Comprehensive Program Review Self-Study Report

Division of Mathematics and Sciences

Year Fall Semester 2014

Table 1A. Programs: Spring 2011- Spring 2014 Mathematics, Science & Engineering

Astronomy		Geography
Biological Sciences		Geology
Chemistry		Mathematics
Drafting /Computer Aided Design		Physical Science
Earth Science		Physics
Engineering		Water Treatment

Table 1B. Programs: Fall 2014 Mathematics and Sciences

Agriculture		Geology
Astronomy		Mathematics
Biological Sciences		Physical Science
Chemistry		Physics
Earth Science		Water Treatment
Geography		

Part 1 - Division Overview

1.1 Briefly describe how the division or area contributes to the district mission.

As evidenced in the tables above (Table 1A, 1B), the Division has undergone significant changes in the programs it has offered since the last Comprehensive Program Review in the Fall of 2010. The changes include changes in name and curriculum as a result of a campus wide reorganization that occurred during the Spring 2014 Semester. Moreover, it should be noted that the Division also moved into the new Health and Sciences Building in the summer period of 2012. The later move provided for centralized office space for all Division full-time faculty members and 13 instructional laboratories, an increase from 9.

The Division embraces the newly recommended Antelope Valley College (AVC) Mission Statement: "Antelope Valley College, a public institution of higher education, provides a quality, comprehensive education to a diverse population of learners. We are committed to student success, offering value and opportunity, in service to our community." The tenants of this statement are reflected in the Divisions ability to offer instruction that contributes to

to Transfer and General Education, completion of degrees and certificates in Career Technical Education and Academic Development/Basic Skills.

Table 2. Distribution of course sections taught in Mathematics and Sciences for Academic Years 2011-12 to 2014-15*.

	Academic Year							
Courses	**2011-12**	**%**	**2012-13**	**%**	**2013-14**	**%**	**2014-15**	**%**
Career Technical	18	2.6	18	2.5	13	1.6	27	3.3
Basic Skills Mathematics	196	28.2	206	28.5	216	26.7	220	27.0
Transfer-General Education	481	69.2	500	69.1	580	71.7	569	69.7
Total	**695**		**724**		**809**		**816**	

* Prior to 2014-15 the Division was Mathematics, Science and Engineering and Agriculture was added in 2014-15.

As evident in Table 2, the numbers of course sections taught by the Division has increased on an annual basis from 695 to 816 sections over the four academic years under consideration. The increase in Career Technical Education reflects campus wide reorganization and the withdrawal of Computer Aided Design and Engineering from the Division and the addition of Agriculture/Landscape/Horticulture in 2014. Further, offerings of Transfer-General Education courses increased from a low of 481 sections in 2011-12 to a high of 580 sections in 2013-14. Largely as a function of budget constraints, this number has declined to 569 courses in 2014-15. As a direct function of the deficiencies in the skills brought to the college by incoming students, there has been a steady increase of the offerings of Basic Skills Mathematics courses from 196 sections in 2011-12 to 220 in 2014-15 (Table 3).

Table 3. Number of Basic Skills and Transfer Mathematics Sections Taught in the Division of Mathematics and Sciences from Summer 2011 to Spring 2015

	2011-2012		**2012-2013**		**2013-2014**		**2014-2015***	
Sections		**%**		**%**		**%**		**%**
Basic Skills	**196**	**69.3**	**206**	**69.6**	**216**	**67.1**	**220**	**65.1**
Transfer	**87**	**30.7**	**90**	**30.4**	**106**	**32.9**	**118**	**34.9**
Total	**283**		**296**		**322**		**338**	

***ProposedSections**

It is estimated based on the proposed schedule of basic skills courses and sections for the spring 2015 semester that, assuming current room maximums, 4262 students could be served. As evident by the table

of student assessment and placement results (Table 4), 88.0 percent or 7,266 of students assessed from August 2013 through Fall of 2014 placed into a nontransferable or below college level course. It is readily apparent that many more basic skills math sections are required. What is not clear at this time is if the college and division has the instructional resources, including personnel, and facilitates to meet these instructional needs.

Table 4. Placement Test Scores and Assessment Results
Testing Period: August 2013 through Fall 2014

Placement test	Score Range	Number of test-takers	Test Score	# of Applicants Who Received this Score	Total Assessed in BSI
MPL	2-8	8,216 (8,483 including x)	2	3,334	
			2.5	464	
			3	3,468	7,266
			4-8	950	
EPL	1-4	5,378	1	1,099	
			2	948	
			3	1,160	3,207
			4	2,171	
RPL	1-4	9,269	1	756	
			2	677	
			3	2,579	4,012
			4	5,257	

MPL, RPL, @ EPL scores below 4 correspond to the Placement level below College

In response to SB 1440, Transfer Model Curriculum, the faculty of the Division have prepared and received Chancellor's Office approvals for AS-T Degrees in Mathematics, Geography, Geology and Physics for transfer to the California State Universities. The degrees in Geography, Geology and Physics represent new degree programs at AVC. In anticipation of pending release of templates for degrees in Biological Sciences, Chemistry, Environmental Sciences/Studies and Plant Sciences, the faculty of these subject areas are reviewing and revising courses relative to the approved C-ID course descriptors for these disciplines. The latter proposed degrees are subject to approvals by the Academic Policies and Procedures Committee and the Community College Chancellor's Office. An Associate's Degree in Water Sciences is also under development through the support of a California Career Pathways Trust Grant. The Mathematics Department has also participated in the regional CB21 discussions aimed at preparing standardized basic skills mathematics course descriptors and assessment/placement tests.

NIne full-time faculty members retired since the last comprehensive program review, six in mathematics, two in the geosciences, one in engineering and one in the biological sciences. As a result of the Engineering (STEM) Cooperative Grant, full-time grant funded instructors in engineering, mathematics and physics were hired. In addition, district funds were used to hire two mathematics instructors and one geoscientist. As indicated in the following table, thirty-eight full-time and sixty-three adjunct instructors, for a total of 101 instructors, are meeting the current divisional instructional schedule**.**

Table 5. Comparison of the Number of Faculty in the Division of Mathematics and Sciences for Academic Years 2011-12 and 2014-15.

Faculty	**2011-12**	**%**	**2014-15**	**%**	
Full-time	**41**	**38.7**	**38**	**37.6**	
Adjunct	**65**	**61.3**	**63**	**62.4**	
Total	**106**		**101**		

As shown in Table 6, the numbers of full-time equivalent students (FTES) at the college has varied from a low of 9,709.95 to 11,345.63 table over the time period since the divisions

Table 6. Comparison of District and Discipline FTES for Academic Years 2010-1011 to 2013-2014.

Disciplines	**2010-2011**		**2011-2012**		**2012-2013**		**2013-2014**	
	Total FTES	**%**	**Total FTES**	**%**	**Total FTES**	**%**	**Total FTES**	**%**
AVC Total	**10,569.52**		**9,709.95**		**10,593.90**		**11,345.63**	
Astronomy	37.75	1.27	21.07	0.82	26.53	0.91	30.64	0.97
Biology, General	641.27	21.51	591.68	23.14	654.85	22.35	734.68	23.19
Chemistry, General	291.13	9.76	264.13	10.33	283.13	9.66	318.37	10.05
Drafting Technology	48.12	1.61	44.34	1.73	51.24	1.75	43.47	1.37
Earth Science	8.7	0.29	8.55	0.33	10.36	0.35	10.57	0.33
Engineering Technology					0.26	0.01	1.27	0.04
Engineering	20.86	0.70	16.86	0.66	21.63	0.74	31.89	1.01
Geography	33.2	1.11	31.59	1.24	40.96	1.40	40.33	1.27
Geology	55.56	1.86	49.5	1.94	57.2	1.95	49.84	1.57
Mathematics Skills	1.36	0.05	1.25	0.05	1.26	0.04	1.11	0.04
Mathematics, General	1,640.31	55.02	1,335.76	52.23	1,562.93	53.34	1,645.91	51.95
Physical Sciences	128.68	4.32	121.7	4.76	130.14	4.44	138.77	4.38
Physics, General	64.48	2.16	61.47	2.40	75.78	2.59	108.37	3.42
Water and Wastewater Tech	9.96	0.33	9.45	0.37	13.99	0.48	12.85	0.41
Division Total	**2981.38**	**28.21**	**2557.35**	**26.34**	**2930.26**	**27.66**	**3168.07**	**27.92**

last comprehensive program review. This table also reveals that on average the Divisional instructional programs account for 27.53 percent (range, 26.34 – 28.21) of the total college

FTES. The trend over the past three academic years has been a gradual increase from 26.34 in 2011-12 to 27.92 percent in 2013-14. To accommodate these levels of student enrollment, the full-time faculty members teach a significant amount of overload and many adjunct instructors are needed. For example, in Fall 2014, all full-time science faculty members are taught overload averaging 7.0 lecture hour equivalents (LHE) (range, 2-12.75), while 94 percent of full-time mathematics instructors are teaching an average of 5.9 LHE (range, 0.6-10). Combined full-time faculty members are paid for 552 LHE as overload, in essence adjunct instruction. Compared to 458.4 LHE taught by sixty two Adjunct Instructors, this is significant.

Although total FTES generated by the division has been increasing gradually over the years under review and the total number of instructional faculty has declined slightly, the divisional efficiency (FTES/FTEF) has declined from an average 17.42 to 16.34. This is documented in the table below (Table 7).

Table 7. Divisional Instructional Efficiencies from Fall Semester 2011 to Spring Semester 2014.

Efficiency (FTES/FTEF)	2011-2012		2012-2013		2013-2014	
DIVISION	Fall	Spring	Fall	Spring	Fall	Spring
BUS	13.20	13.23	12.51	12.26	**11.44**	**11.04**
HD	16.05	16.18	15.40	15.25	**9.82**	**9.86**
HS	8.21	8.36	8.21	7.79	**11.06**	**10.81**
IR	13.39	9.98	8.38	8.61	**5.22**	**8.05**
KIN	19.22	19.48	19.43	17.91	**19.74**	**19.19**
LA	13.60	13.42	14.21	13.72	**13.89**	**13.1**
LIB	12.54	12.66	12.44	10.79	**7.39**	**6.79**
MS	17.22	17.27	17.95	17.24	**15.99**	**16.69**
SS	17.61	17.60	18.76	18.15	**17.69**	**16.53**
TEC	12.84	12.28	13.05	12.09	**14.6**	**13.85**
VAPA	14.08	14.05	14.12	13.07	**13.86**	**12.83**

1.2 Place an "X" by each Institutional Learning Outcome (ILO) supported by the division or area.

_X_ Analyze diverse perspectives from a variety of disciplines and experiences that contribute to the development of self-awareness.

_X_ Value and apply lifelong learning skills required for employment, basic skills, transfer education, and personal development.

_X_ Demonstrate a breadth of knowledge and experiences from the humanities, social and behavioral sciences, arts, natural sciences, and mathematics.

_X_ Solve problems using oral and written communication, critical thinking and listening skills, planning and decision-making skills, information literacy, and a variety of technologies.

_X_ Demonstrate good citizenship and teamwork through respect, tolerance, cultural awareness, and the role of diversity in modern society.
_X_ Identify career opportunities that contribute to the economic well-being of the community.

Prepared by: Dr. Leslie S. Uhazy

Part 6 – Summary: Resource Needs

Identify significant resource needs that should be addressed currently (up to three years), near term (three to five years) and long term (five to ten years). If there may be safety issues, enrollment consequences or other important concerns if a resource is not provided please make this known.*

6.1 List needed human resources. List titles in priority order. Identify which discipline/area goal(s) guides this need.

I. Certificated Instructors:

A. **Full-time Mathematics:** Since presentation of the 2010-11 Comprehensive Program Review, six full-time mathematics faculty members have vacated positions. Of these, three positions have been replaced: one funded through the Engineering Coop Grant and two via District funds. **With the mounting need for basic skills mathematics instruction, there is a need for an additional three full-time positions.**

B. Full-time Sciences:
1. Geosciences: Two full-time faculty members have retired from the Geosciences group. A geologist/earth scientist was hired this past year and there is a significant need for a **full-time Geographer**.
2. With the pending AS-T Degree in Chemistry and increasing student demand, ther is a need for a **full-time Chemistry Instructor**.
3. With the retirement of a full-time biology instructor and the establishment of the AS-T Degree in Biological Science plus the increased student demand for general biology, the faculty have identified the need for three **full-time Biology Instructors with, in order of priority: general biology, cell and molecular/biotechnology, and anatomy-physiology experience.**
4. **Full-time instructor in Water Science**.

C. An Adjunct Instructor is needed in Astronomy.

II. Classified:

1. A **full-time Laboratory Technician** is needed in support of the laboratory course offerings in the **geosciences**. Instructors currently have no technical support.

2. A **Physical Sciences Technician** is needed to support all of the physical sciences offered during the late afternoon to evening laboratory offerings. At present there is no resident technical support for instructors teaching in these laboratory courses at these times.
3. To support the expanding laboratory offerings in **biology** an additional **full-time technician** is needed.

III. Short-term Hourly

1. Agriculture/horticulture has need for short-term hourly workers to support maintenance and operation of the greenhouses and the instructional laboratories.

IV. Tutors and Supplemental Instructors

1. More Tutors and Supplemental Instructors are need to facilitate student success in General and Organic Chemistry and all disciplines in the division on the Lancaster campus and at the Palmdale Center.

6.2 List needed technology resources in priority order. Identify which discipline/area goal(s) guides this need.

Agriculture:

1. Replacement of stolen Laptops (goal 3F)
2. Staff must use personal cell phone to communicate with security or anyone when outside of the classroom, which is most of the time (goal 1B)
3. Upgrade of older computers and laptops (goal 3F)
4. Upgrade and Increase lab electronic testing equipment (goal 3F/3G)

Mathematics:

1. Additional computers, computer desks for the expansion of MATH 099. (Goal 3)
2. Computer lab/classroom needed for the expansion of MATH 099 and for other math classes such as MATH 115 (Statistics) and Basic Skills that regularly require computer work. (Goal1 and 3)

Astronomy:

1. The only technology goal needed is an all-dome video projector for the virtual science classroom (HS 181). The need for this technology is immediate. As stated in 5.1 and 5.2 the video projector is critical for maintaining and further increase the current success and retention rates**.**

Biology:

1. A 5Mp TV to enhance the digital microscope demonstrations in Microbiology labs (Goal 1).
2. Replacement of damaged, stolen or worn anatomical models material (Charts & Slides) used for Biology 102, 201 and 202 (Goal 1). Purchasing slides and articulated skeletons (See table 1) to be used in Biology major's courses (Goal 2).
3. Dissecting microscopes with digital camera capabilities (Goals 2 & 3).
4. Duplication of anatomical models to permit use of HS-133 for additional sections of Biology 201(Goal 1).
5. The Anatomy lab needs an appropriate waste receptacle for dissection debris (animal and preserved materials) (Goal 1).
6. Replacement of cadavers (as needed) (Goal 1).

Table 1: List of specimens for biology majors to be used in majors lab.

Scientific name	Common name	Phylum	Live/preserved
Scypha sp.	Sponge	Porifera	Preserved specimen; prepared slides
Gonionemus sp.	Gonionemus	Cnidaria	Preserved specimen
Hydra sp.	Hydra	Cnidaria	Live specimen
Hexagonaria percarinata	Petoskey stone	Cnidara	Fossil
Dugesia tigrina	Planarian	Platyhelminthes	Live specimen; prepared slides
Dipylidium caninum	Dog tapeworm	Platyhelminthes	Preserved specimen
Ascaris lumbricoides	Roundworm	Nematoda	Preserved specimen for dissection; prepared slides
Nereis succinea	Clamworm	Annelida	Preserved specimen
Lumbricus terrestris	Earthworm	Annelida	Live specimen; preserved specimen for dissection
Romalea sp.	Grasshopper	Arthropoda	Preserved specimen for dissection
Gromphadorhina portentosa	Hissing cockroach	Arthropoda	Live specimen
Cambarus sp.	Crayfish	Arthropoda	Preserved specimen for dissection
Anodonta sp.	Freshwater mussel	Mollusca	Preserved specimen for dissection
Loligo pealei	Squid	Mollusca	Preserved specimen
Pisaster sp.	Sea star	Echinodermata	Live specimen; Preserved specimen
Eupentacta sp. (?)	Sea cucumber	Echinodermata	Live specimen
Strongylocentrotus sp.	Sea urchin	Echinodermata	Live specimen
Branchiostoma sp.	Lancelet	Chordata	Preserved specimen; whole mount
Rattus rattus	Rat	Chordata	Preserved specimen

Geosciences:

1. We would like twelve tabletop magnifying glasses for use in the Geography and Geology lab. Our existing handheld magnifying glasses are breaking and we do not have enough for all of the students to use. These will assist in a variety of ways when

students are exploring maps, minerals, rocks, and other examples and tools of the geosciences.

Physical Science:

1. No technology needs for the near term.

Physics:

1. No technology needs for the near term.

6.3 List facilities/physical resources (remodels, renovations, or new) needed to provide a safe and appropriate student learning and/or work environment. List needs in priority order. Identify which discipline/area goal(s) guides this need.

Agriculture:

1. Wiring for hydroponic unit (facility request approved 3 years ago)
   Goal 3E
2. Programming for door locks. Doors must be blocked open (fire issue) in order for students in enter building from greenhouses or lab facilities. (goal 1B/I\1C)
3. Increase outdoor lighting for nighttime classes. (Goal 1C)

Mathematics:

1. Additional classrooms for accommodating roughly 900 students who need accommodation as a result of class size reduction. (Goal 1)
2. Additional classrooms for accommodating new students as a result of college's annual growth. (Goal 1)

Astronomy:

1. A facilities/physical resources need for astronomy is improvement to the observing deck on the second floor of the HS building to allow the operation and storage of a devoted telescope with imaging equipment. Covered storage is required to protect from outside elements, as well as the need to lock off access to the area to protect the equipment from theft or other damage.

Biology:

1. For safety and security, the ability and responsibility to lock and unlock lecture and lab rooms must be returned to the faculty who use these rooms (Goal 1).

2. Creating a permanent space for undergraduate research (Goals 1-3 & Long Term Goal)

3. An alarming increase in theft, attempted break-ins and vandalism argues strongly for the installation of surveillance cameras and/or RF anti-theft security gates.

Chemistry:

1. Chemistry lab at Palmdale Center (Goal 2, 3, 4)

Geosciences:

1. Asbestos samples were discovered in the Geology Lab, and we are still waiting for the college to make sure it is properly disposed of. This needs to be dealt with immediately before AVC is found liable in harming students and/or faculty. This may have contaminated existing samples of other rocks, which will also need to be replaced. This could be a sizable cost depending on the extent of contamination.

Physical Science:

1. The current facilities are adequate to support the expansion of the program, if needed, up to 50% from the current level.
2. The facilities at the Palmdale Center are also adequate to support the current enrollment trends there.

Physics:

1. The current facilities are adequate to accommodate the current demand and possible increase in the near future.

6.4 List needed professional development resources in priority order. Identify which discipline/area goal(s) guides this need.

Mathematics:

1. Fund the active participation of math faculty in discipline related conferences. (Goal 2)
2. Funds for planning local seminars or conferences. (Goal 2)

Astronomy:

1. No professional development resources are needed. If an all-dome video projector is acquired faculty would need to be trained to use and maintain the equipment.

Biology:

1. Workshops on implementation of Hands-on Inquiry based instructions in biology courses and writing cases that can be used in lecture instructions (Goals 2 & 3).

Chemistry:

1. Training on newly acquired lab analytical instrumentation (Goal 4)
2. Training to implement inquiry-based methods in more chemistry classes (Goal 2, 3, 4)

Geosciences:

1. Since GIS technology and software is constantly changing and geophysical theory is continuing to grow and evolve, we need funding for travel and conference expenses to keep relevant in our fields. Attending conferences such as the meetings of the American Geophysical Union (AGU), the Association of American Geographers 2(AAG), and the ESRI user conference are crucial to our continued professional development.

Physics:

1. Staff development funds are needed on an ongoing basis to accommodate faculty training in Active Learning pedagogical methods and other technology based methods.

6.5 List any other needed resources in priority order. Identify which discipline/area goal(s) guides this need.

Agriculture:

1. Restore and Increased Supply Budget (Goal 3D/E)
2. Increased Replacement Budget (Goal 3G)
3. New tools and equipment to operate classes more efficiently (Goal 1)

Mathematics:

1. Adequate supply of marker pens for the white boards, pens, pencils, erasers and paper. Recently we have had to purchase our own supplies. (Goal 1)
2. Printers and supplies for instructors' offices. (Goal 1)

3. Incentives, in the form of release time or stipend, for faculty coordinators in the Math Basic Skills and Transfer/STEM areas. (Goal 2)

No other resources are needed in the foreseeable future.

Biology:

1. Laptops to be used specifically in Biology majors courses. One additional laptop for Microbiology to be used by students when giving oral research presentations. Use of the instructor's laptop is not appropriate and student services frequently have trouble releasing a computer to meet this need (Goals 1-3 & Long Term Goal).

Chemistry:

No additional resources needed.

Part 7 – Summary: Recommendations and Comments

7.1 List recommended changes to the Educational Master Plan to:

- **Address external issues or mandates such as legislation, industry, and professional standards, etc.**
- **Respond to outcome findings.**
- **Reflect changes in technology, methodology, and/or disciplines.**
- **Address student achievement gaps and/or meet other student needs.**

Mathematics:

1. The large number of students placing into Mathematics Basic Skills courses is still an issue. A lot of these students seem to be passing Algebra courses in high school, but get placed into Basic Mathematics. Projects such as SMAP and Fast Track need to be strengthen and promoted by the math department, AVC, and AVHSD.
2. Several classrooms where math classes are taught are scattered all over the campus and the infrastructure in those classrooms needs work. Starting with the heating and air conditioning, to the projector and computer malfunctions. In addition to the inadequacy of SSV classrooms (e.g., SSV 202, 204, and 236), many ME buildings (especially ME 111) are inadequate for decent teaching and learning experiences: namely, the ventilation system is inefficient to almost nonexistent; the lighting is poor; and the noise level from the nearby students congregating outside waiting for their next classes is unacceptably high. All of these factors affect the students' mood

greatly and decrease their motivational level to learn. To remedy this, we need the resource to maintain and improve the building conditions as well as installing permanent signs, which are written clearly and large enough, to warn these students outside the rooms to be quiet.

3. The classroom clocks are both useful and important in regulating the lecture; the ME 111 room, for example, has been inaccurate. The resource for a proper maintenance of clocks all over the classrooms is desired).
4. In addition to a need for "basic math" tutors, the college lacks quality tutors for high level math courses such as Math 140, 150, 160, 220, 230, and 250. A resource fund to actively search and hire qualified tutors is desirable for these students' successes. A fund to 'train' tutors by faculty is an idea that may be worth considering; such tutors could act as classroom assistants, which would boost the student learning greatly.
5. Here's a positive note: a small faculty room located inside the Health & Science building is providing benefits to some.
6. Perhaps further consideration could be given to placing more math classes in the Health Science building where all mathematics instructors have their offices in and has better equipped classrooms.

Astronomy:

1. Currently there are no external mandates affecting the astronomy program. There has been a significant reduction of FTES and student headcount rates from 2010 to the overall period of 2011-2014, which can be attributed to mainly to the required reduction due to state budget cutbacks and the introduction of Math 102 as prerequisite. Within 2011 to 2014 we also observed a slight increasing trend in enrollment and FTES production. If this trend persists we will need to add more sections and recruit more adjuncts to teach night and weekend courses. The most obvious solution is to expand the astronomy offerings at the Palmdale center, which is under discussion already.

2. While we are satisfied with the current success and retention rates, we will continue to strive to increase them in the near and distant future. Faculty are committed to continuing the implementation of "active learning methods" which has been proven to increase the overall student success and retention rate. However, this trend can only continue to increase by addressing the technology and facilities needs that were discussed above.

Biology:

1. No changes are recommended and we just want to see that the college continues to meet its three main missions, Transfer, Career Tech preparation, & Transfer equally.
2. Overall the Biology program is meeting its SLOs and has achieved significant progress towards its goals. We will continue to try to improve student success and retention rates provide that our human and physical resource needs are met.

Chemistry:

1. As enrollments rise due to the restoration of the state budget, we will strive to increase the participation and success of minority students in chemistry. As every other science program, chemistry has seen significant fluctuations in headcount and FTES figures for the last 5 years. Although this is largely out of our control, we recommend that the needs of the department in terms of human and physical resources are addressed sooner than later so that we can prepare for future increases in enrolments.

Physics & Physical Science:

1. The program currently enjoys a great reputation among students and among the local K-12 teachers. Success and retention rates are at a level higher than the college average. The program has all necessary equipment and facilities to continue to improve.
2. The current method of teaching engages students actively in a variety of hands-on and critical thinking activities. The method, as evidenced by success, retention, and SLO achievement rates, is very successful and we will continue to employ it.
3. Physics & Physical Science faculty, in collaboration with biology faculty, are involved in student undergraduate research projects and are actively promoting the concept to the entire college.
4. Two of the physics faculty is faculty advisors for eth AVC STEM club which has grown to over 100 members in the last couple of years.
5. We plan (subject to adequate funding) to continue to offer summer training academies for local teachers. The initial feedback from the pilot program offered during the summer of 2014 is very encouraging and we expect increased participation in the near future.

Water Sciences-Environmental Sciences

1. With the funded Pathways grant in Water Science, AVC has a significant opportunity to develop a program that address drinking water preparation and waste water management in conjunction with issues of water conservation

7.2 Summary: What changes in the program review process would improve institutional effectiveness or make the results more helpful to the program?

Mathematics:

The current version of the form is well designed. Offering faculty training throughout the academic year is desirable.

Science:

The current process is satisfactory and adequately addresses the needs for both the annual update and the comprehensive report. Our only issue has been the discrepancy observed in data collected locally from Banner as compared to the data reported by the CCC Chancellor's office. In various occasions we have observed significant differences form the two sources. Additionally, in some cases, the section counts and headcounts reported do not agree with the anecdotal data we collected from the divisional schedules. We recommend that a comprehensive review of our Banner data be completed collaboratively between faculty, and IR and IT personnel.

Start of Discipline Reports

Part 2 - Data Analysis and Use

The following presentations reflect the contributions of the disciplines/programs to the division's comprehensive review. It should be noted that Agriculture/Landscape was part of a comprehensive review in 2013-2014 and only the annual update is presented at this time.

Fall 2014 Annual Agriculture / Landscape

1. **Discipline/Area Name**

   Agriculture – Landscape and Park Management

   Landscape Construction (Degree / Certificate)

   Environmental Horticulture (Degree / Certificate)

   Grounds Maintenance (Local Certificate)

2. **Year** 2014

3. **Name of person leading this review**

   Neal Weisenberger

4. **Names of all district participants in this review**

   Neal Weisenberger, Kris Chaisson (Ag Lab Technician) Sharon Weisenberger (adjunct instructor)

5. Status Quo option
Year 1: Comprehensive review
Year 2: Annual update or status quo option

Year 3: Annual update

Year 4: Annual update or status quo option

In years two and four of the review cycle, programs may determine that the program review conducted in the previous year will guide program and district planning for another year. Check here to indicate that the program review report written last year accurately reflects program planning for the current academic year. __X___

(Only programs with no updates or changes may exercise the status quo option. All others will respond to questions 6 – 12.)

Resource Needs

13. Identify significant resource needs which should be currently addressed (up to three years). If there may be safety issues, enrollment consequences, or other important concerns if a resource is not provided please make this known.

List needed human resources. List titles in priority order. Identify which discipline/area goal(s) guides this need.

Short Term -Neither of these needs relate to new positions however they need to be addressed as a staffing need.

Hourly Worker - Staffing the facilities on a short-term situation such as when the Agriculture Lab technician is on vacation, injured or sick. When Agriculture Lab Technician is off, some lab activities are curtailed or rearranged due to safety issues. The workload for maintaining the facilities (mainly watering) fall onto the faculty or volunteers, in which Faculty needs to be present.

Volunteers - Additional staffing needed to maintain the new larger facilities being planned, i.e. student assistance, volunteers, and/or docents.

- List needed technology resources in priority order. Identify which discipline/area goal(s) guides this need.

1. Replacement of stolen Laptops (goal 3F)
2. Staff must use personal cell phone to communicate with security or anyone when outside of the classroom, which is most of the time (goal 1B)
2. Upgrade of older computers and laptops (goal 3F)
3. Upgrade and Increase lab electronic testing equipment (goal 3F/3G)

- List facilities/physical resources (remodels, renovations or new) needed to provide a safe and appropriate student learning and/or work environment. List needs in priority order. Identify which discipline/area goal(s) guides this need.

    1. Wiring for hydroponic unit (facility request approved 3 years ago)
       Goal 3E
    2. Programming for door locks. Doors must be blocked open (fire issue) in order for students in enter building from greenhouses or lab facilities. (goal 1B/I\1C)
    3. Increase outdoor lighting for nighttime classes. (Goal 1C)

- List needed professional development resources in priority order. Identify which discipline/area goal(s) guides this need.

  None

- List any other needed resources in priority order. Identify which discipline/area goal(s) guides this need.

    1. Restore and Increased Supply Budget (Goal 3D/E)
    2. Increased Replacement Budget (Goal 3G)
    3. New tools and equipment to operate classes more efficiently (Goal

Division/Area Name: Mathematics

Year: 2014-2015

Part 1 - Division or Area Overview

1.3 Briefly describe how the division or area contributes to the district mission.
The Department of Mathematics offers an Associate Degree in Mathematics as well as courses in the areas of basic skills that are essential for success in college level degree applicable studies. Our curriculum includes problem solving, analytical and critical thinking skills as well as computational skills that enable our students to enroll in upper division programs at four-year colleges and universities.

1.4 Place an "X" by each Institutional Learning Outcome (ILO) supported by the division or area.

__x Analyze diverse perspectives from a variety of disciplines and experiences that contribute to the development of self-awareness.

x Value and apply lifelong learning skills required for employment, basic skills, transfer education, and personal development.

_x_ Demonstrate a breadth of knowledge and experiences from the humanities, social and behavioral sciences, arts, natural sciences, and mathematics.

_x_ Solve problems using oral and written communication, critical thinking and listening skills, planning and decision-making skills, information literacy, and a variety of technologies.
_x_ Demonstrate good citizenship and teamwork through respect, tolerance, cultural awareness, and the role of diversity in modern society.
_x_ Identify career opportunities that contribute to the economic well-being of the community.

1.5 After completing Parts 2-7, prepare a one page summary of the division/area. Interpret the significance of the findings. Note successes in supporting district strategic goals and where improvements are needed.

Name of person leading this review: Tooraj Gordi

1.6 Names of all participants in this review
Roberto Diaz, Nabeel Atique, Dr. Cindy Hendrix, Mike Tran, Debra Anderson, Kenan Shahla, Dr. Igor Marder, and Dr. Roy Osawa.

Part 2 - Data Analysis and Use

2.1 Please review the headcount and FTES enrollment data provided on the web link. Comment on trends over the past five years and how they affect your program.*

Table 8. Total Annual FTES in Mathematics by Gender from 2010 to 2014.

	Annual 2010-2011	Annual 2011-2012	Annual 2012-2013	Annual 2013-2014
	Total FTES	Total FTES	Total FTES	Total FTES
Antelope Valley Total	10,569.52	9,709.95	10,593.90	11,345.63
Mathematics-17 Total	1,641.67	1,337.01	1,564.19	1,647.02
Female	979.67	796.74	927.76	968.34
Male	644.76	521.52	614.88	661.79
Unknown	17.24	18.75	21.54	16.89

Although the college's overall FTES increased by 7% during the 4-year period 2010-2014, there was been no significant increase in FTES in the mathematics department (Table 8). Like the college as a whole, FTES declined during the first two years and then consistently increased over the next two years. As shown in Table 3, the number of math sections taught has increased from 283 to 338 sections and on average consisted of 67% basic skills and 33 % transfer courses.

No significant change was observed in gender analysis. Overall during the intervening academic years there was about 1% decrease in male student

enrollment and a 2.6% increase in female students.

Table 9. Total Annual FTES by Two-Digit TOP Code by Race-Ethnicity.

	2010-11	2011-12	2012-13	2013-14
AVC Total	**10,569.52**	**9,709.95**	**10,593.90**	**11,345.63**
Mathematics-17 Total	**1,641.67**	**1,337.01**	**1,564.19**	**1,647.02**
African-American	292.51	240.24	287.91	334.97
American Indian/Alaskan Native	9.02	4.98	6.99	6.48
Asian	32.28	26.41	34.81	29.52
Filipino	27.79	23.10	27.26	28.48
Hispanic	567.80	509.07	719.55	779.89
Multi-Ethnicity	31.05	48.49	64.68	74.33
Pacific Islander	4.04	2.57	2.89	3.40
Unknown	244.91	135.88	25.69	19.89
White Non-Hispanic	432.28	346.27	394.41	370.07

FTES examination by ethnicity and race, however, shows significant changes (Table 9). The Hispanic and African American students' enrollment have increased by 37% and 14% respectively, while the enrollment of White and Non-Hispanic declined by 14%.

Table 10. Total Annual FTES by Student Age from 2010-2014.

	Annual 2010-2011	Annual 2011-2012	Annual 2012-2013	Annual 2013-2014
	Total FTES	Total FTES	Total FTES	Total FTES
Antelope Valley Total	10,569.52	9,709.95	10,593.90	11,345.63
Mathematics-17 Total	1,641.67	1,337.01	1,564.19	1,647.02
19 or Less	560.74	449.28	514.07	478.84
20 to 24	556.72	467.19	568.35	613.91
25 to 29	193.54	138.33	158.36	190.83
30 to 34	96.55	84.38	98.87	110.71
35 to 39	66.54	55.18	61.45	71.91
40 to 49	110.89	91.35	100.15	102.12
50 +	56.34	51.17	62.95	78.69
Unknown	0.35	0.12		

Another significant change in students' enrollment in is the return of older students (50+) to math classes, i.e. a 41% increase over the intervening years (Table 10). More investigation is needed to adequately determine the placement level of this age group. The collected data also indicates an 8% FTES increase for younger students between the ages of 20 and 35.

2.2 Report program/area data showing the quantity of services provided over the past five years (e.g. number transactions, acreage maintained, students served, sales figures). Comment on trends and how they affect your program.*

N/A

2.3 Use the discipline student success data provided by web link. Please note by race, gender, location and modality where improvement is needed to meet the Institutional Standard of 68% for student success (students earning grades of A, B, C, Pass, or Credit). Identify what actions are planned to address achievement gaps in success and/or retention in the current academic year.*

Table 11 below shows the student success rate for both the math and science departments over a 3-year period. It must be noted that the success rate in the mathematics department declined from 64 percent to 59 while the sciences remained about 69 percent. This decline in math is felt to be correlated with the great numbers of students taking basic skills courses.

Table 11. Student Success Rate by Academic Year

AY			N	Rate
2011-12	EngrSci	Success Rate	6844	.69
	MATH	Success Rate	11348	.64
2012-13	EngrSci	Success Rate	7557	.69
	MATH	Success Rate	12406	.64
2013-14	EngrSci	Success Rate	8114	.70
	MATH	Success Rate	12826	.59

Further investigation reveals that the success rate in the transferable courses has always

been significantly higher than that for the basic skills courses. In spring 2014 while the success rate of transferable courses reached 68.69%, the basic skills courses hit its lowest rate of 47.71%

It is also worth noting that shorter terms such as summer and winter enjoy a higher rate of success. The success rate in math courses in the winter 2013 reached its highest of 81%. Examining the success rate by ethnicity and race shows the gaps between African American, Hispanic, and White students. In a typical two-semester-year the success rate of African American students is about 42% in the Basic Skills area and 54% in transferable courses. The rates in those areas for Hispanic students are 63% and 66.5% and for White students are 65.5% and 71% respectively.

The Mathematics Department will continue to offer the same quality of instruction to all students regardless of their ethnicity.

2.4 Analyze and summarize trends in student progression through basic skills courses, if applicable. Cite examples of using data, outcome action plans and/or other planning tools as the basis for resource allocation (e.g. human, facilities/physical, technology, financial, professional development) that resulted in or correlate with improvements in course success and progression over the past five years.

Analysis of data clearly indicates the following:

- Students who start their basic skills sequence from the lowest level i.e. three levels below transfer (Math 060), have much less chance to enter a transferable level course and succeed. Twenty-three percent (81 students) of the cohort (358 students) who started in the Fall 2011 taking MATH 060 enrolled in a transferable course by the summer 2014. Eighteen percent of them (63 students) finished successfully (Table 12). In 2013 the progression changed drastically for the worst. Only 0.4% (4 students) of the cohort (889 students) who started in the fall 2013 taking Math 060 or 065 enrolled in a transferable course and 3 finished successfully. There are several explanations for the gap:

    1. The three levels below transfer in Table 13 includes MATH 050, 060, and 065. This also explains the difference between the sizes of the cohorts.

    2. While the first cohort (Table 12) had 3 years to reach a transferable course, the second cohort had only one year. It is also interesting that both cohorts, despite of their sizes, had the same number of students advancing to the "Two Levels Below Transfer".

Table 12. Persistence of Students First Enrolled in MATH 060 Fall 2011.

	Fall 2011-Summer 2014	Fall 2011-Su	Fall 2011-Su	Fall 2011-Su	Fall 2011-Summer 2014	Fall 2011-Su	Fall 2011-Su	Fall 2011-Su	Fall 2011-Su	Fall 2011-Su	Fall 2011-Su	Fall 2011-Summer 2014
	Three Levels Below Transfer			Two Levels Below Transfer			One Level Below Transfer			Transferable		
	Students	Attempts	Success	Students	Attempts	Success	Students	Attempts	Success	Students	Attempts	Success
Basic Skills Math	358	409	284	244	338	181	147	174	121	81	109	63

Table 13. Persistence of Students First Enrolled in MATH 060 and 065 Fall 2013.

	Fall 2013-Summer 2014	Fall 2013-Su	Fall 2013-Su	Fall 2013-Su	Fall 2013-Summer 2014	Fall 2013-Su	Fall 2013-Su	Fall 2013-Su	Fall 2013-Su	Fall 2013-Su	Fall 2013-Su	Fall 2013-Summer 2014
	Three Levels Below Transfer			Two Levels Below Transfer			One Level Below Transfer			Transferable		
	Students	Attempts	Success	Students	Attempts	Success	Students	Attempts	Success	Students	Attempts	Success
Basic Skills Math	889	1005	452	245	249	144	43	45	31	4	4	3

- Tables 14 and 15 show the progression through the basic skills sequence for the cohorts that started from the "Two Levels Below Transfer" i.e. MATH 070. The rates for getting into a transferable course are 48% (159/333) for 2011 cohort and 4% (17/451) for the 2013 cohort.

Table 14. Persistence of Students First Enrolled in MATH 070 in Fall 2011.

	Fall 2011-Su	Fall 2011-Su	Fall 2011-Su	Fall 2011-Su	Fall 2011-Summer 2014	Fall 2011-Su	Fall 2011-Su	Fall 2011-Su	Fall 2011-Summer 2014
	Two Levels Below Transfer			One Level Below Transfer			Transferable		
	Students	Attempts	Success	Students	Attempts	Success	Students	Attempts	Success
Basic Skills Math	333	374	281	255	321	230	159	276	130

Table 15. Persistence of Students First Enrolled in MATH 070 in Fall 2013.

	Fall 2013-Su	Fall 2013-Su	Fall 2013-Su	Fall 2013-Su	Fall 2013-Summer 2014	Fall 2013-Su	Fall 2013-Su	Fall 2013-Su	Fall 2013-Summer 2014
	Two Levels Below Transfer			One Level Below Transfer			Transferable		
	Students	Attempts	Success	Students	Attempts	Success	Students	Attempts	Success
Basic Skills	451	493	294	225	236	152	17	19	10

Table 16 shows the overall success rates in all basic skills courses including MATH 099 sections in two years that includes winter and summer sessions.

Table 16. Overall Student Success in all Basic Skills Math Courses, including MATH 099, for two AcademicYears from 2012-2014.

	Basic Skills excl. 102		Basic Skills incl. 102	
2012-2013	N	SR	N	SR
	6586	57.90%	8821	60.90%
2013-2014	N	SR	N	SR
	6692	52.30%	9055	56.30%

A closer investigation (see below) shows that students perform much better in the traditional short terms eight week summer session and five week intersession or in the MATH 099 mode (Table 17).

Table 17. Student Success in all Basic Skills Math Courses, including MATH 099, during short-term Intersession and Summer Sessions

W/S sessions	Basic Skills excl. 102		Basic Skills incl. 102	
2012-2014*	N	SR	N	SR
	1844	64.80%	2379	68.60%

* includes summer 2012 thru winter 2014

Some well-known reasons for a better performance in short terms are the smaller class sizes, focused attention, population age (younger), and well-prepared students. It must be noted that about 14% of the basic skills students enroll in summer and intersessions sessions.

2.5 List degrees and certificates currently offered in the discipline. Discuss improvements in the completion rates of degrees and certificates over the past five years. Also discuss improvements in license exam results, job placement/post testing and/or transfer rates to four-year institutions, if applicable. *

The mathematics department offers both local AS and AS-T degrees. As shown by the following table (Table 18), there has been a 200% increase in awarded associate degrees in mathematics with a significant increase and interest in AS-T degree in mathematics. Although there is no data available to determine what academic path those 39 math awardees pursued, it is very likely that those with an AS-T degree continued their study in mathematics. Anecdotally, it is also known that some of these graduates continue with transfer degrees in engineering.

Table 18. Degrees Awarded in Mathematics from 2009 to 2014.

	Annual 2009-2010	Annual 2010-2011	Annual 2011-2012	Annual 2012-2013	Annual 2013-2014
Total Mathematics degree	13	14	20	22	39
Associate in Science for Transfer (A.S.-T) Degree			4	6	17
Associate of Science (A.S.) degree	13	14	16	16	22

2.6 **Career Technical Education (CTE) programs: Review the labor market data on the California Employment Development Department website for jobs related to your discipline. Comment on the occupational projections for employment in your discipline for the next two years. Comment on how the projections affect your planning. http://www.labormarketinfo.edd.ca.gov/Content.asp?pageid=1011 ***

N/A

Part 3 – Outcome Analysis and Use

3.1 Analyze changes in student learning outcome (SLO) and program learning outcome (PLO) assessment findings over the past five years. Cite examples of using data during that time as the basis for resource allocation (e.g. human, facilities/physical, technology, financial, professional development) or making other changes that resulted in or correlate with improved learning outcome findings over the past four years.*

SLO and PLO findings, along with the development of action plans have been useful to the discipline in making changes and adjustments in the math curriculum and student learning. One action plan suggests class size reduction from 45 to 35 students for MATH 070, and MATH 102. All other action plans involves making adjustments to curriculum, assessments, teaching methods, and coordination among full time and adjunct faculty.

The Mathematics Department has made several changes in its curriculum that were based on the SLO and PLO data analysis and the suggested action plans. Some examples are:

MATH 050 Arithmetic and 060 Prealgebra: In the fall 2013, MATH 050 and MATH 060 were obsoleted and in an effort to reduce what was determined to be significant redundancy replaced by a new MATH 065 Basic Mathematics course. Student Learning Outcomes (SLO) findings for all 3 courses are presented below (Tables 19, 20, 21) but no action plan was needed. The SLO success rate in MATH 050 averaged 65 % and ranged between 41-79% from Fall 2010 to Spring 2013 (Table 19). For MATH 060, (Table 20) the average SLO success rate was 69% and ranged from 47-86% from Fall 2010 to Fall 2012.

Table 19. Assessment of Student Learning Outcomes for MATH 050 Arithmetic from Fall 2010 to Spring 2013.

SEMESTER	SLOs	TESTED	PASSED	SUCCESS RATE
Fall 2010	2	421	261	62%
	4	409	232	57%
Fall 2011	1	321	213	66%
	2	281	222	79%
	3	341	222	65%
	4	284	217	76%
	5	277	214	77%
Spring 2011	1	328	136	41%
	3	320	229	72%
Fall 2012	1	187	134	72%
	2	270	183	68%
	3	273	135	49%
	4	152	94	62%
	5	137	88	64%
Spring 2012	1	200	130	65%
	2	180	103	57%
	3	191	127	66%
	4	174	130	75%
	5	152	60	78%
Spring 2013	1	140	103	74%
	2	114	76	67%
	3	152	81	53%
	4	176	112	64%
	5	143	76	53%

Table 20. Assessment of Student Learning Outcomes for MATH 060 Prealgebra from Fall 2010 to Fall 2012.

SEMESTER	SLOs	TESTED	PASSED	SUCCESS RATE
Fall 2010	2	540	463	86%
	3	540	306	78%
Fall 2011	1	496	369	78%
	2	559	463	83%
	3	374	286	48%
	4	400	314	79%
Fall 2012	1	509	284	56%
	2	435	206	47%
	3	473	229	76%
	4	404	245	61%

Table 21. Assessment of Student Learning Outcomes for MATH 065 Basic Math for Spring 2014.

SEMESTER	SLOs	TESTED	PASSED	SUCCESS RATE
Spring 2014	1	238	133	56%
	2	312	172	55%
	3	323	217	67%
	4	278	151	54%

With only the Spring 2014 semester available for assessment a decline in student success was noted (Table 21). Average success was 58% and the range was 54-67%. It is too early to draw conclusions from these results; however, class maximums of 45 students per section is worthy of consideration and further study.

MATH 070 Elementary Algebra: SLOs findings varied dramatically for this course (Table 22). The SLO success rate was 67% and ranged from 38-89 % from Fall 2010 to Spring 13. Students performed much better in operations involving whole numbers and integers (SLOs 1 and 2) but perform poorly in graphing and rational expressions (SLOs 3

and 4). In the spring of 2013, the math department reduced the content of the course to fewer topics. As a result, MATH 070's SLOs were reduced to 4.

Action plans emphasize on the importance of daily studying, homework assignments, support system such as the Learning Center's tutoring and workshops, and the class size reduction from 45 to 35 students.

Table 22. Assessment of Student Learning Outcomes for MATH 070 Elementary Algebra from Fall 2010 to Spring 2013.

SEMESTER	SLOs	TESTED	PASSED	RATE SUCCESS
Fall 2010	2	442	343	78%
Fall 2011	1	502	447	89%
	2	505	376	74%
	3	505	387	77%
	4	509	315	62%
Spring 2011	4	658	247	38%
Fall 2012	1	515	457	89%
	2	513	437	85%
	3	462	337	73%
	4	539	317	59%
	5	462	244	53%
	6	522	337	65%
Spring 2012	1	370	275	74%
	2	380	231	61%
	3	310	143	46%
	4	418	219	52%
Spring 2013	1	382	330	86%
	2	415	304	73%
	3	308	218	71%
	4	370	214	58%
	5	261	123	47%
	6	285	185	65%

MATH 080 Plane Geometry: SLO success findings for the Fall 2010 through Spring 2013 averaged 73 % and ranged from 43 to 88% (Table 23). It's been noted that learning proofs requires a great deal of practice. It is a math skill substantially different from algebra skills. Students who do not practice adequately via homework assignments do not do well with proofs. As a general rule, students either do fairly well on proofs or they leave them entirely blank. In a typical geometry class, students who practiced on homework assignments did well on this objective. On the other hand, students who leave all proofs blank on their homework assignments also leave them blank on assessments.

The averaging process of reporting obscures the successes with these students. Moreover, during this reporting period and in the wake of reduced sections campus-wide, arithmetic sections close early, some students who needed to maintain a credit count to sign up for geometry as a fallback, despite having no motivation and low math skills for a class that requires more than basic arithmetic skills. There are no tutors in the Math Lab who can help students with proofs in geometry. In the fall of 2011, the mathematics department established Geometry as a prerequisite for Trigonometry Math 135. As a result of this change, which brought more motivated and higher-skilled students, the subsequent semesters enjoyed higher success rate of SLOs. MATH 080 will be obsoleted in Fall Semester 2015 and will be replaced by a new course MATH 105, Geometry and Methods of Proof, as an effort to streamline a rigorous pathway for math, science and engineering/technology (STEM) students.

Table 23. Assessment of Student Learning Outcomes for MATH 080 Plane Geometry Fall 2010 to Spring 2013.

SEMESTER	SLOs	TESTED	PASSED	SUCCESS RATE
Fall 2010	1	18	11	61%
	2	16	12	75%
	3	13	9	69%
Fall 2011	1	20	16	80%
	2	19	12	69%
	3	15	11	73%
Spring 2011	1	14	6	43%
	2	12	10	83%
	3	10	6	60%
Fall 2012	1	33	27	82%
	2	29	24	83%
	3	29	23	79%
Spring 2012	1	26	22	85%
	2	26	23	88%
	3	26	15	50%
Spring 2013	1	26	20	77%
	2	17	14	82%
	3	17	14	82%

MATH 102 Intermediate Algebra: SLOs findings averaged 69 % and ranged from 44 to 90% success from Fall 2011 to Spring 2013 (Table 24). Action plans placed emphasize on the importance of daily studying, homework assignments, support system such as the Learning Center's tutoring and workshops, and the class size reduction from 45 to 35

students. In the spring of 2013, the mathematics department made changes in the algebra series. We reduced the contents of MATH 070, eliminated the redundancy and repetition, and made adjustments in the content of MATH 102. As a result of these changes, the number of MATH 102 SLOs have reduced to just 3.

It should be noted, that although MATH 102 is considered a Proficiency Requirement, it is non-transferable and is in essence is a basic skills course.

Table 24. Assessment of Student Learning Outcomes for MATH 102 Intermediate Algebra Fall 2011 to Spring 2013.

SEMESTER	SLOs	TESTED	PASSED	SUCCESS RATE
Fall 2011	1	441	354	80%
	2	430	297	69%
	3	373	306	82%
	4	346	199	58%
	5	346	156	45%
Spring 2011	1			90%
	2	546	346	63%
	4	546	389	71%
	5	546	300	55%
Fall 2012	1	418	362	87%
	2	334	228	68%
	3	334	292	87%
	4	413	312	76%
	5	455	292	64%
Spring 2012	1	466	332	71%
	2	353	227	64%
	3	393	275	70%
	4	387	199	51%
	5	353	156	44%
Spring 2013	1	399	348	87%
	2	337	226	67%
	3	273	239	88%
	4	234	161	69%
	5	255	133	52%

MATH 115 Statistics: The SLOs findings averaged 65 % and ranged between 38 and 85% from Fall 2010 to Spring 2013. The results also point out that SLO's 2-5 are significantly below achievement target. In the previous action plans the need for standardization of the assessment process was suggested. It was also suggested that

instructors collect data periodically throughout the course rather than at the end. For SLO 2 in particular, the material is covered early in the course and students do not retain what was taught earlier. Student Learning Outcomes 4 and 5 are very similar and should be condensed. Other action plans include assigning more homework problems and incorporating computational software which demonstrates the application of statistics to data analysis. It is apparent this will help students to master the material. Transfer colleges and universities are now not accepting MATH 115 and have indicated MATH 115 should include student use of statistical software.

Table 25. Assessment of Student Learning Outcomes for MATH 115 Statistics Fall 2010 to Spring 2013.

SEMESTER	SLOs	TESTED	PASSED	SUCCESS RATE
Fall 2010	1	69	53	77%
	2	287	130	45%
	3	319	233	73%
	4	291	173	59%
	5	93	35	38%
Fall 2011	1	243	206	85%
	2	283	215	76%
	3	283	199	70%
	4	275	186	68%
	5	271	181	67%
Fall 2012	1	316	254	80%
	2	316	202	64%
	3	360	264	73%
	4	360	221	61%
	5	316	215	68%
Spring 2012	1	350	268	77%
	2	350	191	55%
	3	350	222	63%
	4	350	202	58%
	5	350	220	63%
Spring 2013	1	282	222	80%
	2	353	214	61%
	3	353	192	54%
	4	353	185	52%
	5	353	210	59%

MATH 120 Math for Teachers: SLOs findings have been consistent for this course that is taken by future elementary and middle school teachers. On average, the success rate has been 88% and ranged from 70 to 100 % over the period of assessment from Fall 2010

to Spring 2013 (Table 26). The content of the course is design to provide methods and techniques for math instruction. No action plan was needed.

Table 26. Assessment of Student Learning Outcomes for MATH 120 Math for Teachers Fall 2010 to Spring 2013.

SEMESTER	SLOs	TESTED	PASSED	SUCCESS RATE
Fall 2010	1	23	20	87%
	2	23	19	83%
	3	23	21	91%
	4	23	20	87%
Fall 2011	1	30	28	93%
	2	29	23	79%
	3	28	26	93%
	4	27	25	93%
Fall 2012	1	27	26	96%
	2	27	23	85%
	3	27	24	89%
	4	27	26	96%
Fall 2013	1	22	18	82%
	2	22	19	86%
	3	22	18	82%
	4	22	20	91%
Spring 2012	1	20	16	80%
	2	20	14	70%
	3	20	17	85%
	4	20	15	75%
Spring 2013	1	23	22	96%
	2	23	22	96%
	3	22	22	100%
	4	22	22	100%

MATH 125 Math for Business and Economics: SLOs findings have been consistent for this course. On average, the success rate was 86% and ranged from 71-98% (Table 27). In the Fall 2013, because student success was low and the difficulty of the course content based on a prerequisite of Intermediate Algebra MATH 102 was significant, the mathematics department introduced two new courses; MATH 124, Finite Math, and MATH 148, Calculus for Business and Economics to replaced MATH 125. MATH 130 has been declared obsolete. No SLO findings are available for the new courses at this

time; however, it is anticipated that the 124-148 course sequence will better prepare students and increase student success.

Table 27. Assessment of Student Learning Outcomes for MATH 125 Math for Business and Economics Fall 2010 to Spring 2013.

SEMESTER	SLOs	TESTED	PASSED	SUCCESS RATE
Fall 2010	1	44	43	98%
	2	43	32	74%
	3	43	34	79%
Fall 2011	1	30	26	87%
	2	30	22	73%
	3	30	23	77%
Spring 2011	1	51	47	92%
	2	51	39	76%
	3	51	44	86%
Fall 2012	1	37	33	89%
	2	37	35	95%
	3	37	35	95%
Spring 2012	1	40	39	98%
	2	40	38	95%
	3	40	37	93%
Spring 2013	1	34	30	88%
	2	34	28	82%
	3	34	24	71%

MATH 130 College Algebra: SLO success findings averaged 66% and ranged from 47 to 75% from Fall 2010 to Spring 2013 (Table 28). Some action plans suggested periodic assessment throughout the semester rather than wait to assess at the end. Others emphasized the need for use of handouts, worksheets, projects, and group work to encourage students to focus on their graphing skills. There was a consensus that this course needed to be changed from a 4-credit class to a 5-credit class due to the large amount of course content that had to be covered; moreover, faculty also were in agreement that class sizes smaller than the current 35-student cap would certainly help. However, the latest survey indicates that about half of the students enrolled in MATH 130 take this course as their last math course required by their transferring institutions. It

was concluded that the course needed to be redesigned to accommodate the diversity of needs presented by the students. As part of its redesign project, the Mathematics Department has decided to obsolete MATH 130 and introduce MATH 128 College Algebra for Liberal Studies to accommodate the needs of non-STEM students.

Table 28. Assessment of Student Learning Outcomes for MATH 130 College Algebra Fall 2010 to Spring 2013.

SEMESTER	SLOs	TESTED	PASSED	SUCCESS RATE
Fall 2010	1	157	106	68%
	2	34	25	74%
	3	170	115	68%
	4	148	99	69%
Fall 2011	1	101	74	73%
	2	120	84	64%
	3	48	36	75%
	4	102	63	62%
Spring 2011	2	120	84	70%
	4	19	9	47%
Fall 2012	1	114	65	57%
	2	124	88	70%
	3	107	67	63%
	4	105	59	56%
Spring 2012	1	54	40	74%
	2	97	66	68%
	3	92	62	67%
	4	87	61	70%
Spring 2013	1	163	114	70%
	2	163	115	71%
	3	181	110	61%
	4	196	126	64%

MATH 135 Plane Trigonometry: SLOs success findings averaged 61% and ranged from 24 to 86% from Fall 2010 to Spring 2013 (Table 29). Realizing students' lack of algebraic skills, action plans call for emphasizes on the importance of the homework assignments and reinforcement of the key concepts. In the fall of 2014, the Mathematics Department required MATH 135 as a prerequisite for the Precalculus course MATH 140.

Table 29. Assessment of Student Learning Outcomes for MATH 135 Plane Trigonometry Fall 2010 to Spring 2013.

SEMESTER	SLOs	TESTED	PASSED	SUCCESS RATE
Fall 2010	1	56	25	45%
	2	73	44	60%
	3	105	45	43%
	4	56	29	86%
	5	75	24	32%
Fall 2011	1	76	50	66%
	2	76	56	74%
	3	76	29	38%
	4	76	59	78%
	5	76	45	59%
Fall 2012	1	87	62	71%
	2	87	59	68%
	3	87	29	38%
	4	87	72	83%
	5	87	55	63%
Spring 2012	1	75	48	64%
	2	75	34	45%
	3	75	18	24%
	4	75	51	68%
	5	75	37	49%
Spring 2013	1	69	48	70%
	2	69	36	52%
	3	69	59	86%
	4	69	59	86%
	5	69	47	68%

MATH 140 Precalculus: SLOs success findings averaged 65% and ranged from 32 to 96% from Fall 2011 to Spring 2013. Action plans placed emphasis on the importance of daily studying and homework assignments. It was also suggested that the number of SLOs to be reduced. On its new revision of the course outline of record (COR), the

Mathematics Department has made substantial changes to this course that includes a reduction of the SLOs from 7 to 5.

Table 30. Assessment of Student Learning Outcomes for MATH 140 Precalculus Fall 2010 to Spring 2013.

SEMESTER	SLOs	TESTED	PASSED	SUCCESS RATE
Fall 2011	1	31	8	32%
	2	25	20	65%
	3	25	15	60%
Spring 2011	1	37	21	57%
	2	37	24	65%
	3	37	23	62%
Fall 2012	1	25	8	32%
	2	27	15	56%
	3	27	15	60%
	4	25	24	96%
	5	27	13	48%
	6	25	14	60%
	7	25	21	84%
Spring 2013	1	50	39	78%
	2	50	29	58%
	3	19	15	78%
	4	19	16	84%
	5	50	43	86%
	6	19	15	78%
	7	50	35	70%

MATH 150 Calculus and Analytic Geometry: SLOs success findings for Calculus 1 have averaged 70% and ranged from 45 to 93% from Fall 2010 to Spring 2013 (Table 31). Outcomes have been consistent for this course due to the great collaboration between the faculty members that teach the course. Action plans re-emphasize the importance for students to practice daily, study regularly and complete all homework.

Table 31. Assessment of Student Learning Outcomes for MATH 150 Calculus and Analytic Geometry Fall 2010 to Spring 2013.

SEMESTER	SLOs	TESTED	PASSED	SUCCESS RATE
Fall 2010	1	111	82	74%
	2	110	78	71%
	3	98	61	62%
	4	98	65	66%
Fall 2011	1	77	63	82%
	2	77	51	66%
	3	77	58	75%
	4	77	32	48%
Fall 2012	1	53	44	83%
	2	60	51	85%
	3	44	24	55%
	4	54	32	59%
Spring 2012	1	68	57	84%
	2	47	36	77%
	3	68	38	45%
	4	45	28	62%
Spring 2013	1	58	54	93%
	2	54	47	87%
	3	38	17	45%
	4	56	45	80%

MATH 160 Calculus and Analytic Geometry: SLO success findings for Calculus II averaged 74 % and ranged from 51 to 92% from Fall 2010 to Spring 2013 (Table 32). The consistent quality of this course is due to the collaboration of the faculty that teaches the course. Action plans re-emphasize the important need for students to practice daily, study and complete all homework.

Table 32. Assessment of Student Learning Outcomes for MATH 160 Calculus and Analytic Geometry Fall 2010 to Spring 2013.

SEMESTER	SLOs	TESTED	PASSED	SUCCESS RATE
Fall 2010	1	55	46	84%
	2	52	44	85%
	3	48	39	81%
	4	48	39	81%
Fall 2011	1	74	59	80%
	2	74	49	66%
	3	74	52	70%
	4	69	48	70%
Spring 2011	1	72	64	89%
	2	68	51	75%
	3	65	51	78%
	4	59	45	76%
Fall 2012	1	72	54	75%

	2	71	48	68%
	3	68	44	65%
	4	65	43	66%
Spring 2012	1	83	76	92%
	2	83	61	73%
	3	80	64	80%
	4	80	53	66%
Fall 2013	1	71	50	70%
	2	68	35	51%
	3	64	37	58%
	4	57	31	54%
Spring 2013	1	85	68	80%
	2	81	64	79%
	3	80	61	76%
	4	79	58	73%

MATH 220 Linear Algebra: SLO success findings have averaged 72% and ranged from 48-96% from Fall 2011 to Spring 2013 (Table 33). The consistency of this course is due to the great coordination amongst faculty teaching the course. After reviewing students' success rate in SLO 5, an action plan calls for a reduction of the achievement target.

Table 33. Assessment of Student Learning Outcomes for MATH 220 Linear Algebra Fall 2011 to Spring 2013.

SEMESTER	SLOs	TESTED	PASSED	SUCCESS RATE
Fall 2011	1	24	20	83%
	2	24	20	83%
	3	22	18	82%
	4	24	23	96%
	5	22	11	50%
Spring 2011	1	62	51	82%
	2	62	44	71%
Fall 2012	1	24	18	91%
	2	24	22	92%
	3	24	19	79%
Fall 2012	4	22	15	68%
	5	24	12	50%
Spring 2012	1	34	24	71%
	2	34	24	71%
	3	52	30	58%
	4	23	18	78%
	5	23	11	48%
Spring 2013	1	37	26	70%
	2	33	23	70%
	3	29	17	59%

	4	29	21	79%
	5	29	14	48%

MATH 230 Introduction to Ordinary Differential Equations : SLO success findings averaged 80% and ranged from 63 to97% from Fall 2011 to Spring 2014 (Table 34). The outcomes for this course are quite consistent due to the great degree of coordination amongst the teaching faculty. The faculty have met and agreed upon an appropriate assessment tool. Some action plans suggest that assigning more homework problems, having students practice in writing short response questions, and participating in class discussion help to solidify the knowledge. Working collaboratively on the skill sheets would also enhance the learning process.

Table 34. Assessment of Student Learning Outcomes for MATH 230 Introduction to Ordinary Differential Equations Fall 2011 to Spring 2014.

SEMESTER	SLOs	TESTED	PASSED	SUCCESS RATE
Fall 2011	1	27	21	78%
	3	27	17	63%
	4	27	22	81%
	5	27	16	59%
Spring 2011	1	21	16	76%
	3	21	17	81%
	4	21	15	71%
	5	21	17	81%
Fall 2012	1	25	23	91%
	3	25	14	56%
	4	25	22	88%
	5	25	20	80%
Spring 2012	3	23	19	83%
	4	23	18	78%
	5	23	19	83%
Spring 2013	1	21	19	90%
	2	21	18	86%
	3	21	19	90%
	4	21	17	81%
	5	21	20	95%
Spring 2014	1	32	27	84%
	2	32	22	69%
	3	32	27	84%
	4	32	31	97%
	5	32	23	72%

MATH 250 Calculus and Analytic Geometry: SLO success findings for Calculus III average 80% and range from 50 to 97% from Fall 2010 to Spring 2013 (Table 35). Outcomes for this course have been consistent because of the great coordination amongst faculty. The faculty have met and agreed upon an appropriate assessment tool. Some action plans suggest that assigning more homework problems, having students practice in writing short response questions, and participating in class discussion help to solidify their knowledge. Working collaboratively on the skill sheets would also enhance the learning process.

Table 35. Assessment of Student Learning Outcomes for MATH 250 Calculus and Analytic Geometry Fall 2010 to Spring 2013.

SEMESTER	SLOs	TESTED	PASSED	SUCCESS RATE
Fall 2010	1	36	31	86%
	2	36	30	83%
	3	36	28	78%
	4	36	31	86%
	5	36	29	81%
Fall 2011	1	32	31	97%
	2	32	27	87%
	3	32	27	84%
	4	32	26	81%
	5	32	26	81%
Spring 2011	1	41	37	90%
	2	41	38	93%
	3	41	31	76%
	4	41	31	76%
	5	41	31	76%
Fall 2012	1	40	24	60%
	2	40	31	78%
	3	40	29	73%
	4	40	20	50%
	5	40	25	63%
Spring 2012	1	46	41	89%
	2	46	41	89%
	3	46	38	83%
	4	46	35	78%
	5	46	35	78%
Spring 2013	1	51	41	80%
	2	51	47	92%
Spring 2013	3	51	39	76%
	4	51	40	78%
	5	51	42	82%

3.2 Analyze changes in operational outcomes (OO) findings over the past five years. Cite examples of using data during that time as the basis for resource allocation (e.g. human, facilities/physical, technology, financial, professional development) or

making other changes that resulted in or correlate with improved OO findings over the past four years.*

N/A for this discipline

Part 4 - Stakeholder Assessment

4.1 Assess how well the program serves the needs of the students, district, and community. Use surveys, interviews or focus groups to obtain feedback from stakeholders (students and/or others who are impacted by your services). Include documented feedback from other sources if relevant (e.g. advisory committees, employers in the community, universities, scores on licensure exams, job placement).

The AVUHSD is a major stakeholder in programs offered at AVC as a majority of our students enter AVC from the AVUSHD. The high number of students requiring remediation is an ongoing issue. Over the past year, several things have been done in an effort to reduce these numbers.

Articulation with the AVUSHD has increased, including the following:

1) Tooraj Gordi attended the head counselor's meeting to present data to the counselors and to seek support for increasing the number of SMAP classes and to offer SMAP at each school. Concern was expressed by the counselors that SMAP was not A-G approved.
2) In September 2013, Tooraj Gordi met with then new college president, Mr. Knudsen to express his concerns about the future of the SMAP project. The mathematics department chair suggested that the matter to be discussed with the AVUHSD superintendents.
3) The AVUHSD math department chairs met at AVC with the AVC math department chair Tooraj Gordi and with the head of assessment Wade Saari. The math department chairs were presented with data of incoming freshmen from their specific schools. Math department chairs also learned about the assessment process and the pathway of math classes required. Many chairs were unaware of the process and said they felt better able to help the students at their schools be better prepared. They also stated that they would tell their students which topics to review before taking the math assessment; most didn't know students would be tested beginning with basic skills such as fractions, decimals, and percent and felt that their students would be scoring better if they reviewed some of these concepts. There was concern expressed that some students were better prepared than the AVC assessment indicated.
4) Finally, an additional school, Highland HS, began offering SMAP and has 3 sections of the class. The course is taught by a teacher who is also an adjunct instructor at AVC. The program was very successful last year and we are waiting for data regarding the number of students who took SMAP and are attending AVC. Data collected will also include the classes these students are enrolled in and their pass rate at AVC.

Part 5 - Goals and Objectives

5.1 Review the goals identified in your most recent comprehensive self-study report and any subsequent annual reports. Briefly discuss your progress in achieving those goals.*

Goal 1: Reduce all math class sizes to a maximum of 35 students.
As part of the ongoing curriculum and course revision, the mathematics department reviewed individual courses and proposed the class size reduction to the Academic Policies and Procedures (AP&P) committee.

Goal 2: Provide better technology, sufficient teaching supplies and access.
No decisive steps have been taken to resolve the issues concerning inadequacy of supplies and access.

Goal 3: Update the Course Outlines of Record (COR) and Student Learning Outcomes (SLOs).
As an ongoing course revision, we have updated both the COR and SLOs of math courses.

Goal 4: Improve student course placement.
Math faculty reviewed the new math placement tool and offered comments and suggestions. The math department added a local "Geometry Assessment" to the new placement tests. MDTP (Math Diagnostics Test Placement) was implemented in July 2012.

Goal 5: Improve the Transfer Model Curriculum (TMC).
Upon reviewing the TMC math courses to ensure a clear alignment with the statewide C-ID system, the mathematics department made changes in the COR of Linear Algebra, Differential Equations, and Multi-variable Calculus, Calculus III. Additionally, in response to the maximum allowable number of units required by the State, we reduced both Calculus II and III from 5 units each to 4 units each.

5.2 List discipline/area goals and objectives related to advancing district Strategic Goals, improving outcome findings and/or increasing the completion rate of courses, certificates, degrees and transfer requirements. Discipline/area goals must be guided by district Strategic Goals in the Educational Master Plan (EMP). They must be supported by an outcome action plan, data analysis, national or professional standards, and/or a requirement or guideline from an outside agency (e.g. legislation, Chancellor's Office, accrediting body, professional board).*

Current (up to three years)

Goal: A specific target

- **Guided by district Strategic Goal(s) #___**
- **Supporting action plan, data analysis, or other documentation**

Objectives: Significant steps or actions needed to achieve the goal

Near Term (three to five years)

Goal: A specific target

- **Guided by district Strategic Goal(s) #___**
- **Supporting action plan, data analysis, or other documentation**

Objectives: Significant steps or actions needed to achieve the goal

Long Term (five to ten years)

Goal: A specific target

- **Guided by district Strategic Goal(s) #___**
- **Supporting action plan, data analysis, or other documentation**

Objectives: Significant steps or actions needed to achieve the goal

Goals

All the math department goals are guided by the goals of the AVC District Educational Master Plan 2013-16:

- Goal # 1: The College as a community will provide students with an environment which supports learning and facilitates student success.
- Goal #2: The College will increase the transfer rate to Cal States, UC, and private colleges.
- Goal # 4: The College will increase student success in Basic Skills and ESL courses.
- Goal # 5: The College will utilize campus resources efficiently and effectively.
- Goal # 6: The College will maintain and enhance community partnerships.
- Goal # 7: The College will increase resources to enhance technology's support of the college mission and processes.

<u>Current Goal:</u>
1-Improvement of students learning outcomes in the areas Math Basic Skills, Transfer, and STEM.

Objective 1: Provide better technology, sufficient teaching supplies and access.

- Activity 1: Increase the number of allotted copies per month in regular fall spring semesters and compressed winter and summer terms.
- Activity 2: Equip faculty offices with printers and inks as needed. Most instructor office's in the Health Sciences building are located at a distance from the Division office were the printers are located. This creates a problem as instructors cannot print out confidential information like grade sheets and rosters, as they can be lost or picked up by others who are in the vicinity of these printers.
- Activity 3: The technology in the classrooms needs to be updated. Although essential, white boards and screen projectors are not adequate to meet the standards of this computerized generation of learners. Classrooms should be equipped with state-of-the-

art equipment, like Smart Boards. This would allow instructors the opportunity to enhance presentations and meet the expectations of today's learners.
- Activity 4: Increase the number of allowable dry erase markers, as it is the main, and in many cases, the only tool used to present material in the classroom.

Objective 2: Increase student success.
- Activity 1: Continuously evaluate the Modular Approach to the Basic Skills and MATH 099 redesign.
- Activity 2: Evaluate the effect of the Combined MATH 070 and 102 textbook on student learning outcomes.
- Activity 3: Introduce Fast Track, 3-4 week short focused basic skills sections in winter and summer terms.
- Activity 4: Schedule classes for maximum utilization of rooms and time slots.
- Activity 5: Continuously monitor student learning outcomes in all transfer courses.
- Activity 6: Improve the existing relationship between the math department and the school districts.

Near Term Goals
2-Organize departmental activities.

Objective 1: Organize the Mathematics Department.
- Activity 1: Assign faculty in charge of Basic Skills, Transfer, and STEM with proper release time or stipend.
- Activity 2: Actively participate in the national math contests.
- Activity 3: Actively attend various math/technology-related conferences.
- Activity 4: Plan local seminars and conferences.

3-Improve the quality of the mathematics curriculum.

Objective 1: Improve Basic Skills Curriculum.
- Activity 1: Expand MATH 099 and Modular Approach.
- Activity 2: Investigate the cause of the increasing number of unprepared students in MATH 070 classes.
- Activity 3: Establish closer contact with local high schools and middle schools.

Objective 2: Improve the Transfer curriculum.
- Activity 1: Examine the COR and SLOs of all 100-level non-major courses.
- Activity 2: Resurrect MATH 110 (Math for Liberal Arts Majors).

Objective 3: Improve the STEM-related courses.
- Activity 1: Evaluate student success in all courses in the proposed Calculus Pathway.
- Activity 2: Continuously examine the COR and SLOs of Calculus Pathway courses.

4-Improve the Transfer Model Curriculum (TMC).

Objectives1: Review and revise all math courses to ensure a clear alignment with the statewide C-ID system.

Long Term Goal (ongoing)
5-Update the Course Outlines of Record (COR) and Student Learning Outcomes (SLOs).
Objectives1: Review the COR and SLOs of all courses and make sure that they correspond.

- Activity 1: Continuously review, revise, and evaluate all CORs and SLOs
- Activity 2: Remove obsolete courses from the math courses sequence.

Part 6 - Resource Needs

Identify significant resource needs that should be addressed currently (up to three years), near term (three to five years) and long term (five to ten years). If there may be safety issues, enrollment consequences or other important concerns if a resource is not provided please make this known.*

6.1 List needed human resources. List titles in priority order. Identify which discipline/area goal(s) guides this need.

1. Additional faculty position needed to manage the newly revised MATH 099. MATH 099 was previously managed by the Math Specialist in the Learning Center. The program is no longer housed in the Math Lab within the Learning Center and needs a full time instructor as well as assistants to allow its success. (Goal 1)

2. At least six full time instructors are needed to fill vacated positions. The positions are replacement for full-time faculty members: Lynda Little (retired), Dr. Zhang (deceased), Amero Beyene (resigned), Daniel Byrne (retired), Sharon Beckman (retired), Rebecca Kitto (retired), and Sam Pearsall (temp.) (Goal 1)

6.2 List needed technology resources in priority order. Identify which discipline/area goal(s) guides this need.

3. Additional computers, computer desks for the expansion of MATH 099. (Goal 3)
4. Computer lab/classroom needed for the expansion of MATH 099 and for other math classes such as MATH 115 (Statistics) and Basic Skills that regularly require computer work. (Goal1 and 3)

6.3 List facilities/physical resources (remodels, renovations, or new) needed to provide a safe and appropriate student learning and/or work environment. List needs in priority order. Identify which discipline/area goal(s) guides this need.

3. Additional classrooms for accommodating roughly 900 students who need accommodation as a result of class size reduction. (Goal 1)

4. Additional classrooms for accommodating new students as a result of college's annual growth. (Goal 1)

6.4 List needed professional development resources in priority order. Identify which discipline/area goal(s) guides this need.

1. Fund the active participation of math faculty in discipline related conferences. (Goal 2)
2. Funds for planning local seminars or conferences. (Goal 2)

6.5 List any other needed resources in priority order. Identify which discipline/area goal(s) guides this need.

4. Adequate supply of marker pens for the white boards, pens, pencils, erasers and paper. Recently we have had to purchase our own supplies. (Goal 1)

5. Printers and supplies for instructors' offices. (Goal 1)

6. Incentives, in the form of release time or stipend, for faculty coordinators in the Math Basic Skills and Transfer/STEM areas. (Goal 2)

Part 7 - Recommendations and Comments

7.1 List recommended changes to the Educational Master Plan to:

- **Address external issues or mandates such as legislation, industry, and professional standards, etc.**
- **Respond to outcome findings.**
- **Reflect changes in technology, methodology, and/or disciplines.**
- **Address student achievement gaps and/or meet other student needs.**

- The large number of students placing into Mathematics Basic Skills courses is still an issue. A lot of these students seem to be passing Algebra courses in high school, but get placed into Basic Mathematics. Projects such as SMAP and Fast Track need to be strengthen and promoted by the math department, AVC, and AVHSD.
- Several classrooms where math classes are taught are scattered all over the campus and the infrastructure in those classrooms needs work. Starting with the heating and air conditioning, to the projector and computer malfunctions. In addition to the inadequacy of SSV classrooms (e.g., SSV 202, 204, and 236), many ME buildings (especially ME 111) are inadequate for decent teaching and learning experiences: namely, the ventilation system is inefficient to almost nonexistent; the lighting is poor; and the noise level from the nearby students congregating outside waiting for their next classes is unacceptably high. All of these factors affect the students' mood greatly and decrease their motivational level to learn. To remedy this, we need the resource to maintain and

improve the building conditions as well as installing permanent signs, which are written clearly and large enough, to warn these students outside the rooms to be quiet.

- The classroom clocks are both useful and important in regulating the lecture; the ME 111 room, for example, has been inaccurate. The resource for a proper maintenance of clocks all over the classrooms is desired).
- In addition to a need for "basic math" tutors, the college lacks quality tutors for high level math courses such as Math 140, 150, 160, 220, 230, and 250. A resource fund to actively search and hire qualified tutors is desirable for these students' successes. A fund to 'train' tutors by faculty is an idea that may be worth considering; such tutors could act as classroom assistants, which would boost the student learning greatly.
- Here's a positive note: a small faculty room located inside the Health & Science building is providing benefits to some.
- Perhaps further consideration could be given to placing more math classes in the Health Science building where all mathematics instructors have their offices in and has better equipped classrooms.

7.2 What changes in the program review process would improve institutional effectiveness or make the results more helpful to the program?

The current version of the form is well designed. Offering faculty training throughout the academic year is desirable.

Division/Area Name: Sciences (Astronomy, Biology, Chemistry, Earth Sciences, Physical Science, Physics)

Year: **2014**

Part 1 - Area Overview

1.1 Briefly describe how the division or area contributes to the district mission.

The Sciences primarily offered course work that is applicable to General Education requirements and transfer degrees. Only one non-transferable course, BIOL 100 100L Elementary Human Anatomy and Physiology, is offered in support of the CTE program, License Vocational Nursing. A certificate in Geographic Information Systems (GIS) is offered.

1.2 Place an "X" by each Institutional Learning Outcome (ILO) supported by the division or area.

_x_ Analyze diverse perspectives from a variety of disciplines and experiences that contribute to the development of self-awareness.

_x_ Value and apply lifelong learning skills required for employment, basic skills, transfer education, and personal development.
_x_ Demonstrate a breadth of knowledge and experiences from the humanities, social and behavioral sciences, arts, natural sciences, and mathematics.
_x_ Solve problems using oral and written communication, critical thinking and listening skills, planning and decision-making skills, information literacy, and a variety of technologies.
_x_ Demonstrate good citizenship and teamwork through respect, tolerance, cultural awareness, and the role of diversity in modern society.
_x_ Identify career opportunities that contribute to the economic well-being of the community.

1.3 **Name of person leading this review:** Chair of the Sciences, Christos Valitois

1.4 Names of all participants in this review: Dr. Mark McGovern, Dr. Anne Hemsley, Dr. Zia Nisani, Dr. Jessica Harper, Dr. David Newman, Dr. Alexandra Schroer, Michael Pesses, Dr. Aurora Burd, Dr. Jason Bowen

Part 2 - Data Analysis and Use

Astronomy

Table 36. ASTRONOMY-FTES

	2009-10	2010-11	2011-12	2012-13	2013-14
Summer	8.3	4.3			4.2
Fall	22.3	19	9.7	16.0	11.4
Inter					
Spring	19.5	21.7	13.6	15.0	10.5
Totals	**50.0**	**45.0**	**23.3**	**31.0**	**26.1**

Table 37. ASTRONOMY-HEADCOUNT

	2009-10	2010-11	2011-12	2012-13	2013-14
Summer	80	40			42
Fall	208	182	93	111	153
Inter					
Spring	185	175	145	111	102
Totals	**473**	**397**	**238**	**222**	**297**

There has been a reduction of FTES and headcount from 09-10 to 11-13, as can be seen by the tables above (Tables 36, 37). The drop observed comparing 2010 to 2011 through 2103 can be attributed mainly to the introduction of the MATH 102 prerequisite, and less so, the severe reduction in the state budget and the subsequent directive by the Chancellor's office to reduce the overall college FTES. Nevertheless, an increasing (albeit small) enrollment/FTES trend can be observed from 2011 to 2013-14. If this trend persists additional sections of Astronomy will be required to serve all students. The observed increasing trend also suggest that the class fill ratio is increasing making the Astronomy program more efficient.

Biology

Table 38. BIOLOGY-FTES

	2009-10	2010-11	2011-12	2012-13	2013-14
Summer	77.5	40.8	8.82		33.5
Fall	296.1	301.9	297.8	333.7	342.2
Inter	4.9	14.3		10.89	
Spring	240.8	284.3	285.1	310.3	329.7
Totals	**619.4**	**641.3**	**591.7**	**654.9**	**705.4**

Table 39. BIOLOGY-HEADCOUNT

	2009-10	2010-11	2011-12	2012-13	2013-14
Summer	688	369	88		278
Fall	2901	2905	2851	2854	2320
Inter	48	147		112	
Spring	2311	2754	2699	2676	2196
Totals	**5948**	**6175**	**5638**	**5642**	**4794**

Looking at the Annual FTES by Six-, Four- or Two-Digit Code, Biology FTES have increased steadily as a proportion of the total AVC FTES, from 5.85% in 2009 to 6.48% in 2014. Data in all three tables is identical. Easing of budgetary constraints that were impacting course offerings have allowed more students access to courses vital to the pursuit of careers in Biological and Health Sciences. The trend suggests a strong and constant demand for biology course offerings (Tables 38, 39).

Examination of section counts indicates that Biology sections are not increasing in step with the entire AVC College trends in all semesters under consideration.

- AVC section counts in Summer 2009 were at the highest reported (500) and presently stand at 227 (45.4% of the 2009 level). The Biology maximum in Summer 2009 was 26 and presently stands at 10, only 38.5% of the original.
- AVC section counts in Fall 2009 were at the highest reported (1652) and presently stand at 1492 (90.3% of the 2009 level). The Biology maximum in Fall 2010 was 91 and presently stands at 76, only 83.5% of the original.

- AVC section counts in Winter 2014 were at the highest reported (142) and presently stand at 111% of the next highest year (2013) Biology section counts in Winter 2014 were at the highest reported (9) and presently stand at 225%% of the next highest year (2013) when only 4 sections were offered.
- AVC section counts in Spring 2011 were at the highest reported (1576) and presently stand at 1502 (95.3% of the 2011 level). The Biology maximum in Spring 2011 was 91 and presently stands at 71, only 78.0% of the original.

The FT/PT faculty ratio in Biology is consistently closer to 3:1 than it is to the mandated 2:1 ratio. There has been an increase in the past year to an average slightly greater than 3:1, from an average of 2.7:1 at the beginning of the five-year period under study.

Chemistry

Table 40. CHEMISTRY-FTES

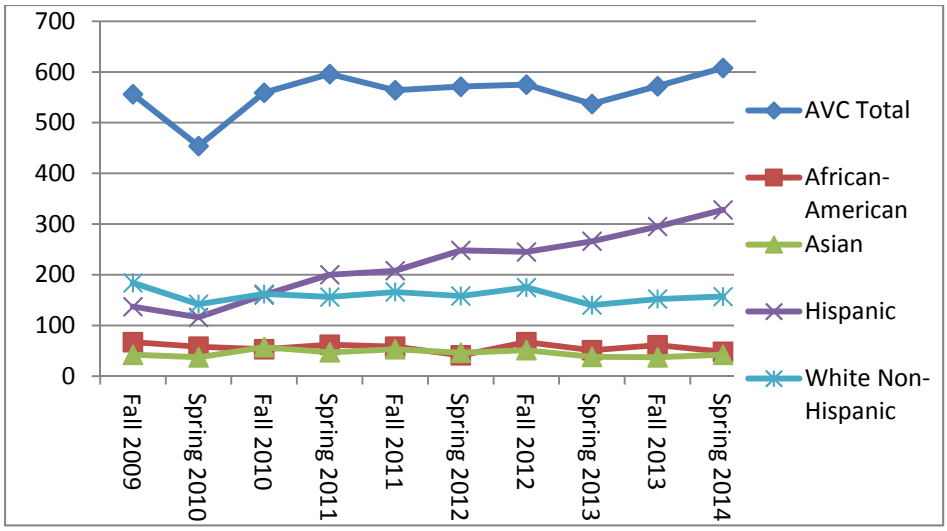
	2009-10	2010-11	2011-12	2012-13	2013-14
Summer	36.3	22.5	11.05		11.4
Fall	122.3	123.1	124.2	142.2	141.0
Inter	6.2	10.5		7.02	
Spring	101.7	135.1	128.8	133.9	151.5
Totals	**266.5**	**291.2**	**264.1**	**283.1**	**304.0**

Table 41. CHEMISTRY-HEADCOUNT

	2009-10	2010-11	2011-12	2012-13	2013-14
Summer	163	97	48		50
Fall	556	559	564	576	572
Inter	26	46		24	
Spring	454	597	571	537	608
Totals	**1199**	**1299**	**1183**	**1137**	**1230**

As enrollment in chemistry classes increased from a low of 454 in spring 2010 to a high of 608 in spring 2014 (Tables 40, 41), there has been a gradual decrease in the percentage of African American, Asian, and White Non-Hispanic students enrolled in chemistry classes. Enrollment of Hispanic students has increased from 24.6% to 53.9% (Fig. 1).

Figure 1. Graph Reflecting the Enrollment Demographics in Chemistry Courses from Fall 2009 to Spring 2014.



This mirrors the trend for the larger population at AVC (Table 42), with the exception of African-American students. Table 42 compares those enrolled in credit courses delivered by non-distance education methods throughout AVC, with those enrolled in AVC chemistry courses (all of which are credit courses). Fewer African –American students are enrolling in chemistry even though the percentage of African-Americans in the general student population is increasing.

Table 42.Comparison of Enrollment Demographics in Chemistry Course to AVC in General.

	African American		Asian		Hispanic		White Non-Hispanic	
	Chemistry	AVC	Chemistry	AVC	Chemistry	AVC	Chemistry	AVC
Spring 2010	12.8%	19.1%	8.1	3.9%	24.6%	27.2%	31.2%	27.2%
Spring 2014	7.9%	22.1%	6.9%	3.2%	53.9%	45.2%	25.8%	22.7%

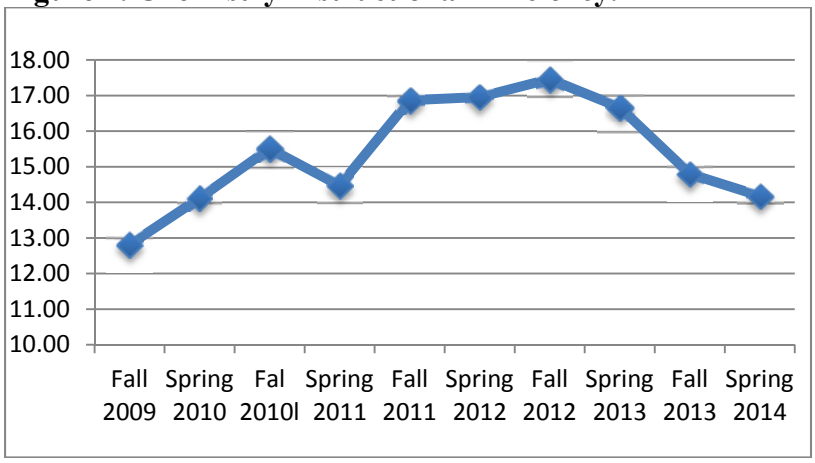
To address this issue, an understanding of the cause is needed. One theory to test is that this group may include more students in need of remediation. A request for analysis will be submitted to DIERP. If this is an underlying cause, increased involvement of chemistry faculty in the campus efforts to improve basic skills is the best strategy to start with. It should also be determined if this trend is apparent in other science classes. This may require concerted effort to increase representation in STEM courses.

Table 43. Numbers of Sections Taught in Chemistry from 2009 to 2014.

	Sections offered in ACADEMIC YEAR

Course	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
CHEM 101 Introductory Chemistry	34	37	32	32	36
CHEM 102 Introductory Organic Chemistry	1	1	1	1	1
CHEM 110 General Chemistry	10	10	10	10	11
CHEM 120 General Chemistry	4	5	5	5	6
CHEM 210 Organic Chemistry	1	2	1	1	1
CHEM 220 Organic Chemistry	1	1	1	1	1
(CHEM 199 Work Experience)	1				
Totals	52	56	50	50	56

Figure 2. Chemistry Instructional Efficiency.



The drop in efficiency in Figure 2 is likely due to growth of the program. Because the chemistry courses are sequential, the whole pipeline has to build. There may be far too many students to accommodate in the second course of a series, but not enough to completely fill an additional section of that course. Efficiency should increase again as those added sections are filled up.

Because of added sections of General Chemistry (Table 43), the number of students wanting to take Organic Chemistry is increasing. It may be necessary to a second section of CHEM 210, the next course in the sequence.

Instructors have been offering "Honors option" for students to work on projects individually to get credit towards their TAP/Honors program requirements. The number of students selecting this option reached the point where it made sense to offer a full section of

CHEM 110 Honors. This was offered in Fall 2014 and will likely be offered again in Fall 2015. Honors options are also available in CHEM 120, CHEM 210 and CHEM 220.

Two sections of CHEM 101 lecture are offered in Palmdale during the spring semesters. Lecture has been offered there in spring, and sometimes summer, for five years. In Spring 2014, one section of CHEM 101 lab was offered in Palmdale by sharing facilities at The Palmdale Aerospace Academy and purchasing equipment through Palmdale Center's STEM grant. While this partnership has been productive and enjoyable, the upcoming expansion of the Palmdale Center will enable more than one lab section to be offered in spring semester. Students in the Palmdale lecture who had to take lab in Lancaster last spring expressed that they would very much have preferred the opportunity to have their lab section meet in Palmdale too. It may also allow CHEM 110 to be offered at that site.

In order to provide the same level of service to students in Palmdale as provided at Lancaster campus, a lab technician or lab assistant is needed. Chemistry tutors must be reliably available at the Palmdale Center. In the past, chemistry tutors were not available during some semesters.

Geosciences

Table 44. GEOSCIENCES-FTES

	2009-10	2010-11	2011-12	2012-13	2013-14
Summer	2.4	0.0	0	0.0	0.0
Fall	49.0	43.9	43.8	50.5	46.3
Inter	0.0	0.0		0	
Spring	38.8	53.6	45.9	58.1	54.4
Totals	**90.1**	**97.5**	**89.7**	**108.5**	**100.8**

Table 45. GEOSCIENCES-HEADCOUNT

	2009-10	2010-11	2011-12	2012-13	2013-14
Summer	0	0	0	19	11
Fall	0	0	174	176	203
Inter	0	0		0	
Spring	0	0	149	173	209
Totals	**0**	**0**	**323**	**368**	**423**

The FTES numbers for Geography, Geology and Earth Science have fluctuated over the academic years varying from a low of 89.7 (2011-12) to a maximum of 108.5 (2012-13) (Table 44). In 2013-14, FTES declined to 100.8; yet from 2011-12 to 2013-14, student headcount consistently increased from 323 to 423 students (Table 45). The totals have shown an upward

trend in the last three years. This is welcome as we are happy to grow the program, though it also gives support for the need of a new fulltime faculty position as outlined in our resource needs later in this report. In the past, three Full-time instructors and three adjunct instructors supported this instructional responsibility; however, at present it is covered by two full-time faculty members and four adjunct instructors.

Physical Science

Table 46. PHYSICAL SCIENCE-FTES

	2009-10	2010-11	2011-12	2012-13	2013-14
Summer	6.2	3.5	4.5	3.5	4.1
Fall	20.7	18.2	17.6	18.4	19.3
Inter	0.0	3.4		0	2.7
Spring	14.3	17.1	13.8	12.6	14.5
Totals	**41.2**	**42.2**	**35.9**	**34.5**	**40.6**

Table 47. PHYSICAL SCIENCE-HEADCOUNT

	2009-10	2010-11	2011-12	2012-13	2013-14
Summer	0	0	0	0	0
Fall	0	0	0	0	0
Inter	0	0		0	0
Spring	0	0	0	0	0
Totals	**0**		**166**	**171**	**199**

Note: There are no headcount data available on a semester basis, and we could only locate annual headcount since 2011.

From 2009-10 to 2013-14 FTES in Physical Science has averaged 38.9 and varied from of 34.5 in 2012-13 to a high of 42.2 in 2010-11. During 2013-14, FTES was 40.6. In contrast to this variability, the student headcount showed a steady increase from 166 in 2011-12 to 199 students in 2013-14 (Tables 46, 47). Physical Science is a stand-alone course that includes a laboratory component. It is mainly attended by pre-service teachers and students who want to satisfy their Physical Science General Education requirement with a lab. Since its major transformation to a fully interactive, hands-on, laboratory based method, the course has enjoyed some success. As shown in Table 47 the steadily increased in student headcount over the last three years has demonstrated growing student interest. If the budget had allowed for additional section offerings, the course would have grown even more. Due the budgetary constraints the course is artificially held to about 39 FTES per year. The annual headcount has increased by 20% since 2011, and without restrictions it would have grown even more. Clearly with a fully

equipped lab dedicated to this course and available lab times, there is room for enrollment increases that perhaps could accommodate over 300 students per year.

Physics

Table 48. PHYSICS-FTES

	2009-10	2010-11	2011-12	2012-13	2013-14
Summer	6.6	4.1	1.2	0.0	2.1
Fall	29.1	28.1	34.1	33.4	47.1
Inter	0.0	0.0		0	0.0
Spring	32.4	39.5	33.4	42.2	65.5
Totals	**68.1**	**71.7**	**68.7**	**75.6**	**114.7**

In the past five years FTES in Physics has increased from a low of 68.1 in 2009-10 to 114.7 in 2013-14 (Table 48). Student headcount has risen significantly from 127 and 140 in Fall 2009 and Spring 2010, respectively, to 189 and 273 in Fall 2013 and Spring 2014 (Table 49). FTES has increased by roughly 75% in the last five years from 68.1 to 114.7.

Table 49. PHYSICS-HEADCOUNT

	2009-10	2010-11	2011-12	2012-13	2013-14
Summer	35	20	6	0	11
Fall	127	124	145	147	189
Inter	0	0		0	0
Spring	140	169	146	184	273
Totals	**302**	**313**	**297**	**331**	**473**

On an annual basis, the number of students served has steadily increase from 302 in the 2009 - 2010 academic year to 473 in 2013-14 academic year. This roughly 68% increase in the number of students has required the discipline to offer more sections of physics courses from 11 overall in 2009 - 2010 to 21 sections in 2013 - 2014.

We are seeing a greater number of students registering for physics courses and as a result we have hired one full time instructor, grant funded, to meet that demand. We have also discussed the possibility of increasing the maximum lecture class size from 24 to 48. A few sections in the last couple of years have tried out the larger class size and we are currently investigating the effectiveness of teaching to a greater number of students in a given class.

The significant increases in the physics program are attributed largely to the tremendous increase in STEM majors for AVC students. The division specifically and the college in general has embarked in a concerted effort to promote STEM in k-12 and as result we seen significant increases in students majoring in engineering and other STEM disciplines. As a result physics courses (who are gateway courses to all STEM disciplines) have exploded in enrollments.

2.3 Use the discipline student success data provided by web link. Please note by race, gender, location and modality where improvement is needed to meet the Institutional Standard of 68% for student success (students earning grades of A, B, C, Pass, or Credit). Identify what actions are planned to address achievement gaps in success and/or retention in the current academic year.*

Astronomy

As of last year student success was above the Institutional Standard of 68% for race for all categories where student numbers were greater than 10 per semester.

As of last year student success was above 80% for gender.

The Palmdale Center does not currently offer any astronomy classes.

Astronomy offers one hybrid online course in the Fall semester and success rates for race (Hispanic, in particular) and gender are below the standard of 68%. However, one semester of data is available so it is pre-mature to make any conclusion regarding the cause and the

subsequent solutions to this data. More semesters have to be observed to make a proper assessment.

Biology

FTES examined by Race/Ethnicity show significant trend changes over the five-year period. Hispanic student enrollment has increased steadily and sharply from 27% in 2009 to 51% in 2014. The reliability of this long-term finding is, however, questionable, as will be discussed below. A more reliable, although shorter-term, trend is the increase from the 2012 - 2013 to 2013-2014 years. Hispanic student FTES increased from 46.8% to 50.7%.

There is a modest 1% increase in African American student enrollment and a 4% increase in reported enrollment of students of multiple ethnicities. Decreasing enrollment trends observed for Asian students, declining from 3% to 2.5%, White students decreasing from 29% to 25% and Pacific Islanders decreasing from 0.3% to 0.13%.

The longer-term reliability of the data is still overshadowed by the reported enrollment in 2009 (and previous years) by 23.6% of students of "Unknown" ethnicity. This number declined to less than 2% in the 2012-2014 data collection cycles, presumably due to changes in data collection methods. It will take some continued years of collection of data using the new ethnic parameters before any reported long-term trends can be considered consistent enough for the drawing of valid conclusions.

Approximately 10% if this value is excluded. The number of students in the online cohort for Sp 14 was 92, the largest cohorts have been Sp10 and Sp 11, (243 and 223 respectively). Average population size was 131, so these values may be relatively high due to the omission from online course offerings of more difficult classes, leaving fewer students also taking easier courses, which would create data that may be the beginning of a more successful trend for future success and retention of students in online biology courses. In addition, the percentage of students enrolled in online courses has ranged from a low of 4.4% in F 11 and F 12, to a high of 19% in Sp 11, making distinct trends difficult to pinpoint. Traditionally held courses attracted .between 81% to 95.6% of students over the five year period. Success rates and retention rates for these larger student populations are more stable, with an average retention rate of 80% and an average success rate of 61%. These averages show a variation of around 2% over the five year period. Comments on success and retention in general have been included in other paragraphs. It would appear that the *average* success and retention figures for both modalities are the same, but the fluctuation around the average is much greater for the online course offerings. These have most likely varied more as the biology department adapted as best it could to the significant budget cuts that were mandated over the past five years.

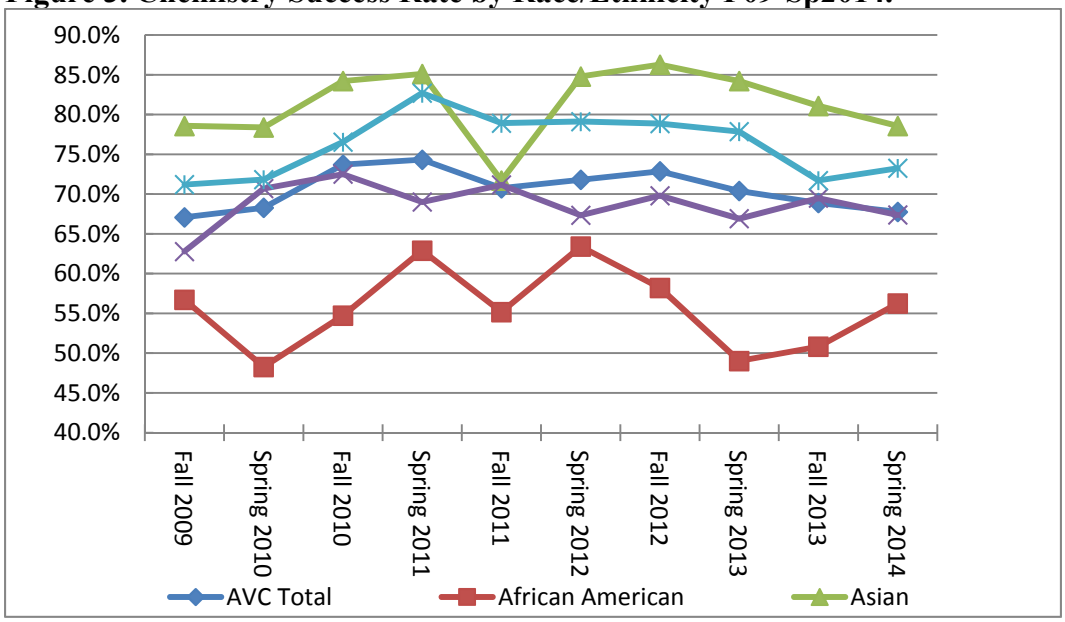
With respect to age, the majority of students (80%) enrolled in biology courses fall within 18 -29 years of age. Roughly another 6% of students, the next largest age grouping are in the 30 – 34 year old age group, flowed by a contribution (3-5% in size) of 35 – 39 year olds. This reflects, for the most part, entry level high school students and young adults choosing the nursing program as their first or second career choice or students taking BIOL 101 to fulfill a laboratory course requirement for an Associate's degree. While the highest retention and success rates are

associated with the 1 -17 year old cohort, this is to be expected since this student population is usually from an accelerated high school program and above average in intelligence and ability. The 18 – 29 year old students perform next best in terms of success and retention and then the numbers appear to decline somewhat as age increases. These trends do not change appreciable over the five year period for which data is available. Interpretive possibilities are many-fold. Younger students may have more plasticity, or more time to study, compared with older adults who have home and work responsibilities. There is no data available regarding lifestyles which may or may not be conducive to success in studying and retaining knowledge.

Grades earned in Biology courses show consistent percentages of A, B, C, D and F grade allocations over the five year time period surveyed. The percentage student success rate in Biology courses averages around 60-64%, slightly lower than the 68% goal required by the college but consistent in both Fall and Spring semesters over the five year time period covered by the collected data. Given that these courses are in the science discipline, and required by students who frequently do not choose science as their study major, the success rate for these more rigorous courses should perhaps be perceived as acceptable, when compared with other college disciplines. A higher success rate is noted in summer and winter sessions. The only course offered during these sessions has been the non-majors Biology course, BIOL 101, a course that is a popular offering among students who require a laboratory course to fulfill their Associate's degree requirements.

Chemistry

Figure 3. Chemistry Success Rate by Race/Ethnicity F09-Sp2014.

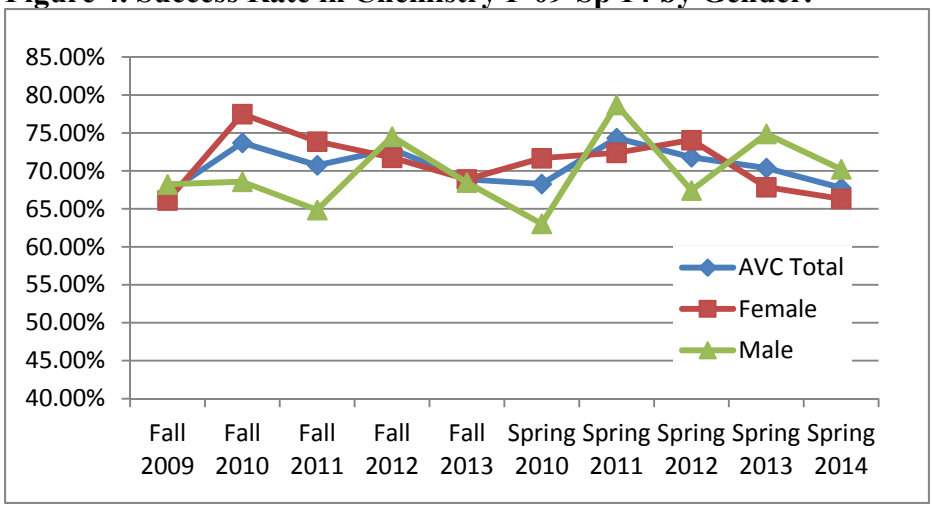


There is no apparent trend of increase or decrease in success rates (Fig 3). The arithmetic average for the previous 10 semesters shows 55.5% success for African-Americans. This is considerably lower than for any other ethnic group. (Asian 81%, Hispanic 69%, White Non-Hispanic 76%) Although the past three semesters show an increase in success rate for African – American chemistry students, the volatility in the previous seven semesters indicates that several more semesters of data would be needed to confirm that this is a trend.

Finding no distinct increase in success rates over the years indicates that previous actions, such as bringing more technology into the courses, have not produced desired results. While there are many factors—such as consistency of expectations and grading criteria among faculty members—concerted effort to improve student success is a goal for the discipline. Strategies, such as instituting prerequisites where validation studies show they would be helpful, mentoring, and working more closely with the Learning Center to ensure tutor availability are the proposed actions. A placement test, even if just voluntary, could help students sort out whether they have had enough chemistry preparation in high school to be ready to start CHEM 110 without first completing CHEM 101.

The gender distribution in chemistry classes remains on average 62% female (+/-2%). There is no difference in success rates for males or females in chemistry (Figure 4).

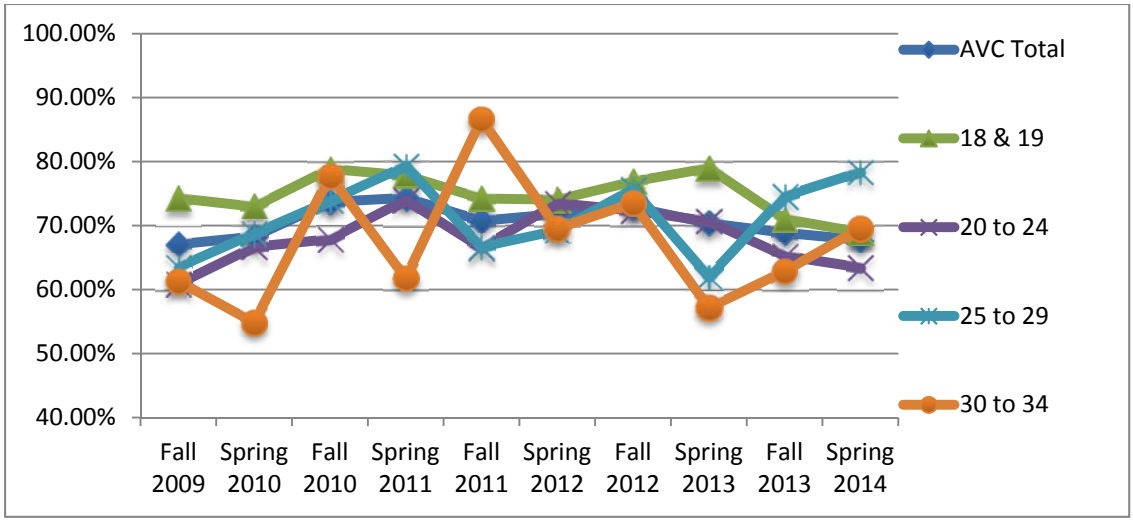
Figure 4. Success Rate in Chemistry F 09-Sp 14 by Gender.



Demographics for all AVC show that 60% of students are under the age of 24. In chemistry, this group represents 74% of students. Only approximately 4.5% of chemistry students are older than 40, whereas this is 14% across all AVC. This makes sense because the chemistry sequence is a prerequisite for many degree and certificate programs at AVC and transfer institutions. The department could promote chemistry to life-long learners by emphasizing its relevance to major societal issues.

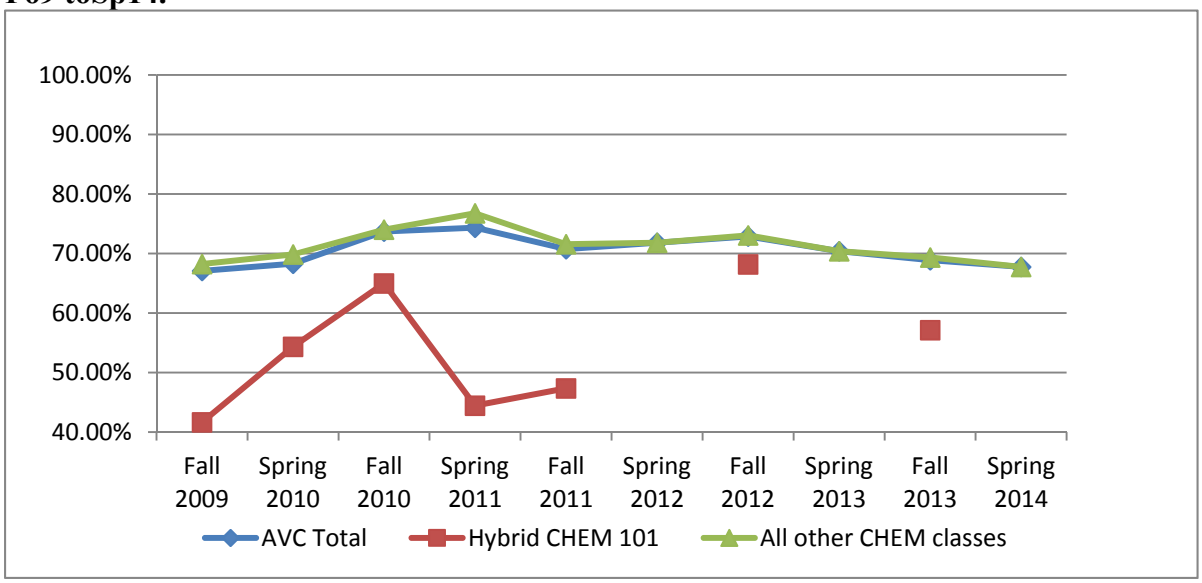
There is no correlation between student success rate and age in the chemistry courses (Fig. 5).

Figure 5. Rate of Student Success by Age Groups from F 09- Sp 2014.



Currently, no AVC chemistry classes are offered online. Until Fall 2013, CHEM 101 was offered as a hybrid with in-class labs and online lecture. Initially success and retention rates were poor (Fig. 6). Revision of the materials improved those metrics to be closer to those for traditional delivery.

Figure 6. Rate of Student Success in Chemistry by Method of Instructional Delivery from Fo9 toSp14.



Geosciences

The average rate of student success across the geosciences has gone up in recent years. We saw a dip in success in the fall of 2011 (55%) and then rise steadily to 70% in Spring 2012, and 74% in Fall 2012, 72% in Spring 2013, and 74% in Fall 2013. Spring 2014 saw a slight fall (67%). It is difficult to say why we have seen an increase in recent years, but it seems safe to say that our new building and equipment have helped instruction significantly.

Most groups seem to meet the institutional standard with the exception of those identifying as Black. It would be impossible to suggest why this without conducting ethnographic research on the African American community in the Antelope Valley. Our attitude has been to provide support to all students and make sure they have the information and materials needed to succeed.

Some preliminary analysis from the Fall 2014 semester shows student success at the Palmdale Center is lower than those at the Lancaster Campus. This may be the result of the absence of a lab at the Palmdale center. We will be analyzing this at the end of the Fall 2014 semester to see if this is the case.

Physical Science

The success rate of students enrolled in the physical science course has significantly outpaced the college average of 68%. During the last five years the success rate has grown form 72% to 80%. Similarly the retention rate has steadily remained close to 90%, again significantly higher than the college average. This is a testament to the efficacy of the active learning methods that have been introduced in the course since 2007.

Consistent with the overall college trend we observe that African-American students are not performing at the same level as others.

The overall trends look fairly constant, from 2009 to2013: Asians success and retention rates fluctuate from 70-100%. Hispanic and whites both success and retention rates vary from 69 % to 100%.

The only slight drops were observed for African Americans in Fall 2011 and Spring 2012 (40 and 38% for success and 50% for retention), but by Fall 2013 there was an immediate improvement (69% success and 85% retention). Prior to Fall 2013, the percentages were between 67-100% for both success and retention. Since it seems to be just a slight discrepancy for that year, we are not concerned that this is a recurring issue.

Physics

Fall 2013 and Spring 2014 saw student success rates by ethnicity at 80 % or higher for white non-Hispanic, Hispanic, and Asian which comprise the top three ethnicities that take

physics courses. The only ethnicity with success rates below the institutional standard were for African-Americans at around 50% however the number of African-American students taking physics is very low (8 in Fall 2013 and 13 in Spring 2014) which makes up roughly 4% of the number of student that take physics. The prior academic year we saw the same number of African-American students take physics courses (7 in Fall 2012 and 13 in Spring 2013) and the success rates then were above 85%. We can likely attribute the lower numbers this past year to variance in low number statistics.

Last academic year student success was above 80% or higher by gender. This matches data from previous years.

The Palmdale Center does not currently offer any physics classes.

2.4 Analyze and summarize trends in student progression through basic skills courses, if applicable. Cite examples of using data, outcome action plans and/or other planning tools as the basis for resource allocation (e.g. human, facilities/physical, technology, financial, professional development) that resulted in or correlate with improvements in course success and progression over the past five years.

None of the Sciences offer Basic Skills courses. However, BIOL 100, Elementary Human Anatomy and Physiology is a non-transferable course intended for students entering the Licensed Vocational Nursing Program.

2.5 List degrees and certificates currently offered in the discipline. Discuss improvements in the completion rates of degrees and certificates over the past five years. Also discuss improvements in license exam results, job placement/post testing and/or transfer rates to four-year institutions, if applicable. *

Astronomy

Astronomy does not offer certificates but does support an associate degree in physical science. ASTR 101 and 101L are program electives for the degree. The number of degrees awarded in physical science has increased dramatically in the last few academic years from 10 three years ago to 35 in the 2013 - 2014 academic year.

Biology

From Fall 2009 to Spring 2014 the number of Associate Degrees awarded in Biological Sciences increased from 10 to 37 (Table 50). On average 24.6 degrees were awarded each academic year. The Biology Department is currently working on the TMC for the pending AS-T transfer degree.

Chemistry

The AS in Physical Sciences requires CHEM 110 and 120. CHEM 101, 110 and 120 are among the science classes that students can opt to take for the Associates degree in Liberal Arts and Sciences, Math and Sciences option (identified in Table 50 as "Biological and Physical Sciences (and Mathematics)"). The current AS in Biology lists CHEM 110 and 120 among electives from which students can select to meet degree requirements.

Table 50 clearly shows a dramatic increase in the number of awards for all three of these degrees in that past five years. Because there had been no specific action from chemistry faculty to achieve these improvements, division and district efforts are responsible for all the success.

Table 50. AA and AS Degrees Awards from Fall 2009 to Spring 2014.

	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
Biological and Physical Sciences (and Mathematics)-490200	54	82	85	119	180
Physical Sciences, General-190100	4	5	10	14	35
Biology, General-040100 (elective)	10	23	17	36	37

An AS-T in Geology has been written and approved by the Chancellor's Office. CHEM 110 and 120 are required for this degree.

Chemistry faculty will develop an AS in Chemistry-TMC as soon as the final requirements and the template are released by the Chancellor's Office. Course Outlines of Record have been updated to match C-ID descriptors for the chemistry courses that will be included in the degree program.

Geosciences

We offer a certificate in Geographic Information Systems (GIS). The academic year 2012-2013 saw three graduates and five students earned certificates in 2013-2014. The program is growing slowly, with this semester's introduction to GIS course seeing a record 20 students enroll.

This Spring 2015 semester will see the introduction of our AA-T in Geography Degree and the AS-T in Geology to our students. These transfer degree programs will provide greater educational opportunity the AVCs student body.

Physical Science

Physical Science is currently an elective course for the AS degree in Physical Science. Details on the degree are presented above in the Chemistry program discussion.

Physics

Physics courses are currently electives for the AS degree in physical science. Details on the degree are presented above in the Chemistry program discussion. The AS-T Degree in Physics has been Chancellor's approved and will be available as another degree option for our students.

2.6 Career Technical Education (CTE) programs: Review the labor market data on the California Employment Development Department website for jobs related to your discipline. Comment on the occupational projections for employment in your discipline for the next two years. Comment on how the projections affect your planning. http://www.labormarketinfo.edd.ca.gov/Content.asp?pageid=1011 *

The Sciences do not offer vocational courses, training, or degrees except for a single course of Biology 100 needed in support of students pursuing the nursing degree, and the GIS certificate offered in the Geosciences.

Geosciences

Students learning GIS can enter a variety of industries. According to a recent report by the State Department of Labor, the projected 10-year job growth for GIS Analysts is 66.7%, Hydrologists 24%, and Environmental Scientists 25%. GIS professionals will be in demand so we will continue to try to grow our program.

Part 3 – Outcome Analysis and Use

3.1 Cite examples of using outcome (PLO, SLO, and/or OO) action plans as the basis for resource requests and the allocation of those requests (e.g. human, facilities/physical, technology, financial, professional development) or making other changes that resulted in or correlate with improved outcome findings over the past five years.*

Astronomy

In astronomy lecture sections, SLO data highlighted the need for students to better visualize complicated 3D behavior of astronomical systems. This need prompted faculty to acquire sky simulation software to be incorporated in lecture demonstrations. This change was accomplished two years ago and improvements in SLOs pass rates (~20% improvement) were seen in last year's data when compared to the year before.

In astronomy laboratory sections, SLO data highlighted the need for students to better understand the working of the telescope and planning observation session. Faculty acquired a solar telescope, a set of reflecting telescope, and a set of star wheel and revised several labs to incorporate more of these activities in lab. Since their implementation SLO data has shown a

greater than 30% improvement but SLO 2 is still consistent below standard. Further equipment needs have been discussed in the action plans of the last couple of years to address this issue.

Biology

Overall, the program continues to meet most of it targets and goals based on the assessment of SLOs and PLOs. In spring 2013 the SLO 3 (For Biology 120), which partially dealt with population biology calculations, did not meet its target. However, after designing and applying a more quantitative and problem based approach (with plenty of homework) the target was met for 2013-2014 cycle. For the next cycle, we plan to stay on course and see how these changes will continue to improve achievement levels. The only official degree is an Associate's (AS) in Biological Sciences. Biology 110 and 120 are the core courses in this program. The overall trend shows that both courses are meeting most of their targets and goals. However, due to outdated microscopes, many students in Biology 120 where not able to identify proper developmental stages and recognize various structures (histological etc.). This resulted in students failing to meet the criteria to pass SLO 2 (Biology 120). Thankfully after protracted and inexplicable bidding delays, we have been able to order these microscopes. It is expected that this will be of great help to students, but we have to wait until the SLOs are accessed in this and future semester in order to have more concrete and quantifiable data.

We are on track when it comes to offering more biology majors (BIOL 110 and 120) sections. In the past, we offered 3 sections of each course per year on an alternating mode, BIOL 110 in Fall & BIOL 120 in spring. Ever since moving to the new HS facility, each course is offered year round with additional courses planned for both spring and fall semesters.

As for Microbiology, SLO achievement targets have been consistently met in BIOL 204 (General Microbiology) since the time that SLO data has been required. Data from the 2013-2014 cycle has been included here and is typical of previous cycles although not directly comparable. There has been a recent reduction in the number of SLOs being tracked, to refine and streamline the record keeping process, and the most recent data from the revised SLOs is presented here. Future yearly updates should permit a more direct comparison of achievement rates from one year to the next across the same SLO set. SLO data demonstrates that all achievement targets are presently being met. Success rates are highest (89.2%) in achieving the laboratory skills proficiency and determination of the identity of unknown bacterial samples. Adult learners thrive in an atmosphere of hand-on experience and group communication. A great deal of time and effort has been dedicated to upgrading laboratory equipment in order to provide an excellent practicum experience; new microscopes have been purchased for both instructor and student use. A better resolution screen is required for the digital camera dedicated for instructor demonstrations. Ongoing collaboration with chemistry faculty provides state-of – the-art experience in spectrometry for observing bacterial population growth. Since the lecture component of this course requires mastery of applied knowledge, a considerable body of specialized knowledge and the development of additional higher level intellectual skills, the success rate for students, who almost all have the lowest permitted level of background knowledge in biology and chemistry, is lower by 15 – 20%. In laboratory class, 6 hours per week are devoted to developing proficiency in culture technique and in understanding of the process of bacterial identification. In lecture, an extremely diverse range of subject matter is

presented briefly during the three contact hours allocated every week. This three hour allocation is considered the minimum time consistent with meeting target achievement goals. Any reduction in lecture hours will inevitably reduce student success. This is mentioned in view of the proposal to reduce Microbiology to a 4.0 unit class, rather than the 5.0 unit course it has been until now. No decisions will be made to change the course until the C-ID is provided by the State of California for faculty input and review. SLO data will continue to provide verification of the need for at least three hours of lecture instruction for BIOL 204 students in light of their low level of preparedness and the lack of completion of the BIOL 201/202 series before entering into BIOL 204.

Finally, SLOs and PLOs have not been used to allocate resources in terms of new hiring as yet. Regarding classroom optimization for best practices, however, all biology faculty agree that some issues with suboptimum whiteboard placement and unreliable projection equipment persist. Due to increasing demand for our courses, we expect to eventually hire three more fulltime faculty preferably in the areas of General Biology, Molecular Biology/Biotechnology and Anatomy/physiology.

Chemistry

CHEM 101Introductory Chemistry

The original learning outcomes for CHEM 101 are being combined into broader outcomes. After several semesters of analysis and increased understanding of outcomes, it became clear that the originals were too narrowly defined.

CHEM 110 General Chemistry (1st semester)

The first SLO deals with laboratory performance and laboratory safety. It has been met about 33% of the time. Since moving to the new HS building, students' ability to properly locate safety equipment around the laboratory has declined. We have requested additional signage around the lab rooms. Some additional signage has been acquired. Additional signage is still needed, specifically marking the location of fire extinguishers. To improve laboratory performance, newer atomic spectrophotometers were requested. The chemistry department needs to continue requesting these.

The second SLO deals with the use of the periodic table. We have met this SLO in every cycle. Action plans have successfully requested increases in tutoring and SI. We have also used action plans successfully to request up-to-date periodic tables for the HS building**.** Additional periodic tables are still needed. Action plans to expand the number of CHEM 110 sections offered have met with mixed results. We have added an honors section and the improved budget has allowed us to offer the course during the summer again. In an effort to expand our offerings during the normal school year, we have requested additional faculty and a lab tech to support labs at night and on weekends. These requests have been unsuccessful.

We have had little success meeting SLOs 3 through 6. The outcomes for SLO 3 have shown some improvement in the last couple of years. Part of the problem was that we set

unrealistic targets on these SLOs. The targets have recently been adjusted. Updated data using these new targets needs to be obtained.

CHEM 120 General Chemistry (2nd semester)

For CHEM 120, there was finally significant increase in student success. In Fall 2012, the format of the course was modified to be more student-centered. This was based on ideas and a training workshop at a Two-Year College Chemistry Consortium conference in March 2012. A STEM grant paid for seven of the AVC chemistry faculty to attend. More class time is spent discussing concepts in groups and solving problems on worksheets. Lab questions are tailored to connect with lecture. This approach seems to be paying off. For almost all SLOs, the highest percentage of students to succeed occurred in 2013-2014.

Despite the great increase, two SLOs are still not met. Although these outcomes are written to assess skills learned in the course, they do require use of college algebra, which is a prerequisite for CHEM 120. Having a supplemental instructor for the course or additional tutors would provide support for the students whose math skills are too weak to allow them to fully apply these concepts.

The lab skills test used to assess the laboratory outcome has been refined to be more consistent from one semester to another and from one instructor to another. The assessment for the other SLOs had already been set. Standardizing this final SLO makes the data more credible.

CHEM 210 Organic Chemistry (1st semester)

The first SLO relates to nomenclature and has been met in all cycles. As the results have been very good, there are no significant action plans.

The second SLO is about the application of bonding theories. We have missed this SLO in all cycles, in most cases by a small number of students. Action plans have dealt with improved assignments and assessment. Targets should be reevaluated, as they were with CHEM 110.

The third SLO is about the application of mechanism. We have missed this SLO in all cycles. Action plans have dealt with improved assignments and assessment. New assignments, based on the action plans, have produced some improvement. Targets should be reevaluated, as they were with CHEM 110.

The fourth SLO is about using spectroscopic data to determine molecular structure. We have missed this SLO in all cycles, in most cases by a small number of students. Lately the percent of students who have met the SLO has increased from about 67% to about 80%. Action plans have asked for updated and expanded instrumentation. These action plans have received funding and the instrumentation should be purchased this cycle. Targets should be reevaluated, as they were with CHEM 110.

The fifth SLO relates to laboratory operations and laboratory safety. It has been met every cycle.

The last SLO covers laboratory reports. It has been met every cycle.

CHEM 220 Organnic Chemistry (2nd semester)

The first SLO covers nomenclature. We have met this SLO most years.

The second SLO is about the application of bonding theories. We have missed this SLO in most cycles. The percent of students meeting this SLO has improved from near 50% to over 70%. Action plans have dealt with improved assignments and assessment. Targets should be reevaluated, as they were with CHEM 110.

The third SLO is about the application of mechanism. We have missed this SLO in all cycles. Action plans have dealt with improved assignments and SI, which have been instituted. Targets should be reevaluated, as they were with CHEM 110.

The fourth SLO is about using spectroscopic data to determine molecular structure. We have met this SLO in all cycles. Action plans have asked for updated and expanded instrumentation and for training on the instrumentation. These action plans have received funding and the instrumentation should be purchased this cycle.

The fifth SLO looks at the relationship between Organic Chemistry and Biochemistry. We have missed this SLO in most cycles. Action plans have proposed addressing this with new assignments and by offering SI for CHEM 220.

The next SLO relates to laboratory operations and laboratory safety. It has been met every cycle. Recent action plans have addressed the possible need for an instrument technician to maintain instrumentation for MS.

The last SLO covers laboratory reports. It has been met every cycle.

AS Physical Science

This degree will be removed as soon as degrees in each specific scientific discipline are available in conjunction with TMC requirements. It is the closest thing to a chemistry degree offered at this time. Students are required to take CHEM 110 and CHEM 120 as well as MATH 150 and MATH 160. The remaining courses for the degree are selected from a list of five other science classes.

The achievement target for the existing PLOs is 100% of students to achieve 70%. This was originally established with the thought that only students obtaining this degree would be assessed. It seemed logical that those students would be able to correctly answer 70% of questions pertaining to each PLO. In reality, there is no way to assess just those students, so the assessments evaluate hundreds of others who are not majoring in physical sciences and therefore are not fully invested in retaining information from the chemistry and math courses in which the assessments are done. Careful thought to assessment for the new degrees is needed.

Geosciences

We saw success in the geography courses in incorporating a geomorphology lab to help explain concepts of glacial, fluvial, and coastal erosion/deposition. While all students in the sections scored just at (71%) or below our success rate (64%), analyzing just the students who completed the lab activity showed success rates of 80% and 86%.

This led to the purchase of a stream table, which allows us to model what running water does to the Earth. We have just begun to incorporate that into our labs to see if it further helps student success. It has already been used with the honors classes, and it seems to truly clarify how moving water shapes the Earth.

Physical Science

For the Physical Science course, PSCI 101, SLO's are assessed yearly and inputted into WEAVE online. Action plans are developed based on outcomes.

We are assessing 7 SLO's for Physical Science, and out of these only one SLO showed need for improvement in the last 5 years.

This is SLO 1, which is testing student's ability to do simple math problems and solve equations. Since there are no prerequisites for this course, math 70 is only advisory.
SLO 1 was met in 2009-2010 (5 quantitative questions; 102 students out of 129 scored at least 4 questions correctly). The expectations are that 80% of the students will score at least 70% of the maximum score. Unfortunately, 2011-2013 this SLO has not been met 45-52% only of students scored 70% or higher.

We requested funding to provide and SI and/or tutor for the Physical Science class (through the learning center) to help students with math related problems.

For SLO 2-6: A test is administered pre/post instruction and the normalized gain is calculated. National average is 40%. A gain of 60% and above represents mastery.
We expect students to perform at least at the national average level. In 2009-2010 as well as 2010-2011 these SLO were met (gain between 48-54%). Since fall 2011 till present not only do we meet these SLO but the gain is between 56-61% which is a great improvement and considered mastery.

Our plan is to continue to maintain and improve these great results.

For SLO 7, this is been consistently met and 90% of students complete consistently at least 70% of assignments.

Physics

In physics lecture courses, data within past action plans have highlighted the need for the development of effective SLO assessment tools and effective achievement targets. In cases where goals were not met or reported, modifications of achievement targets followed by the submission of SLO revisions and assessment methods at the conclusion of the appropriate assessment cycles, were recommended in the action plans. For example at the conclusion of the Spring 2013 cycle updated SLOs and assessment methods were recommended in the PHYS 102 action plan. In the following 2013-2014 cycle the DIRECT test was chosen as the assessment method and the achievement target was partially met with a 60 % class gain (the target class gain was 70%). This result is typical of many SLO results across the physics courses where SLOs and achievement targets are continually being monitored for progress and possible modifications and improvements.

Part 4 - Stakeholder Assessment

4.1 Assess how well the program serves the needs of the students, district, and community.
Use surveys, interviews or focus groups to obtain feedback from stakeholders (students and/or others who are impacted by your services). Include documented feedback from other sources if relevant (e.g. advisory committees, employers in the community, universities, scores on licensure exams, job placement).

Astronomy

The primary goal of astronomy is to provide an avenue for students to complete general education science courses. Many students have used these courses to satisfy those requirements. Feedback is difficult to assess other than observing that the Cal State and UC systems accept astronomy as a satisfactory course to fulfill general education requirements.

Biology

The Biology program continues to offer a rigorous program that prepares many students that transfer to four-year schools. We do not have any solid data but anecdotally, 50% of our students are pre-medical and the other 50% are spread among other pre-health majors and students striving to get into science as profession. Our Anatomy and Physiology courses, along with Microbiology, continue to serve as the corner stones that scientifically prepare nursing students. Overall, the biology classes have a 3-year retention rate of 85% with 65% success rate. Biology 110 and 120 (main courses needed for A.S. Biology) have about 79% and 76% success rate with both being in 88 percentile area when it comes to retention.

Our improved lecture and laboratory facilities in the H & S building are enabling better delivery of course content. Some issues with inferior projection equipment persist with mediocre projector resolution and brightness forcing many instructors to lecture with the lights off.

Furthermore, responsibility for the maintenance and troubleshooting of this equipment has been hard to decipher or acquire at times, and long lag times for help or repairs are common.

With the cooperation of the IMC, podcasting of all lectures in anatomy and physiology is now offered and has grown in student popularity; however, with the loss of the lead technician at the IMC, we are left with no one who is trained in troubleshooting podcasting problems.

The inability of full time instructors to lock and unlock their assigned rooms and labs continues to create unsafe and insecure situations, and often forces instructors to prop open doors with trash cans or leave labs open, increasing the risk of unauthorized entry and theft of equipment. Moreover, the ability of math, science and engineering faculty to choose the lecture rooms best suited for their methodology, even after all the faculty effort of designing the building, has been revoked by authorities outside the Health and Science purview, placing many teachers in rooms ill-suited for their curriculum.

New and separate facilities for the care and handling of live animals, in accordance with state codes and institutional standards have been realized. Adoption of new techniques and solutions used in conjunction with preserved specimens and state-of-the-art lab ventilation has mitigated previous safety concerns and has led to a much better working environment. In Fall 2013, all A & P instructors completed an online safety-training course, provided by Safecolleges, and in Spring 2014, all instructors completed an online disaster preparedness course.

With our procurement of new compound microscopes and digital cameras, our ability to teach histology/cytology and develop and expand our collection of teaching images has improved tremendously.

Support services such as the SI program, IMC services and faculty websites continue to be effective and widely used. WiFi service in the H & S building has simplified internet access for everyone.

This year, we have enjoyed the return of some grants and other funds to acquire new anatomical models and equipment.

Staff development and travel allowances have returned, but are inadequate for all instructors to attend state and national meetings.

With the retirement of one seasoned, full-time instructor in Anatomy, our ability to offer more sections of Biology 201 will be limited. Increased offerings of BIOL 201 and completion of BIOL 202 (advisory-only courses for BIOL 204 at this time) would better prepare students for success in BIOL 204, due to the knowledge base and improved study skills that overlap with that area, so students would be doubly served by an increase in BIOL 201 offerings. Qualified adjunct instructors to teach in this sub-program are not readily available. Replacement of this lost full-time position is strongly advised.

Title V and AVC Foundation funds continue to help replace some equipment, but regular capital funds for replacement or upgrading are scarce. For instance, there is no reliable source of

funding for new cadavers or computers (the need for which arises every two to three years), requiring us to seek grants or community donations. Supply budgets for routine expendable lab materials have not changed for years and have not kept pace with increasing prices and added class offerings.

Chemistry

The AVC Chemistry Department has sought input on how to improve the range of instrumentation we offer to our students. We have received responses from several higher educational institutions. One was from Linda Woods Ph.D, Chair of the Department of Physical Sciences at San Diego Miramar College. She pointed out that the guidelines of the American Chemical Society encourages 2 year colleges to have a gas chromatograph (GC) as a standard item and also to provide access to a mass spectrometer (MS) or a combined GC/MS. We also contacted Dr. Danielle Solano, the professor who handles Organic Chemistry in the Department of Chemistry & Biochemistry at the California State University, Bakersfield. She strongly encouraged us to get an "NMR that has the capability to do C13."

The Chemistry Department developed a survey to assess student thoughts on topics relevant to Program Review. Questions in the survey cover how well the Chemistry Department meets relevant portions of the College's Mission Statement. Other questions deal with student views on areas that need additional support. This survey was given to students who are likely to have taken two or more courses from the Chemistry Department.

The Organic Chemistry class (CHEM 210) took the survey. They were generally in their third semester taking courses in the Chemistry Department. All twenty students felt that student success and student-centered learning is the number one priority within the AVC Chemistry Department. Some of the responses identified this as due to the passion for education displayed by the Dean and Faculty.

When asked about the Associate Degree Programs available, the students were generally aware that an associate in chemistry is currently unavailable. About half of the responses expressed an interest in a Chemistry Associate Degree Program. The department is working on such a program, but is waiting for release of the TMC template. Four students expressed interest in Chemistry Laboratory Technician Certificate Program. This would be in the Career Technical Area. Without a current program within chemistry, most students were taking these courses as Transfer/General Education courses.

The students were also asked about the resources available to their chemistry classes. A majority (75%) were pleased with the new HS building. A few pointed out the need to repair the building's deionized water system. A small number asked that window cleaning receive greater priority. A majority (65%) were happy with the available Human Resources within the Chemistry Department. A few requested that we offer additional sections of General Chemistry. The CHEM 210 students are aware that AVC is working to improve the instrumentation available to the students in the Chemistry Department. When asked about needs in the area of major and minor laboratory equipment, 80% felt improvements were needed in this area. Most

of the replies indicated they agreed with current plans to obtain additional melting point apparatuses, an additional infrared spectrophotometer, a gas chromatography/mass spectroscopy, a nuclear magnetic resonance spectrophotometer and heating mantels. They also requested a greater supply of general and specialized glassware. They also strongly support our interest in a High Pressure Liquid Chromatography system.

Students in General Chemistry (CHEM 120) also took the survey. Some of these students completed CHEM 101 at AVC before starting the General Chemistry sequence, of which CHEM 120 is the second semester. Of the 32 respondents, 75% agree that student success is the number one priority in Chemistry. In addition to engaged teachers, a few students commented that there are abundant supplemental materials available to support student learning. Yet, of the students who disagree that the chemistry department is student-centered, comments expressed frustration that there is not enough tutoring offered.

Requests for additional tutoring and supplemental instruction appeared again in the survey question related to student support and instructional services offered by the chemistry department.

While 66% of students recognized that no chemistry associate degree is currently offered, one comment revealed that the responder equated the Liberal Arts and Sciences degree, Option 1, Math and Sciences with an associate degree in chemistry. Of the 32 respondents, 13 would be likely to pursue an associate degree in chemistry. Similarly, if a chemical technician certificate were offered, 12 students indicated that they would be likely to enroll in that program.

Regarding transfer classes, students lamented that organic chemistry is offered only in fall semester. Some students need only that course to complete their transfer requirements.

Most students (81%) are comfortable with the facilities and equipment available. These students have not yet reached the point in the semester when they are introduced to laboratory instrumentation. For human resources, only 47% reported these as adequate. However, 34% selected "NA" as their response, indicating that they are not aware of myriad employees supporting their classes. One comment did request "More support staff."

CHEM 101 is articulated with SOAR High School. Students can earn college credit from their year of high school chemistry through an articulation agreement with the AV Union High School District. The chemistry department is reviewing a request from Rosamond High School for a similar offering. The high school teachers have suggested revising lecture and lab materials to be more inquiry-based. Students in high school are now more familiar and successful with that style of teaching/learning. Having seen similar success for CHEM 120 with inquiry-based methods is additional support for a change to CHEM 101 curriculum.

Geosciences

We do not have survey data for this. We have an advisory committee for the GIS program, though it has not met regularly, but it has helped shape program. Currently a meeting is being arranged with the City of Palmdale to follow up on a project in which our students have

helped with tracking illegal dumping in the city. The goal is to incorporate more involvement with local agencies to get our students working with real world problems.

Physical Science

In 2004, the physical science course was restructured to include 2/3 physics and 1/3 chemistry in order to satisfy the needs of pre-service teachers pursuing a multiple subject credential so that they can teach in the K-8 setting. The course meets the California science standards and prepares students to be successful in the CBEST and CSET state tests for incoming teachers.

We have no official data of success of our graduates in those tests, but anecdotal data suggest that the students are well prepared to succeed on those tests.

Physics

The primary goal of the physics program is to provide an avenue for students to complete general education science courses and adequately prepare students for transfer and success in their chosen majors including STEM fields. Many students have used these courses to satisfy those requirements. Feedback is difficult to assess however anecdotal evidence and feedback from current and former students indicates that the physics program is currently meeting these goals. At least two students within the past two years have transferred to UC Berkeley and one to UC San Diego. A former physics student recently shared during the summer that a fellow student transfer now at Cal State Pomona remarked that the physics courses at AVC were the most challenging she has ever encountered in a college setting. Courses she had enrolled in this past Spring at Cal State Pomona were not as challenging, indicating that the physics courses at AVC are sufficiently rigorous to adequately prepare students for success at four-year universities. At least four students have received recommendation letters from physics faculty for AVC Foundation Scholarships which were subsequently awarded and accepted at the Honors Convocation held at the end of the year in May and which is attended by esteemed individuals in the community. The physics program at AVC also serves as an effective feeder program into the CSULB Antelope Valley Engineering Program. A current student in this program recently visited the Physical Sciences Department at AVC and shared that “most” of the students currently in the program are former physics students at AVC and “laugh” when a concept is introduced that was formerly encountered in a class at AVC. It should be noted that sixteen of the eighteen December 2013 graduates from the CSULB-AV Engineering Program (including the top student in electrical engineering for the College of Engineering, were from AVC and AVC physics students. Physics at AVC is also enjoying a stellar reputation at SOAR High School where the students and teachers regard the courses with esteem and recommend that these courses be taken when possible. This semester four SOAR High School students are currently (Fall 2014) enrolled in PHYS 110. During the 2013-2014 academic year at least three SOAR High School students matriculated through PHYS 110 and PHYS 120 at AVC. Other students have taken leadership roles in the STEM club and over fourteen students have expressed eagerness at participating in undergraduate research. One student attending Cal State Northridge

shared excitedly that he achieved the highest grade in his mechanics course after having taken PHYS 101 at AVC. The physics program at AVC is currently having a positive impact in the community establishing a standard of rigor, critical thinking, achievement, and optimism that is shared by all in the community and extends to campuses all over the State of California and is also preparing students to be leaders in their environments.

Physics and Biology faculty has also begun two student Undergraduate Research projects that are interdisciplinary in nature exploring concepts that bridge biology and engineering with physics. We will provide details in our next annual update as we are still in the design phase.

Part 5 - Goals and Objectives

5.1 Review the goals identified in your most recent comprehensive self-study report and any subsequent annual reports. Briefly discuss your progress in achieving those goals.*

Astronomy

One goal from the previous comprehensive study was to "Continue the implementation of active learning methods in the classroom." Astronomy has had much success in these regards by gearing instruction toward an active learning environment by offer click-type questions and student led discussion in lecture. In addition, the implementation of an online tutorial and homework system and the use of sky simulation software, to better visualize the complicate behavior of astronomical system, have been of help to students.

Another goal from the annual report of two years ago discusses the need to acquire an all dome digital 3-D video projector for the virtual science classroom (HS 181). We have not been able to do this yet. The equipment is close to $1 million to acquire and potential has upkeep costs in the range or $10,000 - $20,000 range. In the past few years we have had two different opportunities to acquire these funds through the Educational Partnership Agreement (EPA) with the Air Force Research Laboratory (AFRL) at Edwards Air Force Base. These opportunities have not come to fruition. We continue to work with the AVC Foundation and other outside entities to make the acquisition of this equipment a reality for the instructional of our students and the Antelope Valley community in general.

Biology

Goal-1: The biology program will provide students with an environment that supports learning and facilitates student success.

Thanks to the completion of the Health and Sciences Building in 2012 and the availability of Measure R funds for upgrading laboratory facilities, the goals put forth in our last program review for this area are on track to be met. Beside the newly purchased microscopes, thanks to an STEM grant, we were able to purchase some of the badly need equipment (respirometers, a device to measure photosynthesis, and an olfactometer) for the biology majors. All faculty members are striving to offer up-to-date lectures and inquiry-based instruction.

Furthermore, some facultmembers are working with select students in the area of undergraduate research, including a research project in the area of scorpion olfaction. The resulting paper will be submitted soon for publication in a scholarly journal. Numerous others work with high school students through the Science Olympiad or individual projects designed to excite and interest young learners in both Science and Mathematics.

Goal-2: Implement TMCs as they become available

At the time of writing this report, the Biology TMC has been vetted and closed. Once the template is published (anticipated February 2015), the Biology faculty will develop the AVC AS-T Degree in Biological Sciences and present it to AP&P. This may require to revision of courses to fit the C-ID descriptors.

Goal-3: Updating all the microscopes, charts and displays in the Biology classes.

We have received and been using the new microscopes in our majors, microbiology, anatomy and physiology courses. New DNA models were also purchased to be used in many classroom and labs. We still need to look to replace damaged biology charts for our non-majors and majors courses.

Goal-4: Increase the number of Microbiology and Biology majors courses

Ever since moving into the new building we have been offering Biology majors courses year round. It is expected that we will also increase the number of Microbiology courses possibly by Fall of 2015.

Chemistry

Goal 1 to develop a community advisory board seemed like a doable task. Unfortunately, the community partners approached thus far have not been willing or available to participate. Because community members don't see a pressing need for such a board, the department has decided to remove this goal.

There is progress towards Goal 2 to establish an AS in Chemistry Degree. Required courses have had their CORs updated to reflect C-ID requirements. Although a final description of the program was proposed in May 2014, "it cannot be made available for degree development and submission to the Chancellor's Office until IGETC and/or CSU GE Breadth for STEM are fully implemented." (Quote from the Chemistry TMC posted at C-ID website)

Goal 3 to develop a chemistry technician certificate is being reviewed. There is some interest in such a program (as seen in student surveys). However, some of the lab skills and experiences in such a program may be incorporated into a broader Environmental Sciences degree or certificate, which has been discussed at the division level. It is unknown if there would be enough demand to maintain two separate but overlapping programs.

Nevertheless, towards development of a program that incorporates chemistry analytical techniques in some form, instrumentation that was requested is in the acquisition process. UV-vis spectrometers purchased at end of 2013-2014 have already been used in CHEM 120 and BIO 205 courses. They are also the basis of some honors projects. Analysis is in progress to confirm which other instruments would be most valuable for students to work with in preparing them for the most common analytical techniques.

Geosciences

Two of the three goals from the last comprehensive have been met: Goal 2 - Creating a world regional geography course was achieved with the development of GEOG 110; and Goal 3 - developing an associate's degree in geography. The AA-T for Geography and the AS-T in Geology has been approved by the Chancellor's Office. The advisory committee for the GIS Program has proven to be a challenge in getting it to meet regularly (goal 1). Our requested new faculty member would help with this problem.

Physical Science

Our goal is to help students meet all SLO's and strive for continuous improvement. The goal to help students achieve mastery consistently in Physical Science has not been achieved yet. The suggestion to create an SI session to help students meet SLO 1 should alleviate the issue. We will still need to secure funding.

Goal: Increase student transfer rates.
Related to SG: 1,2,5,6

Objectives:
1) Improve student learning outcomes through curriculum enhancement incorporating research based learning methodologies, as well as the latest educational technology advancements.

2) Develop a responsive and adaptable long term scheduling plan to serve the needs of the transfer oriented students and ensure there are no conflicts with the schedules of co-requisite courses.

Physics

The two previous goals were:

Goal 1: Continue and expand when possible the implementation of Active Learning methods in the physics courses. (Related to SG: 1,2,3,4).

The current methods of teaching have delivered above satisfactory results in meeting SLO benchmarks and students enjoy success rates significantly higher than the college average.

Goal 2: Increase student success and retention.

In 2013 we were able to complete and get Chancellors Office approval for our Physics AST degree. However we had to agree to reduce the number of units in the Physics 110, 120, and 211 to 4 units from 5. While this will decrease the amount of student contact time, we believe that with minimal modification in the teaching modality we will be able to offer the same quality of learning as before. We will monitor student outcomes and evaluate after a couple of cycles of course offerings.

5.2 List discipline/area goals and objectives related to advancing district Strategic Goals, improving outcome findings and/or increasing the completion rate of courses, certificates, degrees and transfer requirements. Discipline/area goals must be guided by district Strategic Goals in the Educational Master Plan (EMP). They must be supported by an outcome action plan, data analysis, national or professional standards, and/or a requirement or guideline from an outside agency (e.g. legislation, Chancellor's Office, accrediting body, professional board).*

Current (up to three years)

Astronomy

Goal: Increase student retention and success.

- Guided by district Strategic Goal(s) #1,2
- Supporting action plan, data analysis, or other documentation

Objectives: Significant steps or actions needed to achieve the goal

The student retention rate in astronomy is exceptionally high ranging from 88% to 91% for all five years (09-14). During the same period, the student success rates fluctuated from 70% to 77%, which are significantly higher than the overall college success rate of 68%. As mentioned above in section 5.1, the transformation occurred in astronomy courses by the implementation of "active learning methods" should maintain and improve the already satisfactory success and retention rates. At minimum we expect to maintain the existing rates in the near future while striving to increase them as much as possible.

Biology

Goal 1: Improvement of student learning outcomes.

- Guided by district Strategic Goal # 1: The College as a community will provide students with an environment which supports learning and facilitates student success.
- Guided by district Strategic Goal # 2: The College will increase the transfer rate to Cal States, UC, and private colleges.

- Guided by district Strategic Goal #5. The college will utilize campus resources efficiently and effectively.
- Guided by district Strategic Goal #7. The college will increase resources to enhance technology's support of the college mission and processes.

Objective 1: Increase student success.
Objective 2: Increasing the number of transfer students.
Activity 1: Increasing the number of Biology courses (District Goal 1 & 2).
Activity 2: Purchasing of charts, models, slides and additional articulated animal skeletons for Biology majors, Anatomy and Physiology courses (District Goal 1 & 2).
Activity 3: Hire more fulltime faculty members (District Goal 1 & 2).
Activity 4: Allocation of more financial resources for purchasing and streamlining the purchasing process (District Goal 5).

- Supporting action plan, data analysis, or other documentation:

1. There has been an increase in number of students taking biology courses either as GE, nursing pre-requisite or as declared Biology majors. Looking at the Annual FTES by Six-, Four- or Two-Digit Code, Biology FTES have increased steadily as a proportion of the total AVC FTES, from 5.85% in 2009 to 6.48% in 2014. Overall, the trend suggests a strong and constant demand for biology course offerings and examination of section counts indicate that Biology sections are not increasing in step with the entire AVC College trends in all semesters under consideration.
2. Many of our charts we outdated and damaged during the move. Furthermore, due to increase in number of laboratory rooms (with addition of a major's only lab), our resources are spread thin. Lastly, in preparation on implementation of Goal 1 for "Near Term Goals" for Biology 120, new supplies of vertebrate skeletons are needed.
3. In order to increase student success and meet the College's required increase the percentage of students who successfully achieve 12 transferrable units and transfer-level English and Math courses, a comprehensive study was initiated looking at prerequisites in all biology courses. Specifically, we will look at how successful completion of ENGLISH 101 and MATH 102 completion affects student retention and success in BIOLOGY 101, 104. At the time of publication of this document, the results have not been made available. Furthermore, maintaining a rigorous standard in our majors and advanced courses will ensure that students that transfer are well prepared and successful.
4. In order to meet increase in demand and make up the gap observed between Biology course offering compared to AVC as whole, we need to increase our course offering. It is recommended that there needs to be less or (none at all) non-science courses in scheduled in Health & Sciences Building. This will free up space for Biology classes. Furthermore, we recommend a study of our laboratory sections offered in order to stream line and maximize lab use, with understanding that more support resources (Technicians, etc.) are needed). Finally, to better meet this goal, the final scheduling decision must be handed over to Dean and not a "remote office" that does not understand science courses and does not know the building

Goal 2: Reform instructional methodology to include Inquiry-based learning

- Guided by district Strategic Goal # 1: The College as a community will provide students with an environment that supports learning and facilitates student success.
- Guided by district Strategic Goal # 2: The College will increase the transfer rate to Cal States, UC, and private colleges.

Objective 1: Increase student success.
Objective 2: Increasing the number of transfer students.
Activity 1: Purchasing of equipment that will facilitate hands-on and inquiry-based (District Goal 1& 2).
Activity 2: Creation and support of workshops and other professional development opportunities (District Goal 1 & 2).

- Supporting action plan, data analysis, or other documentation: American Association for the Advancement of Science, Vision and Change: A Call to Action (2010) identified the need and the advantage of inquiry-based instruction in undergraduate education. It has long been thought that the laboratory is a crucial component to science education and that laboratory activities can have great benefits to student learning (Harris 2009). Through research it has been well established that explicit inquiry based teaching helps students learn science content, master how to do science, and understand the Nature Of Science.

References

Abd-El- Khalick, & Lederman, 2000; Dori, 2006; Khishfe, & Abd-El-Khalick, 2002; Olson & Loucks-Horsley, 2000).

Abd-El-Khalick, F., & Lederman, N. (2000). The Influence of History of Science Courses on Students' Views of Nature of Science. Journal of Research in Science Teaching, 37(10),1057-95.

Harris, M.F. (2009) Investigation into the effectiveness of an inquiry based curriculum in an introductory biology laboratory. Master's Thesis, The University of Maine

Khishfe, R., & Abd-El-Khalick, F. (2002). Influence of explicit and reflective versus implicit inquiry-oriented instruction on sixth graders' views of nature of science. Journal of Research in Science Teaching, 39(7), 551-78.

Olson S., & Loucks-Horsley S. (Eds.). (2000). Inquiry and the National science education standards: A guide for teaching and learning. Washington, D.C.: National Academy Press

Goal 3: Develop an undergraduate research (UR) Program.

- Guided by district Strategic Goal # 1: The College as a community will provide students with an environment that supports learning and facilitates student success.
- Guided by district Strategic Goal # 2: The College will increase the transfer rate to Cal States, UC, and private colleges.
- Guided by district Strategic Goal #7. The college will increase resources to enhance technology's support of the college mission and processes.

Objective 1: Increase student success.
Objective 2: Increasing the number of transfer students.
Activity 1: Purchasing of equipment that faculty can use as pedagogical tool during research activities (District Goal 1& 2).
Activity 2: Creation and support of workshops and other professional development opportunities (District Goal 1 & 2).
Activity 3: Figuring out ways to compensate faculty for conducting undergraduate research (either via FPD credit, release time, etc.)

- Supporting action plan, data analysis, or other documentation: "The positive effects of an undergraduate research experience on student learning, attitude, and career choice have passed from anecdote to systematic data. Many educators, particularly in the sciences, have come to see the potential for authentic undergraduate research to be a high-impact educational practice for achieving excellence in liberal education" (Lopatto, 2010). Undergraduate research not only enhances learning and allows students to apply what they know, but increases the number of students that pursue advanced degrees and careers in science, technology, engineering, and mathematics fields (Russell et al., 2007). Currently, 4 faculties are actively involved in research that includes students with some of this collaborations resulting in publication and/or presentation in scientific venues. There is a nationwide trend for undergraduate research at community colleges (See "The Community College Undergraduate Research Initiative" http://www.ccuri.org) and it is time for AVC to start its own initiative, which could lead southern California and serve as a model.

References

Lopatto, D. (2010) Undergraduate Research as a High-Impact Student Experience. Peer Review. SPRING, 27-30

Russell, S.H., Hancock, M.P., & McCullough, J. (2007). Benefits of Undergraduate Research Experiences. Science. 316, 548-549.

Chemistry

Goal #1: Offer AS in Chemistry-TMC at AVC

Guided by:
District Goal 1a, 1b, 2 a
Supported by: Student need, as documented in surveys
State requirements

Objectives: Obtain final program description when released from state
Structure AVC program to align with state.
Submit for approval

Goal #2: Close Achievement Gaps in Success Rates Among Racial/Ethnic Groups
Guided by:

District Goal 1c, 1e, 1f, 4a, 4c, 5d
Supported by: Need to increase number and success rate of African-American chemistry students
Desire to raise success rate of Hispanic chemistry students beyond the minimum district target

Objectives: Coordinate with other campus efforts, such as HSI STEM grant, and First Year Experience program
Evaluate prerequisites
Investigate inquiry-based curricula for CHEM 101
Ensure sufficient tutors and supplemental instructors are available

Geosciences

Goal 1: Develop a network of GIS professionals and agencies to maintain an advisory committee and continue community outreach.

- Guided by Strategic Goal #3
- This is necessary for CTE purposes.

Objectives: In order for this to happen, we need to more support in the department. Ideally this comes from a new faculty hire or at least a lab technician that helps with the geography and geology labs.

Goal 2: Continue to grow the GIS Program

- Guided by Strategic Goals #1, 2, 3
- We struggle to fill classes to ensure they run, but those students who take the courses are very successful in terms of outcomes.

Objectives: We need to continue outreach efforts such as publications highlighting the program, a website giving more information than the just the catalog text, and more community and student outreach to advertise the program.

Goal 3: Introduce and promote the AA-T and AS-T in Geography and Geology, respectively.

- Guided by Strategic Goals#1, 2, 3

Objective: Inform students about the career opportunities linked to degrees in geography and geology.

Physical Science

Goal 1: Continue to meet current SLO achievement and improve at moderate level on an annual basis. (Related to SG: 1,2,5,6).

Activities: Continue the implementation of "active learning methods" in the classroom.

Goal 2: Increase transfer rates (Related to SG: 1,2,5,6).

Objectives:
1) Improve student learning outcomes through curriculum enhancement incorporating research based learning methodologies, as well as the latest educational technology advancements.

2) Develop a responsive and adaptable long term scheduling plan to serve the needs of the transfer oriented students and ensure there are no conflicts with the schedules of co requisite courses.

Physics

The two goals discussed in 5.1 will continue to guide our efforts in the near and long term future. In addition, we would like to introduce two new goals for the near term.

Goal 3: Increase the number of students enrolling and graduating with a Physics AS/ T degree. (Related to SG: 1, 2, 4)
Objectives: 1) Maintain the current number of sections offered and continue to evaluate the need for increases.

Goal 4: Increase the interdisciplinary collaboration of physics faculty with math and engineering faculty.
Objectives: 1) Align course materials in physics, calculus, and engineering course so that students encounter the same terminology as well as practice with problems that are common in the three areas.

Near Term (three to five years)

Chemistry

Goal #3: Improve Student Success and Retention
Guided by: District Goal 1c, 1e, 1f, 4a, 4c, 5d
Objectives: Evaluate prerequisites
Investigate inquiry-based curricula for CHEM 101
Ensure sufficient subject area tutors and supplemental instructors are available

Geosciences

Goal 3: Develop study abroad programs

- Guided by Strategic Goal #1
- While we do not have SLOs showing a need for students traveling abroad, the opportunity for students to experience other cultures and landscapes has obvious merit.

Objectives: Professor Pesses is currently working with Global Exchange and CSUN on a trip to Havana, Cuba. This will act as an introduction to running such programs and will hopefully develop into opportunities for AVC students.

Goal 4: Develop more online materials for the geography program

- Guided by Strategic Goal #1
- Lab activities have been developed in the past that have directly led to better student outcomes.

Objectives: This will simply take time to create new documents, multimedia, and data to supply to students through the AVC website and Blackboard.

Physical Science

Goal 3: Institutionalize the annual Summer K-12 Teacher Training academy
Objectives: 1) Increase the number of teachers that are highly prepared to teach STEM disciplines in K-12.

2) Develop a brand name for AVC as the premier local institution for K-12 teacher professional development.

Physics

Goal 4: Participate actively in the division's effort to establish a robust and sustainable Undergraduate Research program. There are two pilot projects under way, for which we will report results in our next year's annual update.
Objectives: 1) Physics faculty design and supervise student research projects that are more rigorous and engaging than the traditional class projects or honors options.

2) Publish and/or present student research papers in state and/or nation undergraduate research conferences.

Long Term (five to ten years)

Biology

Goal: Have a thriving Undergraduate Research (UR) Program with detected Facility

- Guided by district Strategic Goal # 1: The College as a community will provide students with an environment that supports learning and facilitates student success through enhanced and expanded opportunities for critical thinking.

Objective 1: Allocation of dedicated space for UR.

- Supporting action plan, data analysis, or other documentation: This Goa1 is a continuation of Goal 2 laid out in "Near Term Goals". Having such program and detected facility will serve as a magnate to attract STEM students to our college. In recent years due to economic conditions of the state (country as whole) many STEM students that could have gone to 4-year schools choose to come to AVC. Having these students is very beneficial for AVC in many ways. Not only will they help us achieve targeted goals of transfers etc., but also serve

as role models and support (tutors, leaders, etc.) for others. But as the economy improves, we might see a decline in such students. Thus, having such a program will not only help us to retain our local talented students, but also attract others. This in return might increase our student population connection to the community and many might return after completion of their studies (Especially Engineers). Having research experience as an undergrad will be very beneficial for our students when it comes to transferring and will serve as a way to recruit many capable students. Finally, there are many granting opportunities out there, especially through National Science Foundation, to procure money for developing (via remolding existing space) and supporting a dedicated UR space.

Chemistry

Goal #4: Bring program into full alignment with standard professional practices
Guided by district Strategic Goal(s) #1f, 2c, and 5d
Supported by American Chemical Society Guidelines for Two-Year Colleges

Objectives: Train faculty to use recommended instrumentation
Incorporate recommended instrumentation into curriculum
Provide experience in chemistry research for undergraduates

Part 6 - Resource Needs

Identify significant resource needs that should be addressed currently (up to three years), near term (three to five years) and long term (five to ten years). If there may be safety issues, enrollment consequences or other important concerns if a resource is not provided please make this known.*

6.1 List needed human resources. List titles in priority order. Identify which discipline/area goal(s) guides this need.

Astronomy

No additional full-time faculty are required in the foreseeable future. In the short term, we desire to find adjunct faculty to teach courses offered at night.

Biology

1. Fulltime General Biology instructor (Goal 1).
2. Molecular Biologist or any other Biotechnology expert instructor (Goal 1).
3. Fulltime Anatomy/Physiology instructor (Goal 1).
4. Fulltime Biology technician (Goal 1).

Chemistry

Full time faculty member (Goal 2, 3, 4; long-standing request)
Lab Technician—available at night and weekends; available in Palmdale (Goal 2, 3, 4, long-standing request)
More chemistry tutors—especially for Palmdale Center and for General and Organic Chemistry (Goal 2, 3, 4)
Supplemental Instructors for Introductory, General and Organic Chemistry (Goal 2, 3, 4)

Geosciences

We absolutely need another fulltime geography instructor in the department. We currently have 14 separate geography courses covering a range of topics from the physical sciences, social sciences, and geospatial technology, yet we only have one fulltime instructor. That would be like having one biology professor teach the general, micro, organismal, anatomy, and physiology courses.

Currently, the geosciences labs do not have a technician to assist with the running of the labs, ordering material, and setting up activities and experiments. This further adds to the challenges of the faculty in that addition to our normal duties we also have to be our own technicians. We would like the creation of a lab technician position for geosciences.

Physical Science

Funding needs to be secured to support SI and or tutors for the entire academic year for all sections of this course. We strongly believe that only with additional SI support we will be able to keep improving SLOs.

Physics

In order to accommodate the recent increase in enrollment and the increased number of sections offered at night, the program is in desperate need of an additional full time lab technician. This person would also support Astronomy, Geoscience, and Chemistry.

6.2 List needed technology resources in priority order. Identify which discipline/area goal(s) guides this need.

Astronomy

The only technology goal needed is an all-dome digital 3-D video projector for the virtual science classroom (HS 181). The need for this technology is immediate. As stated in 5.1 and 5.2 the video projector is critical for maintaining and increasing the current success and retention rates**.**

Biology

1. A 5Mp TV to enhance the digital microscope demonstrations in Microbiology labs (Goal 1).
2. Replacement of damaged, stolen or worn anatomical models material (Charts & Slides) used for Biology 102, 201 and 202 (Goal 1). Purchasing slides and articulated skeletons (See Table 51) to be used in Biology major's courses (Goal 2).
3. Dissecting microscopes with digital camera capabilities (Goals 2 & 3).
4. Duplication of anatomical models to permit use of HS-133 for additional sections of Biology 201(Goal 1).
5. The Anatomy lab needs an appropriate waste receptacle for dissection debris (animal and preserved materials) (Goal 1).
6. Replacement of cadavers (as needed) (Goal 1).

Table 51: List of specimens for biology majors to be used in majors lab.

Scientific name	Common name	Phylum	Live/preserved
Scypha sp.	Sponge	Porifera	Preserved specimen; prepared slides
Gonionemus sp.	Gonionemus	Cnidaria	Preserved specimen
Hydra sp.	Hydra	Cnidaria	Live specimen
Hexagonaria percarinata	Petoskey stone	Cnidara	Fossil
Dugesia tigrina	Planarian	Platyhelminthes	Live specimen; prepared slides
Dipylidium caninum	Dog tapeworm	Platyhelminthes	Preserved specimen
Ascaris lumbricoides	Roundworm	Nematoda	Preserved specimen for dissection; prepared slides
Nereis succinea	Clamworm	Annelida	Preserved specimen
Lumbricus terrestris	Earthworm	Annelida	Live specimen; preserved specimen for dissection
Romalea sp.	Grasshopper	Arthropoda	Preserved specimen for dissection
Gromphadorhina portentosa	Hissing cockroach	Arthropoda	Live specimen
Cambarus sp.	Crayfish	Arthropoda	Preserved specimen for dissection
Anodonta sp.	Freshwater mussel	Mollusca	Preserved specimen for dissection
Loligo pealei	Squid	Mollusca	Preserved specimen
Pisaster sp.	Sea star	Echinodermata	Live specimen; Preserved specimen
Eupentacta sp. (?)	Sea cucumber	Echinodermata	Live specimen
Strongylocentrotus sp.	Sea urchin	Echinodermata	Live specimen
Branchiostoma sp.	Lancelet	Chordata	Preserved specimen; whole mount
Rattus rattus	Rat	Chordata	Preserved specimen

Geosciences

We would like twelve tabletop magnifying glasses for use in the Geography and Geology lab. Our existing handheld magnifying glasses are breaking and we do not have enough for all of the students to use. These will assist in a variety of ways when students are exploring maps, minerals, rocks, and other examples and tools of the geosciences. With the AS-T in Geology there is a need to purchase materials in support of laboratory courses in Historical Geology and Mineralogy.

Physical Science

No technology needs for the near term.

Physics

No technology needs for the near term.

6.3 List facilities/physical resources (remodels, renovations, or new) needed to provide a safe and appropriate student learning and/or work environment. List needs in priority order. Identify which discipline/area goal(s) guides this need.

Astronomy

A facilities/physical resources need for astronomy is improvement to the observing deck on the second floor of the HS building to allow the operation and storage of a devoted telescope with imaging equipment. Covered storage is required to protect from outside elements, as well as the need to lock off access to the area to protect the equipment from theft or other damage.

Biology

1. For safety and security, the ability and responsibility to lock and unlock lecture and lab rooms must be returned to the faculty who use these rooms (Goal 1).

2. Creating a permanent space for undergraduate research (Goals 1-3 & Long Term Goal)

3. An alarming increase in theft, attempted break-ins and vandalism argues strongly for the installation of surveillance cameras and/or RF anti-theft security gates.

Chemistry

Chemistry lab at Palmdale Center (Goal 2, 3, 4)

Geosciences

Asbestos samples were discovered in the Geology Lab, and we are still waiting for the college to make sure it is properly disposed of. This needs to be dealt with immediately before AVC is found liable in harming students and/or faculty. This may have contaminated existing samples of other rocks, which will also need to be replaced. This could be a sizable cost depending on the extent of contamination.

Physical Science

The current facilities are adequate to support the expansion of the program, if needed, up to 50% from the current level.

The facilities at the Palmdale Center are also adequate to support the current enrollment trends there.

Physics

The current facilities are adequate to accommodate the current demand and possible increase in the near future.

6.4 List needed professional development resources in priority order. Identify which discipline/area goal(s) guides this need.

Astronomy

No professional development resources are needed. If an all-dome video projector is acquired faculty would need to be trained to use and maintain the equipment.

Biology

Workshops on implementation of Hands-on Inquiry based instructions in biology courses and writing cases that can be used in lecture instructions (Goals 2 & 3).

Chemistry

Training on newly acquired lab Instrumentation (Goal 4)
Training to implement inquiry-based methods in more chemistry classes (Goal 2, 3, 4)

Geosciences

Since GIS technology and software is constantly changing and geophysical theory is continuing to grow and evolve, we need funding for travel and conference expenses to keep relevant in our fields. Attending conferences such as the meetings of the American Geophysical Union (AGU), the Association of American Geographers (AAG), and the ESRI user conference are crucial to our continued professional development.

Physics

Staff development funds are needed on an ongoing basis to accommodate faculty training in Active Learning pedagogical methods and other technology based methods.

6.5 List any other needed resources in priority order. Identify which discipline/area goal(s) guides this need.

Astronomy

No other resources are needed in the foreseeable future.

Biology

Laptops to be used specifically in Biology majors courses. One additional laptop for Microbiology to be used by students when giving oral research presentations. Use of the instructor's laptop is not appropriate and student services frequently have trouble releasing a computer to meet this need (Goals 1-3 & Long Term Goal).

Chemistry

No additional resources needed.

Part 7 - Recommendations and Comments

7.1 List recommended changes to the Educational Master Plan to:

- **Address external issues or mandates such as legislation, industry, and professional standards, etc.**
- **Respond to outcome findings.**
- **Reflect changes in technology, methodology, and/or disciplines.**
- **Address student achievement gaps and/or meet other student needs.**

Astronomy

Currently there are no external mandates affecting the astronomy program. There has been a significant reduction of FTES and student headcount rates from 2010 to the overall period of 2011-2014, which can be attributed to mainly to the required reduction due to state budget cutbacks and the introduction of Math 102 as prerequisite. Within 2011 to 2014 we also observed a slight increasing trend in enrollment and FTES production. If this trend persists we will need to add more sections and recruit more adjuncts to teach night and weekend courses. The most obvious solution is to expand the astronomy offerings at the Palmdale center, which is under discussion already.

While we are satisfied with the current success and retention rates, we will continue to strive to increase them in the near and distant future. Faculty are committed to continuing the implementation of "active learning methods" which has been proven to increase the overall student success and retention rate. However, this trend can only continue to increase by addressing the technology and facilities needs that were discussed above.

Biology

No changes are recommended and we just want to see that the college continues to meet its three main missions, Transfer, Career Tech preparation, & Transfer equally.

Overall the Biology program is meeting its SLOs and has achieved significant progress towards its goals. We will continue to try to improve student success and retention rates provide that our human and physical resource needs are met.

Chemistry

As enrollments rise due to the restoration of the state budget, we will strive to increase the participation and success of minority students in chemistry. As every other science program, chemistry has seen significant fluctuations in headcount and FTES figures for the last 5 years. Although this is largely out of our control, we recommend that the needs of the department in terms of human and physical resources are addressed sooner than later so that we can prepare for future increases in enrolments.

Physics/Physical Science

The program currently enjoys a great reputation among students and among the local K-12 teachers. Success and retention rates are at a level higher than the college average. The program has all necessary equipment and facilities to continue to improve.

The current method of teaching engages students actively in a variety of hands-on and critical thinking activities. The method, as evidenced by success, retention, and SLO achievement rates, is very successful and we will continue to employ it.

Physics/Physical Science faculty, in collaboration with biology faculty, are involved in student undergraduate research projects and are actively promoting the concept to the entire college.

Two of the physics faculty is faculty advisors for eth AVC STEM club which has grown to over 100 members in the last couple of years.

We plan (subject to adequate funding) to continue to offer summer training academies for local teachers. The initial feedback from the pilot program offered during the summer of 2014 is very encouraging and we expect increased participation in the near future.

7.2 What changes in the program review process would improve institutional effectiveness or make the results more helpful to the program?

The current process is satisfactory and adequately addresses the needs for both the annual update and the comprehensive report. Our only issue has been the discrepancy observed in data collected locally from Banner as compared to the data reported by the CCC Chancellor's office. In various occasions we have observed significant differences form the two sources. Additionally, in some cases, the section counts and headcounts reported do not agree with the anecdotal data we collected from the divisional schedules. We recommend that a comprehensive review of our Banner data be completed collaboratively between faculty, and IR and IT personnel.

Comprehensive Program Review Self-Study Report

Mathematics and Sciences: Engineering

2014-2015

Part 1 - Area Overview

1.1 **Briefly describe how the division or area contributes to the district mission**.

The Engineering Program provides courses that satisfy education requirements for the Associate Degree or Certificate in Engineering Technology and the Associates Degree in Engineering. This curriculum also allows students to fulfill degree requirements and enroll in upper division courses and programs at accredited four-year institutions through our articulation agreements. AVC students frequently transfer without an associate's degree and based on a Memorandum of Understanding with California State University, Long Beach College of Engineering can seamlessly matriculate to their Antelope Valley Engineering Program.

1.2 Place an "X" by each Institutional Learning Outcome (ILO) supported by the division or area.

_X_ Analyze diverse perspectives from a variety of disciplines and experiences that contribute to the development of self-awareness.

X Value and apply lifelong learning skills required for employment, basic skills, transfer education, and personal development.

X Demonstrate a breadth of knowledge and experiences from the humanities, social and behavioral sciences, arts, natural sciences, and mathematics.

X Solve problems using oral and written communication, critical thinking and listening skills, planning and decision-making skills, information literacy, and a variety of technologies.

X Demonstrate good citizenship and teamwork through respect, tolerance, cultural awareness, and the role of diversity in modern society.

X Identify career opportunities that contribute to the economic well-being of the community.

1.3 After completing Parts 2-7, prepare a one page summary of the division/area. Interpret the significance of the findings. Note successes in supporting district strategic goals and where improvements are needed.

1.4 **Name of person leading this review:** Christos Valiotis and Dr. Leslie Uhazy

Part 2 - Data Analysis and Use

2.1 Please review the headcount and FTES enrollment data provided on the web link. Comment on trends over the past five years and how they affect your program.*

Table 52. ENGINEERING-FTES

	2009-10	2010-11	2011-12	2012-13	2013-14
Summer	4.5	4.3	4.092	3.5	2.1
Fall	30.7	30.9	31.6	26.7	30.2
Inter	0.0	0.0		0	
Spring	28.9	29.0	25.6	29.1	32.5
Totals	**64.2**	**64.2**	**61.4**	**59.4**	**64.8**

Table 53. ENGINEERING-HEADCOUNT

	2009-10	2010-11	2011-12	2012-13	2013-14
Summer	24	22	21	19	11
Fall	89	105	77	82	112
Inter	0	0		0	
Spring	75	80	74	85	142
Totals	**188**	**207**	**172**	**186**	**265**

From 2009 to 2014, the average FTES generated in engineering was 62.8 with a minimum of 59.4 in 2012-13 to a maximum of 64.8 in 2013-14 (Table 52). The headcount followed a similar trend with a minimum enrolment of 172 students in 2011-12 and a maximum of 265 in 2013-14 (Table 53). Since 2012, when a new full time faculty member was hired, a noticeable uptrend in both metrics can be observed by the table above. Funding provided by the US Department of Education has significantly increased the capacity of the program to attract retain and succeed engineering students. We expect a significant increase in both headcount and FTES for 2014, although we do not as yet have Fall 2014 enrollment data.

2.3 **Use the discipline student success data provided by web link. Please note by race, gender, location and modality where improvement is needed to meet the**

Institutional Standard of 68% for student success (students earning grades of A, B, C, Pass, or Credit). Identify what actions are planned to address achievement gaps in success and/or retention in the current academic year.*

Table 54. Engineering/Science (by Subject) & Math Success and Retention Rates by Term

TERM_DESC				N	Rate
Fall 2011	EngrSci	DRFT	Success_Rate	29	.83
			Retention_Rate	29	1.00
		ENGR	Success_Rate	174	.79
			Retention_Rate	174	.90
		SCIENCE	Success_Rate	3166	.70
			Retention_Rate	3166	.86
	MATH	MATH	Success_Rate	5382	.65
			Retention_Rate	5382	.87
Fall 2012	EngrSci	DRFT	Success_Rate	37	.81
			Retention_Rate	37	.86
		ENGR	Success_Rate	176	.78
			Retention_Rate	176	.92
		SCIENCE	Success_Rate	3381	.68
			Retention_Rate	3381	.87
	MATH	MATH	Success_Rate	5457	.64
			Retention_Rate	5457	.86
Fall 2013	EngrSci	DRFT	Success_Rate	30	.90
			Retention_Rate	30	.90
		ENGR	Success_Rate	203	.76
			Retention_Rate	203	.83
		SCIENCE	Success_Rate	3410	.69
			Retention_Rate	3410	.86
	MATH	MATH	Success_Rate	5401	.57
			Retention_Rate	5401	.81
Spring 2012	EngrSci	DRFT	Success_Rate	22	.95
			Retention_Rate	22	.95
		ENGR	Success_Rate	149	.75
					.87
		SCIENCE	Success_Rate	3204	.67
			Retention_Rate	3204	.87
	MATH	MATH	Success_Rate	5340	.62
			Retention_Rate	5340	.85
Spring 2013	EngrSci	DRFT	Success_Rate	31	.90
			Retention_Rate	31	.94
		ENGR	Success_Rate	173	.82
			Retention_Rate	173	.88
		SCIENCE	Success_Rate	3325	.67

			Retention_Rate	3325	.84
	MATH	MATH	Success_Rate	5393	.60
			Retention_Rate	5393	.82
Spring 2014	EngrSci	DRFT	Success_Rate	25	.88
			Retention_Rate	25	.96
		ENGR	Success_Rate	209	.81
			Retention_Rate	209	.89
		SCIENCE	Success_Rate	3486	.66
			Retention_Rate	3486	.85
	MATH	MATH	Success_Rate	5471	.57
			Retention_Rate	5471	.81
Summer 2012	EngrSci	ENGR	Success_Rate	19	.95
			Retention_Rate	19	.95
		SCIENCE	Success_Rate	81	.73
			Retention_Rate	81	.89
	MATH	MATH	Success_Rate	626	.67
			Retention_Rate	626	.88
Summer 2013	EngrSci	ENGR	Success_Rate	11	.91
			Retention_Rate	11	1.00
		SCIENCE	Success_Rate	315	.80
			Retention_Rate	315	.93
	MATH	MATH	Success_Rate	1014	.73
			Retention_Rate	1014	.91
Summer 2014	EngrSci	ENGR	Success_Rate	19	0.00
			Retention_Rate	19	0.00
		SCIENCE	Success_Rate	456	.79
			Retention_Rate	456	.90
	MATH	MATH	Success_Rate	1077	.67
			Retention_Rate	1077	.86

Table 54 above clearly shows that Engineering and Drafting success and retention rates surpass the overall college rate of 68%. For comparison, the table above shows the rates for Sciences and Math, which are significantly lower than those of Engineering. Overall, we are pleased about the program's ability to recruit, retain and succeed all students. The rates shown above reflect also the overall trend among minority groups, with the exception of African/American students. The success of those hovers around 50%, which is comparable with the overall institutional rate. However, the numbers of African/ American students are very small to statistically validate this result. We are extremely pleased to report that enrollment counts for Hispanics and women have increased by 50% from 2013 to 2014. This is a testament of the impact that the STEM HSI grant has had in increasing those rates.

2.4 **Analyze and summarize trends in student progression through basic skills courses, if applicable. Cite examples of using data, outcome action plans and/or other planning tools as the basis for resource allocation (e.g. human, facilities/physical,**

technology, financial, professional development) that resulted in or correlate with improvements in course success and progression over the past five years.

N/A

2.5 **List degrees and certificates currently offered in the discipline. Discuss improvements in the completion rates of degrees and certificates over the past five years. Also discuss improvements in license exam results, job placement/post testing and/or transfer rates to four-year institutions, if applicable. ***

Even though an Associate's Degree in Engineering is available, very few students complete the degree prior to transferring to an engineering program of their choice. Only five AS degrees have been award in the last 5 years. At present, the engineering program is developing a local degree program that will be compliant with the Transfer Model Curriculum being developed by a statewide consortium of community colleges and state university engineering programs. The AS-T degree has been slow to develop because of the high unit nature of the various degree programs, i.e. well over 120 units. However, once the template is made available, a local degree will be developed and reported on in the next program review cycle.

2.6 **Career Technical Education (CTE) programs: Review the labor market data on the California Employment Development Department website for jobs related to your discipline. Comment on the occupational projections for employment in your discipline for the next two years. Comment on how the projections affect your planning. http://www.labormarketinfo.edd.ca.gov/Content.asp?pageid=1011 ***

N/A

Part 3 – Outcome Analysis and Use

3.1 **Cite examples of using outcome (PLO, SLO, and/or OO) action plans as the basis for resource requests and the allocation of those requests (e.g. human, facilities/physical, technology, financial, professional development) or making other changes that resulted in or correlate with improved outcome findings over the past five years.***

Overall, students are performing satisfactorily meeting or exceeding the achievement targets on all SLOs. SLO reporting was incomplete until the 2012-13 cycle due to the lack of a full time engineering instructor. After the hiring of a new full time instructor in 2012, SLO assessment and reporting became more efficient and regular. In 2013, in order to improve SLO results in ENGR 210 (statics), faculty purchased and implemented data acquisition equipment to assist with hands on activities.
Surveys show that students are still confused about the proper sequence of courses necessary to transfer. Faculty recommended that a STEM trained counselor be hired, or an existing counselor be trained in STEM requirements to address this specific issue.

Part 4 - Stakeholder Assessment

4.1 **Assess how well the program serves the needs of the students, district, and community.**
Use surveys, interviews or focus groups to obtain feedback from stakeholders (students and/or others who are impacted by your services). Include documented feedback from other sources if relevant (e.g. advisory committees, employers in the community, universities, scores on licensure exams, job placement).

During 2014, the program has attempted to revive the community advisory board, but those efforts are on hold presently due to the long-term illness of the only full time instructor. The program is fully supported by community partners with numerous internships and scholarships. Those are the main reason for the observed enrollment increases form 2013 to 2014. The program also supports the local AV Engineering Program offered by CSU Long Beach. Since 2011, 55 AVC students have transferred to this program and in 2013, sixteen of eighteen graduates from the AV Engineering Program were transfer students from AVC engineering.

Part 5 - Goals and Objectives

5.1 **Review the goals identified in your most recent comprehensive self-study report and any subsequent annual reports. Briefly discuss your progress in achieving those goals.***

The overall goal of establishing a community advisory board is on hold presently due to the illness of the only full time instructor, and due to the college's reorganization plan that transferred the department to a new division under a new dean. It is expected that the efforts will resume fully during the Spring of 2015.

5.2 **List discipline/area goals and objectives related to advancing district Strategic Goals, improving outcome findings and/or increasing the completion rate of courses, certificates, degrees and transfer requirements. Discipline/area goals must be guided by district Strategic Goals in the Educational Master Plan (EMP). They must be supported by an outcome action plan, data analysis, national or professional standards, and/or a requirement or guideline from an outside agency (e.g. legislation, Chancellor's Office, accrediting body, professional board).***

Current (up to three years)

Goal #1: Offer AS in Engineering-TMC at AVC

Guided by:
District Goal 1a, 1b, 2 a
Supported by: Student need, as documented in surveys
State requirements

Objectives: Obtain final program description when released from state

Structure AVC program to align with state.
Submit for approval

Goal #2: Close Achievement Gaps in Success Rates Among Racial/Ethnic Groups
Guided by:
District Goal 1c, 1e, 1f, 4a, 4c, 5d
Supported by:
Need to increase number and success rate of African-American engineering students

Objectives: Coordinate with other campus efforts, such as HSI STEM grant, and First Year Experience program
Evaluate prerequisites
Investigate inquiry-based curricula for all engineering courses
Ensure sufficient tutors and supplemental instructors are available

Part 6 - Resource Needs

Identify significant resource needs that should be addressed currently (up to three years), near term (three to five years) and long term (five to ten years). If there may be safety issues, enrollment consequences or other important concerns if a resource is not provided please make this known.*

6.1 **List needed human resources. List titles in priority order. Identify which discipline/area goal(s) guides this need.**

- Full Time Engineering Lab Technician—available at night and weekends if possible.
- More Engineering tutors
- Supplemental Instructors for all, engineering courses

6.2 **List needed technology resources in priority order. Identify which discipline/area goal(s) guides this need.**

6.3 **List facilities/physical resources (remodels, renovations, or new) needed to provide a safe and appropriate student learning and/or work environment. List needs in priority order. Identify which discipline/area goal(s) guides this need**.

The program is in desperate need of a dedicated and fully equipped Engineering testing lab. The current room is extremely small and capable of accommodating only 7 students at a time. It uses old testing equipment that is not easily serviceable. We recommend that a new location is chosen that can accommodate at least 2 4 students and is fully equipped with the latest technology equipment that meet industry standards. Preliminary estimates

for new equipment bring the total cost to about $400,000 not including the cost for remodeling, construction, and other expenses.

6.4 **List needed professional development resources in priority order. Identify which discipline/area goal(s) guides this need.**

Training on newly acquired lab Instrumentation
Training to implement inquiry-based methods in more engineering classes

6.5 **List any other needed resources in priority order. Identify which discipline/area goal(s) guides this need.**

Part 7 - Recommendations and Comments

7.1 **List recommended changes to the Educational Master Plan to:**

- **Address external issues or mandates such as legislation, industry, and professional standards, etc.**
- **Respond to outcome findings.**
- **Reflect changes in technology, methodology, and/or disciplines.**
- **Address student achievement gaps and/or meet other student needs.**

N/A

7.2 **What changes in the program review process would improve institutional effectiveness or make the results more helpful to the program?**

N/A

Division/Area Name: Water Treatment

Year 2014

Part 1 - Area Overview

1.7 Briefly describe how the division or area contributes to the district mission.

Three credit courses are offered in the Water Treatment Program. Successful completion of each of these courses enables the student to sit for California Department of Health Services examinations. Successful completion of these examinations enables the student to receive a Grades 1&2 Operators Certification, Drinking Water Program, State of California. This certificate enables the individual to work in the drinking water industry and satisfies the AVC mission of Workforce Preparation and Economic Development.

1.8 Place an "X" by each Institutional Learning Outcome (ILO) supported by the division or area.

X Analyze diverse perspectives from a variety of disciplines and experiences that contribute to the development of self-awareness.

X Value and apply lifelong learning skills required for employment, basic skills, transfer education, and personal development.

__ Demonstrate a breadth of knowledge and experiences from the humanities, social and behavioral sciences, arts, natural sciences, and mathematics.

X Solve problems using oral and written communication, critical thinking and listening skills, planning and decision-making skills, information literacy, and a variety of technologies.

X Demonstrate good citizenship and teamwork through respect, tolerance, cultural awareness, and the role of diversity in modern society.

X Identify career opportunities that contribute to the economic well-being of the community.

1.9 After completing Parts 2-7, prepare a one page summary of the division/area. Interpret the significance of the findings. Note successes in supporting district strategic goals and where improvements are needed.

1.10 Name of person leading this review Dr. Leslie S. Uhazy

1.11 **Names of all participants in this review** Mr. Tobey Taube, and Peter Thompson, Adjunct Instructors

Part 2 - Data Analysis and Use

2.1 **Please review the headcount and FTES enrollment data provided on the web link. Comment on trends over the past five years and how they affect your program.***

2.2 **Report program/area data showing the quantity of services provided over the past five years (e.g. number transactions, acreage maintained, students served, sales figures). Comment on trends and how they affect your program.***

Table 55. Enrollment in Water Treatment WTDO 2010-2014.

	2010-11	2011-12	2012-13	2013-14
AVC Total FTES	10,652.70	9,709.95	10,593.90	11,345.63
Water Treatment FTES	9.97	9.45	13.99	12.84
Sections Taught	5	5	5	5
Student Headcount	103	99	135	124
Efficiency (FTES/FTEF)	10.02	10.36	14.25	12.78

Five sections of water treatment courses have been presented each academic year from Fall 2010 to Spring 2014. On average 115 students (range 99-135) generated an average of 11.56 FTES (range 9.45 – 13.99) each academic year (Table55). Enrollments in these

courses that generate a Certificate of Training have been relatively consistent over the years. These courses are taught entirely by adjunct faculty members who are professionals in the water field.

2.3 Use the discipline student success data provided by web link. Please note by race, gender, location and modality where improvement is needed to meet the Institutional Standard of 68% for student success (students earning grades of A, B, C, Pass, or Credit). Identify what actions are planned to address achievement gaps in success and/or retention in the current academic year.*

Table 56. Student Success and Retention in Water Treatment WTDO 2010-2014.

	2010-11	2011-12	2012-13	2013-14
Student Headcount	103	99	135	124
Retention	79	77	103	109
Percent Retention	76.7	77.8	76.3	87.9
Success	63	58	74	84
Percent Success	61.2	58.6	54.8	67.7

The water treatment courses, with only advisories and a significant potential for possible employment in a stable industry following successful completion, have attracted a stable cohort of students. On average, 115 students (range, 99-135) enroll in an academic year (Table 56). Student retention from 2010 to 2014 has averaged 79.7 percent (range, 76.3-87.9) with student success averaging 60.5 percent (range, 54.8-67.7). This is just below the Institutional Standard of 68 percent. It is apparent and recommended that the advisories of "eligibility for ENGL 099, Read 099 and MATH 070" should perhaps become prerequisites.

Table 57. Race and percent student success and retention in WDTO courses 2010-2014.

	2010-11				2011-12				2012-13				2013-14			
Race	**SR**	**RR**	**SR**	**RR**	**SR**	**RR**	**SR**	**RR**	**SR**	**RR**	**SR**	**RR**	**SR**	**RR**	**SR**	**RR**
American Indian	100	100	75	100												
Asian					100	100	40	40								
African American	33	67	11	22	50	100	50	100	48	86	39	67	40	80	36	55
Hispanic Latino	70	70	79	100	29	71	69	75	42	67	50	63	72	83	67	95
Pacific Islander									67	100	50	50				
White , alone	100	100	81	94	71	88	64	86	61	78	75	84	79	100	78	93
Two plus races	50	100					100	100	60	80	50	100	100	100	0	50
Unknown/other	65	85	55	100	67	67	67	67			33	67				
Overall	**69**	**83**	**62**	**84**	**60**	**83**	**62**	**80**	**52**	**78**	**57**	**75**	**70**	**90**	**66**	**86**

SR Success Rate.

RR Retention Rate.

As shown in Table 57 and in descending order of average rate of success, White (76.1 %), Hispanic Latino (59.8%) , and African American (38.4%) students are successful in the water treatment courses.

Table 58. Gender and percent success and retention inWDTO Courses 2010-2013.

		Fall 2010			Spring 2011			Fall 2011			Spring 2012			Fall 2012			Spring 2013	
Gender	N	RR	SR	N	RR	SR	N	RR	SR	N	RR	SR	N	RR	SR	N	RR	SR
Total	45	77.8%	64.4%	58	75.9%	58.6%	42	78.6%	57.1%	57	77.2%	59.6%	60	78.3%	51.7%	75	74.7%	57.3%
Female	3	66.7%	66.7%	8	25.0%	12.5%	1	100.0%	100.0%	6	100.0%	33.3%	11	100.0%	72.7%	16	75.0%	62.5%
Male	42	78.6%	64.3%	48	83.3%	64.6%	41	78.0%	56.1%	51	74.5%	62.7%	49	73.5%	46.9%	57	75.4%	57.9%
Unknown				2	100.0%	100.0%										2	50.0%	0.0%
RR Retention Rate.																		
SR Success Rate.																		

From Fall 2010 to Spring 2013, 337 students were enrolled in the water treatment courses. Of these students, 85.5 percent were male, 13.3 percent were female and 1.2 percent were of unknown gender (Table 58). Overall rates of success for the male and female student populations were 58.8 and 58 percent, respectively.

2.4 Analyze and summarize trends in student progression through basic skills courses, if applicable. Cite examples of using data, outcome action plans and/or other planning tools as the basis for resource allocation (e.g. human, facilities/physical, technology, financial, professional development) that resulted in or correlate with improvements in course success and progression over the past five years.

Not applicable, students tend to only enroll in the water treatment courses.

2.5 List degrees and certificates currently offered in the discipline. Discuss improvements in the completion rates of degrees and certificates over the past five years. Also discuss improvements in license exam results, job placement/post testing and/or transfer rates to four-year institutions, if applicable. *

Currently, because the course work is based on the standards of the American Water Works Association (**AWWA Standards** are used by state and national drinking water utilities and manufacturers worldwide to ensure quality and health andsafety.), the instructors award a Certificate of Training that enables the student to sit for a test administered by the California Department of Health Services. This test could lead to awarding of Grades 1&2 Operators Certification, Drinking Water Program, by the State of California. Unfortunately, we do not know the rate of success of AVC students on this test.

2.6 Career Technical Education (CTE) programs: Review the labor market data on the California Employment Development Department website for jobs related to your discipline. Comment on the occupational projections for employment in your

discipline for the next two years. Comment on how the projections affect your planning. http://www.labormarketinfo.edd.ca.gov/Content.asp?pageid=1011 *

According to the California Employment Development Department (EDD), employment opportunities in the Water and Liquid Waste Treatment Plant occupation are projected to be quite good. It is estimated that across California, from 2012-2022, the annual average number of openings will equal 420. To provide opportunity for the students of the Antelope Valley, the division plans to develop an Associate's Degree in Water Science that will be modelled after the successful program at Venture College. It should be noted that several years ago, the Water Treatment Advisory Committee had recommended the development of an associates program at AVC.

It should also be noted that AVC is being encouraged to develop a water sciences program modelled after the program present at Venture College. Margaret Lau, Deputy Sector Navigator of the South Central Coast Region, Allan Hancock College has assisted with our progress towards this end and AVC is the recipient of a California Department of Education California Career Pathways Trust grant to develop this program/pathway in conjunction with local high schools.

Part 3 – Outcome Analysis and Use

3.1 **Cite examples of using outcome (PLO, SLO, and/or OO) action plans as the basis for resource requests and the allocation of those requests (e.g. human, facilities/physical, technology, financial, professional development) or making other changes that resulted in or correlate with improved outcome findings over the past five years.***

Only three courses are currently taught in the Water Treatment curriculum and Certificates of Training are presented to successful students by the all adjunct faculty. These certificates enable students to sit for State Examinations leading to an Operator's License land the possibility of well-paying employment in the water industry. Student Learning Outcomes (SLO) need to be developed for each course and as the Associates Degree in Water Science develops Program Learning Outcomes (PLO) also need to be developed. It is important to note, however, that the courses are based on national standards.

Part 4 - Stakeholder Assessment

4.1 **Assess how well the program serves the needs of the students, district, and community.**
Use surveys, interviews or focus groups to obtain feedback from stakeholders (students and/or others who are impacted by your services). Include documented feedback from other sources if relevant (e.g. advisory committees, employers in the community, universities, scores on licensure exams, job placement).

The local Advisory Committee has expressed great interest in the expansion of the fledgling water treatment program into an Associate's Degree Program. It will be imperative to develop and assess well defined SLOs and PLOs plus maintain the standards of the AWWA. Moreover, it will be required to ascertain the success of AVC students on State licensure examinations.

Part 5 - Goals and Objectives

5.1 **Review the goals identified in your most recent comprehensive self-study report and any subsequent annual reports. Briefly discuss your progress in achieving those goals.***

The goal of developing an Associate's Degree Program in Water Sciences is in a fledgling stage. The following briefly outlines a proposed program of study

Proposed Water Science Program at Antelope Valley College

As a recommendation of the Water Treatment Advisory Committee in the Fall of 2011, Antelope Valley College (AVC) proposes to create a program of study in water science. Further as a response to the current drought conditions and the need for water conservation in the high desert, this associates degree program would not only provide opportunity for students to acquire technical and management training in potable water treatment and distribution but waste water treatment and collection.

At present AVC offers three credit courses in Water Treatment: WDTO 101 Applied Water Treatment and Distribution Mathematics; WDTO 115 Water Distribution I; and WDTO 120 Water Treatment I. Students who take these course receive a certificate of successful completion acceptable to the California Department of Public Health, Operator Certification Branch as a prerequisite to take state exams or contact hours for certificate renewal.

To meet the expectations of industry, AVC will have to develop course work addressing:

1. Water Systems Instrumentation and Controls
2. Water Quality Protection and Cross-Connection Control
3. Water and Wastewater Hydraulics
4. Motors and Pump Maintenance and Operation
5. Water Chemistry and Microbiology (Bacteria and Protista)
6. Water and Wastewater Management
7. Water Conservation

Students interested in a career in Wastewater Management could also choose from courses such as:

1. Basic Water and Wastewater Systems
2. Wastewater Treatment
3. Wastewater Collection

5.2 **List discipline/area goals and objectives related to advancing district Strategic Goals, improving outcome findings and/or increasing the completion rate of courses, certificates, degrees and transfer requirements. Discipline/area goals must be guided by district Strategic Goals in the Educational Master Plan (EMP). They must be supported by an outcome action plan, data analysis, national or professional standards, and/or a requirement or guideline from an outside agency (e.g. legislation, Chancellor's Office, accrediting body, professional board).***

Current (up to three years)
Goal: Associate's Degree in Water Sciences

- Guided by district Strategic Goal(s) #_1a; 3a,b; 6b,c
- See 5.1 above

Objectives: Curriculum and equipment will need to be acquired. A facility such as TE 3 is needed to provide practicum-laboratory space.

Near Term (three to five years)
Goal: A Water Sciences program that is part of a larger program in Environmental Sciences and Natural Resources.

- Guided by district Strategic Goal(s) #_1a; 3a,b; 6b,c
- Supporting action plan, data analysis, or other documentation

Objectives: Significant steps or actions needed to achieve the goal

Long Term (five to ten years)
Goal: A specific target

- Guided by district Strategic Goal(s) #_
- Supporting action plan, data analysis, or other documentation

Objectives: Significant steps or actions needed to achieve the goal

Part 6 - Resource Needs

Identify significant resource needs that should be addressed currently (up to three years), near term (three to five years) and long term (five to ten years). If there may be safety issues, enrollment consequences or other important concerns if a resource is not provided please make this known.*

6.1 **List needed human resources. List titles in priority order. Identify which discipline/area goal(s) guides this need.**

At present the water treatment courses are taught by two adjunct faculty members. A full-time faculty member will be needed to anchor the program. Existing faculty in chemistry and microbiology will be able to contribute to the curriculum and its development.

6.2 **List needed technology resources in priority order. Identify which discipline/area goal(s) guides this need.**

To expand the water treatment courses into a water sciences program, students will have to have access to laboratory/practicum experiences. Existing chemistry and microbiology laboratories are available and equipped with the materials to allow for study of water chemistry and water microbiology. Equipment to teach: Water/waste water Lab, Mechanical Systems Lab, Rigging Fundamentals Lab, Plumbing Lab, Pipefitting Lab, Industrial Maintenance Mechanic Labs, and Instrumentation Labs will need to be acquired. Funding is available through the Pathways grant mentioned previously (See 2.6).

6.3 **List facilities/physical resources (remodels, renovations, or new) needed to provide a safe and appropriate student learning and/or work environment. List needs in priority order. Identify which discipline/area goal(s) guides this need.**

Space in TE3 the Agriculture Laboratory will be utilized.

6.4 **List needed professional development resources in priority order. Identify which discipline/area goal(s) guides this need.**

The water sciences faculty will need financial support for attendance at professional meetings such as the American Water works Association.

6.5 **List any other needed resources in priority order. Identify which discipline/area goal(s) guides this need.**

Students will need to have internship opportunities within the local water industry and it is anticipated the Advisory Committee will be of great assistance in identifying these opportunities.

Part 7 - Recommendations and Comments

7.1 **List recommended changes to the Educational Master Plan to:**

- **Address external issues or mandates such as legislation, industry, and professional standards, etc.**
- **Respond to outcome findings.**
- **Reflect changes in technology, methodology, and/or disciplines.**
- **Address student achievement gaps and/or meet other student needs.**

No comment.

7.2 **What changes in the program review process would improve institutional effectiveness or make the results more helpful to the program?**