

Annual Report for Assessment of Outcomes 2011-2012

Please address the questions below
send to learningassessment@pcc.edu by **June 22, 2012**; with Annual Report in the subject line

Note: Information provided in this report may be inserted into or summarized in Section 2C (LDC/DE) or 6B (CTE) of the Program Review Outline.

- 1. Describe changes that have been implemented towards improving students' attainment of outcomes that resulted from outcome assessments carried out in 2010-2011. These may include but are not limited to changes to content, materials, instruction, pedagogy etc.**

During 2010-2011, the CMET SAC faculty assessed CMET Program Outcomes 1 and 2 (the text of these outcomes are listed in full on the 2nd page). In assessing Outcome 1, the CMET SAC faculty determined that they 'need to be more consistent from instructor to instructor about the format of both homework solutions and lab reports'. This change has been implemented in several courses program-wide. In assessing Outcome 2, it was determined 'that instructors need to place greater emphasis on the importance of the interpretation of the data gathered during experiments'. In this 2011-2012 assessment, the CMET SAC faculty has once again identified this as an area of opportunity for improvement and has put forth specific approaches for implementation in Section 4.

For each outcome assessed this year:

- 2. Describe the assessment design (tool and processes) used. Include relevant information about:**
 - **The nature of the assessment (e.g., written work, project, portfolio, exam, survey, performance etc.) and if it is direct (assesses evidence mastery of outcomes) or indirect (student's perception of mastery). Please give rationale for indirect assessments (direct assessments are preferable).**
 - **The student sample assessed (including sample size relative to the targeted student population for the assessment activity) process and rationale for selection of the student sample. Why was this group of students and/or courses chosen?**
 - **Any rubrics, checklists, surveys or other tools that were used to evaluate the student work. (Please include with your report). Where appropriate, identify benchmarks.**
 - **How you analyzed results, including steps taken to ensure that results are reliable (consistent from one evaluator to another).**

In 2010-2011, the CMET SAC faculty assessed CMET program outcomes 1 and 2 by adding Student Portfolios. These Student Portfolios were added to the previously established assessment methods of examinations, experiments, fieldwork, reports, AutoCAD and Solid Works drawings and oral presentations.

In 2011-2012, the CMET SAC faculty assessed all 5 of the CMET Program Outcomes. The CMET Program Outcomes are:

1. Apply fundamental engineering knowledge to identify, formulate and design successful solutions to real-world technical endeavors.
2. Utilize appropriate laboratory techniques, engineering equipment and computational technology to collect, analyze, and interpret data to acquire scientific knowledge about a stated problem.
3. Utilize the knowledge of visualization skills, computer aided drawing programs and the ability to create and interpret engineering drawings, to design engineering projects within proper industry acceptable standards and conventions.
4. Apply effective communication skills, teamwork, project / time management, ethical engineering practices, and professional responsibility to the development of engineering components and systems.
5. Practice sustainable engineering methodologies.

In 2011-2012, the CMET SAC faculty discussed the viability of expanding the Student Portfolios to include the evaluation of Outcomes 3- 5. After many lengthy discussions, we concluded that we should change our assessment method, rather than expanding the portfolios to include the evaluation of Outcomes 3-5, as we had originally planned.

Outcomes 1, 2, 4 and 5

As stated in the CMET SAC 'Revised CTE Assessment Plan 12/2/11", our revised plan included assessing Outcomes 1, 3, 4, and 5 with a Spring Term capstone project. (Outcome 2 was assessed independently and will be discussed independently.) This project was the Final Project for CMET 223 Project Management, which included an oral report, a written report, calculations and drawings. We felt that this would be a better tool for determining if students have met the program outcomes. Rubrics were developed for evaluating the projects. This rubric can be seen in the Appendix. This is a direct assessment approach.

The student sample size was the entire population of the class, which includes nearly all of the graduating class. (A few June 2012 graduates had taken this required class in the previous year. This option has been discontinued in the future so all graduates-to-be will be taking CMET 223 the quarter of their intended graduation.) There were 4 groups of 5 students and 2 of 6 students for a total of 32 students.

All 5 CMET SAC faculty members were in attendance for the oral presentations of the CMET 223 Project Management Final Project held on Wednesday, June 13th, 2012. There were also staff and part-time faculty that attended these presentations. The CMET SAC faculty members evaluated the first page of the Group Project Grading Rubric (Organization / Mechanics, Subject Knowledge, Power point slides, Eye Contact / Body Language / Poise, and Elocution / Enthusiasm) during the presentation. Immediately after the oral presentations, the written reports of this Final Project were used to evaluate the second page of the Group Project Grading Rubric (Calculations, Drawings, Work Samples, and Community and Environmental Responsibility). Each of the criteria was scored on a 4-point scale: 1 = Beginning or Incomplete, 2 = Developing, 3 = Accomplished and 4 = Exemplary. Each of the 6 student groups were evaluated independently by each CMET SAC faculty member without any knowledge of the other faculty members' scores.

Outcome 2

As stated in the CMET SAC 'Revised CTE Assessment Plan 12/2/11", our revised plan for assessing Outcome 2 was to use laboratory experiment from CMET 211 Environmental Quality and develop a rubric for evaluating the lab report. Again, this rubric can be found in the Appendix. This is a direct assessment approach.

The student sample size was the entire population of the lab section, which consisted of 8 groups of 3 students.

Each lab report was evaluated by three CMET SAC faculty members. Each of the criteria was scored on a 4-point scale: 1 = Beginning or Incomplete, 2 = Developing, 3 = Accomplished and 4 = Exemplary. We considered a score of 2.5 (between Developing and Accomplished) to indicate that a student group meets the criteria.

3. Provide information about the result (i.e., what did you learn about how well students are meeting the outcomes)?

- **If scored (e.g., if a rubric or other scaled tool is used), please report the data, and relate to any appropriate benchmarks.**
- **Results should be broken down in a way that is meaningful and useful for making improvements to teaching/learning. Please show those specific results.**

Outcomes 1, 2, 4 and 5

We tabulated the results of the rubric evaluation and calculated the mean and standard deviation for each criterion; this tabulation is in the Appendix.

For Outcome #1 (engineering fundamentals), the two criteria were Calculations and Work Samples. The Calculations had an average score of 2.69 while the Work Samples had an average of 3.19. This gave us an overall average for Outcome #1 of 2.94. This was quite close to a 3 which was considered to be 'Accomplished' on the 4-point scale and determined to be a satisfactory result by the CMET SAC faculty. One group sited which specific class gave them the ability to produce each part of their project, rattling off 6 classes in the process. This was particularly heartening to the CMET SAC faculty and will be a requirement to perform this activity in the Project Management Final Project next year.

For Outcome #3 (visualization skills), the criterion was Drawings. This criterion had an average score of 2.72 with a relatively high standard deviation of 1.091. The high standard of deviation was due to the fact that one group submitted very little in the way of drawings in the written report and thus received very low scores for this criterion and, in effect, bringing the average down. It was determined that it should be stressed that AutoCAD and Solid Works drawings should be included in the written report.

For Outcome #4 (communication), the criteria were Organization, Subject Knowledge, Slides, Eye contact and Elocution. The average of these criteria was 3.33 ranking comfortably in between 'Accomplished' and 'Exemplary'. The faculty (and staff and part-time faculty) that attended the oral presentations were quite impressed in the professionalism and presentation exhibited by the students, as reflected in this high average. It was postulated by the CMET SAC faculty that perhaps we have a tendency to evaluate Outcome #1 (engineering fundamentals) and Outcome #3 (visualization skills) much more harshly than Outcome #4 (communication). Perhaps, a group of Speech instructors may very well have evaluated these outcomes in a contrary manner.

For Outcome #5 (sustainable engineering), the criterion was Community and Environmental Responsibility, which had an average of 3.54, the highest average of the 4 outcomes. It should be noted that the theme of the Final Project this year was to 'design a project that could be connected to the Village Building Convergence'. The CMET SAC faculty are aware that this theme lent itself quite well to projects that touched upon Community and Environmental Responsibility. However, the recent addition of the Green Technology and Sustainability option has been shown to attract students, who are civically and environmentally minded, as well as educating those who might not have had an initial interest. There has been a push throughout the department to add 'green' aspects to courses and this assessment would indicate that these combined efforts appear to be paying off.

Outcome 2

The CMET SAC tabulated the results of the rubric evaluation and calculated the mean for each criteria; this tabulation can be seen in the Appendix. For the tabulations, the 3 scores of each evaluator (each lab report was evaluated by 3 different CMET SAC faculty) were summed. Then, the summed score was averaged for the 8 lab reports.

For Outcome #2 (lab skills), the Results, Discussion and Conclusion had what the CMET SAC faculty deemed to be disappointing scores, while the Introduction, Spelling / Grammar, and Appearance were quite close to a 3 which is an 'Accomplished' rating. (For example, Spelling / Grammar had a score of 8.123 which divided by 3 is equal to approximately 2.71 which is close to 3.) These results, primarily the disappointing criteria, created a great deal of discussion. Discussion and Conclusion were also seen to have relatively low scores in the previous year. In the 2010-2011 Annual Report for Assessment of Outcomes, we state that "We concluded that instructors need to place greater emphasis of the interpretation of the data gather during experiments." It appears through this analysis that the efforts in this direction were ineffective. To achieve more positive results in these criterion the following year, the CMET SAC formulated a few different specific approaches which will be discussed in Section 4.

4. Identify any changes that should, as a result of this assessment, be implemented to help improve students' attainment of outcomes. (These may include, but are not limited to, changes in curriculum, content, materials, instruction, pedagogy etc).

The CMET SAC faculty were satisfied and somewhat pleasantly surprised with the results of the assessments of Outcome 1 (engineering fundamentals), Outcome 4 (communication) and Outcome 5 (sustainable engineering). However, the results of the assessments for Outcome 2 (lab reports) and Outcome 3 (visualization skills) are seen as areas of opportunity for improvement.

The CMET SAC faculty believes the results of Outcome 3 can be improved by reiterating the importance of including AutoCAD and Solid Works drawings in the written report. The drawings that were included in the written portion of the Final Project were deemed to be quite well-done so the CMET SAC faculty feels that this is more of an error of omission, rather than capabilities.

The Discussion and Conclusion criteria in the results of the Outcome 2 (lab reports) created the most significant discussion during the analyses. As mentioned in Section 3, the CMET SAC faculty formulated a couple different specific approaches to improve the results of these criteria in lab reports next year. The first and most straight-forward approach would be to give more clarification to what comprises a Discussion and what comprises a Conclusion. The CMET SAC faculty felt that the Conclusion should be tied back to the Introduction, something that is

currently lacking. Another approach would be to give students samples of what an appropriate (and inappropriate) Discussion and Conclusion might look like. Finally, a third approach that was proffered would be to have the students self-assess their lab reports using a similar rubric that the CMET SAC faculty use in performing the assessments of the lab reports. It was determined that individual lab instructors will choose their preferred approach.

5. Reflect on the effectiveness of this assessment tool and assessment process. Please describe any changes to assessment methodology that would lead to more meaningful results if this assessment were to be repeated (or adapted to another outcome). Is there a different kind of assessment tool or process that the SAC would like to use for this outcome in the future? If the assessment tool and processes does not need to be revised, please indicate this.

The CMET SAC faculty switched gears, so to speak, in the beginning to middle of the 2011-2012 school year and opted to do perform the majority of the outcome assessments upon the CMET 223 Project Management Final Project, as opposed to Student Portfolios. The faculty thought this would be a more beneficial analysis and this opinion was confirmed upon completion of the 2011-2012 outcome assessments. The 'Final Project' lends an aura of finality in that this is the last time we will see this group of students' written work and presentations. This adds a feeling of significance to the outcome assessments.

Still, the CMET SAC faculty did feel that the assessment of this Final Project could be improved. As mentioned previously, adding a requirement for the student groups to state which course they acquired which skills would be meaningful. In addition, the faculty felt there should be more of the work that lead to the written report included in the written report, that the student groups should develop more of a 'need' for their project or product, and that estimated cost information and a bill of materials should be included in all Final Projects.

Appendix:

Revised CTE Assessment Plan 12/2/11 (CMET)

Group Project Grading Rubric

Lab Report Grading Rubric

Group Project Assessment Data

Lab Report Assessment Data