Course Outcomes Guide (COG)

Course Title: **MAT 099 Elementary Algebra** **Date: June 2015**

Course Team: **Rich Campbell, Lead Instructor for MAT 099, and other DEALS Math Faculty**

Expected Learning Outcomes

Upon successful completion of this course students will be able to:

1. Simplify, model, and evaluate numerical and algebraic expressions in the real number system using the order of operations.

2. Find the area, circumference, and perimeter of simple and complex regions; convert within and between US and metric units of length, weight, capacity, time, and temperature.

3. Solve linear equations and inequalities in one variable, including application problems involving formulas, geometry, motion, percent, and mixtures.

4. Find the slope and the equation of a line, including application problems; model and graph linear equations and inequalities in two variables.

5. Model and solve systems of linear equations using graphing, substitution, and elimination methods.

6. Simplify exponential expressions with positive and negative exponents; convert between scientific and decimal notations; multiply and divide using scientific notation.

7. Recognize and factor polynomials; combine polynomials through addition, subtraction, multiplication, and division, including synthetic division.

8. Communicate and understand mathematical statements, ideas and results, with the correct use of mathematical definitions, terminology and symbolism.

Assessment: All MAT-099 Elementary Algebra students complete the same homework, quizzes, tests, and final exam. We use MyMathLab to run the course and all instructors are using the same assignments. All students take a forty five question final exam on paper. We have eight outcomes which are measured on the final exam. All of the final exam questions fit into one of the outcome categories, so each question is part of an outcome.

Validation: We use a rubric to grade the forty five question final exam where each question is worth 2-points (see attachment 1). The course has been redesigned with 14/FA as the first semester. Outcomes are different from previous semesters, so it is difficult to compare retroactively. Going forward, we will be able to compare results from semester-to-semester, as well as final course grade. For AY14-15, we did not have any external validation for our assessment.

Results: Students' assessment results and success rates have been analyzed.

1. Final Exam assessment scores were calculated by adding up all eight outcome scores and dividing by the total points possible (90).

2. Final Exam success is defined as a score of at least 63 out of 90 points (70%).

3. The data shows a decline in final exam scores from 14/FA to 15/SP, 68.7% to 63.3% (see attachment 4).

4. MAT 099 course success rates dropped from 64.7% in 13/FA to 51.9% in 14/FA (12.8%) and from 55.5% in 14/SP to 41.1% in 15/SP (14.4%). The fall to spring drop in success was about 10% when looking at both fiscal years and comparing fall to spring (see attachment 3).

5. Students typically had success with the following outcomes: simplifying expressions, geometry, conversions, and slope of lines. Success rates for those outcomes were mostly near 70% or above for 14/FA and 15/SP.

6. Students typically did not have success with the following outcomes: Solving linear equations, word problems, systems of equations, factoring, and communicating an understanding of mathematical statements. Success rates for those outcomes were mostly near 60% or below for 14/FA and 15/SP.

Percentage of Correct Answers for Outcomes on MAT 099 Final Exam

FA14	SP15	Questions	Outcome being measured	
82.3 %	80.7 %	1-4	1	Simplify, model, and evaluate numerical and algebraic expressions in the real number system using the order of operations.
78.6 %	75.2 %	5-12	2	Find the area, circumference, and perimeter of simple and complex regions; convert within and between US and metric units of length, weight, capacity, time, and temperature.
66.9 %	61.8 %	13-21	3	Solve linear equations and inequalities in one variable, including application problems involving formulas, geometry, motion, percent, and mixtures.
74.8 %	68.9 %	22-25	4	Find the slope and the equation of a line, including application problems; model and graph linear equations and inequalities in two variables.
52.5 %	46.4 %	26-29	5	Model and solve systems of linear equations using graphing, substitution, and elimination methods.
74.5 %	70.2 %	30-34	6	Simplify exponential expressions with positive and negative exponents; convert between scientific and decimal notations; multiply and divide using scientific notation.
59.7 %	53.7 %	35-43	7	Recognize and factor polynomials; combine polynomials through addition, subtraction, multiplication, and division, including synthetic division.
55.4 %	35.4 %	44-45	8	Communicate and understand mathematical statements, ideas and results, with the correct use of mathematical definitions, terminology and symbolism.

Follow-up: Starting in 14/FA, several changes were implemented in MAT 099.

1. I became the new lead instructor for MAT-099, while Rebecca Kendrick became the lead instructor for MAT-100.

2. We changed the textbook for the developmental mathematics sequence and redesigned each course to incorporate more rigor. We think this is evident due to the drop in success rates for MAT 099 this academic year. MAT 098 and MAT 100 had similar experiences.

3. All developmental math courses now have two exams and one final exam. In previous semesters, courses had two or three exams and a final exam depending on course length and/or format. All final exams were on paper this time instead of some formats using MyMathLab and some using paper. We wanted to standardize the courses a little more in order to make comparisons more valid.

4. We redesigned the developmental mathematics sequence in 12/SP and starting collecting pre and post test data for the next seven semesters. We noticed that students improved on those assessments from approximately 15% correct on the pre-test to about 65% correct on the post-test by taking the MAT 099 course. That was to be expected, but was confirmed by collecting and analyzing the data. The 14/FA and 15/SP semesters will be our new baseline for MAT 099 SLOA for several semesters until we redesign once again in 16/FA. We no longer give a pre-test in our developmental mathematics courses.

5. The new SLOA measures eight outcomes and every question on the final exam fits into one of the eight categories. The table in the Results section specifies all eight outcomes, which final exam questions match those outcomes, as well as student success for those outcomes for each semester. We are still using this assessment and will not attach it to this COG for security reasons since this document will be posted on the HCC website.

6. Students were expected to have at least a 60% final exam score AND at least a 70% overall course grade in order to move on to MAT 100, i.e., pass MAT 099. In rare occasions where the student only met one of those criteria, a portfolio of the student's work was evaluated by the DEALS math team. After the portfolio review, the team recommended a C, D, or F grade for the student. Based on previous studies at HCC, we noticed that students who get a D typically do not have success in their next course. Furthermore, those students do not seem to have success in their general education math course when they do eventually make it there. The D grade has been a very sensitive topic in DEALS since we have sequential courses that are a gateway to a "Gen Ed" math or English class. Passing the D student to the next course may lower success rates for that course, much to the dismay of that Lead Instructor, so we need to do more research on whether or not the D grade is in the best interest of the student. This process will be refined as we go through the future course redesign.

7. It may be too early to compare 14/FA and 15/SP grade distributions since we just started using this assessment but they are provided in attachment 2. Some formats are represented by one section, so it may be unfair to make comparisons at this point until we collect more data. There is a breakdown of lecture, package, and 15 week web sections in that document. A quick analysis shows that lecture and package courses have about a 10% decrease in success from 14/FA to 15/SP, so that is consistent with what we saw overall.

8. Another area that we are trying to address is online courses. We are compiling a list of criteria that seem to have statistically significant implications on success. One of our goals is to ensure that those students are online ready. It takes extreme patience dealing with a first time online student since they have many obstacles to hurdle, most of which is not course content. We hope to implement these criteria for our online DEALS courses in the future. The MAT 099 web data for 14/FA and 15/SP is interesting since their success rates rose from fall to spring, contrary to other formats. Please note that these are small sample sizes, so it is imperative that we collect more data on web classes.

9. The redesign in 16/FA should address the outcomes that have low success rates by giving students more time to digest that material. We will rearrange content for MAT 098, 099, and 100 courses. We also hope that we can find external validation for our outcomes as well. The redesign is in its infancy at the moment and will most likely change several times before next year's COG 16SP. Hopefully with another year's worth of data we can make more informed decisions while redesigning our courses.

Budget Justification: No additional funding/resources are needed at this time.

Attachments:

1. Developmental Mathematics Grading Rubric
2. MAT 099 Grade Distribution
3. MAT 099 SLOA Report
4. MAT 099 SLOA Summary

Grading Rubric for Developmental Mathematics

This general scale is to be used for all Tests and Final Exams in MAT 098, MAT 099, and MAT 100.

Percentage of Point Value	**Description**	
	Computational Questions	***Essay Questions***
100%	The student has the problem worked out completely, showing all the proper steps, and has the correct answer.	Answer must meet the criterion listed to the left AND must also be in complete sentences and use correct mathematical terminology and symbolism
90%	The student has worked out the problem using the correct mathematical procedure, but has made one minor mathematical (arithmetical) mistake giving the incorrect answer (unless the problem is testing one of these concepts, as oft is the case in MAT 098).	The criterion to the left is to be used.
75%	The student has used the correct mathematical procedure, but has several minor arithmetical errors or has one more major mathematical error in the problem.	The theme of the answer is correct, but has a minor error in mathematical terminology or symbolism OR the answer is not grammatically correct.
50%	The student has started the problem using the correct mathematical procedure, but has several mathematical errors and weak justification for the work.	The theme of the answer is correct but there is major mistake in mathematical terminology or symbolism.
25%	The student response demonstrates understanding of at least one major concept, however, it is mostly incorrect. Justifications may be missing or may lack clear mathematical reasoning. Only the correct answer is given without any supporting work.	The criterion to the left is to be used.
0	The student response in incorrect and lacks reasonable justification. The student did not respond to this problem.	The criterion to the left is to be used.

MAT-099 14/FA

	Total	A	B	C	D	F	WF	W/I/AU	Success	Completer Success
Lecture 12	28	3.6% (n=1)	3.6% (n=1)	28.6% (n=8)	0.0% (n=0)	50.0% (n=14)	32.1% (n=9)	14.3% (n=4)	35.7% (n=10)	66.7%
Lecture 15 week	194	6.7% (n=13)	15.5% (n=30)	21.1% (n=41)	2.6% (n=5)	41.8% (n=81)	22.7% (n=44)	12.4% (n=24)	43.3% (n=84)	66.7%
Lecture Second 7.5	1	0.0% (n=0)	0.0% (n=0)	0.0% (n=0)	0.0% (n=0)	100.0% (n=1)	100.0% (n=1)	0.0% (n=0)	0.0% (n=0)	#Num!
Lecture Subtotal	*223*	*6.3%* (n=14)	*13.9%* (n=31)	*22.0%* (n=49)	*2.2%* (n=5)	*43.0%* (n=96)	*24.2%* (n=54)	*12.6%* (n=28)	*42.2%* (n=94)	*66.7%*
Package Hybrid	74	13.5% (n=10)	31.1% (n=23)	21.6% (n=16)	1.4% (n=1)	28.4% (n=21)	20.3% (n=15)	4.1% (n=3)	66.2% (n=49)	87.5%
Package Lecture	190	15.3% (n=29)	23.7% (n=45)	25.3% (n=48)	0.0% (n=0)	31.6% (n=60)	14.7% (n=28)	4.2% (n=8)	64.2% (n=122)	79.2%
Package Web	26	15.4% (n=4)	23.1% (n=6)	3.8% (n=1)	0.0% (n=0)	42.3% (n=11)	38.5% (n=10)	15.4% (n=4)	42.3% (n=11)	91.7%
Package Subtotal	*290*	*14.8%* (n=43)	*25.5%* (n=74)	*22.4%* (n=65)	*0.3%* (n=1)	*31.7%* (n=92)	*18.3%* (n=53)	*5.2%* (n=15)	*62.8%* (n=182)	*82.0%*
Web 15 week	25	0.0% (n=0)	4.0% (n=1)	8.0% (n=2)	8.0% (n=2)	68.0% (n=17)	52.0% (n=13)	12.0% (n=3)	12.0% (n=3)	33.3%
Web Subtotal	*25*	*0.0%* (n=0)	*4.0%* (n=1)	*8.0%* (n=2)	*8.0%* (n=2)	*68.0%* (n=17)	*52.0%* (n=13)	*12.0%* (n=3)	*12.0%* (n=3)	*33.3%*
14/FA Subtotal	**538**	**10.6%** (n=57)	**19.7%** (n=106)	**21.6%** (n=116)	**1.5%** (n=8)	**38.1%** (n=205)	**22.3%** (n=120)	**8.6%** (n=46)	**51.9%** (n=279)	**75.0%**

Full-Time Faculty vs Adjunct Faculty

	Total	A	B	C	D	F	WF	W/I/AU	Success	Completer Success
Full-time	180	7.8% (n=14)	17.8% (n=32)	18.9% (n=34)	3.9% (n=7)	39.4% (n=71)	25.6% (n=46)	12.2% (n=22)	44.4% (n=80)	71.4%
Adjunct	358	12.0% (n=43)	20.7% (n=74)	22.9% (n=82)	0.3% (n=1)	37.4% (n=134)	20.7% (n=74)	6.7% (n=24)	55.6% (n=199)	76.5%

*Completer success is defined as the success rate of students who completed the course. It is calculated by the formula (A + B + C) divided by (Total - WF - W - I - AU).

MAT-099 15/SP

	Total	A	B	C	D	F	WF	W/I/AU	Success	Completer Success
Lecture 12	24	16.7% (n=4)	16.7% (n=4)	25.0% (n=6)	0.0% (n=0)	29.2% (n=7)	20.8% (n=5)	12.5% (n=3)	58.3% (n=14)	87.5%
Lecture 15 week	142	4.2% (n=6)	12.7% (n=18)	12.0% (n=17)	3.5% (n=5)	57.7% (n=82)	30.3% (n=43)	9.9% (n=14)	28.9% (n=41)	48.2%
Lecture Second 7.5	11	9.1% (n=1)	18.2% (n=2)	9.1% (n=1)	0.0% (n=0)	36.4% (n=4)	27.3% (n=3)	27.3% (n=3)	36.4% (n=4)	80.0%
Lecture Subtotal	*177*	*6.2%* (n=11)	*13.6%* (n=24)	*13.6%* (n=24)	*2.8%* (n=5)	*52.5%* (n=93)	*28.8%* (n=51)	*11.3%* (n=20)	*33.3%* (n=59)	*55.7%*
Package Hybrid	14	7.1% (n=1)	7.1% (n=1)	7.1% (n=1)	28.6% (n=4)	35.7% (n=5)	14.3% (n=2)	14.3% (n=2)	21.4% (n=3)	30.0%
Package Lecture	118	13.6% (n=16)	16.9% (n=20)	23.7% (n=28)	4.2% (n=5)	35.6% (n=42)	17.8% (n=21)	5.9% (n=7)	54.2% (n=64)	71.1%
Package Web	23	17.4% (n=4)	21.7% (n=5)	30.4% (n=7)	0.0% (n=0)	17.4% (n=4)	17.4% (n=4)	13.0% (n=3)	69.6% (n=16)	100.0%
Package Subtotal	*155*	*13.5%* (n=21)	*16.8%* (n=26)	*23.2%* (n=36)	*5.8%* (n=9)	*32.9%* (n=51)	*17.4%* (n=27)	*7.7%* (n=12)	*53.5%* (n=83)	*71.6%*
Web 15 week	28	3.6% (n=1)	7.1% (n=2)	14.3% (n=4)	14.3% (n=4)	35.7% (n=10)	25.0% (n=7)	25.0% (n=7)	25.0% (n=7)	50.0%
Web Subtotal	*28*	*3.6%* (n=1)	*7.1%* (n=2)	*14.3%* (n=4)	*14.3%* (n=4)	*35.7%* (n=10)	*25.0%* (n=7)	*25.0%* (n=7)	*25.0%* (n=7)	*50.0%*
15/SP Subtotal	**360**	**9.2%** (n=33)	**14.4%** (n=52)	**17.8%** (n=64)	**5.0%** (n=18)	**42.8%** (n=154)	**23.6%** (n=85)	**10.8%** (n=39)	**41.4%** (n=149)	**63.1%**

Full-Time Faculty vs Adjunct Faculty

	Total	A	B	C	D	F	WF	W/I/AU	Success	Completer Success
Full-time	165	4.8% (n=8)	13.3% (n=22)	17.0% (n=28)	7.3% (n=12)	43.6% (n=72)	20.6% (n=34)	13.9% (n=23)	35.2% (n=58)	53.7%
Adjunct	195	12.8% (n=25)	15.4% (n=30)	18.5% (n=36)	3.1% (n=6)	42.1% (n=82)	26.2% (n=51)	8.2% (n=16)	46.7% (n=91)	71.1%

*Completer success is defined as the success rate of students who completed the course. It is calculated by the formula (A + B + C) divided by (Total - WF - W - I - AU).

MAT-099 SLOA Report

Lead Faculty: Rich Campbell

	Course Results					*Common Assessments*				
Term	**# of Students**	**Success**	**Walk-Away F**	**With-drawal**	**Mean GPA**	**PreTest Avg**	**PostTest Avg**	**Avg Change**	**Course**	**GenEd**
12/SP	n = 422	60.0% n = 253	16.6% n = 70	5.9% n = 25	1.89	N/A out of 10	N/A out of 10	N/A	----	N/A
12/SU	n = 161	69.6% n = 112	11.2% n = 18	5.0% n = 8	2.29	1.47 out of 10	6.87 out of 10	5.21	----	N/A
12/FA	n = 719	61.6% n = 443	18.5% n = 133	5.1% n = 37	1.92	1.29 out of 10	6.38 out of 10	5.00	----	N/A
13/SP	n = 414	57.7% n = 239	20.0% n = 83	5.8% n = 24	1.76	1.29 out of 10	6.13 out of 10	4.83	----	N/A
13/SU	n = 182	59.9% n = 109	0.0% n = 0	7.1% n = 13	1.99	1.93 out of 10	6.85 out of 10	4.89	----	N/A
13/FA	n = 620	64.7% n = 401	14.4% n = 89	5.5% n = 34	2.07	1.51 out of 10	6.42 out of 10	4.89	4.46 out of 6	N/A
14/SP	n = 339	55.5% n = 188	22.1% n = 75	6.8% n = 23	1.79	1.50 out of 10	5.92 out of 10	4.53	4.29 out of 6	N/A
14/SU	n = 151	62.3% n = 94	14.6% n = 22	6.6% n = 10	2.04	1.31 out of 10	6.41 out of 10	5.09	4.20 out of 6	N/A
14/FA	n = 538	51.9% n = 279	21.9% n = 118	8.0% n = 43	1.59	N/A	N/A	N/A	60.66 out of 90	N/A
15/SP	n = 354	41.2% n = 146	22.0% n = 78	12.1% n = 43	1.36	N/A	N/A	N/A	56.95 out of 90	N/A
15/SU	n = 112	0.0% n = 0	0.0% n = 0	0.0% n = 0	0.00	N/A	N/A	N/A	----	N/A

MAT-099 SLOA Assessment for 14/FA

Registered	Completed	SLO1	SLO2	SLO3	SLO4	SLO5	SLO6	SLO7	SLO8	Total
538	*369*	*6.58*	*12.58*	*12.05*	*5.99*	*4.20*	*7.45*	*10.74*	*2.21*	*61.81*
		of 8	*of 16*	*of 18*	*of 8*	*of 8*	*of 10*	*of 18*	*of 4*	*of 90*
		82.3%	*78.6%*	*66.9%*	*74.8%*	*52.5%*	*74.5%*	*59.7%*	*55.4%*	*68.7%*

MAT-099 SLOA Assessment for 15/SP

Registered	Completed	SLO1	SLO2	SLO3	SLO4	SLO5	SLO6	SLO7	SLO8	Total
354	*229*	*6.46*	*12.04*	*11.13*	*5.51*	*3.71*	*7.02*	*9.67*	*1.42*	*56.95*
		of 8	*of 16*	*of 18*	*of 8*	*of 8*	*of 10*	*of 18*	*of 4*	*of 90*
		80.7%	*75.2%*	*61.8%*	*68.9%*	*46.4%*	*70.2%*	*53.7%*	*35.4%*	*63.3%*