	Extron Demo Station – 4 x \$14,000 = \$56,000	College Funds/Instructional Equipment
Supplies		
Computer Hardware		
Computer Software		
Training		
Other	Upgrade Wi-Fi for classrooms – 15 x \$1,000 = \$15,000	College Funds/Instructional Equipment
<b>Total Requested Amount</b>	<b>\$71,000</b>	

STRATEGIC ACTION PLAN # 10	
Describe Strategic Action Plan: (formerly called short-term goal)	Continue to support and impact high-impact enrichment-oriented activities, such as advanced problem-solving seminars, the AMATYC Student Math League and practice sessions for it, the William Lowell Putnam Mathematical Competition and practice sessions for it, the Joint Math Club and Colloquium, and Informal Learning Seminars.  <b>Discussed in Sections: 1.0 and 5.0</b>
List College goal/objective the plan meets:	College Goals: Goal 1: Fullerton College will increase student success. Goal 2: Fullerton College will reduce achievement gaps. Goal 3: Fullerton College will strengthen connections with the community.  Objectives: 1.5: Increase the number of students participating in STEM activities. 1.6: Increase the persistence rate of students.  2.4: Increase persistence rate of Hispanic and African-American students by at least 2%.  2.5: Increase the number of students from underrepresented groups participating in STEM activities.  3.1: Strengthen our contacts with Alumni. 3.2: Strengthen partnerships with local feeder high schools and universities. 3.3: Strengthen partnerships with local business and industry. 3.4: Increase funding capabilities of the college. 3.5: Increase engagement of the college with the community through college events, community service, and other partnerships.
Describe the SAP: (Include persons responsible and timeframe.)	To increase the culture of persistence in problem-solving and to provide internal motivation for students to be thoroughly prepared to transfer, the Division proposes to continue the following activities:

	<p>1. Establish two new Seminar courses: MATH 296 Probability and Statistics Seminar and MATH 296H Honors Probability and Statistics Seminar, to be offered jointly at the same time as the other stacked courses.</p> <p>Dana Clahane will pre-launch the new courses in Curricunet in Spring 2018.</p> <p>2. Continue to fund a weekly specialized set of informal learning seminars that meet for 1.5 hours weekly, with participating faculty giving talks on mathematical science and on challenging problems in their specific specialties.</p> <p>Participating faculty on this project include Dana Clahane, Kara Pham, and Tim Cobler.</p> <p>We propose that these Seminars, which were funded under the ENGAGE in STEM grant but have not yet been funded since the expiration of the grant, to begin in Fall 2018.</p> <p>3. We propose to fund \$200 as an honorarium each month (10 months) for external faculty and industry speakers on open problems and emerging applications of math at the Math Colloquium.</p> <p>4. We are requesting a hospitality allowance of \$30 per external Colloquium speaker so that the participants and faculty can have the opportunity to get to know the speakers after the Colloquia, which end at dinner time. Dana Clahane will host the dinners for the speakers, with these dinners being held in downtown Fullerton.</p> <p>5. During the summer, it is proposed that the external speakers and after-dinner (or lunch) for the guest speaker continue to be weekly during each week of Summer Intersessions, for five weeks, each Thursday. Dana Clahane will continue to host.</p> <p>6. We propose to fund two hours daily, of special extra lab/office hours in the Math Lab Annex held by faculty who are interested in helping students with challenging math problems in our advanced courses and their research projects either as ad hoc researchers or as students who are enrolled in the Math Seminar courses.</p> <p>Participating faculty will be Dana Clahane, Abraham Romero-Hernandez, Paul Sjoberg, Kara Pham, and Tim Cobler. We propose to begin this activity in Fall 2018.</p> <p>7. We propose that sound barriers be installed between the Math Lab Annex and the Computer Lab (611T) so that cross-noise is reduced and so that we can increase study concentration in both rooms.</p> <p>8. We propose to continue funding of the overnight shipping of the Putnam Competition exams, and lunch for the participants on the first Saturday of each December.</p>
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	<p>9. We would like to fund lab hours that begin after each AMATYC Competition, with the lab hours provided in two-hour weekly format and designed for interested faculty to work with students on strategies for working on the challenging problems in this competition.</p> <p>10. We propose to continue to support pizza and lemonade at three AMATYC Exam Practice Sessions each semester, for Fall Round 1 and Spring Round 2.</p> <p>11. We propose to fund faculty subscriptions to ShareLaTex, a collaboration and document preparation tool involving LaTeX, the current state-of-the-art typesetting for STEM. The faculty subscriptions will allow students to join projects at no cost.</p> <p>12. We propose to fund approximately ten students for registration fees to attend and/or give talks at local math conferences such as MAA and AMS meetings.</p>
What <i>Measurable Outcome</i> is anticipated for this SAP?	Increased retention and success in the Calculus sequence, the seminars, and our 200-level math sequence, and in particular, increased retention and success for DIY populations in STEM at FC. We would also like to see an increase in the number of students who transfer to a four-year school STEM program, and in particular, we would like to see an increase in the number of students from DIY populations at FC who transfer to a STEM program at a four-year school. In addition, we would like to see a rank of fifth or higher by FC nationally in the AMATYC Competition, and at least six students scoring positively in the Putnam Competition. Finally, we would like to see at least one student from FC rank in the top 900 or higher, in the Putnam Competition, with at least one of these students being a student from a DIY population and at least two being female.
What specific aspects of this SAP can be accomplished without additional financial resources?	The Math Seminar courses are already part of our program, and the Math Colloquium honoraria were institutionalized by the Math/CS Division in the 2016-17 AY. Also, the Division currently has institutionalized sustenance for the AMATYC and Putnam practice sessions and the Putnam Competition, which has been supported by the Division for several years now with good success.

If additional financial resources would be required to accomplish this SAP, please complete the section below. Keep in mind that requests for resources must follow logically from the information provided in this self-study.

Type of Resource	Requested Dollar Amount	Potential Funding Source
Personnel	\$17,000	Math Lab Funds

Facilities	\$2,000	Physical Plant Funds
Equipment		
Supplies		
Computer Hardware		
Computer Software	\$720	Division Technology Funds
Training		
Other: Sustenance for competitions and practices and student conference registration fees	\$3,000	College Funds
<b>Total Requested Amount</b>	<b>\$22,720</b>	

STRATEGIC ACTION PLAN # 11		
Describe Strategic Action Plan: (formerly called short-term goal)	Continue to increase the number of full-time faculty members  <b>Discussed in Sections: 3.1 and 3.3</b>	
List College goal/objective the plan meets:	College Goal: The hiring of fulltime faculty provides the human resources to address all the college goals.	
Describe the SAP: (Include persons responsible and timeframe.)	We continue to need fulltime faculty to provide the best possible instruction to students. While we have an excellent pool of adjuncts, the Division believes that students have a more meaningful experience when they can access their instructor out of class during office hours and have the consistency in instruction that a fulltime faculty member can provide. Data from 2015 used to justify hiring in 2016 shows that over 69% of the department's FTEF was adjunct, and that of all sections taught in the Division, 54% were taught by adjunct faculty. We request additional fulltime hires to address this disparity.	
What Measurable Outcome is anticipated for this SAP?	<ul style="list-style-type: none"> <li>• Increased retention and success of students in math classes</li> <li>• Students will have increased access to faculty</li> <li>• Faculty involvement in campus-wide initiatives will increase</li> <li>• Faculty involvement in special programs, grants, outreach etc. will increase</li> </ul>	
What specific aspects of this SAP can be accomplished without additional financial resources?	None. The hiring of fulltime faculty requires considerable financial resources	
If additional financial resources would be required to accomplish this SAP, please complete the section below. Keep in mind that requests for resources must follow logically from the information provided in this self-study.		
Type of Resource	Requested Dollar Amount	Potential Funding Source
Personnel	\$64,236 - \$94,354	District Budget
Facilities		

Equipment		
Supplies		
Computer Hardware		
Computer Software		
Training		
Other		
<b>Total Requested Amount</b>	<b>\$64,236 - \$94,354</b>	District Budget

## **7.0 Long Term Plans**

Describe the long term plans (four-six years) for your program. Please consider future trends in your narrative. (Identifying financial resources needed for these plans is optional.)

- Increase retention/success in all courses by continuing to embrace new pedagogies and assessments, continuing to participate in college initiatives, involve all faculty in solid professional development.
- Navigate and response to changing demographics, students' preparedness, legislation, changes to placement tests and processes, issues raised by AB705 etc.
- Continue to advocate for more and better facilities.
- Begin planning the remodel of the 600 building.
- Continue to advocate for an increase in FT faculty.
- Continue to advocate for additional funding for more tutoring support, better classroom technology.
- Strengthen connections with students, faculty & 4 year institutions.

## **8.0 Self-Study Summary**

This section provides the reader with an overview of the highlights, themes, and key elements of this self-study. It should not include new information that is not mentioned in other sections of this document.

There have been many changes since the last Program Review and the Math Department has rapidly adjusted to the changing demands of students, advances in technology, pedagogy, assessments and the requirements set out in such regulations as CSU Executive Order 1100 and AB 705. The Math Department is committed to increasing student success and retention rates, shortening the length of time needed to reach transfer level math, improving distance education and creating flexible pathways for students. The following are goals completed or in the process of completing:

- Offer multiple pathways-STEM, Liberal Arts Math, Business Calculus, Elementary Teaching
- Offer a 6 unit Combined Elementary and Intermediate Algebra course (Math 041) since Fall 2015 and create and offer a 6 unit Pre-statistics Math course (Math 024) starting Fall 2018 to allow students to reach college level math classes after one semester.
- Reduced maximum enrollment for Calculus classes 151, 151 H, 152, 152 H to 30 students since Fall 2017.
- Continue the Mathematics Colloquium which gives students the opportunity to prepare a professional mathematics talk.
- Continue the Math Club and 2 unit stacked Math Seminar course where students gain valuable training on unsolved problems in mathematics as well as other skills.
- Support professors that are experimenting with flipped classrooms, collaborative learning activities and other group learning experiences.

In order to effectively implement necessary changes as well as address the concerns and suggestions outlined in this Program Review, the Math Department is requesting the following from Fullerton College:

- Allow the Math Department to maintain control of all current classrooms for scheduling and acquire more classrooms to meet scheduling needs.
- Provide funding for boot camps, review sessions, content specific workshops and final exam review sessions to improve student success and retention rates.
- Provide funding for lead teachers for Math 024, 026, 031, 041 and other support courses planned.
- Provide funding for math-specific training for faculty teaching online, hybrid, accelerated and flipped courses.
- Provide professional expert pay or lab rate pay for instructor-led discussion (ILD) sessions.
- Provide funding for roaming tutors in the Math Lab and acquire space for additional interventions such as group tutoring, workshops, SI, etc.
- Provide funding for class sets of Chrome books and/or iPads for students in the classroom.
- Provide funding to support the equipment and technology needs of faculty and staff.
- Provide funding to upgrade four classroom demo stations.
- Provide funding for problem-solving seminars, practice sessions for the AMATYC Student Math League and William Lowell Putnam Mathematical Competition, Joint Math Club and Colloquium and Informal Learning Seminars.
- Continue to increase the number of full-time faculty members.

The requested funding will allow the Math Department to better serve its students and comply with new regulations as well as increase student success, retention and persistence in its courses through the development of interest in the subject, intellectual curiosity and mental persistence over difficult problems.

## **9.0 Publication Review**

Fullerton College is committed to assuring integrity in all representations of its mission, programs, and services. As such, during the program review self-study process programs are required to document their publications (websites, brochures, pamphlets, etc.), when they were last reviewed, and denote the publication is accurate in all representations of the College and program missions and services. In the far right column please provide the URL where the publication can be accessed. If it cannot be accessed via the internet, please provide a sample of the publication with your program review self-study.

For publications that you have identified as inaccurate, please provide the action plan for implementing corrections below.

Publication	Date last reviewed	Is the information accurate?	URL of publication
Math and Computer Science Division Website	Ongoing	Yes	<a href="http://math.fullcoll.edu/">http://math.fullcoll.edu/</a>

## Routing & Response Page

**Originator → IMS → Appropriate President's Staff Member → Program Review Chair**

## Originator

*Electronically submit completed Program Review to Division Dean/IMS for review.*

## **Appropriate Immediate Management Supervisor (IMS)**

## **RESPONSE**

MARK GREENHALGH DEAN OF MATH/CSCI 12/7/17  
Printed name of IMS Title Date

*Select one and provide response if necessary. Forward electronically to appropriate Vice President's Office.*



*I concur with the findings contained in this Program Review.*



*I concur with the findings contained in this Program Review with the following exceptions (include a narrative explaining the basis for each exception):*

### *Area of exception:*



*I do not concur with the findings contained in this Program Review (include a narrative exception):*

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Digitized by srujanika@gmail.com

### **Appropriate President's Staff Member**

### Acknowledging Receipt

**Printed Name**

**Signature**

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**Title**

Date

*Print Program Review, sign, and route both hard copy and electronic version to Program Review Chair.*