Yavapai COLLEGE

Student Learning Outcomes Assessment

AGEC/GECCO Report
Quantitative Literacy

Data Report:

Assessment Director (Molly Beauchman)
Data Collected Fall 2014 – Spring 2016
Report Completed: April 2017

Analysis of Data Completed:

Mathematics Department (Jeri Hamilton, Dept Chair)
Analysis Submitted September 2017

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Student Learning Outcomes Assessment

General Education Outcomes Assessment Data Report Analysis Directions

Please use the following guidelines when completing your department/discipline annual outcomes assessment report.

General Education Assessment Information

The General Education Core Curriculum Outcomes (GECCO) are assessed each semester using a common 4-point rubric and scores for a random sample of ten students are submitted through Banner. Scoring guidelines for assessing student attainment of GECCO outcomes are:

- **Advanced Proficiency (4):** This is highest level of proficiency that characterizes student attainment of the outcome as exceptional and above-and-beyond expectation. This is student work that "goes the extra mile".
- **Proficiency (3):** This level represents a student who has submitted work that meets expectations. They have exhibited that they have attained every aspect of the outcome.
- **Developing Proficiency (2):** This level represents a student who is very close to meeting expectations, but is not yet able to demonstrate that they have attained all aspects of the outcome.
- **Limited or No Proficiency (1):** This is the lowest level of proficiency that describes student work that does not demonstrate understanding of the outcome. This does not describe the student who did not submit work.
- **Vanished (V):** Vanished is intended for students who are on your roster, but who did not complete the assignment/activity used to assess the outcome.
- **Not Applicable (NA):** This option is for Associate of Applied Science courses that do not incorporate a particular outcome(s) from a GECCO category in their course/program. AAS program courses are required to assess at least one outcome from each GECCO category.
  NOTE: Courses on the General Education list may not assign NA for any outcome in the GECCO categories (all outcomes must be assessed).

General Education Data Report Description

The data report contains displays of data submitted for the General Education Core Curriculum Outcomes (GECCO) over a two-year period. The data is disaggregated and results are displayed in several ways:

- All Yavapai College courses combined (General Education and AAS Program)
- All Yavapai College courses combined by delivery method (F2F, Online, Hybrid, ITV)
- All General Education courses
- All Associate of Applied Science courses
- General Education courses by prefix and/or department/discipline

Analysis of Data and Displays of Data

When analyzing the data report, consider attainment of the outcomes for:

- all YC students.
- students in the AAS programs.
- students in the General Education program.
- students taking courses in your specific department/discipline.

How well are students attaining the desired outcomes?

What benchmark for success is reasonable for your data?
What percentage of students successful (scoring 3 or 4) would you consider acceptable?

Are there any trends in student attainment of the outcomes?

Describe in terms of the benchmarks how well students are doing.
Are there any outcomes or content areas where students score very high or very low?

What are possible reasons why students score very high or low on a particular outcome?

Discuss any changes in curriculum or instruction that may help students learn the desired information. If the possible reason is the assessment process itself, review and make improvements to the process.

Does the assessment process need to be revised?

Do the outcomes clearly state what you would like students to be able to do?
Does the rubric clearly define levels of attainment?
Does the course assignment or process used to assess the outcome need to be revised?
How will you communicate the outcomes and process to all faculty and students between now and the next collection cycle?

What actions or resources are needed to help students attain the outcome?

What adjustments or improvements are needed to improve curriculum or instruction?
What adjustments or improvements are needed to the assessment process so information is valid and reliable?
What resources are needed?

Yavapai COLLEGE

Student Learning Outcomes Assessment

General Education Outcomes Assessment
Quantitative Literacy Report:
Data totals for F2014 (LO#1), S2015, F2015 and S2016 (for LO#2 through LO#4)

Prepared by Molly Beauchman (District Assessment Director): April 2017
District Assessment Director

Quantitative Literacy:

Modern society is run by the numbers, from statistics to computer algorithms to news reporting on government budgets. Therefore, in the fall of 2012, the college General Education outcome Quantitative Literacy was revised. This category fulfills both the GECCO and AGEC Quantitative Literacy requirement. The following was included in the new General Education Values and Outcomes approved by the Curriculum committee in December 2012.

Quantitative Literacy (also known as Numeracy or Quantitative Reasoning) is a "habit of mind," competency and comfort in working with numerical data. (from the AACU Value Rubric). Students who graduate from Yavapai College with a degree or AGEC certificate will be able to:

LO#1: Use appropriate mathematical language and operations.
LO#2: Apply mathematical concepts to real world situations.
LO#3: Create, analyze and interpret various representations of data (e.g., graphs, tables, charts, summary statistics, etc.)
LO#4: Use a variety of problem solving strategies and evaluate their appropriateness.

	Advanced Proficiency (4)	**Proficiency (3)**	**Developing Proficiency (2)**	**Limited/ No Proficiency (1)**
LO #1: Use appropriate mathematical language and operations.	Demonstrates superior knowledge of the language of mathematics and basic mathematical concepts and operations (terms, symbols, signs, and/or formulas). Has the ability to teach and explain basic mathematical concepts and operations to others.	Demonstrates the appropriate use of the language of mathematics and basic mathematical concepts and operations (terms, symbols, signs, and/or formulas).Initiates or contributes to discussions about basic mathematical concepts and operations.	Understands the basic language of mathematics and basic mathematical concepts (terms, symbols, signs, and/or formulas). Participates in discussions about mathematical concepts and operations and demonstrates adequate knowledge.	Does not demonstrate knowledge of the language of mathematics and basic mathematical concepts (terms, symbols, signs, and/or formulas). Avoids participation in discussions about mathematical concepts and operations.

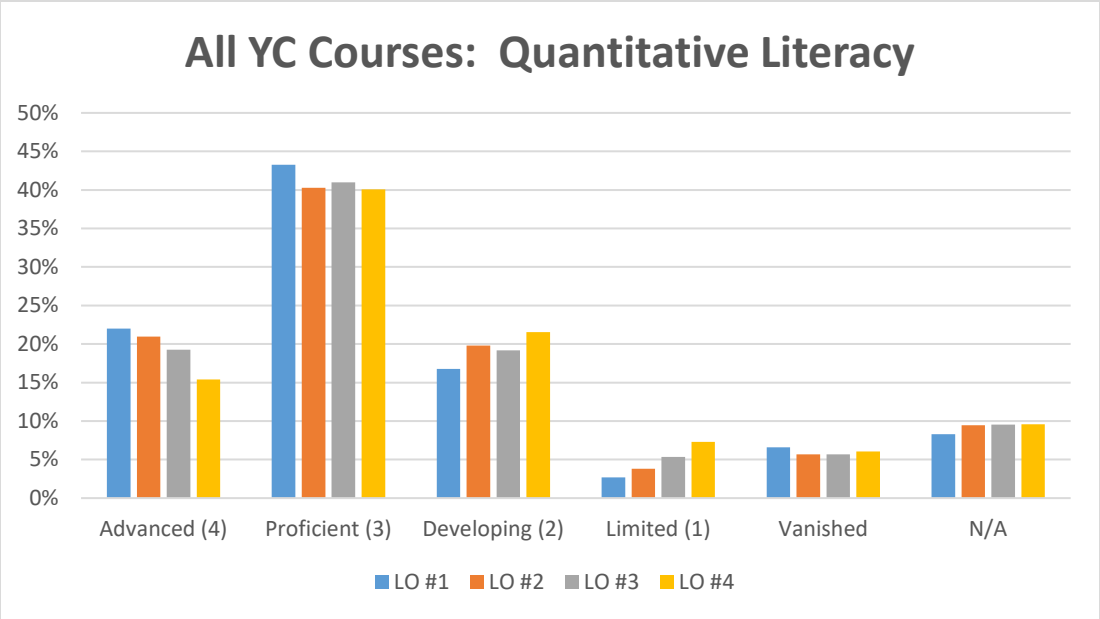
LO #2: Apply mathematical concepts to real world situations.	Understands a broad scope of quantitative approaches to solve application problems and the advantages of and disadvantages of each. Chooses the most efficient quantitative method (equation, formula, computation, table, graph, etc.) to describe the problem, accurately perform mathematical operations and articulates the meaning of the solution in terms of the original problem.	Recognizes that an application problem can be solved using a quantitative method. Chooses an appropriate quantitative method (equation, formula, computation, table, graph, etc.) to describe the problem, accurately performs mathematical operations, and articulates the meaning of the solution in terms of the original problem.	Recognizes in a limited scope that an application problem can be solved using a quantitative method. Chooses an appropriate quantitative method (equation, formula, computation, table, graph, etc.) to describe the problem and accurately performs most mathematical operations but may have limited ability to articulate the meaning of the solution in terms of the original problem.	Does not recognize that an application problem can be solved using any quantitative method (equation, formula, computation, table, graph, etc.). Unable to choose an appropriate quantitative method or perform basic mathematical operations.
LO #3: Create, analyze and interpret various representations of data (e.g., graphs, tables, charts, summary statistics, etc.)	Creates, analyzes and interprets sophisticated displays of data (e.g., graphs, tables, charts, summary statistics, etc.) and makes inferences consistent with the data. Explains clearly in everyday language the meaning of the data and relates it to the appropriate context.	Analyzes and interprets sophisticated displays of data (e.g., graphs, tables, charts, summary statistics, etc.) Creates an appropriate representation of data and explains the meaning of the data in everyday language and relates it to the appropriate context.	Creates, analyzes and interprets **simple** displays of data, makes inferences consistent with the displays of data, and explains the inferences within a limited context.	Demonstrates limited ability to create, analyze and interpret **simple** displays of data as evidenced by inaccurate inferences or the lack of inferences.
LO #4: Use a variety of problem solving strategies and evaluate their appropriateness	Chooses appropriate, efficient strategies for solving the problem. Verifies that their solution was correct and that their approach was valid through the use of multiple solution strategies.	Chooses appropriate, efficient strategies for solving the problem, but does not verify that their solution is correct using another strategy.	Uses an oversimplified approach to the problem or offers little or no explanation of their strategies. Some of the student's representations accurately depict aspects of the problem, but the student sometimes makes leaps in their logic that are hard to follow. The student's process led to a partially complete solution.	Strategies are not appropriate for the problem and approach to the problem would not lead to a correct solution. The student didn't seem to know where to begin or their reasoning did not support their work. There was no apparent relationship between the student's representations and the task.

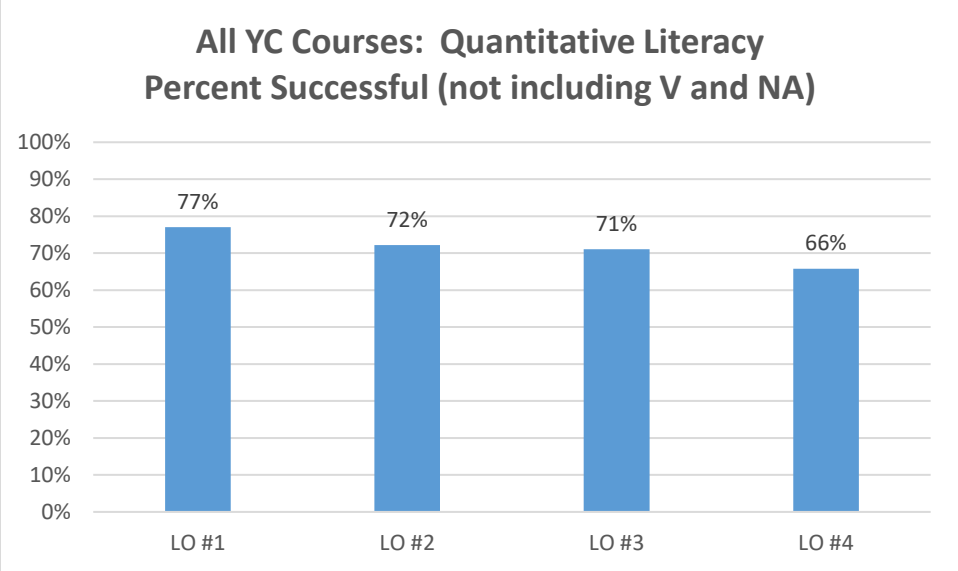
1: Quantitative Literacy Results for all Yavapai College Students

	LO #1	LO#2 – LO #4
Number of Sections	289	142
Number of Instructors	66	46
Number of Students	2646	1288

The data for LO #1 were collected from Fall 2014 through Spring 2016 and the data for the other LOs were collected Spring 2015 through Spring 2016.

	Advanced (4)	Proficient (3)	Developing (2)	Limited (1)	Vanished	N/A
LO #1	582	1,145	444	71	174	220
LO #2	270	519	255	49	73	122
LO #3	248	528	247	69	73	123
LO #4	198	515	277	94	78	123



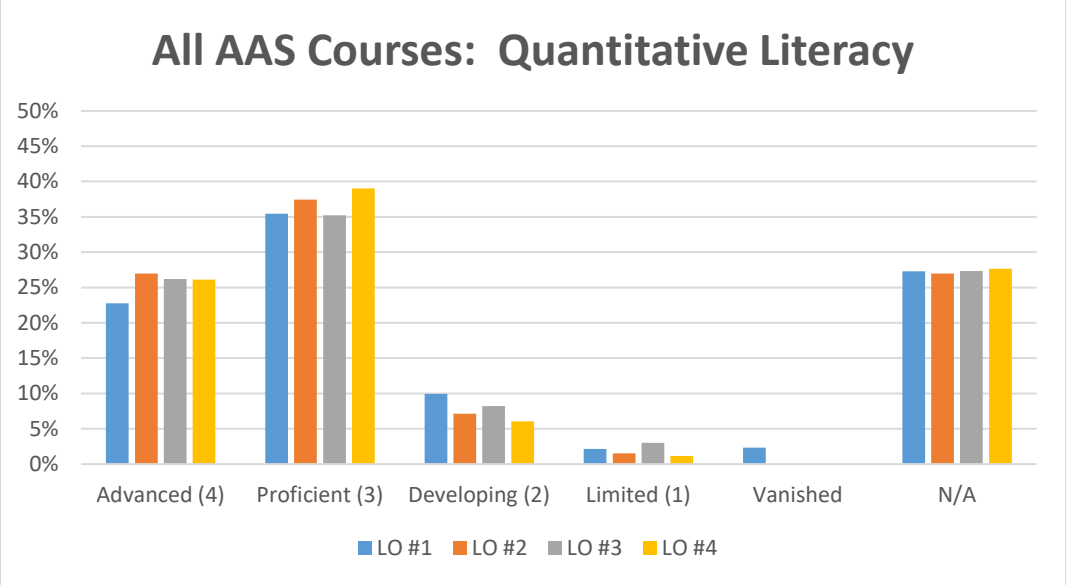


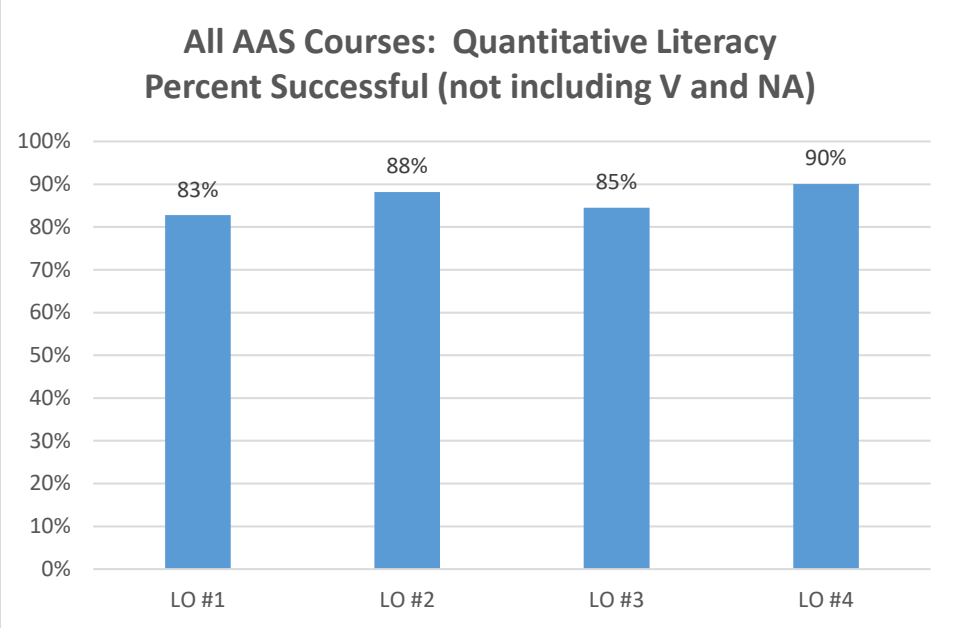
2: Quantitative Literacy Results for Associate of Applied Science (AAS) Courses

	LO #1	LO#2 – LO #4
Number of Sections	65	33
Number of Instructors	35	21
Number of Students	553	267

The data for LO #1 were collected from Fall 2014 through Spring 2016 and the data for the other LOs were collected Spring 2015 through Spring 2016.

	Advanced (4)	Proficient (3)	Developing (2)	Limited (1)	Vanished	N/A
LO #1	126	196	55	12	13	151
LO #2	72	100	19	4	0	72
LO #3	70	94	22	8	0	73
LO #4	69	103	16	3	0	73





Degree Programs Listing NA for all outcomes:

AJS: Administration of Justice

CNT: Computer Networking Technology

CSA: Computer Systems and Applications

EMA: Emergency Management Applications

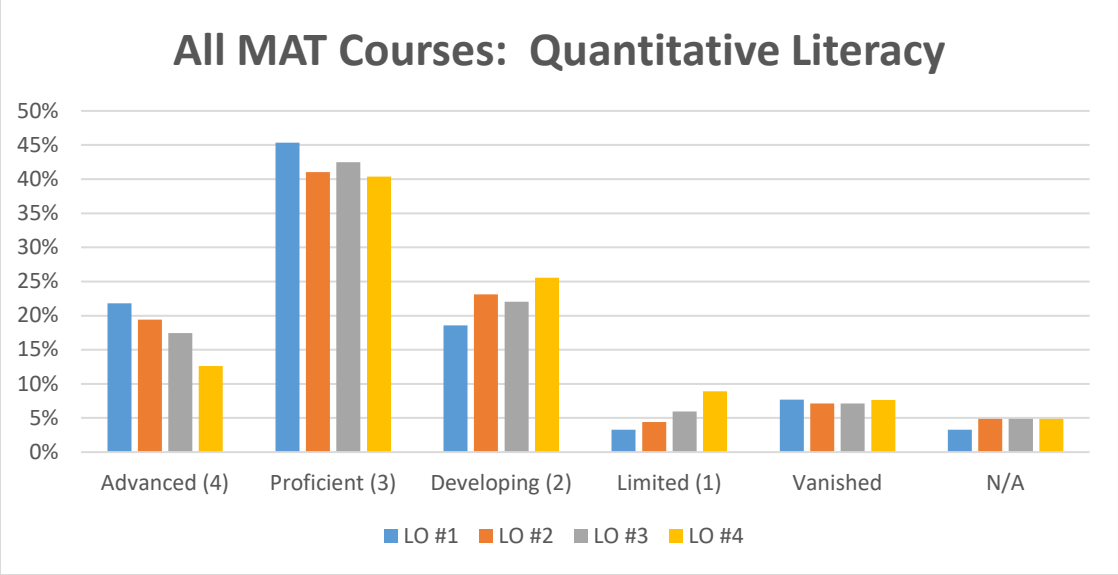
LAW: Paralegal Studies

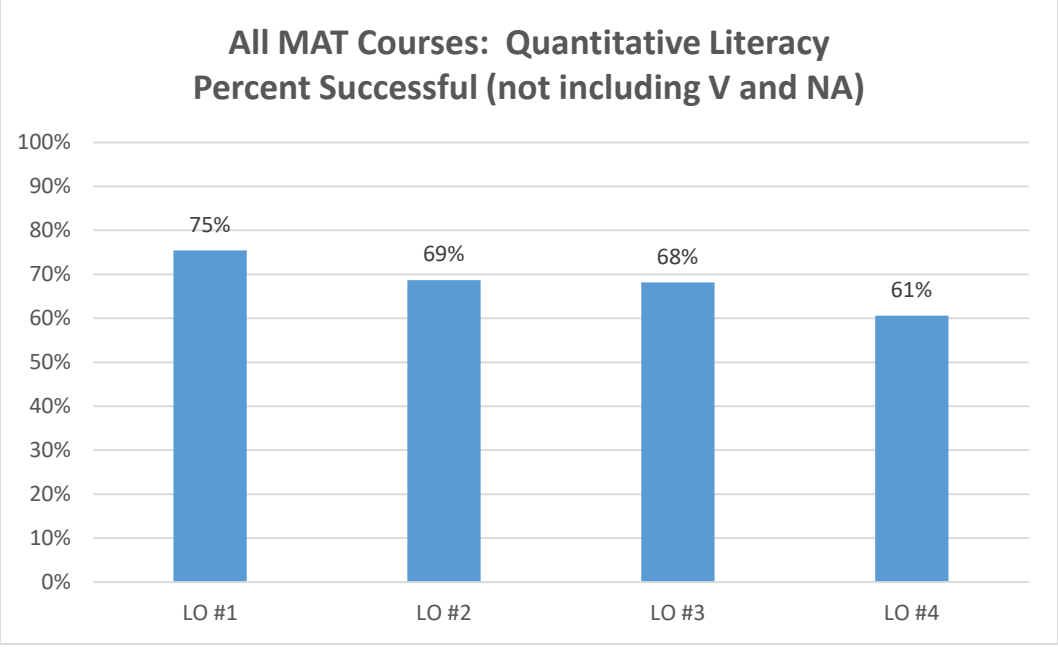
3: Quantitative Literacy Results for all Mathematics (MAT) Courses

	LO #1	LO#2 – LO #4
Number of Sections	224	109
Number of Instructors	72	53
Number of Students	2093	1021

The data for LO #1 were collected from Fall 2014 through Spring 2016 and the data for the other LOs were collected Spring 2015 through Spring 2016.

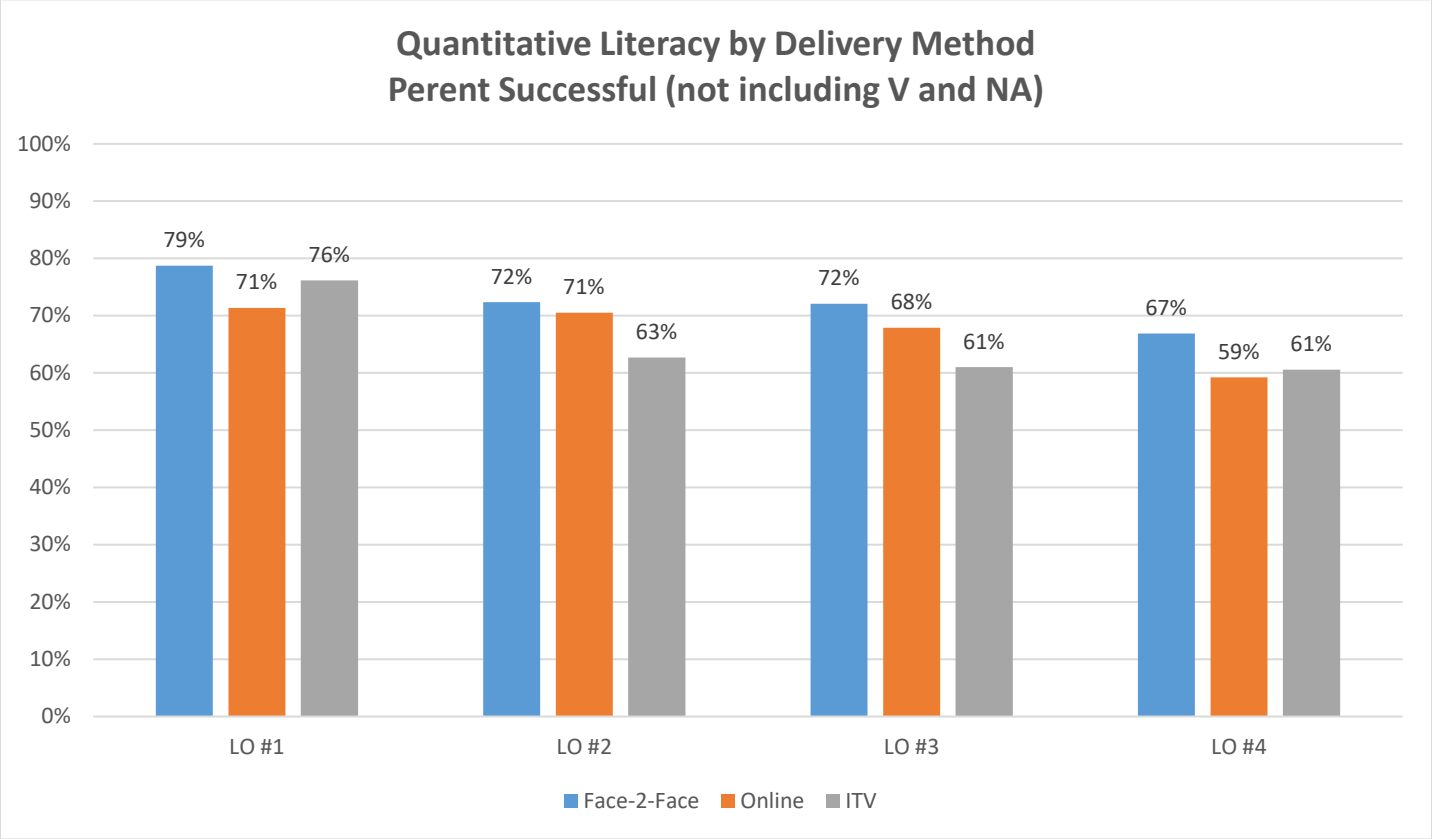
	Advanced (4)	Proficient (3)	Developing (2)	Limited (1)	Vanished	N/A
LO #1	456	949	389	69	161	69
LO #2	198	419	236	45	73	50
LO #3	178	434	225	61	73	50
LO #4	129	412	261	91	78	50



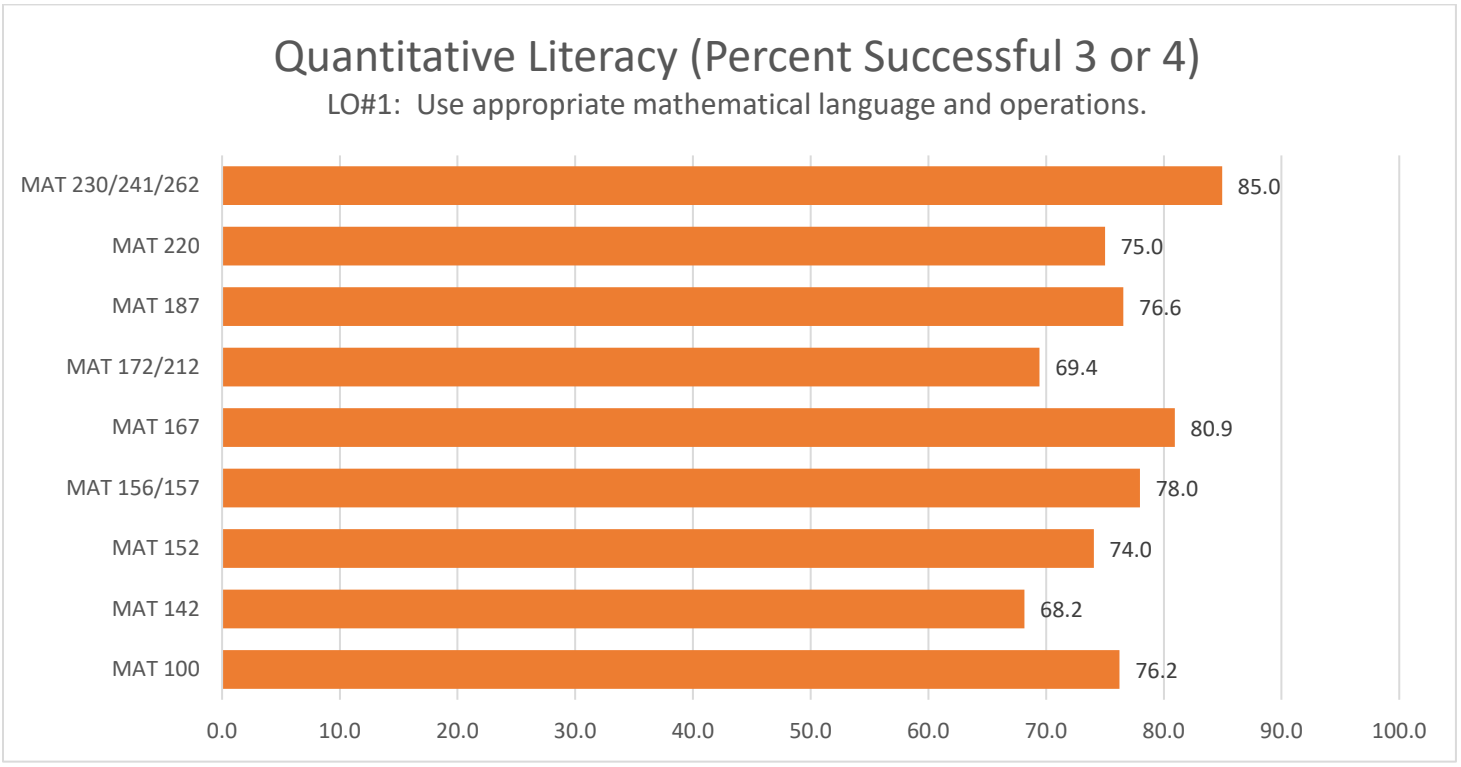


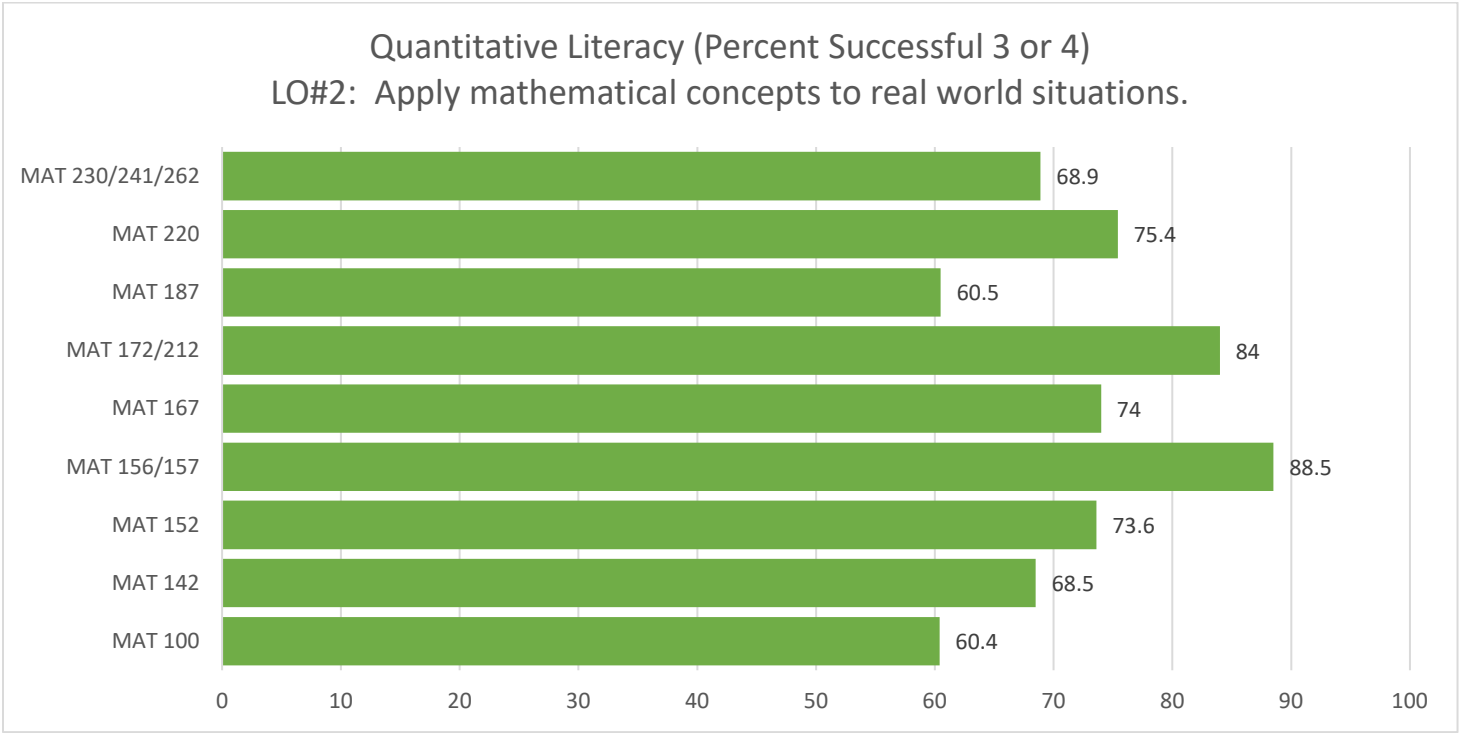
4: Delivery Method:

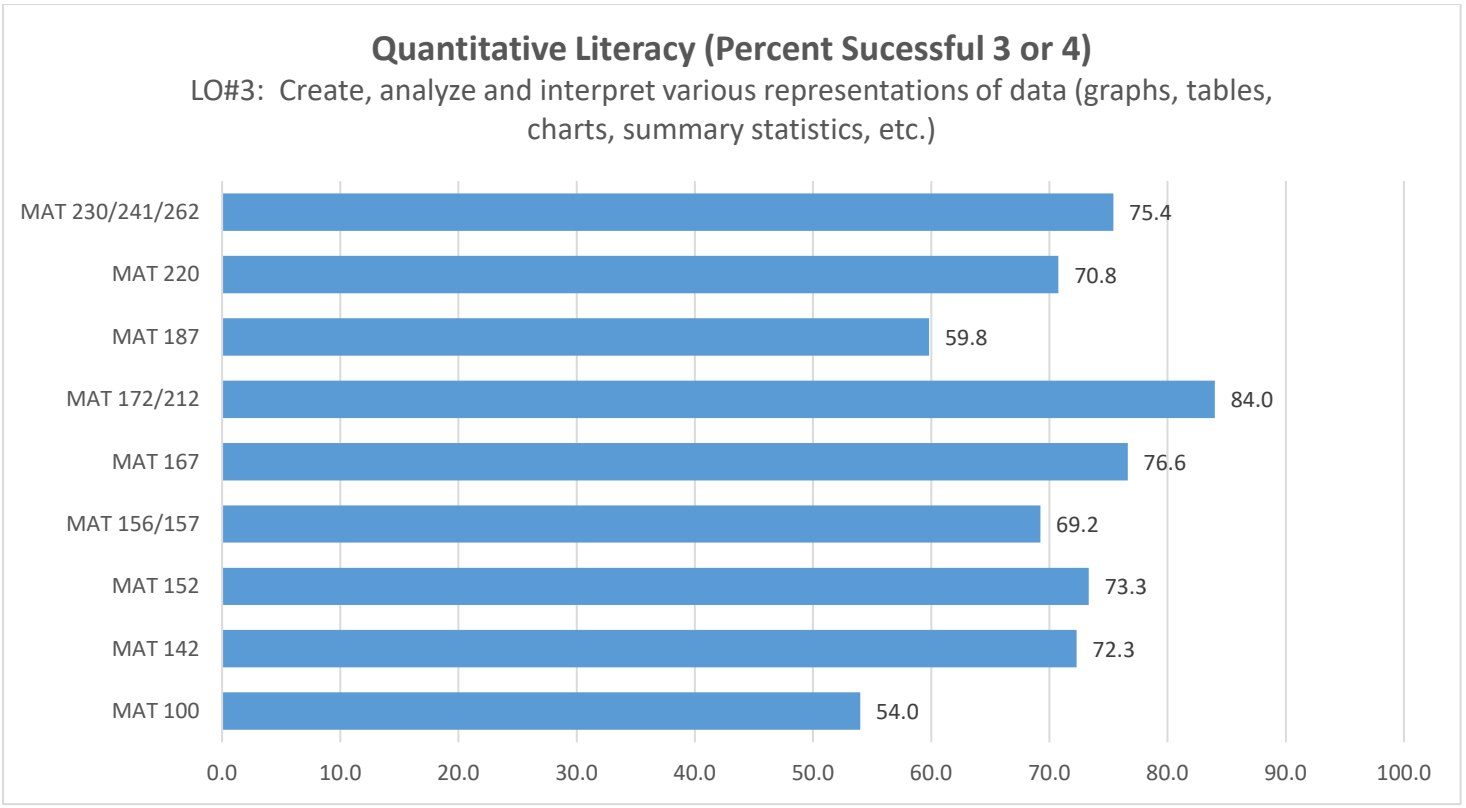
	Face-2-Face	Online	ITV
Number of Sections	79	39	12
Number of Instructors	33	15	3
Number of Students	759	360	83

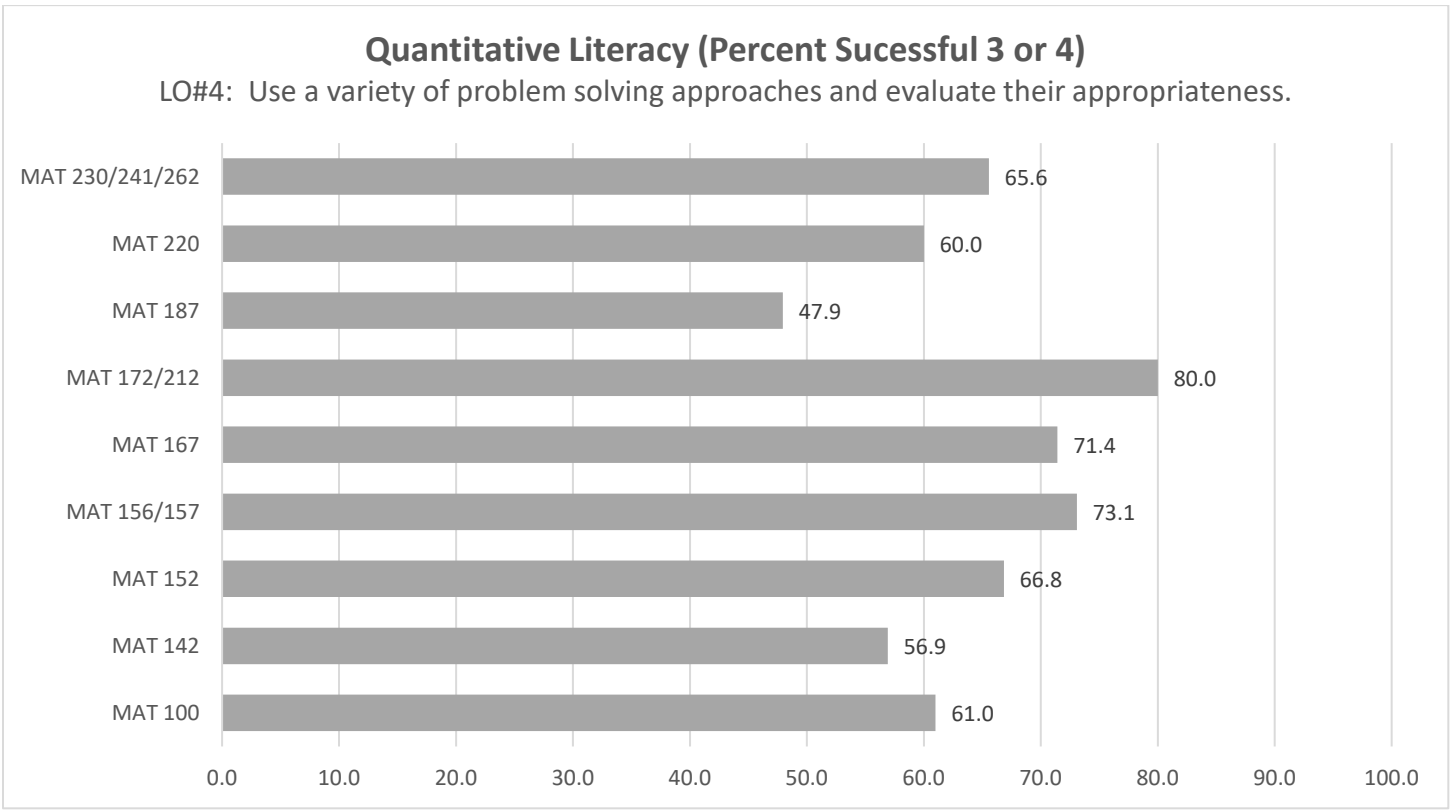


5: Mathematics (MAT) Courses






Quantitative Literacy (Percent Sucessful 3 or 4)
LO#3: Create, analyze and interpret various representations of data (graphs, tables, charts, summary statistics, etc.)
MAT 230/241/262
MAT 220
MAT 187
MAT 172/212
MAT 167
MAT 156/157
MAT 152
MAT 142
MAT 100
75.4
70.8
59.8
84.0
76.6
69.2
73.3
72.3
54.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0


Quantitative Literacy (Percent Sucessful 3 or 4)
LO#4: Use a variety of problem solving approaches and evaluate their appropriateness.
MAT 230/241/262
MAT 220
MAT 187
MAT 172/212
MAT 167
MAT 156/157
MAT 152
MAT 142
MAT 100
65.6
60.0
47.9
80.0
71.4
73.1
66.8
56.9
61.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0

Report Year	**2016/2017 (submit September 2017)**
Academic Department/Discipline	Mathematics
Contact Person (include email)	Molly.Beauchman@yc.edu; Jeri.Hamilton@yc.edu
Date Submitted	September 2017

AGEC/GECCO Data Analysis: Quantitative Literacy

Learning Outcome(s) Assessed (copy and paste each outcome from the Gen Ed website)	**What assessment measure(s) was used?**	**Findings and recommended actions based on assessment data.**	**Resources or support needed.**
LO #1: Use appropriate mathematical language and operations.	Common Assignments in each Course	Benchmark was 70%. Data shows attainment for all YC at 78%, all AAS courses at above 80%, MAT courses at 76.7%, but MAT 142 at 68%, slightly below benchmark – plan to investigate further.	None – satisfactory performance
LO #2: Apply mathematical concepts to real world situations.	Common Assignments in each Course	Benchmark was 70% Data shows attainment for all YC at 69%, all AAS courses at above 80%, MAT courses at 68.7%, MAT 187 and MAT 100 at 60% - will review/discuss in math meetings in S2017	Discussed MAT 187 in Focus Groups April 21, 2017 meeting with Dual Enrollment, Adjunct and Full time faculty – will address in LO #4 (Problem solving)
LO #3: Create, analyze and interpret various representations of data (e.g., graphs, tables, charts, summary statistics, etc.)	Common Assignments in each Course	Benchmark was 70% Data shows attainment for all YC at 71%, all AAS courses at above 80%, MAT courses at 68.2%, MAT 187 at 60% and MAT 100 at 54% -will review/discuss a plan of improvement in math meetings in S2017	MAT 187 discussed in Focus Groups in April 21st meeting – addressed in LO #4
LO #4: Use a variety of problem solving strategies and evaluate their appropriateness	Common Assignments in each Course	Benchmark was 70%. Data shows attainment for all YC at 66%, all AAS courses at above 80%, MAT courses at 60.6%, MAT 187 at 47.9% and MAT 100 at 61% -will review/discuss a plan of improvement in math meetings in S2017 Low percentage attainment in all YC math classes except MAT 167, 156, 157 212 172 (statistics, math for elementary teachers and business calculus and finite math). YC math department will review and devise a plan for incorporating problem solving in courses. Focus Groups: Identified student weaknesses: +Tend to depend upon one strategy for all problems. +Lack of motivation or persistence. +Don't check answer for reasonableness or to see if they have answered the question posed in the problem. +Have difficulty transferring the knowledge to other similar problems (near vs far transfer)	Focus Group Results: All Dual Enrollment, Adjunct and Full Time instructors decided on a few approaches: Improve Instruction: +Model different strategies in class and assign two different strategies for solutions. +Have students share their different strategies in class. +Use multiple representations in problems (analytic, table, graph, ordered pairs). +Incorporate applications in many different contexts – connect to students' interests/occupation. +Cyclic review of problems involving different content. Share activities in the Math Canvas shell –for all courses. Possible focus in-service development in the area – request time/funds to develop projects, create activities/scoring guides etc.

Course Assessment (Gen Ed Courses)

Course(s) Assessed (Prefix and number: AAA111)	**Learning Outcome(s) Assessed** (copy and paste each outcome from the course outline)	**What assessment measure(s) was used?**	**Findings and recommended actions based on assessment data.**	**Resources or support needed.**
MAT 100	Scored below benchmark on outcomes 2, 3 and 4	Common assessment	Students scored low on outcomes 2, 3 and 4. Redesign of the course is needed along with advising information (degrees the course is appropriate for). **NOTE:** Meeting with AAS faculty in F2016 resulted in several issues; success rates low, delivery method and availability of sections, content broad, course not appropriate for all AAS degrees, students enrolled who did not need the course.	Professional development for instructor to learn what content is needed for CTEC degrees. Time/stipend for instructor to restructure curriculum and design the course for CTEC degrees.
MAT 187	Scored below benchmark on outcomes 2, 3 and 4	Common assessment - box problem	Student attainment low – use of functions to model max/min problem. Dual enrollment professional development day in April – discuss; (strengths and weaknesses) – in the assignment and student work. Discuss S2017 and revise assignment or implement strategies for improvement for F2017.	Dual enrollment professional day; assessment day already scheduled. See detailed description in LO#4 of part A.
MAT 142 MAT 152 MAT 187			During Spring 2017 meeting – focus group looked at the outcomes and made suggestions based on students strengths and weaknesses in content – will revisit the outcomes on Assessment Day F2017 and submit to curriculum	Will revise outcomes for MAT 142, 152 and 187 based on feedback from instructors based on students strengths/weaknesses with content – submit on A-Day 2017

<u>Summary:</u> Please write a paragraph summarizing the findings, recommended actions and resources needed for the General Education Outcomes Report.

After analyzing the data, it is clear that our MAT100 and MAT187 are the two courses most in need of closer examination with respect to LO#2, LO#3, LO#4. On April 21, 2017, YC math instructors (full-time, adjunct, and dual enrollment) brainstormed ways to improve instruction in these courses. In MAT187, it was determined that much of the course is “skill and drill” related. Improvement with respect to the last three learning objectives will require emphasis on problem-solving in this course.

Modeling multiple problem-solving strategies and having students share their approaches to various problems will enable students to use higher order thinking skills addressed by the last three learning objectives. Assigning rich problems that can be solved in a multitude of ways will also aid in proficiency with respect to LO#2, LO#3, LO#4. Further, in MAT100, incorporating applications in many contexts that connect to students’ occupations contributes to attaining higher achievement. (It

should be noted that the math department is beginning to work with CTEC areas to embed mathematics related to specific fields.)

Based on the discussion of math faculty, it was decided that common activities and projects be developed and disseminated through the Math Canvas. Development of such activities/projects along with associated scoring rubrics will require time and funding. Additionally, providing instructors in-service training on the use of these materials will require time and funding.

The mathematics department selected the quantitative literacy outcomes as department or "program" outcomes for all courses. All mathematics course outcomes were reviewed, revised, and a curriculum map was created that shows the alignment of the course outcomes to the quantitative literacy outcomes. All course outcome changes were submitted to the Curriculum Committee Fall 2017 and were approved.

Review of Assessment Processes and Tools for General Education Assessment

The quantitative literacy outcomes and rubric will remain unchanged and will also serve as the mathematics department or "program" outcomes for all courses. Quantitative literacy outcomes were assessed using a common assessment for all courses, which will continue next cycle, but the activities will be reviewed and revised by each course coordinator before the next assessment cycle. Common final exams are used to assess course outcomes for consistency across delivery methods (online, face-to-face, hybrid) and instructor type (full-time, part-time, dual enrollment).

Additional Activities or Initiatives that Support Student Learning and Success, Retention, or Recruitment (Strategic Initiatives)

Additional Activities or Initiatives	Findings and recommended actions based on assessment data.	Resources or support needed.
Revision of Placement Test: using MyMathTest. Piloting tests and remediation	Use MyMathTest instead of Accuplacer for incoming students -	Stipends for faculty developing the tests, testing services and advising support, IT for implementing the test and Banner report
Students were not able to complete developmental sequence to transfer courses.	Shorter developmental math path to MAT 142. Changed prerequisite to MAT 092 instead of MAT 122. Need to collect final exam information about how students did in MAT 142 without the MAT 122 prerequisite	None needed – need to collect information about how students did in MAT 142 without the MAT 122 pre-requisite
Low success rate in MAT 100, students taking the course that didn't need it	Revision of curriculum, delivery of MAT 100 for CTEC degrees.	Advising to communicate appropriate course depending upon career or transfer path.
Tutors are not available on a regular basis in the learning center for students in statistics, calculus sequence and business calc/finite math courses.	Possible solutions: Math faculty can spend some hours in the learning center Explore looking into hiring a math tutor full time – the position could involve teaching some developmental courses, tutoring in the learning center specifically for stats, calc and business math courses, supplemental instruction for MAT 192 and MAT 187 courses.	Possible hiring of a full time mathematics tutor (instead of replacing a faculty position – or fund a math tutor in the learning center – or possibly explore grants that may fund the position).