Colorado State University – Pueblo Academic Program Assessment Report for AY 2015-2016

Program: <u>Mathematics</u> BA/BS

Completed by: \_\_Bruce N. Lundberg \_\_\_\_

## Assessment contributors (other faculty involved in this program's assessment): \_\_\_\_\_\_ Julie Spangler

Introduction: For the 2015-2016 academic year, two math program faculty, Dr. Lundberg and Ms. Spangler, evaluate the program's SLOs and other aspects by conducting a "focus group" discussion of over one hour in length. The two students who attended were both double majors in mathematics and physics, so a discussion questions on both programs was conducted. We also sent out an "exit survey" form to all Spring 16 graduates, though only one student returned this so far. Results for 15 students who took the MFAT (Major Field Achievement Test) in mathematics were received since 2015 assessment activities. The data collected give strong corroboration to one Spring 16 graduate's statement (see below for

completed form): Mathematics is one of the best major on campus.

Last year a team of faculty reviewed ungraded and unidentified final exams from the Sophomore-Junior level mathematics course Math 307 – An Introduction to Linear Algebra, and from the capstone courses Math 427 – Abstract Algebra and Math 421 – Introduction to Analysis. The plan was to evaluate the program's effectiveness in developing its students proficiencies in the SLOs identified in the program's assessment plan by comparing their early abilities in mathematical argumentation with their abilities at the conclusion of their degree program. Students enrolled in Math 307 are largely or exlusively math majors that have successfully completed the freshman level Calculus sequence (Math 126, Math 224) and the freshmansophomore level matrix and vector course (Math 207). These students should be computationally proficient with introductory Calculus application problems, but not yet exposed to formal mathematical arguments or proofs. Math 307 provides the program's principle introduction to reading and composing mathematical proofs. It was anticipated that students will still be in the development phase of constructing mathematical arguments even at the conclusion of Math 307. Math 427 and 421 are capstone courses, with much higher expectations. By the students' senior year, they have been exposed to two or three semesters of courses with problems of increasing difficulty, requiring more sophisticated and advanced techniques of argumentation and proof. Additionally, there are the expectations in the capstone courses that students will have developed increased confidence, maturity, mathematical literacy and fluency, and greater intellectual rigor and aesthetic appreciation, as demonstrated by creating and writing elegant mathematical arguments. A team of four faculty, Professors Barnett, Chacon, B. Lundberg and Zizza, assessed final exams from the aforementioned courses for which they were not the instructor of record. The rubrics used for the similar assessment activity in AY12-13 were distributed, discussed and edited in an effort toward greater precision, objectivity, calibration and comparability in assessment results for this type of exercise. The participating professors ended up using the circulated rubric with somewhat varying interpretations, symbols, and categories.

Date: June 1, 2016

Due: June 1, 2016

## I. Program student learning outcomes (SLOs) assessed in this cycle, processes, results, and recommendations.

A. Which of the program SLOs were assessed during this cycle? Please include the outcome(s) verbatim from the assessment plan.	B. When was this SLO last assessed?	C. What method was used for assessing the SLO? Please include a copy of any rubrics used in the assessment process.	D. Who was assessed? Please fully describe the student group.	E. What is the expected achievement level and how many students should be at it?	F. What were the results of the assessment?	G. What were the department's conclusions about student performance?	H. What changes/improvements to the <u>program</u> are planned based on this assessment?
1. Learn, understand and apply mathematics from the core mathematical disciplines of calculus, abstract algebra, analysis, modeling, differential equations, geometry, probability, and statistics.	AY 13-14	The Mathematics Major Field Achievement Test, given to each student at the end of their second capstone course (Math 421 and Math 427).	All(15) students in either Math 421 or Math 427 who were completing the second of these two capstone courses during the Spring 15 or Fall 15 term. These are generally students who will graduate in this or the subsequent term. (Scores for the MFAT test given Spring 16 are not yet available).	A 90% of students above the 50 <sup>th</sup> percentile in the national rankings. Unfortunately, the number of test takers and/or the expense prevents us from obtaining sub-score analysis.	The national percentile rankings on the Math MFAT for the 15 students tested were: 96, 89, 84(4), 81, 74, 69, 56(2), 25(2), 18, 3. Note that the median percentile ranking was 74. Also, 11 of the 15 ( <b>73%</b> ) of students were at or above the 56 <sup>th</sup> percentile	Four students of 15 (26%) were far below the 50 <sup>th</sup> percentile rank, with one very low.outliner. On rare occasions students do not take this test seriously – since it does not count in their grade (the scores arriving too late). Given the goal of 10% or less below 50 <sup>th</sup> percentile, the program may need to strengthen standards and support for C students to attain greater competency and care. There is evidence the program is very successful in leading ad aiding most students to learn, understand and apply the core mathematical disciplines listed, which are tested on the MFAT. Several studets demonstrated outstanding achievement in comparison to there national peers.	<ol> <li>In AY 15-16 committees began extensive analysis, discussion of, and possible changes in, our mid level (soph. and jr) courses of Math 126- 224-325, 207-307.We plan to continue discussions of these in early Fall 16, considering proposals to strengthen the mid level courses to help more to achieve in the top half on the MFAT.</li> </ol>

B. Follow-up (closing the loop) on results and activities from previous assessment cycles. In this section, please describe actions taken during this cycle that were based on, or implemented to address, the results of assessment from previous cycles.

A. What SLO(s) did	B. When was this SLO	C. What were the recommendations	D. Were the recommendations	E. What were the results of the changes? If the
you address? Please	last assessed?	for change from the previous	for change acted upon? If not,	changes were not effective, what are the next
include the		assessment?	why?	steps or the new recommendations?
outcome(s)				
verbatim from the				
assessment plan.				
3. Students will	AY 12-13	1 The new AY 14-15 uniform rubric	1. – 2. No, we did not find time to	3. A. In AY 15-16 committees began extensive
create, analyze and		for evaluation of final exams will be	carry out last year's type of	analysis, discussion of, and possible changes in,
use mathematical		refined during the AY 15-16, based	assessment due to other	our mid level (soph. and jr) courses of Math
abstraction. They		on the experience of using and	priorities and tasks.	126-224-325, 207-307
will understand and		discussing in this exercise.		<b>B.</b> We plan to continue discussions of
write formal				these in early Fall 16, considering proposals to
mathematical		2. The logistics of keeping portfolios		strengthen the mid level courses to help more
arguments. They		of final exams for each student will		to achieve in the top half on the MFAT.
will appreciate the		be discussed and addressed. This		
standards for		improvement planned improvement		<b>C.</b> The chair recruited faculty to give brief
mathematical rigor,		was delayed due to staff cutbacks		talks about various teaching techniques in
elegance and		and teaching load increases in AY		department meetings.
beauty.		14-15.		
4. Students will produce and deliver effective oral and written presentations of mathematical material and ideas.		3. The assessment exercise and discussion showed the need for and current lack of time spent on conversation on teaching and curricular challenges and issues. Ways to foster such conversation collaboration, and to improve teaching morale, will be sought, and tried, and assessed	3. Yes	<ul> <li>D. The chair created and promoted a "teaching resources" book shelf in the department office. Contributions of books and articles were reqested and obtained from faculty.</li> <li>E. The chair emphasized and sustained a theme on the promise, prospects and purposes of student learning during AY 15-16.</li> </ul>
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Comments: A committee considering improvements in the Math 121: College Algebra course, text and online homework system used by most instructors, has met regularly during Summer – Fall 15, coordinating online homework, schedule and testing for the new text and syllabus. Many meetings with publishers have also been held. The decision on adopting a new homework system and text in favor a McGraw-Hill text and homework system that promises to improve the curriculum, delivery, and initial assessment of student preparedness for the course was carried out, and continued with slight adjustments for the Spring 16 term. We now have our Math 121 course back into the position of covering systems of equations and conic sections as we once did, and as PCC does. A pilot program experimenting with the use of the ALEKS individualized learning system in the Group Learning Program, and Math 121 as a whole course, has been initiated and supported by PROPEL Summer Institute funds.

The mathematics program suspended the "Black-Hills Model" experiment in the remedial mathematics offerings after analysis of its first full-blown implementation in all sections did not show improvement worthy of the additional human and financial costs. Analysis of data based on tracking students forward from Math 098 also showed that Math 098 needs to increase its effectiveness for students moving on to Math 099.

All of these revisions have kept the departmental curriculum committees and Chair very busy We plan to engage in these important activities in the coming semesters. We are discovering and clarifying through (sometimes challenging) discussions more about the sources of disagreement over curriculum among math program faculty, and have ideas and plans for fostering more discussion and sharing of curricular needs and changes, teaching challenges and practices, in the Department meetings and other venues.

## **Department of Mathematics and Physics**

		Colorado State University - Pueblo Mathematics Exit Interview			
Name:		Telephone:			
Email:					
Program of Study:					
Mark the planned set	mester and year for grad	uation:			
Spring 2016	Summer 20	Fall 20			

What did you like most about your mathematics experience at CSU-Pueblo?

Friendly and knowledgeable faculty the was who were always supportive.

What are, in your opinion, the indispensable, core courses in the major? Calculus sequence INTO to Compatition Linear Algebra Intro to Analysis Abstrae Algebra Can you think of things that should be changed? Offering of Unusual upper Nevel Courses (Complex, Topology, Graduale Courses) More regularly Would be Nice.

Can you think of things that should not be changed?

The quality of the protonous.

What are your overall perceptions of the degree program?

Mathemation is one of the best major on campus.

What is your overall satisfaction with advising?

Very good, when I coult find Dr. Charcon.

How prepared are you to securing appropriate employment/graduate study?

I'vie applies to several physics graduate program

one an happing to attem one make Full.

Will you, and have you recommended the program to others?

Did your program of study meet, form, expand, or exceed the goals you set upon entering the program?

Very much 50.

How would you rate your capabilities in the following areas? Circle one

5 = excellent - 1 = poor

50 50 5 5 5 5 5	(4) 4 (4) 4 (4) (4) (4) (4) (4) (4) (4)	~~~~~~	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	$     \begin{array}{c}       1 \\     $	A strong grounding in the fundamentals of calculus Ability to identify and solve mathematical problems A strong grounding in linear and abstract algebra Ability to communicate effectively in writing Ability to communicate effectively orally Ability to read and write proofs Awareness of the applications of mathematics Appreciation for the beauty of mathematics Desire to learn more mathematics or related areas
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## About you

Have you been admitted to any professional or graduate programs? Where? CJU Fort Colling 75 CONSTANTY Me for Physics.

Do you plan to pursue a teaching career?

Do you plan to pursue a career in government or public service?

Did you tutor other college students? How many? Ver, Jepenson how many come Wo the MLC

Did you tutor K-12 students?

No

Did you do any internships? How many?

Did you take research courses? How many

Per ORTA Physics.

What are your future employment/graduate school plans?

PhD m Phyno

We would like to keep in contact with you. May we contact you in the future? If so, please provide your email address and permanent home address below:

Address going to change but I provided my poronal at the stury of the form. Contact me there Emost