General Education Assessment: Quantitative Literacy Results 2019

What do we mean by Quantitative Literacy?

Virginia Western describes Quantitative Literacy as the ability to perform accurate calculations, interpret quantitative information, apply and analyze relevant numerical data, and use results to support conclusions.

A person who is quantitatively literate possesses the skills and knowledge necessary to apply the use of logic, numbers, and mathematics to deal effectively with common problems and issues. A person who is quantitatively literate can:

- perform accurate calculations
- interpret quantitative information
- analyze relevant numerical data
- use results to support conclusions

How did we assess Quantitative Literacy?

We assessed students' quantitative literacy abilities through assessment of selected classwork.

How was student work selected?

Fall 2018

- At the beginning of the fall 2018 semester, program heads discussed the general education competencies that would be assessed that year with the faculty in their area. For 2018-19, these competencies were Quantitative Literacy and Written Communication.
- Faculty identified what assignments in their courses might be appropriate to serve as "artifacts" for the assessment process, and submitted a list of these to the Institutional Effectiveness Office. Such assignments might include homework, lab assignments, test questions, projects, or other student work.
- The Institutional Effectiveness Office (IEO) reviewed the lists and worked with program heads and faculty as needed to ensure that an appropriate array of course sections was included.

Spring 2019

- By the end of the following semester (spring 2019), faculty sent the Institutional Effectiveness Office the student work (artifacts) from all of the students in their class for the selected assignments.
- The faculty submissions were not graded and included the student names and student IDs for demographic analysis. All student and faculty information was redacted from the artifacts by the IEO prior to assessment.

Fall 2020

- The IEO selected a random sample of 150 redacted quantitative literacy artifacts to be assessed.
- Student artifacts from Spring 2019 were assessed from the following classes, which include a range of subjects, instructor types, student levels, and course modalities:

Subject	Instructor Type	Course Level	Mode of Instruction
CHM	Full-time	1xx	On campus, day
ECO	Adjunct	2xx	On campus, evening
HIS	Dual	1xx	Dual enrollment in high school
MTH	Full-time	1xx	Online
MTH	Full-time	2xx	On campus, day
MTH	Full-time	2xx	Academy: on-campus instruction of high school students

Who assessed the student work?

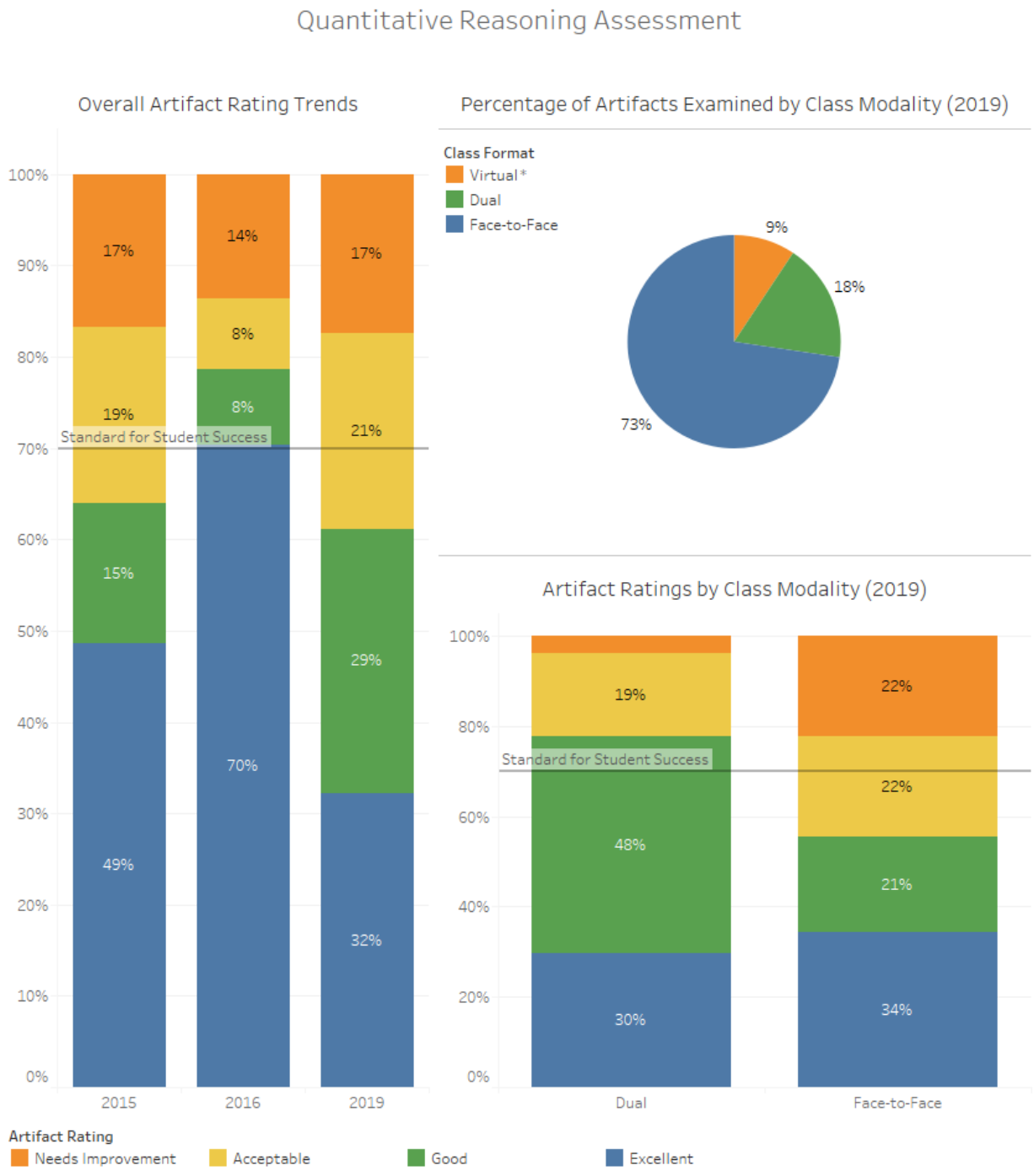
- Through the governance process, some faculty chose to serve on the General Education Workgroup for 2019-20. This workgroup was charged with:
    - Assessing the artifacts for the selected general education competencies
    - Analyzing prior general education assessment results and developing a plan for improving student learning for these outcomes
    - Revising the assessment rubrics as needed
- The members of the workgroup were divided into teams, each assessing an equitable set of artifacts from Spring 2019. The team members evaluated and scored each artifact based on criteria in the appropriate rubric.
- Each team then provided the IEO with a list of reconciled scores as well as summary information regarding the process, the rubric, student strengths and student weaknesses.

The IEO analyzed the results, with comparison against a target for student achievement of the competency. This target was established by the Vice President of Academic and Student Affairs based on prior results, and approved by Faculty Senate. The results were discussed with faculty at the beginning of the Fall 2019 semester.

What were the standards for assessment?

The rubric used in evaluating the 2019 quantitative literacy artifacts is included at the end of this report.

What were our results?



Categories that comprised less than 10% of examined documents are noted with an asterisk (*) and are not included in ratings breakdown.

The standard for student success is that at least 70% of examined artifacts receive a rating of "Good" or "Excellent".

The assessment teams noted the following overall student strengths in the Spring 2019 artifacts:

- Many artifacts indicated students had at least an understanding of how to set up and begin the calculations
- Most students were able to set up initial steps and calculations

The teams also noted the following overall student weaknesses:

- Students showed difficulty either knowing how to complete calculations or at some point had math errors
- Some students seemed to lack critical thinking skills for problem solving, as indicated by difficulties in identifying the relevant information as they moved through the calculation and carrying appropriate results over to the next step.

Have results changed since the last time this outcome was assessed?

Prior to 2016, all general education competencies were evaluated each year. This resulted in an overload of information that made it difficult to implement meaningful change. It also meant that Virginia Western had several assessment teams, which led to turnover and potential discrepancies in assessment over time. Starting in 2016, the college shifted to focusing on two general education competencies each year. Faculty were encouraged to remain with the assessment teams from year to year even though the competencies to be assessed were different each year. This led to reduced turnover and a deeper cohesiveness within the assessment teams. The college was also able to analyze results more fully and make deliberate change to impact student learning in specific areas.

Results for 2019 were roughly equivalent to results from 2015 and 2014, and were somewhat below the standard for success that 70% of student artifacts would earn a rating of Excellent or Good.

Year	% of Artifacts assessed as Excellent or Good
2019	62%
2016	78%
2015	64%
2014	61%

Breakdown of current results

A breakdown of the Spring 2019 results by type of course showed that 78% of artifacts from dual enrollment classes were assessed as Excellent or Good, compared to 55% of artifacts from in-person classes on campus. Online classes were excluded from this analysis due to an insufficient number of artifacts from these classes. Since the information on class location had been redacted from the artifacts prior to assessment, the high success rate among the dual enrollment artifacts may be viewed as validation of the quality of the dual enrollment instruction and the caliber of the dual enrollment students.

Future analyses will also include an analysis of the achievement of various demographic groups, including a comparison of achievement by race/ethnicity, age range, and Pell grant eligibility.

What changes are we making to improve student learning for Quantitative Literacy?

We continue to work to improve student competency in quantitative literacy. For students that are struggling, we offer the STEM tutoring center, which is a walk-in center with no appointment needed. We have recently added Brainfuse 24/7 online tutoring support. Both services are offered to students free of charge. The in-person tutoring was converted to Zoom sessions from Spring 2020 through Summer 2021 due to COVID-19 restrictions, but will resume the option of in-person sessions in Fall 2021.

In addition, we have changed the curriculum in our basic mathematics class from MTH 151 to MTH 154 and included more relevant material for students. The MTH 154 class is supported by a co-requisite class, MCR 4. MCR 4 is offered to students who have been in developmental math or who are struggling in the MTH 154 class. MCR 4 provides “just in time” tutoring support for the topics taught in MTH 154.

We have also recently adopted a multiple measures approach to math placement. Further developing our ability to place students and recommend supports as needed will increase student competency in this area.

Quantitative Literacy Rubric

Revised January 2019

Quantitative Reasoning: the ability to perform accurate calculations, interpret quantitative information, apply and analyze relevant numerical data, and use results to support conclusions.

A person competent in quantitative literacy possesses the skills and knowledge necessary to apply the use of logic, numbers, and mathematics to deal effectively with common problems and issues. A student with strong quantitative literacy skills can perform accurate calculations, interpret quantitative information, apply and analyze relevant numerical data, and use results to support conclusions.

	Excellent-4	**Good-3**	**Acceptable-2**	**Needs Improvement-1**
Interpretation. Can the student answer questions directly related to the information provided? Example – Look at a chart and give the correct temperature for a charted date.	Demonstrates a thorough understanding of the given information. Can correctly answer questions directly related to the data.	Demonstrates an understanding of the given information. Can answer questions directly related to the data, but with minor errors.	Demonstrates a limited understanding of the given information. Can answer questions directly related to the data, but with substantial errors.	Demonstrates very little if any understanding of the given information.
Analysis. Can the student use the information provided to draw conclusions about a related topic? Example – Use a graph of past data to make predictions about the future.	Uses the given information to make conclusions, with no errors.	Uses the given information to make conclusions, with minor errors.	Uses the given information to make conclusions, with substantial errors.	Fails to present a conclusion, or does so in a completely invalid manner.
Problem Solving. Can the student set up the problem and solve it correctly?	Correctly organizes and calculates a mathematical strategy for a given situation	Organizes and calculates a mathematical strategy for a given situation, with mistakes in organization **OR** calculation.	Organizes and calculates a mathematical strategy for a given situation, with mistakes in organization **AND** calculation.	Did not organize or calculate a mathematical strategy for a given situation, or did so in a completely invalid manner.
Translate Information. Can the student correctly translate information from the problem/experiment into mathematical symbols, graphs, or tables?	Takes information from the problem/experiment and correctly translates it into mathematical symbols, graphs and/or tables.	Takes information from the problem/experiment and translates it into mathematical symbols, graphs and/or tables, with minor errors.	Takes information from the problem/experiment and translates it into mathematical symbols, graphs and/or tables, with substantial errors.	Did not translate the information, or translated it in a completely invalid manner.