Department of Mathematics and Computer Science
Program Review Annual Update
June 2006

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Supporting Materials, available online at:
http://www.westmont.edu/departments/mcs/phunter/progrev/

1. Minutes from departmental program review meetings
2. Samples of student writing (including summary of dept. assessment)
3. Rubric for evaluating student writing (draft)
4. Data on numbers of graduates
5. Data on inquiries about mathematics and computer science
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PROGRAM GOALS

I. Research and Technology
As reported in the department’s January 2006 Update, we focused this year on the following goal:

Students in the following classes will learn to use technical word processing software: MA-019, MA-108, MA-110. In particular:

- 80% of students completing MA-019 will produce a paper using technical word processing software.
- 100% of students in MA-108 and MA-110 will produce a paper using technical word processing software.
- 20% of students in MA-108 and MA-110 will use technical word processing software for an assignment without being required to do so.

This goal is one aspect of our disciplinary expectations for our students. It is also one element of Westmont’s “Research and Technology Standard” (Student Learning Standard #6).

DATA

Data in the form of papers written by students using technical word processing software have been collected in the following courses:

- MA 108, Spring 2005—Mathematical Analysis
- MA 19, Fall 2005—Multivariable Calculus
- MA 110, Spring 2006—Modern Algebra

The department met on 1/19/06 to discuss the papers from MA 108 and MA 19, and on 5/17/06 to discuss the papers from MA 110. (minutes from these meetings are posted on the department’s program review web page). See our January Update for the details of the 1/19/06 discussion. What follows is our analysis of 5/17/06.

INTERPRETATION

The papers from MA 110 demonstrate that students mastered the software sufficiently to produce a paper. However, the quality of the papers was decidedly mixed.

Students were required to use the software on the assignment evaluated here, but 1 of the 5 students in the course used the software on a later assignment for which it was not required (our goal was to have 20% of students in the course use it when not required, so we’ve met that goal).

As mentioned in the January Update, lack of accessibility of technical word processing software was an obstacle to students’ learning to use it. The professor of MA 110 implemented her plan to introduce students to more accessible software (freeware, widely used in the academic communities of mathematics and computer science). The software was more difficult for students to install on their computers and required them to spend more time learning to use it than the software used in previous semesters. Consequently, more time (in and outside of class) was needed by students and professor to enable students to use the software. Students did report that in spite of the initial challenges, they preferred having the software on their own computers.
While these pieces of student work demonstrate one particular student learning outcome that our department hoped for, we continue to discuss how to include assessment of our broader goals for student writing in our evaluation of the technical word processing goal.

Toward that end, one faculty member circulated (within the department) a draft of a rubric that could help us take a more detailed look at the work students are producing with technical word processing software (this rubric is available on the department’s program review web page). To make use of such a rubric, we need further departmental discussion about the student learning outcomes it would measure. As we considered when to have such a conversation, it became evident that we do not have consensus as a department about the value of pursuing the goal of having our students learn to use technical word processing software.

Moreover, the technical difficulties of installing and learning to use the freeware mentioned above have left us uncertain about whether our students are well-served by its use.

Those faculty who do value the goal may simply decide to make it a goal for the courses they teach, without making it a goal for all of our majors. Those faculty may decide to collaborate with each other on the assessment of that goal, and may find ways to collaborate across courses, but these ideas need further discussion. All the faculty who share this goal will be away for parts of 2006-07, so we will postpone further discussion until 2007-08.

During the fall semester of 2007, we will meet as a department to discuss how we want to refine our assessment of students’ use of technical word processing software.

As noted in our assessment plan update (Fall 2005), our department has been working for several years to increase recruitment and retention of students majoring in our disciplines. Our goals in this area were not part of the department’s 2004 program review proposal. In recognition of their importance to our department and upon the advice of our Assessment Coordinator, we have decided to begin reviewing this aspect of our program.

We are concerned about the overall number of students in our programs as well as about the enrollment of female students (traditionally underrepresented in mathematics and computer science).

Our goals in these areas are not linked directly to particular student learning outcomes. However, we have observed that our students have better learning experiences when they have a critical mass of fellow students in classes with them.

- Students in the last two years have reported at the Senior Breakfast (May 2005, May 2006) that they valued having fellow students in their upper division mathematics and computer science courses. They also reported that the opportunity to be a part of a learning community enhanced their education.
• Next year’s senior class has only one mathematics major. She has reported in several conversations with Professor Rosentrater, her academic advisor, that the lack of fellow students will decrease her enthusiasm for learning.
• Four department faculty members reported on teaching experiences of the last 3 years in which the sizes of particular classes varied. Each reports that student morale and motivation and academic performance was higher in the classes that had more students.

This spring, a committee of the department (Iba, Kihlstrom, P. Hunter) met on 2/2/06, 3/6/06, and 5/23/06 to evaluate past recruiting and retention activities and to plan future efforts. All members of the department met on 5/17/06 to discuss our goals in this area, our strategies for achieving those goals, and our means of assessing them (minutes for these meetings are available on the department’s program review web page).

We found it somewhat challenging to agree upon a specific number of graduates and upon appropriate goals for the enrollment of female students. On the one hand, we are aware of the current challenges facing many institutions of higher education (particularly relative to recruiting computer science students) and want to set realistic goals. On the other hand, we recognize that our students will be well served by programs in our disciplines that include a critical mass of students. With that disclaimer, we are currently working with the following specific goals:

Each year, Westmont will enroll twenty new students expressing interest in majoring in computer science.

Each year, Westmont will enroll twenty new students expressing interest in majoring in mathematics.

Each year, ten students will graduate with degrees in computer science. Forty percent of graduates in computer science will be female.

Each year, ten students will graduate with degrees in mathematics. Forty percent of graduates in mathematics will be female.

DATA

At the meeting of 5/17/06, department members discussed data comparing Westmont’s mathematics and computer science graduates with numbers of graduates at other institutions. (This data is available on the department’s program review web page.)

At a meeting on 5/24/06, Professors Iba and P. Hunter discussed data from our admissions office that shows the numbers of students inquiring about, applying to, and enrolling in Westmont who expressed interest in our disciplines. (This data is available on the department’s program review web page.)

INTERPRETATION

The data on graduates reveal that we are currently not meeting our goals for numbers of graduates in either discipline. In 3 of the 6 years for which we have data (and on average), we graduated the targeted percentage of females in mathematics.
It is not yet clear to us what the data from the admissions office reveals. A committee of the department will meet in September 2006 for further reflection.

**USING THE RESULTS**

The data we have been gathering still needs to be fully analyzed, but what we have considered confirms an awareness the department has had for several years that we need to increase our student enrollment. In response, we have taken the following steps:

- designed a brochure for the computer science program that emphasizes aspects of the discipline that appeal to a broad range of students, particularly females;
- made changes to the computer science curriculum to provide the following:
  1. introduction to the discipline that appeals to students with a range of interests, particularly females;
  2. opportunities to combine study of computer science with other disciplines.
- applied for a grant from the National Science Foundation that specifically aims to increase the number of computer science students at Westmont (see the proposal, available on the department’s program review web page);
- met with representatives from the admissions office to discuss ways to collaborate with them in recruiting students to our disciplines (spring semester, 2006);
- begun conversations with the director of academic advising to discuss ways to collaborate with her office in recruiting students to our disciplines; as a result of these conversations, Professors P. Hunter, Iba, and Kihlstrom will be taking on academic advisees who show aptitude for our disciplines but have not expressed an interest in a particular major;
- begun conversations with members of the physics department to discuss ways to collaborate with them in assessing our progress in recruiting female students.

**NEXT STEPS**

We are keenly aware that up to this point in the review of this aspect of our program, we have focused much more on creating and implementing plans to improve student enrollment and retention than we have on the effectiveness of those plans. We recognize that as we continue our efforts to attract students to our disciplines, we need to evaluate the effectiveness of specific steps we are taking. In other words, we need to go beyond an examination of the numbers of students enrolling and graduating, and look more particularly at the impact of the programs we are implementing. During the coming academic year, we intend to put in place procedures for evaluating just these particulars. We expect that these procedures will be an important part of our next five-year plan (for 2007-2011).

**III. Serving Client Departments**

While we strive to serve adequately all of the departments that depend on us, the Liberal Studies major (Education Department) is a program which depends upon the Mathematics Department in a particularly critical way. If Liberal Studies graduates do not pass the CSET exam, they are unable to continue their path toward a career in elementary education.
Our department goal is that 100% of Liberal Studies student taking the CSET exam will pass the subject area exam in mathematics.

DATA

As of May 06 CSET scores are available for 8 of the 9 Westmont Liberal studies graduates continuing into the Westmont Elementary program.

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<tr>
<th>CSET: Westmont students results (Maximum score = 4)</th>
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<tbody>
<tr>
<td>2004-05</td>
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<tr>
<td>Mathematics</td>
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<td>100% of students passed in each year</td>
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INTERPRETATION

The scores of Westmont Liberal Studies graduates leave very little room for improvement. The data clearly indicate that the current configuration of the MA160/MA165 series is serving the Liberal Studies majors well.

USING THE RESULTS

The scores do not indicate the need for any changes in the current program. Rather, any proposed changes should be carefully monitored to insure that there is not a negative impact.

NEXT STEPS

We will continue to monitor the CSET mathematics scores of Liberal Studies students to insure that the current quality is maintained.