Liberal Arts: Math and Science
Program Review
Executive Summary

The Liberal Arts: Math and Science Program description is clear, is based directly on Title 5 language, and conveys the program’s objectives of providing a well-rounded education for those students seeking a Liberal Arts degree. However the language may need to be changed as it may not be appropriate for students transferring into certain Environmental Science and Health Career fields. Some key strengths of the program are: A sufficient variety of options is available for students to fulfill program requirements. Scheduling of Math and Science courses has always focused primarily on the demands of local students; a long-term reliable (very rare class cancellations) schedule has been in place for several years. The Math and Science Departments are well situated in curriculum currency.

Individual instructor workstations are kept current through a hardware replacement process that ensures all computers are in warranty until planned replacement at end of life. Classroom technology is also on a closely scrutinized upgrade and replacement schedule. In the area of requisites, the college has converted writing, reading, and math levels to actual courses; develop an out-of-discipline prerequisite plan to comply with state regulations and give the college guidance in this crucial area; and establish a process for consistently completing validation studies across the curriculum.

A central concern is the lower success and retention rates in online sections compared to traditional offerings. This needs to be improved. Because many online courses are Liberal Arts courses, continuing to find ways to improve retention and success rates is of paramount importance to the Liberal Arts degrees.

Safe and appropriate laboratory facilities for the lab-based science classes are a challenge at all campus locations but particularly at the non-Indian Wells Vally (IWV) sites. As the college moves ahead with facility changes at Kern River Valley (KRV) and East Kern, it is imperative that safe, sufficient, and modern lab facilities are provided. The laboratory sinks at IWV are too shallow and unsafe, however there is a plan to replace these sinks, though there is grave concern that this may not happen as the remodel was completed about 5 years ago.

Some actions required are: A second round of mapping takes place to sharpen the relation between Program Learning Outcomes (PLO’s) and courses required—such as drawing distinctions between active participation and lecture, or demonstration and application—and possibly grouping the lists by outcomes rather than subject area. This redrafting of the PLO’s needs to be completed by 2015. The college is still (this was mentioned in a program review 5 years ago) without a dedicated Institutional Researcher. The fact the faculty and staff still have to perform data analysis inhibits the ability of the Math and Science Department to sustain continuous quality improvement. Furthermore, the poor functionality and abysmal level of service provided by Curricunet (specifically for SLO reports) is a great hindrance to the efficiency of program review.
The Math and Science Department will work with changes resulting from the creation of SB 1440 Transfer degrees, which will increase alternatives to the three areas of emphasis in the Liberal Arts degrees and may affect the number of students seeking degrees in the Liberal Arts. Both counselors and faculty need to consider how they will advise future students, perhaps concluding that Associate Degrees for Transfer (ADTs) provide better preparation for transfer to Math, Science and Engineering Degrees at California State Universities and that Liberal Arts majors should be declared only as preparation for elementary school teaching or for transfer to private schools with requirements different from those of UC and Cal State universities. It needs to be determined what benefit from the Liberal Arts: Math and Science Degree students transferring into Math, Science and Engineering Degrees at UC systems will receive.
Part 1—Relevance

1. Catalog Description

The Cerro Coso Community College 2012-2013 Catalog offers the following definition of the Liberal Arts: Mathematics and Science A.A. Degree Program:

Liberal Arts: Mathematics & Science Associate in Arts (60 units total, 18 units in the area of emphasis): The Liberal Arts degrees are designed for students who wish to have a broad knowledge of liberal arts and sciences plus additional coursework in an “Area of Emphasis”. This emphasis allows students to satisfy general education requirements as well as focus on transferable course work. It is ideal for students who plan on transferring to California State University (CSU) or University of California (UC) for a major in education or for a major that Cerro Coso does not offer. Please consult with a counselor for information regarding your intended major at the specific college or university of your choice.

Analysis: Cerro Coso established the Liberal Arts degrees in 2008—Arts and Humanities, Mathematics and Sciences, and Social and Behavioral Sciences—superseding and specifying in three areas the General Education major. As was done simultaneously with the emphases in Math and Science and Social and Behavioral Sciences, in 2011 the Vice President of Academic Affairs and the faculty chairs in Arts and Humanities reviewed the language in Title 5 addressing the overarching objectives of Mathematics and Sciences, solicited input from area faculty, and then used that information as the basis for the program description and PLO’s (Program Learning Outcomes).

The Liberal Arts: Mathematics and Science degree has been relevant to the extent that it provides educational programs and services tailored to the students in the communities and rural areas served by the institution. Up to this point, it has provided an option for completing Associate-Degree requirements that are transfer-oriented. However, a statewide undertaking that has had major implications for the relevance of Liberal Arts is the SB 1440 Transfer degrees. With the increasing codification of ADT (Associate Degrees for Transfer) in areas such as English, Math, and Sociology, we anticipate a gradual but significant reduction in the number of students seeking degrees in the three areas of emphasis in the Liberal Arts. With more specific options available to them in the ADTs, we expect that some future students will declare themselves as Liberal Arts majors for the following reasons: 1. as preparation for elementary school teaching; 2. as preparation for transfer to private schools with requirements different from those of UC and Cal State universities; 3. as preparation for students who plan on transferring to California State University (CSU) or University of California (UC) for a major in education or for a major that Cerro Coso does not offer; and for terminal AA students who do not intend to transfer.

Conclusion: The description is clear, closely mirrors the state’s Title 5 language, and conveys the program’s objectives of providing a well-rounded Mathematics and Science education for those students seeking an Associate Degree. The catalogue description may need to be changed as the Liberal...
Arts: Math and Science Degree might not be appropriate for some Environmental Studies and Health Careers programs. However, the creation of far more specific ADTs might change the number of Liberal Arts majors, converting the degree from a catch-all net of non-specific intentions to more focused preparation for elementary school teaching, transfer to private schools, or transfer to CSU or UC for a major not offered by Cerro Coso.

2. Program Learning Outcomes

The following are the program learning outcomes for the Liberal Arts: Math and Science:

Upon successful completion of the courses in the area students will be able to

A. Apply multiple approaches to problem solving, using algebraic, graphical, and numerical methods to solve applied problems in other areas of mathematics, natural sciences, computer graphics, and computer animation.

B. Demonstrate a general understanding of the nature of science, the methods applied in scientific investigations, and the value of those methods in developing a rigorous understanding of the physical world.

C. Demonstrate mastery of the Scientific Method, including the experimental and empirical methodologies characteristic of science and the modern methods and tools used in scientific inquiry.

D. Perform hands-on laboratory and/or field experiments of all science classes safely.

E. Identify the difference between science and other fields of knowledge. Perform a critical analysis of a topic in order to determine science from pseudoscience

Analysis: As a part of the revision of the degree in 2011, the VP and faculty chairs identified program learning outcomes. Similar to how it proceeded with the description of the degree, the VP and chairs returned to the original founding language in Title 5 regulations section 55063 to guide the development of learning outcomes. Since program design and the definition of learning outcomes are “10 plus 1” matters, the group limited itself to writing a first draft of the PLO’s. Department chairs solicited input from the faculty in their areas and gained agreement on the language. The PLO’s were then presented to Academic Senate where they were approved.

Conclusion: Cerro Coso now has a mechanism to correlate courses to PLO’s and reflect the goals expressed in the description of the degree. Successful achievement of the PLOs is measured by SLO assessment of courses related to the respective PLO.
3. Courses/Program Matrix

In the following tables, numbers refer to the individual SLO's that align with the General Education Learning Objectives in each area.

### PLOs A and B

A. Apply multiple approaches to problem solving, using algebraic, graphical, and numerical methods to solve applied problems in other areas of mathematics, natural sciences, computer graphics, and computer animation.

B. Demonstrate a general understanding of the nature of science, the methods applied in scientific investigations, and the value of those methods in developing a rigorous understanding of the physical world.

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### Course Outcome(s) Outcome(s)

**Life Sciences**

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C. Demonstrate mastery of the Scientific Method, including the experimental and empirical methodologies characteristic of science and the modern methods and tools used in scientific inquiry.

D. Perform hands-on laboratory and/or field experiments of all science classes safely.
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Analysis: All mathematics courses involve the use of critical thinking and analysis. All of the Science courses use various aspects of the Scientific Method. Only the Lab-based Science Courses support PLO D. Although PLO C is supported by all Science classes, PLO C may need to be re-written as a strict interpretation of “Mastery of the Scientific Method” usually comes after 200-level Science classes have been completed.

Conclusion: The Math and Science Courses solidly support the PLOs for the Liberal Arts: Math and Science Program.
4. Program Pathway

Students Enrolled at the IWV campus have the most options (as far as courses offered) to earn a Liberal Arts: Math and Science Degree.

Students at the ESCC campuses have the next most options. There appear to be reliable on-site offerings of enough of the required courses, particularly the lab-based science classes. Students can take nearly all required Math classes Online.

Students taking all classes online may also receive a degree, but the course offerings in laboratory based Science classes are limited to Physical Science Lecture and Lab and Astronomy. There is a lecture-based Biology class offered.

Students at the KRV campus may be able to obtain a degree, but it will usually require taking online math classes and traveling to IWV (about 50 miles) for lab-based Science classes. There may be more options, dependent upon Science Department planning, of lab-based biology classes at KRV with the hiring of the new full-time tenure track Biology instructor.

Students at the East Kern campus have the fewest options. It may be possible to get a degree, but most transfer-level math classes must be taken online and there are no on-site options for lab-based physical science classes. Students may need to take these online.

Analysis: The Math and Science Departments have put together a reliable (very rare cancellations) long term schedule that gives students the opportunity to complete the Math and Science requirements within 2 years, provided students are placed in transfer-level courses in their first year. This long-term schedule has been developed over the last 7 years and minimizes conflicts among classes. Math classes are offered both on-site and online. The ESCC campuses have now been developing long-term reliable classes in Chemistry and potentially Physics.

Students who place into transfer-level courses in their first year at other sites have the option of completing their math pathway via distance education or by taking on ground math courses. All required and elective math courses are offered on ground at the main IWV campus as well as in a distance ed format with two exceptions. Math C255 Differential Equations currently has no supporting course management system and is only offered on ground. While Math C257, Linear Algebra has been taught on ground at the IWV campus in the past, it is currently only offered online due to the fact that the Math Department is currently understaffed. Math C121, Probability and Statistics, and Math C151, Analytic Geometry and Calculus, are also offered online during an 8-week summer session.
5. Conditions of Enrollment

Courses in Physics and Chemistry have mathematics prerequisites. These prerequisites are not only appropriate, but also required to maintain transfer and articulation—the prerequisites generally mimic those of the transfer institution. The Department constantly checks the UC and CSU courses to determine if any changes are warranted.

Over the past several years, the Science Department has been a strong advocate of selecting appropriate prerequisites and advisories. Many college Science books in particular are written at Gunning Fog Index of 13 or 14—especially those in Biology. The Department has judiciously chosen the appropriate English prerequisites/advisories for classes. In some cases, a semester of Chemistry is required or advised for a Biology C262 Microbiology. There is some difficulty in establishing this as a prerequisite as the Chemistry offerings at the ESCC Campus have until recently not been consistent. The Department continues to monitor the situation.

Some of the physics courses have a Calculus prerequisite or a concurrent Calculus enrollment requirement. It is recommended that students complete the Calculus I prerequisites early in their course of study. Biology courses have a prerequisite of Intermediate Algebra, and this requirement should be completed early in the program as well. The Math Department has designed a long term schedule so that prerequisite courses such Intermediate Algebra, College Algebra and Trigonometry are available both semesters as well as during the summer session.

Analysis: Consistent with the Arts and Humanities Analysis, the Reading and Writing advisories have been changed to the appropriate English course.

A related but more complex development is the recent change in Title 5 language permitting out-of-discipline prerequisites. The language requires colleges to have a plan for developing such prerequisites and not just embarking on isolated and scattered changes. The Science Department has embarked on a deliberate process for enforcing out-of-discipline prerequisites: Generally one or two courses—particularly those with low success rates due to, for example, inability to read and comprehend the textbook, or to perform the basic mathematics in the course, were revised via the Curriculum process to include the enforceable prerequisite.

Conclusion: The Science Department has been at the forefront of establishing out-of-discipline prerequisites. This is facilitated by a years-long awareness of why students are unsuccessful, and by the fact that the transfer institutions also have out-of-discipline prerequisites (usually Math or English). The Science, English and Math departments are in the progress of statistically validating these prerequisites. Preliminary feedback from instructors in which an English prerequisite has been enforced are positive. To paraphrase the input: “Students often fail or drop the course because they are unable to read the textbook. It is encouraging that I am seeing far fewer signs of students’ inability to read the text.”
Part 2—Appropriateness

1. Connection to College Mission

Analysis: The Liberal Arts: Math and Science degree fulfills the college mission of providing educational programs and services tailored to the students in the communities and rural areas served by the institution. Up to this point, it has provided a viable option for completing Associate Degree requirements that are transfer-oriented. However, as mentioned earlier, the SB 1440 Transfer degrees might have implications for all three of the Liberal Arts emphases. Most future students will declare themselves as Liberal Arts majors as preparation for elementary school teaching, for transfer to private schools with requirements different from those of UC and Cal State universities, as preparation for students who plan on transferring to California State University (CSU) or University of California (UC) for a major in education or for a major that Cerro Coso does not offer; and for terminal AA students who do not intend to transfer.

Conclusion: The degree is sufficiently and appropriately derived from the college mission, but the creation of far more specific ADT’s might affect the number of Liberal Arts majors, converting the degrees to more focused preparation for elementary school teaching, transfer to private schools, or transfer to CSU or UC for a major not offered by Cerro Coso.

2. Determination of Student Needs

In the last five years there has been tremendous growth in online course offerings, which peaked in 2010. Large numbers of students outside the area enrolled in Cerro Coso online GE courses, leading to a growth in online GE offerings. The proliferation of course offerings provided a boost to FTES, which led to a period of unfettered, unevaluated growth. More recently, however, there has been a shift in focus to achieving a balance between onsite and online to better serve our local student population. Demand continues to be high for online GE offerings, particularly core GE survey classes.

Science offerings at the ESCC Campuses have grown substantially since the hiring of a Full-Time Biology instructor 5 years ago. The presence of the full time instructor has allowed the department to offer a consistent Biology track. The full-time instructor and the Lab Manager at IWV have provided more consistent Chemistry offerings. Now that the Fume Hoods appear to be working at ESCC and have been certified; it may be possible to offer courses such as Chem C111 or Chem C113.

In addition to the above limitations in offerings at other campuses, Science offerings are further limited by the lack of safe and appropriate laboratory space, and in some cases, qualified instructors.
Conclusion: In order to increase student success and retention, Science and Math courses must be scheduled appropriately and with deliberation. In particular, adequate laboratory facilities must be available for many Science Classes.

Very few lab-based science courses are offered online. Many professional societies (The American Chemical Society for example) **absolutely require that all labs be hands on**, with computer simulations used only as supplements. Other disciplines, such as Biology and Physics also require hands-on labs. Courses such as Introduction to Physical Science (PHSC C115), Introduction to Biology (BIOL C101) and Astronomy (PHSC C121) are offered online because they lend themselves well to the online environment and the labs can be performed safely and/or computers are used appropriately for the lab. Offering any additional lab-based Science classes online must be done with the utmost care and deliberation. Strictest attention must be paid to maintaining transferability and extra caution is required because all online classes tend to have greatly lower success rates.

Math offerings at the ESCC Campuses have been streamlined over the last three years to include a consistent and clear path towards program completion. PreAlgebra, Beginning Algebra, Intermediate Algebra, and Probability and Statistics are now scheduled consistently during a regular Math Block time frame and the delivery mode of ITV has been eliminated. At both the Bishop and Mammoth Lakes campuses these course are scheduled during the Math Block time so that there will be as little conflict as possible with other courses that students need towards graduation. At the KRV campus, this streamlining through the Math sequence has been designed by the collaborative efforts of a new campus manger and a full-time senior math faculty who now teaches all of the math classes offered at the KRV site. This same math faculty also travels to and teaches at the new Tehachapi site where the same math sequence is now being implemented. At the East Kern campus, the PreAlgebra, Beginning Algebra, and Intermediate Algebra sequence has been accelerated to be completed in as little as one and a half semesters. This accelerated program was implemented for the first time in the spring of 2014 with good results. Classes at this campus are generally comprised of a small group of students who are motivated to complete the three course math sequence in the spring and summer sessions so that they may move ahead with their careers.

The Math offerings at the IWV campus have been maintained to support the online and on ground math programs, the science program, and other programs that require a solid math foundation. Within the last year, some courses such as Trigonometry, Business Calculus, and Finite Math have been moved to being offered in alternate semesters or a different semester than what they had been scheduled previously in order to reduce the amount of time that a student needs to wait until the subsequent math course is offered. In the Fall of 2014, the math faculty at IWV lost one of its full-time faculty but is still able to offer the math courses that support several of the school’s programs. This is due in part to the fact that the Math Department currently employs several excellent and reliable adjunct instructors. However, in order to sustain the consistency in offering these math courses in years to come, the department needs to hire another full-time faculty member. In addition, the Math Faculty at the IWV
main campus continue to look for better ways to accelerate students through the remedial math sequence.

Analysis: The Math and Science Departments use careful planning, rigorous instructor evaluations and long-term scheduling to meet student demand. Lab facilities at some sites will be needed to meet the demand for safe lab courses at other sites. The Math Department needs a replacement full-time tenure track position in fall of 2015 to meet student demand.

3. Place of Program in Curriculum/Similar Programs

The Liberal Arts: Science and Math degree is designed for students who intend to transfer to a four-year institution; therefore, as part of the required courses for the degree, it fulfills the CSU Certification and the IGETC transfer patterns. The CSU Certification is the pattern of general education (GE) for the California State University system. The Intersegmental General Education Transfer Curriculum (IGETC) is the pattern of GE specific to the University of California system, but it is also applicable for transfer to CSU.

Analysis: The courses on the list are designed and approved for transfer, and the degree is similar in both requirements and course options to those required across the state.

Conclusion: The areas chosen are comparable to other Math and Science degrees and adhere to Board policy language.

4. Majors and Completers

Below is a table of students listing Liberal Arts: Math and Science as a major for the past five years.

<table>
<thead>
<tr>
<th>Year</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16</td>
<td>46</td>
<td>46</td>
<td>69</td>
<td>107</td>
</tr>
</tbody>
</table>

The Fall 2014 list is being compiled.

Below are the completers of the Liberal Arts: Math and Science degree in the last six years

<table>
<thead>
<tr>
<th>Year</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>14</td>
<td>21</td>
<td>23</td>
<td>46</td>
<td>43</td>
</tr>
</tbody>
</table>

The numbers of majors and completers has been rising steadily for the past five years. Over the past five years, 150 students have completed the degree out of 284 declared Majors. At first glance, the completion rate of 52.8% (150/284) seems rather low; however, the Liberal Arts Math and Science Degree is a 2-year program. Students declaring Liberal Arts Math and Science as a major in fall 2013
should not be counted as they are one year into the program (their respective completion date is Spring of 2015). A more appropriate data analysis yields 150 completers out of 177 majors for a very respectable 84.2% completion rate. An 80% completion rate will be used as a benchmark for the next program review.

5. Summary of Student Demand Data

See the attached files for detailed Data. Student demand (and enrollment) appears fairly solid in the 100-level Science classes. The demand (enrollment) for 200-level classes is significantly lower and is addressed appropriately with long-term scheduling. 200-level Math, Physics, Biology, and Chemistry are scheduled to meet student demand by the appropriate long-term scheduling. Additional sections of BIOL C251 and C255 have been added to the long-term schedule after careful analysis of waitlists. Chem C111 has seen a large increase in enrollment (average going from 29 to 45 in the past 2 years). The section size for Chem C111 has been increased to 28 and additional sections of Chem C111 are offered when appropriate.

The numbers of both Majors and Completers has increased steadily over the last 5 years. If this trend continues, additional sections and offerings may be necessary.

6. Labor Market Information and Analysis (CTE Programs Only)

Not Applicable

7. Explanation of Employer Relationship (CTE Programs Only)

Not Applicable

8. Advisory Committee (CTE Programs Only)

Not Applicable

9. Current Cost of the Program to Students

The following chart is based on 28 units for an academic year.

<table>
<thead>
<tr>
<th>Cerro Coso Community College</th>
<th>Estimated Cost of Living for 2012-2013</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Based on 28 units (Fall, Spring, Summer)</td>
</tr>
<tr>
<td>Living at Home</td>
<td>Living Away from Home</td>
</tr>
<tr>
<td>Fees</td>
<td>Fees</td>
</tr>
<tr>
<td>Books &amp; Supplies</td>
<td>Books &amp; Supplies</td>
</tr>
</tbody>
</table>

Version 2013-14
Approved by IEC, 4-30-13
Although nearly all Science and Engineering classes have a laboratory component which consumes materials, there is a regulation strictly forbidding the charging of a materials fee.

Analysis: The materials fees for these courses are determined by the department and approved yearly by the Board of Trustees. The charging of materials fees is compliant with the CCCC’s Student Fee Handbook, and the fees are often part of the district’s yearly audit. The Science Department strongly objects to the regulation that does not allow the charging of materials fees for laboratory courses. As resources become more difficult to obtain and expenditures at the discipline level in the supply budget are undergoing increasing scrutiny (even down to expenditures of several dollars), the inability (it is apparently illegal due to a ridiculous law) to charge a modest materials fee of $30 per student per class to replace broken glass, which is a trivial amount compared to the cost of the program, puts an increased strain on the supply budget. The Science Department has also experimented with lower cost textbooks, but found that students were not completely satisfied with the cheaper texts as they did not have all the reference material. The instructor was completely dissatisfied with the level of service provided by the textbook publisher.
1. Staffing

Science

Over the last five years, based on retirements, replacements, or identified demand, several faculty members have been hired in Math and Science areas:

- Full Time Tenured Biology at ESCC
- Full time Tenured Physics at IWV
- Full time Tenured Biology at IWV

Math

In the past five years, 1851.3 FTES in Mathematics courses were produced by a total of 123.3 FTEF, resulting in a productivity rate of 15.00, which is higher than the corresponding number for the college as a whole (14.6).

Analysis: Between the 2009 and 2011 academic years, there was a pattern of steady decline in the ratios of traditional to online delivery modes for math courses. However, there was a dramatic increase in the ratio (from 0.67 in 2011-12 to 1.02 in 2012-13) which most likely was a direct result of the Math Department’s decision to implement exam proctor requirements in all online math courses from Math C055 and higher. Over the last year, the ratio has dropped back to what it was in 2009-10 (0.77) suggesting that some students who were originally deterred from online delivery are now returning to online courses as they adjust to the testing procedures of the math department. The data also indicate that over a 5 year period, the drop rates between the first day and Census were higher for online courses than in traditionally taught math courses as is evidenced by the increased ratios of traditional: online at census versus the same ratio on the first day. Since more than half of the Math Department’s enrollments are from distance ed students, the importance of quality online math instruction cannot be overemphasized. The math department maintains the practice of allowing only its full-time faculty to deliver instruction online in order to ensure that best practices are implemented in the online environment. One such practice addresses the college’s policy of “regular effective contact” between teacher and student. Although different instructors have different methods of implementing this policy of reaching out to students through the use of materials such as discussion boards, assessments on the moodle website, videos and online office hours etc., all the fulltime instructors are aware of the importance of maintaining and continuously improving over time the materials they put into their moodle courses. This practice of allowing only full-time faculty to teach online is also maintained in order to insure the integrity of the online Math Degree.

Conclusion and Analysis: The College is currently meeting student demand in Math and Science courses. The math adjunct workload is currently 30% and is in line with Cerro Coso as a whole and permits the
institution to offer as many sections in as many different time blocks as possible in order to maximize student access to courses. However, in order to maintain quality online instruction and provide access to all of the math offerings in a consistent sequence year to year, it is projected that a new full-time tenure track Math instructor will need to be hired in the fall of 2015. The Science Department has adequate full-time and part time faculty to meet demand; however, due to the limited adjunct teaching pool, a loss of any full-time faculty in Science would render the Science Department incapable of meeting demand.

The College is currently meeting student demand in Math and Science courses. The adjunct workload, while higher than the 25% suggested by the 75/25 law, is in line with Cerro Coso as a whole and permits the institution to offer more sections with no appreciable difference in student success. The college hiring process for full-time faculty has seen great improvement over the past 5 years. While not perfect, the most recent iteration of the full-time faculty hiring process is improving. However, the hiring process for adjunct faculty (particularly in Science and Engineering) has been nothing short of non-functional for the last four years or more. Advertising does not accurately reflect the job location. When adjuncts apply from out of the service area no follow up email is sent by human resources, letting the candidate know the work is temporary and on site. When out of service area adjuncts are left in our pools it artificially inflates the numbers of qualified applicants. The Science Department at the utmost focuses on maintaining transferability.

2. Professional Development

A Distance Education Task Force was assembled by the president in the fall of 2010. This group established a series of recommendations for improving success and retention in online and distance education courses. Action has been taken on a number of these recommendations, including reinstituting faculty training and ongoing professional development opportunities.

This discrepancy also has been addressed by professional development opportunities specifically targeting adjunct instructors. For example, in Fall 2011, adjuncts were invited to the IWV campus to participate in a workshop on SLO development and assessment. The adjuncts who attended were provided with an overview of the purpose and value of SLO’s and training on SLO development and assessment. Professional Development needs are also met by Flex day training and by Flex Day Proposals and Completion documents that are tailored to the needs of the individual faculty. Most recently a professional development day was made available to all adjunct faculty. There were several useful sessions on teaching and success strategies at this meeting.

3. Facilities and Physical Resources

Each department uses the process of the annual integrated planning cycle to evaluate its needs. The departmental needs are fed into section- and then college-wide needs. Needs based on student safety
(e.g., emergency eyewashes) and state and federal law (ADA compliance) are given first priority. Other high priority equipment items include program-critical materials necessary for student success in the class (e.g., up-to-date maps; replacement of broken or obsolete equipment; etc.). Items in the next priority level include equipment to increase section size or accommodate anticipated growth.

The department submits a prioritized list of equipment needed for the following academic year, as well as any identified facility needs (e.g., new or updated smart classrooms; replacing laboratory sinks that are too shallow; etc.). The Maintenance and Operations and Information Technology divisions identify the items listed in the annual unit plans for each department, evaluate such needs across the college, and summarize the trends and commonalities in a resource request analysis, one of the documents of the integrated planning cycle.

In the last five years, a major facilities project was completed at IWV impacting Math and Science courses: the renovation of the Science Labs. **There are still some issues that have not been solved to the satisfaction of the Science Department.** The sinks are too shallow (a safety hazard and the department has written evidence that the shallow sinks were a cost-cutting measure and not an ADA issue) and secure access to the Prep room is problematic. This issue has appeared on nearly every Annual Unit plan for the Science Department. The Science Department remains hopeful that these issues will be resolved, however there is great concern that this issue is stuck somewhere in limbo and may never get solved.

At ESCC, the fume hoods have been put in working order and have been certified. This may allow for expanded offerings in Chemistry.

Conclusion: The shallow sinks at the IWV campus are a major concern. The fact that the construction was completed nearly 4 years ago and the project is stuck in limbo at the District is ridiculous. The Science Department must maintain constant vigilance to make sure these concerns are not forgotten, and will seriously consider filing an unsafe work environment complaint against KCCD (although it appears the sink issue may be corrected in June of 2015). The Math Department has no major safety concerns as the math laboratories can be held in traditional classrooms. It may be possible to expand Science offerings at ESCC.

4. Technology

Currently, Liberal Arts courses are taught online and on campus. Instructors who teach online or plan to teach online are encouraged whenever possible to attend appropriate workshops. The current office of Distance Education routinely offers Moodle and other distance education training on Flex days as well as throughout each semester in the form of workshops, webinars, and “lunch and learns.”
In the last five years, the college has seen a major upgrade of the iTV classrooms and the installation of several smart classrooms at IWV and ESCC, enough to fulfill current curriculum needs at these locations. The art building at IWV recently put in a request to convert two of its rooms to Smart classrooms. At KRV and East Kern, classroom technology needs are currently being assessed in light of the planned renovations. Other technology upgrades, such as low profile projectors (which appear to be very popular with the faculty) are forthcoming.

The laptops in the Science Labs are very slow.

Conclusion: In terms of technology currency, the college is well situated. The only concern is the laptop computers in the Science Labs, which appear to get slower and slower with each new software and operating system push. Furthermore, instructors no longer have administrative privileges on the laboratory work stations. This decreases efficiency when notifications for routine software updates can no longer be performed by the instructor.

5. Marketing

Aside from the program page on the college website, the biggest marketing tool that the Math and Science Departments have is word-of-mouth. As students attend programs such as “Open House” and the 5th grade “I’m going to College” they learn of the facilities and instructors available to them. Furthermore, as Cerro Coso graduates with Bachelors, Masters, and PhDs return to their respective areas, Cerro Coso is cast in a positive light.
Part 4—Student Achievement

1. Course-Level Student Performance Data

The student success rates are quite varied throughout the Math and Science Departments, from 40% to as high as 100%. Courses with 100% success rates consist of capstone classes (often classes with 2-3 in-discipline prerequisites) and honors classes (with 10 or fewer people). Courses with the lowest success rates are almost exclusively online classes. See attached data for each class.

The number of majors and completers has been rising steadily for the past 5 years. Over the past 5 years 150 students have completed the degree out of 284 declared Majors. At first glance, the completion rate of 52.8% (150/284) seems rather low, however, the Liberal Arts Math and Science Degree is a 2-year program; students declaring Liberal Arts Math and Science as a major in fall 2013 should not be counted as they are one year into the program (their respective completion date is Spring of 2015). A more appropriate data analysis yields 150 completers out of 177 majors for a very respectable 84.2% degree completion rate. An 80% degree completion rate will be used as a benchmark for the next program review.

Analysis: Consistent with data across the state and country, online shows a statistically significant lower success and retention rate. Strategies for improving this include providing orientation and workshops for online students, and guidelines for effective student/instructor contact. Despite numerous studies by many organizations, there is still no clear cause for this performance. Until the cause is discovered, care must be taken not to waste resources on unproven methods. Some courses have low success rates due to the fact that there are out-of-discipline unenforceable prerequisites. While it might seem perfectly logical to require that students be able to read the textbook (often written at college level reading (ENGL C101)), the resources needed to enforce these prerequisites are limited (no institutional researcher for example) and there is some resistance/concern about access to classes.

2. Employment Data (CTE Programs Only)

Not Applicable

3. Summary of Achievement of Student Learning Outcomes

All of the course-level SLO’s in Math and Science have been assessed and entered into CurricUNET. However, by the next program review, Cerro Coso must be at the level of sustainable continuous quality improvement, as defined by ACCJC. In terms of making progress, this means assessment results must reflect all campus locations, include all delivery modes, and involve all faculty contract types, and that the cycle of identifying gaps, designing improvements, and reassessing is clearly in place for all
disciplines. Given the large number of sections, the continued lack of an Institutional Researcher, and the poor to abysmal functionality of Curricunet, achieving this will be a challenge.

4. SLO Gaps Identified

Below gaps and improvement designs are listed for individual courses that were found to have gaps in SLOs. Because CurricUNET has a poor/non-existent SLO reporting program, the formats of these reports vary.

**Chem C113 (General Inorganic Chemistry II)**

One of the gaps identified was the achievement of “Understanding of Electrochemical Reactions” SLO 7 in Chem C113. This was identified in 2010 and measures were put in place to improve this: introducing the topic of oxidation states earlier in Chem C111 and Chem C113, and reviewing the material more often, and placing the assessment questions on the second midterm as well as the final. This led to the achievement of 70% of this outcome in 2013 and 2014.

**Biology C255 (Human Physiology)**

<table>
<thead>
<tr>
<th>Semester Assessed</th>
<th>SLO/AUO</th>
<th>Target Missed/Gap Detected</th>
<th>Improvements Designed</th>
<th>When Reassessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL C255 Spring 2014</td>
<td>SLO 2. Relate cellular chemistry to cellular metabolism and functions.</td>
<td>Target missed 58% correct Chemistry is a particular weakness for many Physiology students</td>
<td>As chemistry is not a prerequisite for the course, an attempt is made to provide students with one or two lectures to prepare them for the chemistry required for successful comprehension of human physiology.</td>
<td>Spring 2018</td>
</tr>
</tbody>
</table>

There is an SLO gap in BIOL C255 (Physiology). This is due to the fact that Chemistry is not a prerequisite for BIOL C255.

SLO gaps were also identified some of the Math courses. Below is a detailed discussion:

**Math C121 Statistics**

Below are the outcomes which missed the 70% target and the departmental recommendations.
Outcome B 58%
Upon successful completion of this course 70% of the students should be able to have a basic literacy in the areas of probability and statistics.

Plan for improvement:

1. Describe the population and sample in an experiment.
2. Draw a tree diagram for a probability experiment.
3. Demonstrate the concept of mutually exclusive using a Venn Diagram.
4. Explain the concept "independent".
5. Define the random variable, sampling distribution, hypothesis test, null hypothesis, and p-value.
6. Use normal, binomial, t, chi-square, and F-test tables.
7. Describe what it means to reject the null hypothesis.

Outcome C 60%
Upon successful completion of this course 70% of the students should be able to follow and evaluate a statistical line of reasoning.

Plan for improvement:

1. Encourage students to use and learn the flow charts on pages 400 and 403 when working hypothesis test problems. The chart on page 403, fig. 8-7 is especially useful in helping with the wording of final conclusions. Differentiate between terms such as "support" and "fail to reject". It might be helpful to use the wording "don't reject" in place of "fail to reject."
2. Show students the connection between confidence intervals, p-values and the test statistic. Encourage them to check that the different methods agree and support the same outcome.

Outcome D 52%
Upon successful completion of this course 70% of the students should be able to choose and apply appropriate statistical techniques to real world data problems.

Plan for improvement:

1. Define the word inclusive so that students see the difference between a small probability and one that is zero.
2. Emphasize the definition of probability, especially the denominator part.
3. Draw tree diagrams for probabilities involving multiple trials to emphasize the multiplication rule.
4. Present more examples of contingency tables in class so that errors are not made in interpreting them.
5. For the concept of odds, arrange a field trip to Vegas. LOL
Math C130 Finite Mathematics

There were three outcomes that were under the 65% success target for this course. They are listed below and department recommendations follow.

Outcome A 52%
Upon successful completion of this course 70% of the students should be able to recognize and graph functions.

Plan for Improvement:

a. Present a "big picture" explanation using a scatter diagram with several lines drawn through it, and ask which line best fits the points in the diagram.
b. Explain the "Least Squares" approach to curve fitting, first graphically, then algebraically.

Outcome B 69% (Decided Okay—no action needed at this cycle)
Upon successful completion of this course 70% of the students should be able to understand applications of rates of change.

Outcome C 59%
Upon successful completion of this course 70% of the students should be able to use both geometric and simplex methods of linear programming to solve optimization problems with two or more variables.

Plan for Improvement:

Here's another one where pictures help. Tie together the concepts of evaluating the objective function at corner points with the Simplex Method process. Demonstrate that the first process occurs in two dimensions, whereas the second occurs in at least two.

Outcome G 57%
Upon successful completion of this course 70% of the students should be able to summarize and analyze data sets and apply statistical models to them.

Plan for Improvement:

This is a good one for doing experiments such as getting data from scale model trains, roller coasters, and assortments of springs; algal or bacterial growth in a Petri dish for logistic curve data gathering is also good and maybe helps relate the stuff to biology classes.

a. Present a "big picture" explanation using a scatter diagram with several lines drawn through it, and ask which line best fits the points in the diagram.
b. Explain the "Least Squares" approach to curve fitting, first graphically, then algebraically.
Math C131 Calculus for Business

Outcome E 68%
Upon successful completion of this course 70% of the students should be able to recognize and graph functions.

Student success rate at 68% is close to the target 70%. The numbers are really close and we will keep an eye on these outcomes in the future.

Outcome G 65%
Upon successful completion of this course 70% of the students should be able to find the maximum and minimum in more than two variables by the second derivative test and LaGrange Multipliers.

Student success rate at 65% is close to the target 70%. The numbers are really close and we will keep an eye on these outcomes in the future.

Math C141 College Algebra

Target missed/ gap detected

<table>
<thead>
<tr>
<th>Spring 2014</th>
<th>Math 141 5. Recognize the equations of exponential functions and logarithmic functions, describe their graphs and use their properties algebraically and via calculator methods.</th>
<th>57.9% / 12.1%</th>
<th>Spend more class time working with transformations involving logarithmic and exponential graphs. Associate graphs to various types of functions and encourage the use of graphing calculators. Allow more class time to be spent with students presenting their graphs to the class.</th>
<th>3/6/19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 141 7. Perform basic operations with matrices and determinants; solve systems of equations by multiple methods.</td>
<td>65% / 5%</td>
<td>Construct assessment problems that allow for partial credit to be given for parts done correctly. A grading rubric that accounts for how far the problem</td>
<td>3/6/19</td>
<td></td>
</tr>
</tbody>
</table>
Liberal Arts: Math and Science Instructional Program Review

Math 141 8. Find limit values through exploratory numerical methods and through application of basic algebraic principles. 

Math 141 9. Apply multiple approaches to problem solving, using algebraic, graphical, and numerical methods to solve applied problems in other areas of mathematics, natural sciences, computer graphics, and computer animation.

Outcome F 66%
Upon successful completion of this course 70% of the students should be able to analyze trigonometric equations to determine what combination of algebra and identities will lead to a solution.

The success rate is close to 70%. The department will closely monitor this outcome in the future.

Outcome G 67%
Upon successful completion of this course 70% of the students should be able to apply trigonometry to operations with complex numbers.

The success rate is close to 70%. The department will closely monitor this outcome in the future.
Outcome I 44%
Upon successful completion of this course 70% of the students should be able to identify and solve problems using parametric equations and vectors in the plane and in space.

Although the results are very low for this particular outcome, there is no record of any departmental discussion on how to improve.

Math C151 Analytic Geometry and Calculus I

Outcome F 67 %
Upon successful completion of this course 70% of the students should be able to apply the integral in finding the center of mass in one and two dimensions.

The success rate is close to 70%. The department will closely monitor this outcome in the future.

Math C152 Analytic Geometry and Calculus II

Outcome D 67 %
Upon successful completion of this course 70% of the students should be able to identify the conic section represented by a second degree equation and give the foci, vertices, and directrices.

The success rate is close to 70%. The department will closely monitor this outcome in the future.

Math C251 Analytic Geometry and Calculus III

Outcome D 58 %
Upon successful completion of this course 70% of the students should be able to use vector-valued functions to describe motion in space.

Plans for Improvement

Student success rate falls below 70%. Departmental discussion suggests that more time during the semester is devoted to this chapter, and less time to the differential equations chapter; the rationale being that differential equations is offered as its own class.
5. SLO Improvements Planned

The Planned SLO improvements are listed with the individual courses. However, the planned improvements can be summarized:

**Science Classes:** Carefully and deliberately incorporate out-of-discipline prerequisite (Chemistry) for Human Physiology (BIOL C255) and re-assess the SLO after the prerequisite is in place. Continue to monitor SLO 7 in General Inorganic Chemistry II (Chem C113)

**Math Classes:** Spend more time on the subject areas that are in the subject areas of the SLOs needing improvement; monitor the SLOs that are borderline; and use some real-world examples. Develop a strategy for improving outcome I of Math C142 (Trigonometry).

SLOs will be re-assessed during the next cycle and it will be determined whether the improvements worked.

6. Summary of Achievement of Program Learning Outcomes

The success rate in achieving the PLO’s is almost universally 70%, a generally very positive picture, with the vast majority of Student Learning Objectives (SLO’s) meeting the PLO’s. Considering the overwhelming number of satisfactorily achieved SLO’s, students are virtually assured of achieving the PLO’s in one class or another.

Conclusion: Both the GE Program Review and the SLO committees agree that a second round of mapping is needed to sharpen the relation between the PLO’s and SLO’s and course content—perhaps some PLO’s can be reworded or even combined for better effect, perhaps SLO assessments can be better chosen to measure the learning domains of the PLO’s with which they match, perhaps some classes just need to be more effective in delivering course content. In any event, the belief of the committee is that 80% of the task has been completed in establishing the PLO’s, mapping them to SLO’s, and completing the first round of assessments. What needs to happen now is modifications and tinkering within the framework to achieve better and more precise assessment, leading to better and more precise improvement, the hiring of a dedicated Institutional Researcher and a vast improvement in Curricunet.

7. PLO Gaps Identified

Two of the PLO’s (C and D) raised concern:
C: Demonstrate mastery of the Scientific Method, including the experimental and empirical methodologies characteristic of science and the modern methods and tools used in scientific inquiry.

D: Perform hands-on laboratory and/or field experiments of all science classes safely.

PLO C appears to require a 200-level Science class. Not all students completing this program will have completed any of the 200-level Science classes.

PLO D raises concern as the only ESCC and IWV offer hands-on lab classes. Students at KRV, East Kern or online may need to travel to the appropriate site to meet this requirement.

8. PLO Improvements Planned

PLO C may need to be re-written/re-assessed to so that a 200-level Science class is not required. The changing of PLO D is a bit more problematic. It needs to be assessed whether the laboratory sections of the online classes is sufficient to meet PLO D.
1. Analysis of Current Program Strengths

A. The program description is mostly clear, is based directly on Title 5 language, and conveys the program’s objectives of providing a well-rounded education for those students seeking a Liberal Arts degree.

B. The demand has been steadily rising for the past 5 years, and completion rates are averaging 84%

C. A sufficient variety of options is available for students to fulfill program requirements at IWV.

D. The college now has a mechanism to correlate courses to PLO’s. Successful achievement of the outcomes is measured by SLO assessment of individual courses.

E. The program is sufficiently and appropriately derived from the college mission.

F. Course scheduling is done according to student need, takes into account the unique circumstances at the campus locations, and is sufficient to meet demand.

G. The college is well situated in curriculum currency. Largely on account of early faculty champions in the key positions of CIC Chair and SLO Coordinator, Cerro Coso has developed a culture of curriculum currency, from keeping COR’s continually up-to-date to defining SLO’s.

H. In terms of technology currency, the college is well situated. Individual instructor workstations are kept current through a hardware replacement process that ensures all computers are in warranty until planned replacement at end of life. Classroom IT is also on a closely scrutinized upgrade and replacement schedule.

I. The college is currently meeting student demand in Math and Science

J. Modifications are being made to all of the courses in which the success rates of the PLO’s (and corresponding SLO’s) are under 70%. We anticipate that these modifications will lead to improved success in achieving the PLO’s.

K. Courses undergo a rigorous CIC review process.

2. Analysis of Improvements Needed

A. The catalogue description may need to be changed as the Liberal Arts: Math and Science Degree might not be appropriate for some Environmental Studies and Health Careers programs. The Math and Science Department will work with Counseling on the language.

B. In the area of requisites, the college needs to implement a focused deliberate method for enforcing out-of-discipline prerequisites. For example, it was very difficult for the Science Department to enforce an ENGL class requirement for 200-level Biology classes (even though the text book is written at a Gunning Fog index of 13).

C. A central concern is the lower success and retention rates in online Math sections compared to traditional offerings. This may be mitigated by hiring a full-time replacement Math Faculty in 2015.
D. Physical resources are a challenge at all campus locations but particularly at the non-IWV sites. As the college moves ahead with facility changes at KRV and East Kern, it is imperative that safe, sufficient, and modern facilities are provided. This will provide student in the outlying areas more on-site options for completing the degree. The sinks at the IWV campus are still too shallow (please note that there is a plan to fix this in June of 2015).

E. **There is still no dedicated Institutional Researcher at Cerro Coso College.** This is an extreme disappointment, as this was mentioned in the General Sciences Program Review about 5 years ago. The lack of an institutional researcher is a severe detriment to faculty morale.

F. The level of functionality of Curricunet in entering and collecting SLO and PLO reports is poor. The level of contract service provided is abysmal. The Math and Science Department want to be perfectly clear that the CIC committee and the Assessment coordinator are doing outstanding jobs! The problem lies in Curricunet. The SLO analysis section of this program review should have been generated by a single report on CurricUNET.

### 3. Three-Year Program Strategies

Within the next three years, the Cerro Coso faculty needs to begin addressing each of the areas of improvement above. Some of these concerns can be resolved at the department level while others will require a collective response and action plan by the Academic Senate. Of these recommendations, perhaps the most important are the following:

A. Adopt a formal mechanism for approving or disapproving courses newly proposed as additions to the Liberal Arts degrees (CIC/Senate).

B. Begin a second round of mapping to sharpen the relation between PLO’s and courses required.

C. Assess the level of on-site options at other sites, with focus on laboratory classes.

D. File an unsafe work environment complaint against the District if the problem with the shallow sinks in the IWV Science labs is not solved. The Science Department recognizes that this is neither a problem with the IWV campus administration, nor with IWV Maintenance and operations. The roadblock to this work getting completed is squarely on the shoulders of the District and has been sitting at the District for nearly 4 years. Although, there is a plan to fix the sinks in June of 2015

E. Anticipate the changes resulting from the creation of SB 1440 Transfer degrees, which will increase alternatives to the three areas of emphasis in the Liberal Arts degrees and significantly reduce the number of students seeking degrees in the Liberal Arts. Both counselors and faculty need to consider how they will advise future students, perhaps concluding that the ADTs provide better preparation for transfer and that Liberal Arts majors should be declared as preparation for elementary school teaching or for transfer to private schools with requirements different from those of UC and Cal State universities. It still remains unclear whether ADTs will be accepted at UCs. There is also some concern that the ADTs concerns and UC transfer concerns may be working cross purposes as there is some pressure to reduce units from the ADTs, and pressure to include and combine lecture and lab and recitation from UC transfer.
4. Six-Year Program Strategies

Within the next six years, all attempts should be made to resolve the areas of improvement above and to determine the impact of ADTs on Liberal Arts: Math and Science degree (Math and Science Department). The next Program Review will be performed by the Math and/or Counseling Department. Another program review will be performed if and only if there is a dedicated Institutional Researcher and the level of functionality and service offered in Curricunet is improved.
Math

Fall Math Department Meeting Minutes         Friday August 22, 2014
Room 212 - IWV Main Building
11:30 A.M

Department members present: Dean Bernsten (by phone), Rachel Winston, Yihfen Chen, Joe Slovacek, Monette Fowler, Helen Wang, Jorge Martin, Steve Rogers (Chair)

1. **Syllabuses – Cheating Policy**
   Steve mentioned that the department should agree on a policy for dealing with issues of student cheating. Dean emailed us the statement in his syllabus and Joe and Rachel said that they use the same or a similar statement in their syllabi.

   The consensus among the group was that individual instructors should be allowed to implement their own practices for dealing with student cheating issues and that the specific offense and subsequent consequence should be stated in their syllabus.

2. **SLO assessments for Fall 2014**
   It was announced that SLO assessments will need to be completed for Math C050, Math C055, Math C121, and Math C257 in all sections for the fall. The SLO artifacts have been delivered electronically to instructors of Math C050 and Math C055. Discussion ensued about the most efficient way to assess Math 121 and Steve, Rachel and Dean who will be teaching this class in the fall, agreed that the discussion would continue by email. Joe Slovacek will be creating the assessment for Math C257

3. **Supplemental Instruction for Basic Skills Math Courses.**
   Steve reminded instructors to be on the lookout for potential Supplemental Instruction Leaders for the Basic Skills Math Courses. Yihfen explained in more detail the benefits of supplemental instruction as she has already employed some of its methodologies in her classes.

4. **Spring 2014 Assessment Results and Interventions.**
   Steve shared the results of the spring SLO assessments with the group. Success rates overall were quite good with math C040 having average success percentages over 70% for every SLO. Although interventions were suggested for a few of the SLOs that had success rates below 70%, a more thorough discussion will take place in the future.

5. **Math Department Goals for 2015/16**
   Dean mentioned it would be a good idea to use the same book for Math C020 and Math C40 and do the same for Math C050 and C055. This would not only save students money and make transitions between classes easier, it would help to increase student success in these courses as well. More discussion by email will be required if we want to pursue this.
6. **Spring Schedule**

Several instructors felt that we needed to run more sections than we have been offering especially for online sections and courses that are only offered once a year. Some felt that by running the courses only once per year we cause a decline in the enrollments of these already under-enrolled courses as students opt out of taking the course or continuing the sequence.

7. **Goals for Distance Education in Math for 2015/16**

It was suggested that we reduce the caps on online sections now that we have REC as a requirement in online courses. It’s difficult to maintain REC with 45 students using discussion boards as well as typing lengthy solutions to math problems.

The department would like to explore more options with live video technology but realized it would need access to additional technological equipment.

8. **Policy on Calculators, Extra Credit, Proctors for online Math 40 &50.**

Although there was agreement that calculators should not be used on exams in classes below Math C121, nor should there be extra credit assignments, it was decided to allow instructors to choose their own practice regarding these two items. It was also decided to require exam proctors for online Math C040 and Math C050 beginning in the spring of 2015 in order to increase success rates in online Math C055.

9. **STEM Tutoring and Office Hours in LAC**

Rachel, Steve and Yihfen all agreed to conduct some or all of their office hours in the LAC in order to be more available to students and help them move more successfully through the transfer level courses.

It was suggested that we request funding to pay adjuncts for tutoring especially since they are the ones teaching many of the math classes in which STEM students are enrolled.

1:00 P.M. Meeting Adjourned

**Science and Engineering Department  2014/15 Dept. Meeting #2 Minutes**

This meeting was held Sept. 2-9, 2014 via email.

- All current adjunct, full-time, and department lab manager were included in the email (James Rachels was excluded by mistake; Edward Teets, and Sam Ghalab were also excluded in because I did not have their names).
  - Jennifer Figueroa, Biology, Online
  - Jessica Scott, Physical Sciences, Online
  - Carol Mead-Barrett, Geology, KRV
  - Jim Gude, Biology, EKR
  - Lauren Brown, Chemistry, ESCC
  - David Herbst, Biology, ESCC
  - Claudia Sellers, Biology, IWV
I. Approval of Minutes from Meeting #1 Aug. 22, 2014

Minutes from Meeting #1 were included as a separate attachment and approved for lack of objection.

II. Old Business – Further Discussion of Items from Aug. 22 Meeting

- Completion/Increasing Caps
  a. John was unable to attend the meeting but here is his input:

  If I may presume to add to the discussion, which may or may not be added to the minutes at the Chair's discretion.

  The goal of increasing completion, without understanding WHY students aren't completing, is illogical. If we don't know why students are unable (or unwilling) to complete, we might as well start building Ouija boards and make students eat prunes every day to improve completion. I am also VERY strongly in favor of maintaining our academic standards. I am in GREAT fear of us being told to 'not fail anyone' by the State.

  Having said that, there may be some things the state can change and we can help, such as not requiring students to take so many Gened classes for a high unit science/math/engineering major.

  It would be interesting to see if the students that finished my Chem C223/C223H class last year were counted as successful transfers/etc....

  Regarding section size. I have data from the past 4-5 years that say the enrollment for Chem C111 at IWV will support an increase in section size to 28, provided that the administration is aware that, when we need to open another lab section of Chem C111, the second section (size 28) might not fill as much as it has in the past 2 years. For the past 2 years, each section of 25 has pretty much filled to 100% in the future, the second section might be 18-22 out of 28.

  I'll be re-completing the Gened Math and Science Program Review (it's nearly complete, I just need to talk to the Math folks) and I'll gladly initiate the Engineering Program review. My gut tells me that the Engineering classes numbers will not support continuation of the Engineering Program. I'm hoping that something from the Transfer Model Curriculum will help us out--I hear there's one for Chemistry.....

  That's all.

  Also, if you have anything that would like for me to discuss at College Council, please use this
email group and reply/send to all.

The one thing I am going to ask is the status of the new deeper sinks in the Science Labs at IWV.

- **Student Learning Outcomes (SLO’s)**
  a. Please be aware that we are now assessing SLO’s from every section of every class offered within the department. SLO’s are identified for every course in the Course Outline of Record (COR) and may be viewed by anyone through Curricunet. SLO assessments for every course is/will also be available through Curricunet.

(Notne: The value of SLO’s and SLO assessments is a source of constant debate and argument amongst faculty; many see them as a complete waste of time. (Cliff Davis, Chair, English Dept., pointed out during a particularly lively Flex Day discussion that, if nothing else, they can serve to help us reflect on ways to be more effective teachers. Nice way of viewing something that, it seems, we can’t avoid for the time being.)

We have identified point-persons for all courses being taught this semester (see Meeting #1 minutes). Please contact that person if you have any questions about specific SLO’s or the SLO assessment. Point-persons will forward SLO assessments from all sections of each course to the department Chair at the end of the semester.

III. **Increase of Caps for Science Courses**
    As a department we agree to support the increase of caps on sections, from the current 25 to 28 students (when facilities allow), for Biol C101, Biol C105, Chem C101, Chem C111, and Chem C113. We include the caution to administration that this increase may adversely affect enrollment in the second section of courses such as Chem C111.

IV. **Evaluations**
    Three members of the department will be evaluated this semester. The following persons will conduct evaluations:
    - Guck Ooi (Biology, IWV, Mode A): **Claudia Sellers, John Stenger-Smith, Dennis Jensen**
    - Carol Mead-Barrett (Geology, KRV): **Dennis Jensen (October 7)**
    - David Herbst (Biology, ESCC): **Dennis Jensen (late October)**

V. **Program Review: Engineering**
    John Stenger-Smith has offered to initiate this.

VI. **Annual Unit Plan**
    This unit plan will cover the academic year Fall 2015-Spring 2016. **Dennis Jensen**

VII. **Courses for Revision**
    Courses scheduled for revision:
    - **Fall 2014**
      - Chem C111 Gen Inorganic Chemistry: **John Stenger-Smith**
      - Phsc C132 Intro to Meteorology Lab: **Scott Cameron**
    - **Spring 2015**
      - Geol C111 Physical Geology (Revised 2013)
VIII. Long Term Schedule *(This is still a work in progress)*

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Jensen | Phsc C115  
Scott | Phsc C115  
Scott | Biol C101-2  
Figueroa | Phsc C115  
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IX. Meeting Adjourned Sept. 9  
Dennis Jensen, September 14, 2014

Science and Engineering Department Meeting Minutes  
Date: Aug. 22, 2014  1:00 – 3:00 PM  
Present:  
- Claudia Sellers  
- Susan Hurst  
- Scott Cameron  
- Jim Gude  
- Dennis Jensen

X. Goals for the California Community College System

We discussed some of the goals proposed for the California Community College System. The primary goals deal with: 1) increasing completion rates, 2) increasing the number of transfer degrees awarded, 3) establishment of equity regarding completion and participation among racial/ethnic subgroups.

Most discussion concerned goals involving tracking and potential interventions to mitigate performance gaps in racial/ethnic subgroups. It was the majority consensus that the proposed goal to increase underperforming subgroups’ equity index to 0.8 or above is especially problematic. The majority agrees that any unequal treatment, grading, or standards of subgroups based on race/ethnicity is inherently unfair and unacceptable.
XI. Increase of caps in Lab Sections for Biology and Chemistry

The discussion regarding raising caps is not new. Unfortunately, John was not present to give a more complete historical perspective but said the following a few years ago:

“The section size in Chemistry and in some Biology classes has been increased from 18 to 24 because the presence of the Laboratory Manager permits the instructors to accommodate more students in the laboratory. It is planned to increase the section size of Chemistry C111 class to 28 in the fall of 2013. Other disciplines may follow this model if Chem C111 is successful.”

We discussed the possibility of raising caps of science courses from the current 25 (should be 24?) to 28.

- **Biology**
  Caps of 28 may be appropriate for certain 100-level introductory courses. We agreed to raise the cap on Biol C101 and Biol C105 from 25 to 28 (though not discussed, perhaps C145 should be included; C125 remains at 25). For 200-level courses (recognizing the importance of instructor assistance during dissections and technically difficult laboratory procedures) we will keep the cap at 25. Instructors still have the flexibility of adding students on the first day, thereby giving them some control of how many students are in the class.

- **Chemistry**
  We did not discuss because John was not present. Caps are currently at 25 for all chemistry courses.

- **Physical Science, Physics, Engineering**
  We did not discuss as administration has not requested increased caps for any of the physical science courses.

XII. Adding Lab Sections

Second lab sections were added to Fall 2014 CHEM C113 and PHSC C125 at the IWV campus. An additional section was opened for Online BIOL C101 and discussion of adding a third (117 currently registered).

Discussed opening second lab section for BIOL C262 (current enrollment 33). Claudia suggested that we wait and see what happens in the current class before making any decisions. If the demand for Microbiology persists possible future solutions may include increased frequency (every semester) or multiple sections.

XIII. SLO’s

We should be in a position to assess SLO’s every semester in every course taught within the department. Data from multiple sections (or sites) of a particular course will be forwarded to a single responsible person who will consolidate the data and forward it to the department chair.

- Biol C101, C105: Guck (with data from IWV, EKR, ESCC, and 2 online sections)
- Biol C111: Dennis (data from ESCC)
- Biol C125: Claudia (IWV)
- Biol C251: Guck (IWV)
Liberal Arts: Math and Science Instructional Program Review

Biol C255: Dennis (IWV, ESCC)
Biol C262: Claudia (IWV)
Chem C101: John (IWV)
Chem C111: John (IWV, ESCC)
Phsc C125: Scott (IWV)
Phsc C115: Dennis (data from Online)
Geol C111: Dennis (data from KRV)

XIV. Long Term Schedules

We briefly discussed the development of 1 or 2-year repeating schedules for all courses offered. We will discuss this further in the near future.

Courses Suggested for a Repeating Schedule

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XV. Evaluations

- Guck Mode A
- Adjuncts, TBD
XVI. Program Review

- Engineering

XVII. Additional Items

None

Adjourn: 3:00 PM

Dennis Jensen

Long Term Schedule of Math Courses in the Liberal Arts Math and Science Program

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<tr>
<td>MATH - C227 -</td>
<td>Linear Algebra</td>
<td>Onl.</td>
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</tbody>
</table>

The courses that meet the Liberal Arts: Mathematics and Science degree are divided generally into the areas of biology, chemistry, geography, geology, math, physical science, physics, and computer science. To attain the degree, students must take 60 units total, with 18 units in the area of emphasis. For depth of study, 2 or more courses in one discipline are required. For breadth of study, courses must be taken from 2 or more disciplines within the area of emphasis. Students must select at least 18 units from the following courses. At least one course must be from Mathematics and at least two courses from the sciences, including one laboratory or field experience course (*).
Liberal Arts: Math and Science Instructional Program Review

or
BIOL C111H*General Biology I – Honors 6
BIOL C112 *General Biology II 5
or
BIOL C112H*General Biology II – Honors 6

BIOL C125 *Survey of Anatomy and Physiology 4
or
BIOL C121 Survey of Anatomy and Physiology Lecture 3
BIOL C122 *Survey of Anatomy and Physiology Laboratory 1
BIOL 145 *Environmental Studies 4
or
BIOL C141 Environmental Studies Lecture 3
BIOL C142 *Environmental Studies Laboratory 1
BIOL C251 *Human Anatomy 4
BIOL C255 *Human Physiology 4
BIOL C261 *General Microbiology 4

CHEM C101 *Introduction to Chemistry 4
CHEM C111 *General Inorganic Chemistry I 5
CHEM C113 *General Inorganic Chemistry II 5
or
CHEM C113H*General Inorganic Chemistry II – Honors 6
CHEM C221 *Organic Chemistry I 5
CHEM C223 *Organic Chemistry II 5
or
CHEM C223H*Organic Chemistry II – Honors 6

GEOG C101 Physical Geography Lecture 3
GEOG C102 *Physical Geography Laboratory 1
GEOG C111 *Physical Geography 4
GEOL C111 *Physical Geology 4

GEOL C131 Environmental Geology 3
MATH C121 Elementary Probability and Statistics 4
or
MATH C121H Elementary Probability and Statistics – Honors 5
MATH C130 Finite Mathematics online only 4
MATH C131 Business Calculus online only 4
MATH C141 College Algebra 4
MATH C142 Trigonometry 4
MATH C151 Analytic Geometry and Calculus I 5
MATH C152 Analytic Geometry and Calculus II 5
MATH C251 Analytic Geometry and Calculus III 5
MATH C255 Ordinary Differential Equations 4
MATH C257 Linear Algebra 4
### Liberal Arts: Math and Science Instructional Program Review

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSC C105</td>
<td>*General Earth Sciences</td>
<td>4</td>
</tr>
<tr>
<td>or</td>
<td>PHSC C101 General Earth Sciences Lecture</td>
<td>3</td>
</tr>
<tr>
<td>PHSC C102</td>
<td>*General Earth Sciences Laboratory</td>
<td>1</td>
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<tr>
<td><strong>PHSC C115</strong></td>
<td>*Physical Science.</td>
<td>4</td>
</tr>
<tr>
<td>or</td>
<td>PHSC C111 Concepts of Physical Science</td>
<td>3</td>
</tr>
<tr>
<td>PHSC C112*</td>
<td>Physical Science Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>PHSC C121</td>
<td>Elementary Astronomy</td>
<td>3</td>
</tr>
<tr>
<td>PHSC C122*</td>
<td>Elem. Astronomy Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>PHSC C125*</td>
<td>Astronomy</td>
<td>4</td>
</tr>
<tr>
<td>PHSC C131</td>
<td>Introduction to Meteorology</td>
<td>3</td>
</tr>
<tr>
<td>PHSC C132*</td>
<td>Introduction to Meteorology Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>PHYS C111*</td>
<td>Mechanics</td>
<td>5</td>
</tr>
<tr>
<td>PHYS C113*</td>
<td>Electricity and Magnetism</td>
<td>5</td>
</tr>
<tr>
<td>PHYS C211*</td>
<td>Waves, Optics and Modern Physics</td>
<td>5</td>
</tr>
<tr>
<td>CSCI C251</td>
<td>Introduction to Visual Basic Programming</td>
<td>3</td>
</tr>
<tr>
<td>CSCI C252</td>
<td>Introduction to Computer Science</td>
<td>3</td>
</tr>
<tr>
<td>CSCI C265</td>
<td>Introductory C++ Programming</td>
<td>3</td>
</tr>
</tbody>
</table>

Students must also complete one of the following general education patterns:

A. IGETC—Intersegmental General Education Transfer Curriculum
B. CSU General Education Breadth
C. Cerro Coso Local General Education Pattern.

**Total Units:** 60

Note that some of the material in this section was originally in the Arts and Humanities Program Review as the material is generally applicable.

**Analysis:** As of the 2012-2013 Catalog, the college offers approximately fifty five courses to fulfill the requirements of the Liberal Arts: Math and Science degree. This number reflects a significant number of recent deactivations, combinations (for example PHSC C111 and PHSC C112 have been combined into PHSC C115) and deletions. For many years, deactivated, obsolete, and deleted courses were retained on the list because students matriculating in prior years had catalog rights, but it was determined that keeping these outmoded courses in new catalogs was misleading, suggesting erroneously that new students could still take them. New course lists will show only those courses that are active for the upcoming catalog year.
The areas chosen are comparable to other arts and humanities degrees and adhere to Board policy language. Individual courses are mapped to the program by means of learning outcomes. It was one of the purposes of the VP and the faculty chairs to develop a method for measuring student achievement of the PLO’s (Program Learning Outcomes). The group agreed the most direct way to do this was to create a map (or “crosswalk”) of course learning outcomes to the program outcomes: at least one course-level SLO had to match up with at least one PLO. That would not only allow PLO’s to be measured—course outcomes aggregated to provide an overall achievement rate—but also establish why specific courses belong in the program in the first place; if a course has no SLO’s that match to the area’s PLO’s, it should not apply. Faculty chairs, working with their departments, completed the mapping project by the end of Spring Semester, 2012. The chart of this crosswalk was created and posted to the college’s SLO website.

Conclusion: A sufficient variety of options is available for students to complete the degree. To reiterate what is stated in the Arts and Humanities Degree Program Review: “One deficiency in this area is how courses are approved (or disapproved) for the program list. Program applicability is an appropriate topic for discussion at CIC, but nothing guides this conversation to make sure it happens; the college has no formal mechanism for approving or disapproving courses newly proposed as additions to the program.”