

**WITC General Studies Course Assessment**

<b>Course Assessed: Pre-Algebra (10-834-109)</b>	
<b>Dates of assessment</b>	1 <sup>st</sup> : Fall 2012 – write-up: Spring 2013 2 <sup>nd</sup> :
<b>Faculty</b>	1 <sup>st</sup> : Pat Kinney and Todd Hoff 2 <sup>nd</sup> :
<b>Assessment Process/Design</b>	<p>Students taking Pre-Algebra are primarily either enrolled in, or intend to enroll in, programs that require an associate degree level math course. For this study, all students were enrolled in IPV sections with a total of 19 students. All students were assigned online homework in MyMathLab.</p> <p>The Pre-Algebra Course Outcome Summary has the following competencies:</p> <ol style="list-style-type: none"> <li>1. Use operations on the real numbers</li> <li>2. Solve simple linear equations by inspection</li> <li>3. Use algebraic expressions</li> <li>4. Solve basic linear equations using the principles of equality</li> <li>5. Solve problems using percent and proportion</li> <li>6. Perform operations with polynomials</li> <li>7. Graph lines and calculate statistics</li> <li>8. Solve application problems</li> </ol> <p>The course competencies include mathematical applications, which are broad in nature because the course is intended to prepare students for a variety of fields. The applications often made use of basic geometry formulas or could be solved using direct proportions. For this assessment, common applications of the mathematics were used so that students were likely to understand the context of the application.</p> <p><b>Method</b></p> <p>The data was gathered through the use of a common final exam that was proctored and completed using paper-and-pencil. Several problems were developed for each of the eight competencies. Part I of the exam was without a calculator, and primarily covered skill related problems related to whole numbers, fractions, decimals, and order of operations. Part II of the exam allowed for a calculator, and it covered the remaining competencies and included solving equations, percents, conversions, and applications.</p> <p>On the exams the points for problems varied because of the differences in their difficulty. Points earned were recorded for each student on each problem; then the average score for each test item was calculated and converted to a percent.</p>
<b>Results and Analysis (includes number of students, # by delivery mode if pertinent, and average score)</b>	<p># of students participating in the 2012-13 assessment: <b>19 students</b>                      # of students on-line/# of IPV students in course: <b>19 students in IPV</b>                      Average score for students on this assessment: <b>78.8% average for all</b></p> <p>Student performance for each item was considered acceptable if the average was at least 80% - for on the grading scale, the lowest score for a C is 80%.                      Part I of the comprehensive final exam did not allow a calculator and contained 21 items.</p> <ul style="list-style-type: none"> <li>• Scores were 80% or higher on 11 items - 52.38% of the items.</li> <li>• Scores were below 80% on 10, or 47.62% of the items; most missed were related to rounding, mixed number operations, and order of operations.</li> </ul>

Part II of comprehensive final exam did allow a calculator & contained 46 items.

- Scores were 80% or higher on 24, or 52.18% of the items.
- Scores were below 80% on 22, or 47.82% of the items. Most of the items missed were related to simplifying algebraic expressions, evaluating expressions, solving equations, and solving word problems.

For the entire test there were 67 items.

- Scores were 80% or higher on 35, or 52.24% of the items.
- Scores were below 80% on 32, or 47.76% of the items.

The table below shows the results by competency.

	Competency	# of questions
1	Use operations on the real numbers	18
2	Solve simple linear equations by inspection	4
3	Use algebraic expressions	8
4	Solve basic linear equations using the principles of equality	11
5	Solve problems using percent and proportion	4
6	Perform operations with polynomials	5
7	Graph lines and calculate statistics	5
8	Solve application problems	12

Overall, students averaged 78.8% correct (in the C- range) on the 67 total points for the final exam. The comprehensive final exam was 10% of the final grade. Of the students who took the final exam, 16 of 19 students (84.2% of students) had final grades of C or better. Two of the students did not take the final exam, yet received final grades of C or better. Overall, 18 of 21 students finished with a final grade of C or better, which is 85.7% of the students.

### Implications

The performance on Part I without a calculator was almost identical to Part II with a calculator. Part I was primarily skills with numerical computations with whole numbers, fractions, decimals, and order of operations. Part of what students should learn in the process of learning these skills in Part I is the conceptual understanding needed to perform similar skills in algebra. So, to some extent, the necessity of understanding the underlying concepts and skills in Part I had implications for performance on algebra in Part II where similar underlying concepts and skills were involved.

The performance for three of the eight competencies was below 80%. What's interesting is that the two competencies where performance was the lowest, using algebraic expressions and operations with polynomials provide background for the third competency where performance was below 80%, which was solving basic linear equations. The low performance on the two competencies that provide background for solving basic linear equations imply that consideration needs to be given to first building sufficient background for solving basic linear equations. This may mean more repetition with the basics of working with algebraic expressions and operations with polynomials as opposed to going more deeply into these topics. There should be a close correlation with the level of difficulty covered in working with algebraic expressions and operations with polynomials and solving basic linear equations.

<p><b>Action Plan relative to results</b></p>	<p>The current textbook for Pre-Algebra takes the approach of introducing algebra early. As each arithmetic skill and concept is introduced, the author includes some problems that involve variables so students can see the relationship between the skills and concepts in arithmetic and algebra. The level of difficulty of the arithmetic and algebra problems is similar in part because the author introduces the algebra early. Given that the results from Part I on arithmetic and Part II on algebra were almost identical, it's possible that the approach in the textbook does help students see the connections between arithmetic and algebra. The consistency in the arithmetic and algebra performance is noteworthy given how frequently students perform very differently on arithmetic and algebra when taking placement tests. That is, the consistency is a positive outcome and suggests that we should continue to use a textbook that introduces algebra early.</p> <p>In introductory level algebra, students are taught how to use algebraic expressions and perform operations with polynomials primarily so that they can solve equations. The results suggest that the level of difficulty in the problems related to using algebraic expressions and operations with polynomials exceeds that what is needed when solving basic equations. <u>Recommendations:</u></p> <ul style="list-style-type: none"> <li>• Decrease the time spent on algebraic expressions and operations with polynomials and increase the time spent solving basic equations;</li> <li>• In MyMathLab, remove the more challenging problems from the assignments on using algebraic expressions and operations with polynomials and adding some more challenging problems on solving basic equations, and perhaps applications;</li> <li>• Do this in a way that the level of difficulty of using algebraic expressions and operations with polynomials would not exceed that of what is needed to solve basic equations;</li> <li>• Provide more review of rounding (covered early in the course) prior to the final exam;</li> <li>• If the course is offered via ITV, do not have computers available at the remote site, unless there is a way for the instructors to prevent students from using them during class.</li> </ul>
<p><b>Implementation Assessment (following year – 2013-14)</b></p> <p><b>(includes number of students, # by delivery mode if pertinent, and average score)</b></p>	<p># of students participating in the 2013-14 assessment:  # of students on-line/# of IPV students in course:  Average score for students on this assessment:</p> <p>The follow-up study will be conducted during the 2013-14 academic year. This assessment will be similar in format, with particular attention to discovering whether or not the recommendations ...:</p> <ul style="list-style-type: none"> <li>• To what extent were recommendations consistently implemented across all sections of the Pre-Algebra classes?</li> <li>• To what extent did the decrease in time spent with the algebraic expressions and operations with polynomials negatively impact students' scores w/these?</li> <li>• To what extent did the increase in time spent on solving problems and basic equations and applications result in improved students' scores on these?</li> <li>• To what extent did students' scores in rounding improve?</li> <li>• Other:</li> </ul>