Unit Plan: Description of the Unit

Unit: Physics
Division or Area to Which You Report: Math-Science
Author(s) of this Unit Plan: Alphabetical by last name: Nick Alexander, Tim Dave, Scott Hildreth
Date: 3/13/09

Audience: To be read and responded to primarily by Marketing and Outreach
Purpose: Used for public relations, used in catalog and/or brochures, grant applications. Marketing & recruiting materials
Instructions: Write about one paragraph which should include the unit's mission statement. You may include an image or picture, if you wish. You may use last year's description with updates or revisions as needed.

Please use this text box to write your description. Expand if necessary.

Mission of this Unit:
The Chabot College Physics unit offers a broad range of inter-related courses which enlighten and prepare students for further study in their chosen fields. Physical Science is becoming key to understanding and meeting the challenges of our increasingly complex world, whether or not students choose to specialize in these areas or related fields in engineering and technology. And, quoting Noble Laureate and pioneering educator Richard Feynman, “Physics is the most fundamental and all inclusive of the sciences, and has a profound effect on all scientific development.”

In this context, the Physics unit’s mission is to offer opportunities for basic scientific literacy, personal enrichment, career preparation, job advancement, and retraining, and to aid our students as they seek to transfer to four-year institutions. Within this framework it’s instructors are committed to integrating new technologies with pedagogical approaches that best support student success. Presently, we have 3 full time faculty, two of whom divide teaching between physics and astronomy. To help increase dwindling enrollments and boost them further in already-successful courses, we continue to upgrade the program. We look forward to longer-term improvements, discussed further below.

Description of the Unit:
Below is survey of course offerings that meet a broad range of general education requirements dependent on the knowledge of this fundamental science that lies at the heart of the other fields.

#We offer four introductory, calculus-based courses for students in science and engineering (Physics 4A, 4B, 4C, and 5); the latter is a new course in this sequence. It allows students more time to complete the Physics sequence, enhancing their learning of this challenging material.

#Two courses for life-science majors using pre-calculus mathematics are Physics 2A and 2B. Two one unit supplemental courses will also soon be resurrected—Physics 22A and 22B. These courses allow students to satisfy the physics requirement for life-science majors at universities requiring a calculus-based physics sequence. To sustain and enlarge enrollments by satisfying a significant demand, 22A and 22B when
combined with 2A and 2B will be part of an upgraded sequence paralleling what UC campus and other 4 year universities already offer in one calculus based physics course for life-sciences. The resurrected supplements now have strict calculus pre-requisites, ensuring students have a sound grasp of calculus. The new prerequisite removes the need to teach calculus from scratch so that time is devoted solely to illustrate calculus applications to physics. The new prerequisites could also boost enrollments in two new related math courses—Math 15 and 16—more suited for life science majors than the standard first year calculus course presently offered.

# A single 4-unit descriptive lecture/lab course for non-majors in physical science, Physics 11 broadens our students' opportunities for preparation in the sciences and expands the college's GE science offerings.

# A new preparatory mathematical methods in physics class (Physics 18) is listed in the catalogue for students planning to take either the Physics 2 or 4 sequence.

Courses in physics relying on math, including preparatory Physics 18, are designed to serve major transfer curriculum. Meanwhile, the non-mathematical Physics 11 course also transfers to CSU and UC, satisfying the lab requirement for education and nursing majors.

Students who enroll and stay in physics courses have historically been found to be 3 – 4% more likely to succeed when compared to other courses at the college as a whole. Currently, an AS Degree in Physics is not offered for students who complete the recently and significantly expanded, calculus-based sequence. Unit instructors will soon take the technical steps to put the program back on the books.
# 2009-11 Program Review & Unit Planning Years 2 or 3

**Unit:** Physics  
**Division or Area to Which You Report:** Math-Science  
**Author(s) of this Unit Plan:** Alphabetical by last name: Nick Alexander, Tim Dave, Scott Hildreth  
**Date:** 3/31/09 (rev)  
**School Year Program Review Completed:** 1999-2000

**Audience:** IPBC; Program Review Committee; Deans/Unit Administrators; Budget Committee  
**Purpose:** To provide evidence of progress on from previous year and to provide input into planning for subsequent years.

**Instructions:** If you have completed your first year of program review, please answer the questions below. If you are updating/changing your timeline, list the appropriate year in which revisions were made.

## 1A. Problem Statement: Summarize your original (Y1) Program Review conclusions.

**1B. Analysis: What was the basis for these conclusions?**

Our Goals from the prior (2007-2009) Astronomy/Geology/Physics Unit Plan included the following (Goals 2-6 and 8 involve the Physics program):

<table>
<thead>
<tr>
<th>Goal</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Building 1900 Planning</td>
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<tr>
<td>2</td>
<td>Improve student success and retention in Astro &amp; Physics classes</td>
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<tr>
<td>3</td>
<td>Improve visibility of Physics Program</td>
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<td>4</td>
<td>Improve enrollment for Physics 5, 11, 18</td>
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<td>5</td>
<td>Improve Physics and Astronomy Lab Experiences</td>
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<tr>
<td>6</td>
<td>Improve Physics Lab Equipment Usage/Repair/Ordering</td>
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<tr>
<td>7</td>
<td>Offer Geology Classes</td>
</tr>
<tr>
<td>8</td>
<td>Tying Chabot &amp; students to Industry</td>
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</table>
2. What have you been able to accomplish this year? How are these accomplishments related to your previous program review and unit planning work?

We have been successful in our efforts addressing goal 5 (Improving Lab Experience) and 6 (Improving Physics Lab Usage). We are doing better with goal 3 (Improving Visibility of the Program) largely through the efforts of Tim Dave to publicize his creative student lab projects in hydrogen-powered cars, computer assembly, and solar-powered computers. In addition, the new Physical Science 15 course was visibly advertised and student lab competitions publicized and held on campus (including jumping rockets, coke+mentos fountains, ballistic target practice) in front of other students.

Since 2000, we've seen a gain from 1.5 to 2 Full-time-equivalent physics faculty. This addition has helped return the program closer to the desirable status quo of more than a decade ago when three full time physics instructors taught the full range of classes. This increase in the number of full time faculty, has led to:

1) This year’s continued, improved ability of full time faculty to maintain current equipment, plan upgrades with new equipment purchased though block grant applications, innovate with new curriculum and DE courses, and play a collaborative role collaborating with faculty across Chabot and the region (including CSUEB) regarding physics science and science in general.

This year, we’ve collaboratively resurrected an old course, Physics 22A, a one unit calculus supplement for students enrolled in algebra based Physics 2A. The corresponding 22B for Physics 2B is on the way. Planning for 22A triggered a reasoned textbook search that ended with two books perfectly aligned topic-wise, written by the same author in a similar style using identical text and figures but differing only in the inclusion of calculus. 22A students, concurrently enrolled in non-calculus Physics 2A, will buy the calculus based textbook, offered at a reduced price as an e-book, for a one unit discussion section exploring the week’s topics at a deeper level. We’ve also chosen that book for the first semester calculus based physics course to strengthen the sequence with a more coherent introduction to mechanics.

2) Tested this term (Spring 09) and related to Student Learning Outcomes (SLOs), we have also made good headway establishing a problem solving rubric and a practical yet statistically advanced assessment protocol applicable to other exact sciences and mathematics.

3) The continued maintenance and ordering of new capable computing equipment deployed and maintained for physics labs, including newly ordered “smart” experiments we have been successfully trying out since the last unit plan.

4) The ability for faculty to more effectively pursue extra curricular work consistent with Chabot’s mission and growth such as participation in the Reading Apprenticeship Program, the DE, budget and facilities committees, and advising student clubs, such as the newly formed Chabot International Engineers for the Future (CHIEF).
### 3. What are your new or continuing unit goals? What do you plan on accomplishing? Please detail how you will accomplish these goals in the timeline on the next page.

| 1. | Continue to improve physics labs and utilization of new equipment purchased through the Measure B Bond program. Develop a shared lab manual for both Physics 2 and Physics 4 Sequences. |
| 2. | Ensure a plan is put into place that will upgrade the (24) old physics lab laptops acquired through an NSF grant by Tim Dave that they might continue to be used in the Astronomy and Physics Program. |
| 3. | Develop the Physics Annex outside of 1714 to support physics students studying before and after class. Provide tables, chairs, demonstrations, lighting, and study aids to encourage student collaboration and improve student retention and success with Physics. |
| 4. | Aggressively advertise for student-friendly adjunct physics faculty to teach courses; hiring interviews should emphasize the candidate’s use of demonstrations, multimedia, enthusiasm for the subject, and desire and ability to explain physics concepts in an accessible way. |
| 5. | Organize the marketing of classes, using Welcome Week, Bay Area cable channels, the counseling department, the distribution of flyers, etc. Of particular concern are Physics 11 and 18, the newly-revamped, non-mathematical course, and the math preparation course, respectively, which are slowly developing a student base. As a UC transfer course and desirable for Teaching majors, Physics 11 has a much larger base than Physics 18, which is only a stepping stone to transfer courses and rarely scheduled by comparison. |
| 6. | Evaluate the success of distance or hybrid Ed in the parallel non-mathematical courses within the chemistry (Chem 10), and develop an analogous plan for Physics 11. But perhaps more importantly continue to define new strategies to enliven recently established online Physics 5. Will it take more institutional support for DE in general? Will it take more collaboration with neighboring colleges? |
| 7. | Evaluate the success of online methods in the Physics 2 and 4 sequences, and give formal training and/or encouragement to adjunct faculty to consider or adapt these methods. Evaluate the effectiveness of Mastering Physics across the program. |

For example one full-time faculty has developed an extensive set of web-based tutorials and helpers that guide students to the solution of homework problems, which are assigned from the text, collected, and graded for a significant portion of the course grade. In his mind, these postings are a compensatory measure in light of the funding crunch of community colleges, and without them, the other alternatives are to lose large numbers of students or to water down the material. The web-assisted take home quizzes are integral to passing the exams. Is this approach effective in evoking critical thinking skills? What other teaching styles and grading standards are being used along side the online “hints.” What other equivalent methods, unified by the goal of student success, are out there? What are the strengths or weaknesses of each?
Meanwhile the full-time faculty members who double between astronomy and physics have created vibrant online learning communities via web discussion forums, chat rooms, and internet research projects related to their courses. Using this experience, we want to explore opportunities to network our low-enrollment classes with those of LPC, either staggering their scheduling and/or supporting remote or hybrid instruction with local discussion and labs. This could help boost enrollment in end-of-sequence Modern Physics, Physics 5

8. More actively assisting the engineering program in its marketing efforts, with cross promotion of its courses and with its outreach to area high schools.

9. Working collaboratively with the chemistry department on developing physics prerequisites or advisories that may enhance Physics enrollments. Exchange ideas about online delivery of these courses.

10. Maintain concurrent day and night sections of Physics 2A and 2B, consistent with sufficient demand stemming from active promotion and inviting yet rigorous teaching. This would lessen the importance of creating sections of physics for life science majors with a Saturday lab.

11. Investigate making Physics 18 a ‘strongly recommended course for students considering Phys 2 or 4 to build enrollment in that prep class, as well as to increase student success in the Physics program overall. Work harder to get interest in Physics 18, either through recommending it more often to students who do not pass Physics 2 or 4 or through more active universal advertising. Perhaps a diagnostic test could be given to recommend enrollment in Physics 18 where needed. While some students scoring below the cut off for admission to Physics 2 or 4 might well have passed if admitted, the diagnostic test could help build a stronger foundation for students who would have failed and would enrich the experience of students eventually entering and succeeding in Physics 2 or 4.

Physics 18 is only one of several possible responses to pockets of low Physics 2 and 4 student success and enrollment shown by college records since year 2000. Are the dips due to poor student mathematical preparation or are they the confluence of several other factors, including the need for better Physics 2 and 4 pedagogy? Only time and more surveys will tell.

12. Create and sustain interest in Physics 22A and 22B to open new access points for Physics 2 students seeking transfer to 4 year universities requiring calculus-based life science physics.

13. Within the college wide SLO effort, finalize establishment of a problem solving rubric and practical yet statistically powerful assessment protocol applicable to other exact sciences and mathematics.

14. Establish connections with Mesa (Mathematics Science Engineering Achievement) and become partners in Mesa’s School’s Program designed to prepare and recruit historically disadvantaged high school students into 2 and 4-year colleges and universities.
5. Solution: How will you accomplish your goals?

Unit Action Plan Timeline

<table>
<thead>
<tr>
<th>No.</th>
<th>Timeline</th>
<th>Milestone Activity</th>
<th>Person(s) Responsible</th>
<th>Accomplished?</th>
<th>Revised?</th>
<th>Do you need additional funds to support this activity?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Present – Spring 2011</td>
<td>Develop shared lab manual with all experiments for 4ABC and 2AB</td>
<td>All Faculty</td>
<td>In progress</td>
<td></td>
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</tr>
<tr>
<td>2</td>
<td>2009-2010</td>
<td>Work with IT to ensure laptops are on list to be replaced.</td>
<td>Hildreth/Dave</td>
<td>No</td>
<td></td>
<td>Yes – apparently funds to replace grant computers is not part of the campus computer funding algorithm; if we got them through a grant, they aren’t then part of the normal replacement plans.</td>
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<tr>
<td>3</td>
<td>Spring 2009</td>
<td>Work with M&amp;O and administration to get support for project</td>
<td>Hildreth/Dave</td>
<td>Yes</td>
<td></td>
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<td></td>
<td>Summer 2009</td>
<td>Move furniture, outfit annex area with lights, put up posters, develop exhibits, advertise</td>
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<td>4</td>
<td>Present–Spring 2012</td>
<td>Do outreach to local high tech businesses and Physics or related grad schools with employees having the background and desire to teach Physics.</td>
<td>All Faculty</td>
<td>In progress</td>
<td>No</td>
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<td>5</td>
<td>Present-Spring 2012</td>
<td>Visit local high schools and talk with teachers and counselors there. Market a Chabot summer Phys 11 session to revive historically high enrollment of high school students in summer</td>
<td>All Faculty</td>
<td>In Progress</td>
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<td>6</td>
<td>Present-Spring 2012</td>
<td>Look at models and success rates for online and hybrid lab courses at Chabot and other local colleges; brainstorm with LPC instructors on enlivening Physics 5 as online or hybrid</td>
<td>All Faculty</td>
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<td>7</td>
<td>Present-Spring 2012</td>
<td>Encourage communication about web-assisted instruction geared toward problem-solving and developing conceptual thinking. Engage in more intra unit discuss on what works and what does not work regarding student success. Brainstorm with LPC instructors on enlivening Physics courses, online or hybrid</td>
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<td>8</td>
<td>Present-Spring 2012</td>
<td>Work with engineering faculty to coordinate offerings and high school visits. Market concurrent enrollment.</td>
<td>All Faculty</td>
<td>In progress</td>
<td>No</td>
<td>No</td>
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<td>9</td>
<td>Present-Spring 2012</td>
<td>Look at prerequisites and success rates of other colleges in chem. and physics. Re-do prerequisites and advisories in our program.</td>
<td>All Faculty</td>
<td>In progress</td>
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<td>10</td>
<td>Present-Spring 2010</td>
<td>Actively promote and advertise Physics 2A and 2B, emphasizing the enhancements offered through 22A and 22B.</td>
<td>All Faculty</td>
<td>No</td>
<td>New, 2009</td>
<td>No</td>
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<td>11</td>
<td>Present-Spring 2010</td>
<td>Prepare a curriculum change proposal for Phys 2 and 4. Discuss with LPC at a future date and present to curriculum ASAP. Before this stage, however, hold discussions in unit to pinpoint in detail causes of pockets of low enrollment in Physics 2 and 4</td>
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<td>No</td>
<td>Yes;2009</td>
<td>No</td>
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<td>12</td>
<td>Present-Spring 2010</td>
<td>Actively promote and advertise Physics 22A and 22B, emphasizing increase in entry points into 4 year universities.</td>
<td>All Faculty</td>
<td>No</td>
<td>New, 2009</td>
<td>No</td>
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<td>13</td>
<td>Present-May 2009</td>
<td>As our agreed upon SLO assessment tool, finalize establishment of a problem solving rubric and practical protocol that aggregates overall average class performance in each step of 10 problem solving steps. In this compromise, students could be conveniently ranked according to their overall performance over the range of steps, but the aggregation pinpoints average class strengths and weaknesses in every step, aiding remediation.</td>
<td>All Faculty</td>
<td>No</td>
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<td>14</td>
<td>Present-Summer 2009</td>
<td>Begin to establish connections with Mathematics Science Engineering Achievement by participating in and supporting the goals of the March 28, 2009 Mesa event to raise awareness of the empowering program for disadvantaged young people on a science track.</td>
<td>All Faculty</td>
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<td>Revised? Yes/No</td>
<td>If yes, list revision year</td>
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** List types such as "equipment," "supplies," "staffing," "contractual services," etc...
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2009-11 Program Review & Unit Planning Years 2 or 3

Unit: Physics

Division or Area to Which You Report: Math-Science

Author(s) of this Unit Plan: Alphabetical by last name: Nick Alexander, Tim Dave, Scott Hildreth

Date: 3/13/09

School Year Program Review Completed: 1999-2000

Audience: IPBC; Program Review Committee; Deans/Unit Administrators; Budget Committee

Purpose: To provide evidence of progress on from previous year and to provide input into planning for subsequent years.

Instructions: If you have completed your first year of program review, please answer the questions below. If you are updating/changing your timeline, list the appropriate year in which revisions were made.

1A. Problem Statement: Summarize your original (Y1) Program Review conclusions.

1B. Analysis: What was the basis for these conclusions?

1A: Below are the Conclusions and Recommendations from the previous Program Review, written in February 2000:

Enrollments are high and success rates are over the college average for these courses in total. Expansion of courses and improvements in retention in physics will require a commitment to more hiring and resources to this field. Currently the College and the Division of Health and Natural Sciences has not seen this as a priority. The addition of TWO full-time equivalent faculty will return the program to the status quo of several years ago when three full-time physics instructors taught the full range of classes. Currently, we have only an average of 1.5 full FTEF, contractual employees, committed to each course per semester, and at least 3 adjuncts. One of the full-time faculty members in the physical science subdivision, which includes astronomy, geology, and physics, doubles between teaching Astronomy and Physics. So, with the number of FT faculty in physics being 1.5, the ratio of FT/PT is 50%. The loss of full-time faculty has directly led to:

1. The inability for one full-time faculty to maintain the current equipment, upgrade with new equipment purchased through block-grant applications, and innovate with new curriculum and Distance Education courses, and play the role as physical science coordinator with administrative tasks.

2. The lack of capable computing equipment deployed and maintained for physics labs.

3. An enormous burden on existing full-time faculty to teach additional evening and day sections to provide a full menu of courses for our students. Because there is a ceiling of (9 CAH) units for part-time faculty, adjuncts often cannot teach a double section of physics without getting special, highly restrictive waivers. These difficulties have been longstanding and have recently become more pronounced with the retirements of full-time physics faculty.

If we do not hire full-time faculty and/or technical support staff, we will hurt our physics program, as it will be impossible to maintain the current equipment, upgrade for new technology, coordinate the hiring, staffing and evaluation of the evening labs, and coordinate and teach part-time faculty about the tasks of the program. The single full-time instructor cannot be expected to do all of these tasks.
Ultimately, we will also lose our ability to provide students with the necessary skills required to compete effectively at UC and CSU in physics and engineering, as we will not be able to upgrade and maintain our lab with the necessary computer equipment and software.

The most important recommendations relative to the physics program of the Health and Natural Sciences Division of those listed are:

1. increasing the use of technology and the potential use of distance education in the curriculum.
2. development of a formal training and evaluation mechanism for adjunct faculty, greater allocation of physical resources and support staff, and the hiring of new full-time faculty.

IB: Basis for year 2000 Program Review conclusions.
The enrollment trends and faculty resources sited above were based on college student, employment, and supply data along with personal observations of the work environment for then-full and part time faculty.

2. What have you been able to accomplish this year? How are these accomplishments related to your previous program review and unit planning work?

Since the year of the previous Program Review, we’ve seen a gain from 1.5 to 2 Full time equivalent physics faculty. This addition has helped return the program closer to the desirable status quo of more than a decade ago when three full time physics instructors taught the full range of classes. This increase in the number of fulltime faculty, has led to:

# this year’s continued, improved ability of full time faculty to maintain current equipment, plan upgrades with new equipment purchased though block grant applications, innovate with new curriculum and DE courses, and play a collaborative role as physical science coordinator with administrative tasks.

This year, we’ve collaboratively resurrected an old course, Physics 22A (see Description of Unit), a one unit calculus supplement for students enrolled in algebra based Physics 2A. The corresponding 22B for Physics 2B is on the way. Planning for 22A triggered a reasoned textbook search that ended with two books perfectly aligned topic-wise, written by the same author in a similar style using identical text and figures but differing only in the inclusion of calculus. 22A students, concurrently enrolled in non-calculus Physics 2A, will buy the calculus based textbook, offered at a reduced price as an e-book, for a one unit discussion section exploring the week’s topics at a deeper level. We’ve also chosen that book for the first semester calculus based physics course to strengthen the sequence with a more coherent introduction to mechanics.

Tested this term (Spring 09) and related to Student Learning Outcomes (SLOS), we have also made good headway establishing a problem solving rubric and a practical yet statistically advanced assessment protocol applicable to other exact sciences and mathematics.
the continued maintenance and ordering of new capable computing equipment deployed and maintained for physics labs, including newly ordered “smart” experiments we have been successfully trying out since the last unit plan.

the continued lessened burden on existing full time faculty to teach additional evening and day sections to provide a full palette of courses for our students, and to more effectively pursue extra curricular work consistent with Chabot’s mission and growth such as participation in the Reading Apprenticeship Program, the DE, budget and facilities committees, and advising student clubs, such as the newly formed Chabot International Engineers for the Future (CHIEF).

3. What are your new or continuing unit goals? What do you plan on accomplishing? Please detail how you will accomplish these goals in the timeline on the next page.

- Aggressively advertise for student-friendly adjunct physics faculty to teach courses; hiring interviews should emphasize the candidate’s use of demonstrations, multimedia, enthusiasm for the subject, and desire and ability to explain physics concepts in an accessible way.

- Organize the marketing of classes, using Welcome Week, Bay Area cable channels, the counseling department, the distribution of flyers, etc. Of particular concern are Physics 11 and 18, the newly-revamped, non-mathematical course, and the math preparation course, respectively, which are slowly developing a student base. As a UC transfer course and desirable for Teaching majors, Physics 11 has a much larger base than Physics 18, which is only a stepping stone to transfer courses and rarely scheduled by comparison.

- Evaluate the success of distance or hybrid Ed in the parallel non-mathematical courses within the chemistry (Chem 10), and develop an analogous plan for Physics 11. But perhaps more importantly continue to define new strategies to enliven recently established online Physics 5. Will it take more institutional support for DE in general? Will it take more collaboration with neighboring colleges?

- Evaluate the success of DE methods in the Physics 2 and 4 sequences, and give formal training and/or encouragement to adjunct faculty to consider or adapt these methods. In particular, one full-time faculty has developed an extensive set of web-based tutorials and helpers that guide students to the solution of homework problems, which are assigned from the text, collected, and graded for a significant portion of the course grade. In his mind, these postings are a compensatory measure in light of the funding crunch of community colleges, and without them, the other alternatives are to lose large numbers of students or to water down the material. The web-assisted take home quizzes are integral to passing the exams. Is this approach effective in evoking critical thinking skills? What other teaching styles and grading standards are being used along side the online “hints.” What other equivalent methods, unified by the goal of student success, are out there? What are the strengths or weaknesses of each?

Meanwhile the full-time faculty members who double between astronomy and physics have created vibrant online learning communities
via web discussion forums, chat rooms, and internet research projects related to their courses. Using this experience, we want to explore opportunities to network our low-enrollment classes with those of LPC, either staggering their scheduling and/or supporting remote or hybrid instruction with local discussion and labs. This could help boost enrollment in end-of-sequence Modern Physics, Physics 5

- More actively assisting the engineering program in its marketing efforts, with cross promotion of its courses and with its outreach to area high schools.

- Working collaboratively with the chemistry department on developing physics prerequisites or advisories that may enhance Physics enrollments. Exchange ideas about online delivery of these courses.

- Maintain concurrent day and night sections of Physics 2A and 2B, consistent with sufficient demand stemming from active promotion and inviting yet rigorous teaching. This would lessen the importance of creating sections of physics for life science majors with a Saturday lab.

- Investigate making Physics 18 a ‘strongly recommended course for students considering Phys 2 or 4 to build enrollment in that prep class, as well as to increase student success in the Physics program overall. Work harder to get interest in Physics 18, either through recommending it more often to students who do not pass Physics 2 or 4 or through more active universal advertising. Perhaps a diagnostic test could be given to recommend enrollment in Physics 18 where needed. While some students scoring below the cut off for admission to Physics 2 or 4 might well have passed if admitted, the diagnostic test could help build a stronger foundation for students who would have failed and would enrich the experience of students eventually entering and succeeding in Physics 2 or 4.

Physics 18 is only one of several possible responses to pockets of low Physics 2 and 4 student success and enrollment shown by college records since year 2000. Are the dips due to poor student mathematical preparation or are they the confluence of several other factors, including the need for better Physics 2 and 4 pedagogy? Only time and more surveys will tell.

- Create and sustain interest in Physics 22A and 22B to open new access points for Physics 2 students seeking transfer to 4 year universities requiring calculus-based life science physics.

- Within the college wide SLO effort, finalize establishment of a problem solving rubric and practical yet statistically powerful assessment protocol applicable to other exact sciences and mathematics.

- Establish connections with Mesa (Mathematics Science Engineering Achievement) and become partners in Mesa’s School’s Program designed to prepare and recruit historically disadvantaged high school students into 2 and 4-year colleges and universities.

4. How do these goals support the college Strategic Plan goals?
Unit Plan: Full-Time Faculty/Adjunct Staffing Request(s) [Acct. Category 1000]

Unit: Physics
Division or Area to Which You Report: Math and Science
Author(s) of this Unit Plan: Nick Alexander, Scott Hildreth, Timothy Dave
Date: March 2009

Audience: Faculty Prioritization Committee and Administration
Purpose: Providing explanation and justification for new and replacement positions for full-time faculty and adjuncts
Instructions: Please justify the need for your request. Be sure to include reference to Goals/Objectives from Part II, and Strategic Planning Priorities. Please cite any evidence or data to support your request, including enrollment management data (EM Summary by Term) for the most recent three years, student success data (EM Success report), and any other pertinent information. For EM data, go to http://help/EMC/ (from on campus—college intranet). If you have not worked with EM data previously, seek assistance from your division dean or CEMC rep.

No Request for Faculty
Unit Plan: Classified Staffing Request(s) [Acct. Category 2000]

Unit: Physics

Division or Area to Which You Report: Math and Science

Author(s) of this Unit Plan: Nick Alexander, Scott Hildreth, Timothy Dave

Date: March 2009

Audience: Administrative Staff

Purpose: Providing explanation and justification for new and replacement positions for full-time and part-time regular (permanent) classified positions

Instructions: Please justify the need for your request. Be sure to include reference to Goals/Objectives from Part II, and Strategic Planning Priorities. Please cite any evidence or data to support your request. If this position is categorically funded, include and designate the funding source of new categorically-funded position where continuation is contingent upon available funding.

N/A

Criteria For Classified Staffing Priorities (not necessarily in Priority Order as developed by the Admin Staff)

1) Impact on enrollment and revenue;
2) Safety;
3) Mandates;
4) Workload distribution (impact on other’s work);
5) Relationship to institutional priorities.
Unit Plan: Enrollment Requests (Discipline Plan)

Unit:

Division or Area to Which You Report:

Author(s) of this Unit Plan:

Date:

Audience: Budget, Deans, CEMC

Purpose: To recommend FTEF allocations for subsequent academic year.

Instructions: Please be sure to analyze enrollment trends and provide rationale below for any requested changes. Attach Spreadsheet to this form. Spreadsheet format and instructions available on Enrollment Management website (http://help/EMC/). Please seek your dean's assistance as needed.

We would like to request an FTEF increase for the AGP subdivision from 8.4 to 9.6. This would allow for a .6 allocation to offer a Geology and additional .6 FTEF to be applied to Physics based on some of the reasoning presented by Scott Hildreth in March 2008 (See attached sheet) and reasoning offered by Tim Dave (also see attached sheets)
Unit Plan: Enrollment Requests (Discipline Plan)

Unit: Astronomy, Geology, Physics
Division or Area to Which You Report: Science & Math
Author(s) of this Unit Plan: Scott Hildreth, Timothy Dave, Nicholas Alexander
Date: March 2008

Purpose: To recommend FTEF allocations for subsequent academic year.

Request:

Additional 0.6 FTEF allocation for the Unit, expressly dedicated to offering at least one Geology class each semester (fall and spring).

In the past 5 years, Chabot College has been able to offer just one section of Geology 10 per year – to our students. In 2007-2008, we were not able to offer any geology classes.

The reason for this is not demand – Las Positas college offers a selection of 12 geology classes each fall and spring term, and a distance education version of Geology 12 each summer. And when we did offer a geology class, it filled well (41/44 slots for Spring 2005 & 2006, 39/44 slots for Spring 2007). It generated an average WSCH/FTEF of 605 for those three years.

Instead, the limitation is FTEF allocation. We have enough FTEF to support a limited number of physics classes, and astronomy lectures/labs. Each year, we are left with an option of either cancelling an astronomy class we know we could fill to offer a geology class (and thereby underutilizing our planetarium facility significantly), or an even more unpleasant option of cancelling a physics sequence class for students needing the subject to transfer. We have opted to allocate one astronomy course FTEF for a geology offering, but that seems a poor choice. Instead, we believe Chabot should return to the ranks of community colleges offering a full spectrum of physical science classes for GE transfer without pre-requisites.

If supported, this proposal would increase the subdivision FTEF by 0.6 FTEF, allowing a total of 3 geology classes to be offered (either Geology 10 each term, Fall/Spring/Summer, or Geology 10 and Geology 12 in a mix.)
Critical Issues and Concerns
Defining Enrollment Management and Productivity
Ever since I have been a member of the Faculty (CLPFA) Association executive board and talk about EM began some 2-3 years ago, I have felt there was very little of any attention paid to what was perceived to be less tangible "quality" in the education process while the "nuts and bolts" of was perceived to be less tangible "quality" in the education process while the "nuts and bolts" of attention was paid to the more tangible concept of "productivity". Since I find myself again writing attention was paid to the more tangible concept of "productivity". Since I find myself again writing this discipline plan, I embarked again, on an investigation to find a way to infuse the concept of quality in accessing program impact on students and one that would be acceptable to my peers. I can say now, that I have failed to find such a way to make this happen. However, I have found that it might be better to redefine terms.

"Under the Instruction Paradigm, colleges suffer from a serious design flaw- they are structured in such a way that they cannot increase their productivity without diminishing the quality of their product. In the Instruction Paradigm, productivity is defined as cost per hour of instruction per student. In this view, the very quality of teaching and learning is threatened by any increase in the student-to-faculty ratio.

Under the Learning Paradigm, productivity is redefined as the cost per unit of learning per student. Not surprisingly, there is as yet no standard statistic that corresponds to this notion of productivity. Under this new definition, however, it is possible to increase outcomes without increasing costs. An abundance of research shows that alternatives to the traditional semester-length, classroom-based lecture method produce more learning. Some of these alternatives are less expensive; many produce more learning for the same cost. Under the Learning Paradigm, producing more with less becomes possible because the more that is being produced is learning and not hours of instruction. Productivity, in this sense, cannot even be measured in the Instruction Paradigm college. All that exists is a measure of exposure to instruction.

Given the Learning Paradigm's definition, increases in productivity pose no threat to the quality of education. Unlike the current definition, this new definition requires that colleges actually produce learning. Otherwise, there is no "product" to count in the productivity ratio.

But what should be the definition of "unit of learning" and how can it be measured? A single, permanent answer to that question does not and need not exist. We have argued above that learning, or at least the effects of learning, can be measured, certainly well enough to determine what students are learning and whether the institution is getting more effective and efficient at producing it.

The Instruction Paradigm wastes not only institutional resources but the time and energy of students. We waste our students' time with registration lines, bookstore lines, lock step class scheduling, and redundant courses and requirements. We do not teach them to learn efficiently and effectively. We can do a lot, as D. Bruce Johnstone, former chancellor of SUNY, suggests, to reduce the false starts and aimless "drift" of students that slow their progress toward a degree.

Chabot as an Institution might want to consider this redefinition and structure it strategic plan around it.

Declining FTEF goals –
Over the past few semesters the AGP subdivisions have been assigned a declining FTEF goal:

- Fall 2003 4.42
- Fall 2004 4.32
- Fall 2005 3.87
- Spring 2006 3.6

As a result of this trend, in order to meet these goals we were forced to eliminate 2 sections of Astronomy that would normally fill in order to sustain a core Physics curriculum in the Fall '05. It is clear that if this trend continues, not only will the Physics curriculum as offered at Chabot seriously be diminished, so in turn would the Astronomy curriculum also be seriously jeopardized.
In Table 1 data is presented from Fall 2000 to Fall 2004. This data does not account for sections that were cancelled due to low enrollment nor the "true absolute" number of students that enrolled for a particular class. However, what it does offer is a "demand trend" for a "given" class as displayed in Chart 1. Upon further inspection of course enrollments (not shown in Table 1), a particular course would have sufficient demand to fill one section but fall short of sufficient numbers to warrant a second section. This loss would vary from 5 - 13 students per cancelled course. In other words, with 1 to 2 sections being canceled per semester due to low enrollment within a 5 year period, a net loss of 50 - 130 students may occur. In Chart 1 we see that Physics 4A, 2A, 2B, 11, all show some slight trend upwards in enrollment demand, while only Physics 4B and 4C show a slight decline.
One attempt to recapture some of the students lost, came this semester (Spring 2005) when we will not schedule two sections of Physics 2B or 4B, instead we collapsed what would have been two sections (evening and day) into just one spring section, in the late afternoon. This option was chosen after again asking students what might best work for them in the prior semester. Even though we received affirmative opinions from students prior to implementing this plan we found that there were still 5 to 10 students still wanting to take each class above their limit of 24 as the semester began. At the face of it, this attempt would seem as though it did not work. Considering for a moment that not offering a night section of either class might have resulted in a loss of 12-14 students our attempt to recapture some lost students was at best, some limited improvement.

New curriculum, Physics 15, Physics 18, and Physics 122, created because of the NSF project were introduced during 2003-2004 academic year. Physics 15's offering was limited to the NSF Gateway to Success program only, while Physics 18 and Physics 122 were offered. Physics 18 (a supplemental review of mathematics needed for Physics 4A and 2A) was well received by students in the summer of 2004. It did not survive the "cut" in the Fall 2004 due to low enrollment. Along with Physics 122 (an equivalent to the Math Lab operation) will require a much more aggressive "marketing" campaign to "sell" their value to students, but there is little doubt that over time these classes will fill given the polled response of students evaluating their worth.

Looking at the overall success rate of Physics in Table 2 we see:

Table 2 – Student Success Rate

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<td>P2A Success</td>
<td>68.00%</td>
<td>83.00%</td>
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<td>P2B Success</td>
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<td>89.00%</td>
<td>90.00%</td>
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Unit Plan: Equipment Requests [Acct. Category 6000]

Unit: Physics
Division or Area to Which You Report: Math and Science
Author(s) of this Unit Plan:
Date: March 2009

Audience: Budget, Deans
Purpose: To be read and responded to by Budget Committee.
Instructions: Please fill in the following as needed. Text boxes below will expand as you type.
Please note: this form is for equipment whose unit cost is over $200

Brief Title of Request (Project Name): N/A

Building/Location:

Request Amount (include unit cost, total cost, tax, and shipping):

Description of the specific equipment or materials requested:

What educational programs or institutional purposes does this equipment support?

Briefly describe how your request relates specifically to the Educational Master Plan and the Goals and objectives Section of your Unit Plan (Part II, Section 2)?
Why is this equipment necessary?

- Immediate health, safety, or security issues
- Increases enrollment
- Prevents further deterioration of facilities
- Replaces deteriorated equipment or facilities
- Shows cost advantage due to rising prices
- Provides visibility for the Bond Program

Briefly describe how the above criteria are satisfied:


What is the consequence of not funding the equipment?


What alternative approaches have been considered to meet programmatic demands for this equipment?


How many students will be impacted by the purchase of this equipment? ______

Do students use this equipment? _____yes _____no

Is this equipment a replacement? _____yes _____no

Staffing requirements for new equipment (number of staff, are they available, training, etc.):

Will training be required? _____yes _____no

At whose cost?


What are the estimated ongoing costs (for maintenance, etc.)?

Are there potential utility costs/savings?

Is this request CTE (Career Technical Education) Eligible?  _____yes  _____no
Unit Plan: Supplies & Services Requests [Acct. Category 4000 and 5000]

Unit: Physics
Division or Area to Which You Report: Tom Duce, Nick Alexander, Scott Heldwein
Name of Person Completing this Form: Math Science
Date: March 2009

Audience: Budget, Deans
Purpose: To be read and responded to by Budget Committee during the Fall Semester.
Please note: this form is for budget items such as maintenance requests, equipment, supplies, Contractual Services, etc.

Instructions: Please fill in the following as needed. Text boxes will expand as you type. If necessary, feel free to continue your list onto a second page by adding additional rows. Budget Item Descriptions should include estimates of the per unit cost as shown in the example below. If you have questions about estimated cost and/or the criteria of each of the funding sources, please consult your dean or a Budget Committee member.

Organization: ___________________________ Org. Number: ____________ Department/Program: ___________________________

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<th>Instruc. Block Grant (X)</th>
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* Career Technical Education
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Running Total $982.31
# Unit Plan: Request for Resources

**Unit:** Astronomy/Physics  
**Division or Area to Which You Report:** Math/Science  
**Author(s) of this Unit Plan:** Scott Hildreth  
**Date:** March 2009

**Audience:** Budget, Deans  
**Purpose:** To be read and responded to by Budget Committee.  
**Instructions:** Please fill in the following as needed to justify your requests. Text boxes below will expand as you type. To list the items you are requesting, please complete the accompanying Excel spreadsheets for the items you are requesting in the 4000, 5000, and 6000 account categories, as needed, along with the justification for these requests below.

## Equipment Requests [Acct. Category 6000]

Please note: Equipment requests are for equipment whose unit cost is over $200

**Brief Title of Request (Project Name):** Upgrade of Astronomy/Physics computer resources  
**Building/Location:** 1710  
**Request Amount (include tax and shipping):** $25,000 (est).

**Description of the specific equipment or materials requested:**

- (24) laptop computers, of at least 2Ghz, with 2 MB RAM, 1M Cache, 80GB drive, with DVD @$1000
- (1) labpack site license for image processing software at @$1000.

**What educational programs or institutional purposes does this equipment support?**

The astronomy/physics lab computers are used in all facets of our lab work, from data acquisition and analysis through simulation.
Briefly describe how your request relates specifically to meeting the Educational Master Plan and the Strategic Plan Goals and support the goals and outcomes detailed in your Unit Action Plan (Part II, Section 2)?

Updating our aging computers is clearly part of our Strategic Goal D: Vision, Leadership, Innovation/ Strategy D5: Providing safe, secure and up-to-date facilities and technology.

Why is this equipment necessary?

__X__ Replaces deteriorated equipment or facilities

__X__ Provides visibility for the Bond Program

Briefly describe how the above criteria are satisfied:

Our Astronomy/Physics lab has (24) HP laptops dating from 2002 that can no longer hold charges, and have inadequate processing power to analyze captured astronomical images. With Bond funds, we have new physics and astro lab equipment that will not run on the older computers.

What is the consequence of not funding the equipment?

While we have acquired a new telescope and camera through the Bond, we will not have the ability for students to process photos or analyze them scientifically with current image processing programs without upgrades to the aging computer system. In essence, we will be unable to fulfill our goal of improving the Astronomy laboratory and learning experience for our program.

What alternative approaches have been considered to meet programmatic demands for this equipment?

We originally hoped and requested that the computers be upgraded as part of a campus-wide replacement for aging computers. But that has not happened, and apparently will not. This equipment was original purchased with the help of an NSF grant, saving the college tens of thousands of dollars in initial costs. But now having acquired them, we can't seem to get them upgraded or included on any published upgrade plan. Since they were not original District purchases, they don't seem to fall under any improvement plan, and given that they are lab computers and require some additional processing power, we need to fund their replacement specifically.

How many students will be impacted by the purchase of this equipment?

50/term in Astronomy Labs; 200/term in Physics lab

Do students use this equipment? __X__ yes ______no
Briefly describe how your request relates specifically to meeting the Educational Master Plan and the Strategic Plan Goals and support the goals and outcomes detailed in your Unit Action Plan (Part II, Section 2)?

Why is this equipment necessary?
_____ Immediate health, safety, or security issues
_____ Increases enrollment
_____ Prevents further deterioration of facilities
_____ Replaces deteriorated equipment or facilities
_____ Shows cost advantage due to rising prices
_____ Provides visibility for the Bond Program

Briefly describe how the above criteria are satisfied:

What is the consequence of not funding the equipment?

What alternative approaches have been considered to meet programmatic demands for this equipment?

How many students will be impacted by the purchase of this equipment? _____

Do students use this equipment? _____yes _____no

Is this equipment a replacement? _____yes _____no
**Supplies & Services Augmentation Requests [Acct. Category 4000 and 5000]**

**Definition of Augmentation:** A request for additional funds for your current allocated budget (the funds you actually received), over and above the current amount.

Last year's 4000 category budget $1,800.00
Last year's 5000 category budget $4,100.00

**Please state why you are requesting these funds in addition to your current allocated budget (the funds you actually received). Why were the funds previously allocated insufficient?**

Some of the list of equipment we ordered last year but it wasn't acted on by purchasing because when the requisitions got "lost". See the list preceding the $932.41 subtotal, total amount lost in the shuffle on attached spread sheet. Substantiating this charge, Tim and Scott tracked:
1) Requisition #, as they filled them out, and made copies.
2) Expected costs

**Staffing requirements for new equipment** (number of staff, are they available, training, etc.):

Will training be required? _____yes  _____no

At whose cost?

_________

**What are the estimated ongoing costs** (for maintenance, etc.)?

**Are there potential utility costs/savings?**

Is this request CTE (Career Technical Education) Eligible? _____yes  _____no

**Note: Augmentations are rarely funded and are based upon available funding.**

Definition of Augmentation: A request for additional funds for your current allocated budget (the funds you actually received), over and above the current amount.

**Brief Title of Request (Project Name):**

Last year’s 4000 category budget _____$1,800.00
Last year’s 5000 category budget _____$4,100.00

Reference to Part VI
3) Receipt of email from Linda Wilson or other purchasers saying they were ordered with a PO#
4) Receipt of actual copy of PO, checking the price paid
5) Delivery of the equipment to the warehouse.
<table>
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<tr>
<th>Slinky</th>
<th>AAA batteries</th>
<th>Energizer CR1616 Battery Pack 1</th>
</tr>
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<td>Energizer-CR1616 total</td>
</tr>
</tbody>
</table>

|          | 5.50 | $0.48  | 7.95  | $43.83  |
|          | $10.32 | $0.90 | $8.65 | $31.10  |
|          | $3.95  | 0.34 included | 25.76 | $1,008.07 |

2 boxes of AAA batteries -24/box