**AFM 083 Student Learning Outcomes (SLO) Assessment**

**SLOAT Spring 2011 Final Report**

**prepared by Violeta De Pierola and Arturo Vera**

**\*Introduction**

 Academic Foundations Math 083 is a beginning mathematics course designed to take students from concrete arithmetic ideas to the more abstract algebraic forms of these ideas. One of the instructional components of AFM 083 is two mandatory sessions (one hour each) of tutoring per week and the required completion of ALEKS (computer software) assignments. The Academic Foundations Math 083 course outline lists the following goals:

1. Demonstrate knowledge of the fundamental concepts and theories from arithmetic, algebra and geometry.

2. Utilize various problem-solving and critical-thinking techniques to set up and solve real-world applications.

3. Communicate accurate mathematical terminology and notation in written and/or oral form in order to explain strategies to solve problems as well as to interpret found solutions.

**\*Purpose**

 The purpose of the SLOAT was to determine if the students enrolled in AFM 083 are successful in learning the goals set forth in the course outline. It was also meant to assist the Math instructors understand how the students enrolled in the Center for Academic Foundations learn and what different teaching techniques they can use. This assessment was conducted by Violeta De Pierola and Arturo Vera, and it was done based on 40 students.

**\*Methodology**

 During the Spring 2011 SLOAT assessment, the two goals that were assessed were goals 1 and 2 from the course outline (same as Fall 2010). We decided to continue to assesse the first two goals to determine if the new approaches and techniques recommended and implemented as a result of the Fall 2010 semester assessment study were effective in improving our student learning outcome results. We also compared the Fall 2010 and Spring 2011 results from the pre-test, midterm exam and post-test. AFM 083 course goals 1 and 2 and all related measurable course performance objectives (MPOs) are given below.

1. Demonstrate knowledge of the fundamental concepts and theories from arithmetic, algebra and geometry:
2. perform arithmetic operations on signed numbers;
3. perform arithmetic operations on fractions;
4. perform arithmetic operations on decimals;
5. perform arithmetic operations on percents;
6. determine the perimeter and area for simple geometric figures;
7. determine whether a ratio is a proportion;
8. convert from one unit of measure to another;
9. simplify basic algebraic operations; and
10. solve simple linear equations involving one operation
11. Utilize various problem-solving and critical-thinking techniques to set up and solve real world applications:

 2.1 apply arithmetic to solve application problems encountered in daily life

**\*Population**

 A total of 40 students as a sample size were selected from 5 sections of AFM 083. Specifically, the entire student population of the 5 sections were administered the pre-test, midterm exam, questionnaire, and post-test. For purposes of data analysis, we sampled only 40 of those students (i.e., 8 from each section).

 The purpose of this assessment was to help determine whether students taking AFM 083 are achieving the Measureable Performance Objectives (MPOs) as outlined for this course. To do so, we began by blueprinting the pre-test administered to all students. Then we randomly chose 8 students from each section and tracked questionnaire responses, quiz and test scores, and ALEKS (an online homework software) statistics.

**\*Instrumentation**

For this study we used data from 4 sources:

- Outcomes data from SLOAT 2010 (Fall)

* Blueprinted multiple-choice questions\*
* Questionnaires\*
* Statistics from ALEKS

\*Copies of assessment instruments used are included in Appendices A, B, and C of this report.

**\*Results**

Pre- test, Midterm exam, and Post-test Results

Graphs comparing the scores the 40 sampled students received on the pre-test, midterm exam and post-tests are given below.

Interpreting this graphed data and comparing the results with the Fall 2010 SLOAT AFM 083 assessment, we observed the average increase from pre-test to post-test in Fall 2010 was 50.95%, and for Spring 2011 the average increase from pre-test to post-test was 48.97%. A possible reason for this small difference is that during Fall 2010 all four of sections used in SLO data collection were taught by full-time instructors in the Center for Academic Foundations. Even though students in the sample were randomly selected, we believe that having full-time instructors had a positive impact on their performance. In Spring 2011, five AFM 083 sections participated in data collection. Four of these sections were taught by adjuncts and only one was taught by a full-time instructor in the Center for Academic Foundations.

**Pre-test, Midterm Exam and Post-test Scores**

The pre- and post-tests were given by the instructors in class. The pre-test was administered on the first day of class. Students were asked to try their best and were not allowed to use calculators. The post-test was also given by the instructors in class at the end of the semester. Interpreting the graphs above, it is evident that the students’ scores changed drastically.

In section 002, the average score on the pre-test was 31.2%, the midterm exam average score was 61.8%, and the average score on the post-test was 81.3% indicating an increase of 50.1% during the semester. In section LS2, the average score on the pre-test was 35.0%, the midterm exam average score was 85.7%, and the average score on the post-test was 80% indicating an increase of 45% during the semester. In section OAC, the average score on the pre-test was 20.9%, the midterm exam average score was 78.3%, and the average score on the post-test was 79.1% on the post-test indicating an increase of 58.2% during the semester. In section LS5, the average score on the pre-test was 28.1%, midterm exam average score was 74.8%, and the average score on the post-test was 72.8% indicating an increase of 44.7% during the semester. In section 008, the average score on the pre-test was 25.6%, the midterm exam average score was 75.6%, and the average score on the post-test was 72.5% indicating an increase of 46.9% during the semester

It is evident from the pre-test data that that the students scored quite low as they entered this course. Many different factors could have caused this such as the fact that students did not expect the pre-test, returned to school after many years, and were not well-prepared mathematically. These are just a few reasons reported by the students to explain why they did not perform well on the pre-test.

Questionnaire Results

 As in Fall 2010, students were administered two questionnaires. The first one was conducted before they took the midterm exam, and the second one was administered before the final exam. Average student responses to both questionnaires are given in AFM 083 – Appendix B. From looking at the average responses of students’ answers to the survey, we can conclude that the students still need extra help when working on the following MPOs:

 1.1 perform arithmetic operations on signed numbers

 1.2 perform arithmetic operations on fractions

1.8 simplify basic algebraic operations

 2.1 apply arithmetic to solve application problems encountered in daily life

 It is notable that the students are still reporting some of the same content issues as they did in Fall 2010 even though new instructional techniques were implemented. We believe this is a result of sampling different instructor’s classes to assess. The average student responses for each question related to these four MPOs were less than 70%. Since students need at least 70% to pass the course, the instructors should ensure that students spend more time practicing these topics. This information is already being shared with CAF instructors and students.

The Spring 2011 AFM 083 class syllabus was enhanced to include much content from the course outlines prepared by SLOAT members. The following elements have been added to the syllabus:

* Course Number and Name
* Credit Hours
* Prerequisites
* Co-requisites
* Course Description
* Course Goals
* Course Requirements
* Methods of Evaluation
* Academic Integrity
* Student Code of Conduct
* Course Content Outline (by week)

By including all of these elements, the students will be more aware of what is expected from them in AFM 083 on day one, and they will also know what they must learn by end of the semester.

**\*Suggestions**

After reviewing all the data collected from the assessment, we realize that instructors need to spend more time reviewing fractions (adding, subtracting, multiplying and dividing), relating word problems to real life, and solving basic algebraic equations. Some suggestions to help students learn more effectively include the following:

* Instructors can have SIs work with students struggling in these areas during mandatory tutoring sessions.
* Students can work on ALEKS at least one day per week during tutoring time.
* Instructors will need to review ALEKS student records data weekly to determine who has mastered the skills mentioned above and who has not. Proper interventions can then be implemented on an individual student basis as warranted.
* Students can work collaboratively on the more difficult topics.

**APPENDIX A**

Center for Academic Foundations

Academic Foundation Mathematics

AFM 083 Pre-test

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_ Section: \_\_\_\_\_\_\_\_

1. Name the property that is illustrated below.

 4 x (3+6) = (4 x 3) + (4 x 6)

2. What is the product of 1636 and 58?

3. Write in expanded form 353,999.

4. Write in expanded form *x*5.

5. What is nine thousand, seventy-eight in standard form?

6. The average age of students in College X is 23.58, and the average age of students in College Y is 23.5798. Which College has the lower average student age?

7. Express seventy-one thousand, seventy-one and seventy-six hundredths in decimal form.

8. Evaluate: -22 + (-11) + 11 + (-10)

9. Evaluate**:** *d3 – b3* if *b = 5; d = 6.*

10. Write the following phrase using symbols*: Twice the difference of x and y*

Center for Academic Foundations

Academic Foundation Mathematics

AFM 083 Midterm Questionnaire

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_ Section: \_\_\_\_\_\_\_\_

*Please mark only* ***one X*** *on the one that applies to you.*

1. How do you think you will do on the midterm exam?

 \_\_ Really good \_\_ good \_\_ average \_\_ not so good

 **On a scale from 0% - 100%:**

2. How comfortable do you feel rounding? (Round 8,416 to the nearest thousand.)

 \_\_ 100% \_\_ 75% \_\_50% \_\_25% \_\_0%

3. How comfortable do you feel dividing fractions? (Divide $\frac{3}{8}$ ÷ $\frac{2}{8}$ .)

\_\_ 100% \_\_ 75% \_\_50% \_\_25% \_\_0%

4. How comfortable do you feel finding a product? (Find the product of -90 and 60.)

\_\_ 100% \_\_ 75% \_\_50% \_\_25% \_\_0%

5. How comfortable do you feel with prime factorization? (Find the prime factorization of

 144.)

 \_\_ 100% \_\_ 75% \_\_50% \_\_25% \_\_0%

6. How comfortable do you feel finding the perimeter? (A rectangle has a length of 26m and

 a width of 12m. Find the perimeter of the rectangle)

\_\_ 100% \_\_ 75% \_\_50% \_\_25% \_\_0%

7. How comfortable do you feel with evaluating expressions? (Evaluate $\frac{-x}{y}$ for *x* = 12 and *y* = -3.)

\_\_ 100% \_\_ 75% \_\_50% \_\_25% \_\_0%

8. How comfortable do you feel simplifying? (Simplify -8 ÷ 2 + (-6)²)

\_\_ 100% \_\_ 75% \_\_50% \_\_25% \_\_0%

9. How comfortable do you feel with absolute value? (Write in ascending order –׀-4׀, ׀-9׀,

 –׀17׀ , ׀8׀ .)

\_\_ 100% \_\_ 75% \_\_50% \_\_25% \_\_0%

10. How comfortable do you feel with multiplying fractions? [Multiply ( $\frac{5}{3}$ ) x ( $\frac{9}{4}$ ) x ( $\frac{2}{5}$ ) .]

\_\_ 100% \_\_ 75% \_\_50% \_\_25% \_\_0%

Center for Academic Foundations

Academic Foundation Mathematics

AFM 083 Final Questionnaire

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_ Section: \_\_\_\_\_\_\_\_

*Please mark only* ***one X*** *on the one that applies to you.*

1 How do you think you will do on the final exam?

 \_\_ Really good \_\_ good \_\_ average \_\_ not so good

2. Do you think you will do better on the final exam then you did on the midterm exam?

\_\_\_ yes \_\_\_ no

**On a scale from 0% - 100%:**

3. How comfortable do you feel working with order of operations? (Simplify 20-16 ÷ 4.)

\_\_ 100% \_\_ 75% \_\_50% \_\_25% \_\_0%

4. How comfortable do you feel working with percents? (Write 0.818 as a percent.)

\_\_ 100% \_\_ 75% \_\_50% \_\_25% \_\_0%

5. How comfortable do you feel solving proportions? ( $\frac{3}{8 }$ = $\frac{6}{16}$ Is this proportion true?)

\_\_ 100% \_\_ 75% \_\_50% \_\_25% \_\_0%

6. How comfortable do you feel simplifying variable expressions? [Simplify 4+5m+(-5m).]

\_\_ 100% \_\_ 75% \_\_50% \_\_25% \_\_0%

7. How comfortable do you feel solving equations? (Solve 2*d* = -12.)

\_\_ 100% \_\_ 75% \_\_50% \_\_25% \_\_0%

8. How comfortable do you feel dividing fractions? (Divide -110 ÷ 3$\frac{1}{7}$ .)

\_\_ 100% \_\_ 75% \_\_50% \_\_25% \_\_0%

9. How comfortable do you feel solving word problems? (A digital camera with a regular price of $265 is on sale for 19% off the regular price. Find the sale price.)

\_\_ 100% \_\_ 75% \_\_50% \_\_25% \_\_0%

10. How comfortable do you feel multiplying exponential expressions? (Multiply z$³$ \* z$²$ \* z.)

\_\_ 100% \_\_ 75% \_\_50% \_\_25% \_\_0%

**APPENDIX B**

Center for Academic Foundations

Academic Foundation Mathematics

AFM 083 Midterm Questionnaire

Spring 2011 Results

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_ Section: \_\_\_\_\_\_\_\_

*Please mark only* ***one X*** *on the one that applies to you.*

1. How do you think you will do on the midterm exam?

 \_\_ Really good \_\_ good \_\_ average \_\_ not so good

 **On a scale from 0% - 100%:**

2. How comfortable do you feel rounding? (Round 8,416 to the nearest thousand.)

 75%

3. How comfortable do you feel dividing fractions? (Divide $\frac{3}{8}$ ÷ $\frac{2}{8}$ .)

57%

4. How comfortable do you feel finding a product? (Find the product of -90 and 60.)

61%

5. How comfortable do you feel with prime factorization? (Find the prime factorization of

 144.)

78%

6. How comfortable do you feel finding the perimeter? (A rectangle has a length of 26m and

 a width of 12m. Find the perimeter of the rectangle)

70%

7. How comfortable do you feel with evaluating expressions? (Evaluate $\frac{-x}{y}$ for *x* = 12 and *y* = -3.)

55%

8. How comfortable do you feel simplifying? (Simplify -8 ÷ 2 + (-6)²)

70%

9. How comfortable do you feel with absolute value? (Write in ascending order –׀-4׀, ׀-9׀,

 –׀17׀ , ׀8׀ .)

79%

10. How comfortable do you feel with multiplying fractions? [Multiply ( $\frac{5}{3}$ ) x ( $\frac{9}{4}$ ) x ( $\frac{2}{5}$ ) .]

60%

Center for Academic Foundations

Academic Foundation Mathematics

AFM 083 Final Questionnaire

Spring 2011 Results

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_ Section: \_\_\_\_\_\_\_\_

*Please mark only* ***one X*** *on the one that applies to you.*

1 How do you think you will do on the final exam?

 good

2. Do you think you will do better on the final exam then you did on the midterm exam?

yes

**On a scale from 0% - 100%:**

3. How comfortable do you feel working with order of operations? (Simplify 20-16 ÷ 4.)

89%

4. How comfortable do you feel working with percents? (Write 0.818 as a percent.)

78%

5. How comfortable do you feel solving proportions? ( $\frac{3}{8 }$ = $\frac{6}{16}$ Is this proportion true?)

70%

6. How comfortable do you feel simplifying variable expressions? [Simplify 4+5m+(-5m).]

63%

7. How comfortable do you feel solving equations? (Solve 2*d* = -12.)

72%

8. How comfortable do you feel dividing fractions? (Divide -110 ÷ 3$\frac{1}{7}$ .)

68%

9. How comfortable do you feel solving word problems? (A digital camera with a regular price of $265 is on sale for 19% off the regular price. Find the sale price.)

59%

10. How comfortable do you feel multiplying exponential expressions? (Multiply z$³$ \* z$²$ \* z.)

69%

**APPENDIX C**

ALEKS Results by Section Spring 2011

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Section** | **Number of Students** | **Active Users** | **28-Feb** | **Number of Students** | **Active Users** | **31-Mar** | **Number of Students** | **No Show students** | **Active Users** | **30-Apr** |
| 002 | 31 | 25 | 43% | 30 | 25 | 59% | 28 | 11 | 17 | 78% |
| 008 | 15 | 11 | 45% | 15 | 11 | 68% | 15 | 0 | 15 | 73% |
| LS2 | 17 | 12 | 62% | 16 | 12 | 82% | 16 | 4 | 12 | 97% |
| LS5 | 17 | 9 | 43% | 15 | 9 | 48% | 15 | 2 | 13 | 59% |
| OAC | 23 | 21 | 36% | 23 | 21 | 43% | 22 | 3 | 19 | 52% |