

# **General Education Assessment**

## **Mathematics**

***FALL 2009***

***ANALYSIS and REFLECTION***

**Division of Natural Sciences and  
Mathematics**

**Chaminade University**

**Program Assessment Timeline**

<b>Task</b>	<b>Timeframe</b>	<b>Method</b>	<b>Participants</b>
Decide on nature of GE assessment instrument	Spring 09	Discussion in Divisional and Discipline Meetings	Dean, Faculty
Construct draft instruments	Summer 09	Collate questions	Dean, Faculty
Review draft instruments	Fall 09	Tasking at August 09 Faculty Retreat	Faculty
Appoint GE Assessment Coordinator	Fall 09		Dean
Decide schedule of test administration	Summer 09		Dean and GE Assessment Coordinator
Deliver tests	Fall 09	Provision of test materials to participating faculty, grading and review by GE assessment Coordinator	GE Assessment coordinator and faculty
Assemble data for report to faculty	Winter 2009	Document for distribution at January 10 Faculty Retreat	Dean and GE Assessment Coordinator
Review and Reflect	Winter 2009	Tasking at January 10 Faculty Retreat	GE Assessment coordinator and faculty

## **Table of Contents.**

<b>1. BACKGROUND.....</b>	<b>4</b>
<b>2. MA103 (TRACK B) GENERAL EDUCATION ASSESSMENT RESULTS.....</b>	<b>4</b>
2.1. MA103 (TRACK B) STUDENT PERFORMANCE ANALYZED PER THE GE MATHEMATICS ASSESSMENT RUBRIC. ....	6
<b>3. MA100 (TRACK A) GENERAL EDUCATION ASSESSMENT RESULTS.....</b>	<b>6</b>
3.1. MA100 (TRACK A) STUDENT PERFORMANCE ANALYZED PER THE GE MATHEMATICS ASSESSMENT RUBRIC.....	9
<b>4. FACULTY REFLECTIONS. ....</b>	<b>10</b>
4.1. ACTION POINTS. ....	10
<b>5. DISSEMINATION OF IDEAS ON MATH ASSESSMENT FROM JOINT MATHEMATICS MEETING, SPRING 2010. ....</b>	<b>11</b>
5.1. BACKGROUND.....	11
5.2. MEETING REPORT.....	11

## 1. Background.

In FD09 math classes in Track B (MA103, College Algebra) and Track A, (MA100, Survey of Mathematics) were assessed using the instruments presented in the Assessment Plan.

CLO Evaluated
<p><b>#1.</b> An understanding of basic mathematical principles needed to function effectively in our world;</p> <p><b>#2.</b> An understanding of basic symbolic reasoning that can be used to describe relationships and patterns found in nature;</p> <p><b>#3.</b> An understanding of the mathematical tools necessary for success in their selected major.</p>

## 2. MA103 (Track B) General Education Assessment Results

- 1) Six sections were tested
- 2) Overall: Paired t-test w/ Partial Credit (PC)
- 3) Individual Questions: Chi square goodness-of-fit test w/ Partial Credit

### 1) Overall: Paired t-test w/ PC

Answers for the MA103 assessment questions were assigned partial credit. Below are the overall results using the partial credit system. The assessment has 10 questions with 30 possible points.

N = 69, T-Value = 2.48, P-Value = 0.016

	<u>Mean</u>	<u>StDev</u>
Post	19.7391	4.5654
Pre	18.2609	4.5168
Difference	1.47826	4.95749

Comment: There was significant increase in four sections (two instructors), a decrease in two sections (two instructors).

### 2) Chi square goodness-of-fit test: Each Question w/ PC

Since the pre-test was given eight weeks into the semester. A chi-square test is a way to give us some credit for a good performance on the pretest.

Yes =  $(\text{Post} - \text{Pre}) > 0$

No =  $(\text{Post} - \text{Pre}) \leq 0$

Perfect = For those with  $\text{Post} - \text{Pre} = 0$  AND  $\text{Pre} = 3$  (a perfect score).

Question 1 (CLO# 1)

Yes = 43

No = 26

$X^2 = 4.188$ ,  $p = 0.0407$

Question 2 (CLO#1)

Yes = 48

No = 21

$X^2 = 10.565$ ,  $p = 0.0012$

Question 3 (CLO# 1,2)

Yes = 39

No = 30

$X^2 = 1.174$ ,  $p = 0.2786$

Question 4 (CLO# 2)

Yes = 46

No = 23

$X^2 = 7.667$ ,  $p = 0.0056$

Question 5 (CLO# 1,2,3)

Yes = 33

No = 36

$X^2 = 0.130$ ,  $p = 0.7180$

Question 6 (CLO# 2)

Yes = 32

No = 37

$X^2 = 0.362$ ,  $p = 0.5472$

Question 7 (CLO# 1,2)

Yes = 44

No = 25

$X^2 = 5.232$ ,  $p = 0.0222$

Question 8 (CLO# 2)

Yes = 20

No = 49

$\chi^2 = 12.188, p = 0.0005$

Question 9 (CLO# 1,2,3)

Yes = 36

No = 33

$\chi^2 = 0.130, p = 0.7180$

Question 10 (CLO# 2,3)

Yes = 39

No = 30

$\chi^2 = 1.174, p = 0.2786$

**2.1. MA103 (Track B) Student performance analyzed per the GE Mathematics Assessment Rubric.**

Questions/CLO	Percentage correct	Benchmark achieved per rubric.
CLO#1-3	<p><b>Pre:</b> 61%</p> <p><b>Post:</b> 66% (statistically significant difference, <math>p=0.016</math>)</p>	<p><b>Pre:</b> Very Good</p> <p><b>Post:</b> Very good</p>

**3. MA100 (Track A) General Education Assessment Results**

- 1) One section was tested
- 2) Paired t-test w/o PC
- 3) Individual Questions: Chi square goodness-of-fit test w/ PC

**1) Overall: Paired t-test w/o PC**

N = 11: T-Value = -0.48 P-Value = 0.645

	Mean	StDev
Pre	5.36364	1.43337
Post	5.09091	1.51357

Difference     -0.272727                      1.902152

**2) Individual Questions: Chi square goodness-of-fit test w/ PC**

Answers for the MA100 assessment questions were assigned partial credit. Below are the overall results using the partial credit system. The assessment has 11 questions with 33 possible points.

Yes = (Post – Pre) > 0

No = (Post – Pre ) <= 0

Perfect = For those with Post – Pre = 0 AND Pre = 3 (a perfect score).

Question 1 (CLO #3)

Yes = 6

No = 5

X<sup>2</sup> = 0.091; p-value = 0.7630

Question 2 (CLO #1)

Yes = 5

No = 6

X<sup>2</sup> = 0.091; p-value = 0.7630

Question 3 (CLO # 1,2,3)

Yes = 7

No = 4

X<sup>2</sup> = 0.818; p = 0.3657

Question 4 (CLO #1)

Yes = 4

No = 7

X<sup>2</sup> = 0.818; p = 0.3657

Question 5 (CLO #1)

Yes = 8

No = 3

X<sup>2</sup> = 2.273; p = 0.1317

Question 6 (CLO #1)

Yes = 7

No = 4

X<sup>2</sup> = 0.818; p = 0.3657

Question 7 ( CLO #1,2)

Yes = 7

No = 4

$X^2 = 0.818$ ;  $p = 0.3657$

Question 8 (CLO #1,2)

Yes = 8

No = 3

$X^2 = 2.273$ ;  $p = 0.1317$

Question 9 (CLO #1,2,3)

Yes = 2

No = 9

$X^2 = 4.455$ ;  $p = 0.0348$

Question 10 (CLO #1)

Yes = 2

No = 9

$X^2 = 4.455$ ;  $p = 0.0348$

Question 11 (CLO # 1,2,3)

Yes = 7

No = 4

$X^2 = 0.816$ ;  $p = 0.3657$



**3.1. MA100 (Track A) Student performance analyzed per the GE Mathematics Assessment Rubric.**

Questions/CLO	Percentage correct	Benchmark achieved per rubric.
<b>CLO#1-3</b>	<p><b>Pre:</b> 49%</p> <p><b>Post:</b> 46% (no statistically significant difference)</p>	<p><b>Pre:</b> Incomplete to proficient</p> <p><b>Post:</b> Incomplete</p>

## 4. Faculty Reflections.

- MA103 Basically, the syllabus given out by each instructor should have identical chapters being covered in the course
- MA103 If the assessment test is similar to usual tests that the student takes in the class, it may seem okay, but if the class is taking a different type of tests, such as non-multiple choice, the student may have a different kind of reaction (bad or good) to the assessment test and may not take it too seriously.
- MA103 I don't know if you have tested the math assessment instruments for reliability, but I would guess this would be important in order to gather reliable data upon which one can infer learning trends appearing in the students' performance. I am guessing a Cronbach alpha and a Pearson correlation with a re-test might be a good way of establishing the validity of the instrument itself.
- MA103 The other thing that can misconstrue these kinds of assessment is the myriad of factors that encompass the testing of 'learning'. To mention one, from mere observation, it seems to me that 'motivation' was a salient factor that affected the resulting grade-scores in my class. Thus, if this is true, modification of curriculum based on score trends may not be an accurate reaction to compensate for deficient motivation on the part of the participants. Another observation that I would pursue is the students' proficiency in essential skills needed to succeed in college: organizational skills, compiling material through notes, assimilating information from the text, online resources, and from other classmates; I would even be interested in reading and writing skills, both of which have been identified as key essentials for succeeding in math.
- MA100 Clarity and specifics should show how the assessment objectives are related to the overall objectives of the course.
- MA100 The assessment should address MA100 being a terminal course and the only math course required for certain liberal arts majors. The current test items are useful to assess algebraic processes.
- MA100 Items are needed for logic, geometry, probability, statistics and the history and philosophy of mathematics.
- MA100 The test item on annuity requires use of a scientific calculator so its use in the course should be specifically noted
- MA103 Assessment of MA100 would be enhanced if the objectives being assessed are clearly stated
- MA103 Again, I am guessing that a triangulated research approach may address other factors that would provide a more comprehensive perspective of what is actually going on in the learning dynamics of Chaminade. And by the way, there is no reason why a well put together research of this kind cannot be published and put Chaminade in the literature as a leading-edge organization studying the recent phenomena of 'Developmental Math' courses in colleges.

### 4.1. Action Points.

In SD2010 the MA100 and 103 assessment instruments will be delivered unchanged in order to gather more data. In order to elevate student buy-in, the Assessment Coordinator will visit each

class and reiterate in briefings with instructors. Work is continuing on standardized finals and syllabi for MA103.

## **5. Dissemination of Ideas on Math Assessment from Joint Mathematics Meeting, Spring 2010.**

### **5.1. Background.**

A session on *How Assessment Results Changed Our Program* was held at the Joint Mathematics Meeting of the AMS and MAA, San Francisco, 15 January 2010. Ms Sheryl Dohm, Assessment Coordinator for Math and Gen Ed Sciences in DNSM, and an Adjunct Mathematics Professor, attended this meeting in order to gain exposure to current ideology and best practices in assessment of these developmental mathematics courses.

Six talks featured the efforts of different math departments that assess learning outcomes in the general education math courses. The summary below discusses the types of assessment instruments used, how assessment results were reported, and what actions were taken to improve assessment results.

### **5.2. Meeting Report.**

The assessment instruments reported were: (1) pre/post test, (2) common midterm and finals, and (3) common questions on the final. A general consensus was that regardless of the type of instrument, results from the first implementation of an instrument showed that learning outcomes were not met. Moreover, student performance was typically lower than anticipated. According to the speakers, the results of the initial assessment set each department on a course of action to improve teaching effectiveness and student learning. A compiled list of reported actions taken by the different math departments is below. In general, speakers claimed that subsequent assessments showed improvement. Assessment results were reported as a percent change, and/or D,F,Withdraw percentages. In six of six presentations, no additional statistics were used to indicate significance, effect size, or inter-rater effect.

The typed of actions taken by departments to help improve assessment results:

- Incorporate the assessment instrument into the curriculum
- Hold faculty dinner meeting
- Create a course-wiki
- Allow Developmental Math to count toward GPA
- Hold faculty workshops
- Compose guidebook for faculty and students
- Publish practice tests
- Adjust emphasis on certain lecture topics, based on communication with the departments being served
- Develop student and instructor handouts for topics that need special treatment
- Create common midterms and finals that assess certain outcomes

- MAA guidelines are explicitly linked to decisions about curriculum and learning outcomes.  
<http://www.maa.org/cupm/crafty/CRAFTY-Coll-Alg-Guidelines.pdf>
- Use a five-column model to organize and record the effort to improve student outcomes.  
(Goal: Student outcome: Assessment Methods and Criteria: Data collection: Use of Results)