



2017-2018 VALUE Institute Summary
Quantitative Literacy

July 2, 2019

Prepared by Dr. Tim Burrows, Director of Assessment and Accreditation

Introduction

In light of the UND Strategic Plan Goal #1 and, as a way to assess Essential Studies (ES) outcomes at the University of North Dakota (UND) in accordance with the Higher Learning Commission, state, and university policies, UND selected the Association of American Colleges and Universities' (AAC&U) VALUE (Valid Assessment of Learning in Undergraduate Education) Institute to measure core student learning outcomes. The VALUE Institute uses external reviewers to rate student artifacts and provide feedback to the institution. The VALUE Institute provided UND with results and information regarding its own performance as well as the overall performance of all 2018 participants in aggregate. UND participated for the first time in the VALUE Institute assessment process during the spring of 2018. The Quantitative Reasoning learning goal within ES was due for evaluation at this time and so was submitted as the first outcome to be assessed through the VALUE Institute using their Quantitative Literacy Rubric.

UND selected the VALUE Institute as the primary measure for its ES outcomes because it offered an objective external review process by professionals who are specifically trained on scoring VALUE Rubrics. In addition to the benefit of trained external reviewers, the VALUE Institute also provides savings in both faculty/staff time and monetary compensation.

This report will highlight the methods used by AAC&U to collect and assess the submitted artifacts, limitations of the report, results, and recommended steps by UND for continuous improvement.

Method

Institutions were allowed to submit up to 100 artifacts for scoring. Submitted artifacts were meant to be aligned with the AAC&U VALUE Rubric for quantitative literacy. Scores ranged between 0 (No Evidence) and 4 (Capstone) in six categories. These categories included interpretation (the ability to explain information, such as graphs and diagrams), representation (the ability to convert information into mathematical forms), calculation (the ability to calculate quantities), application/analysis (the ability to make judgments and draw conclusions based on the analysis of data), assumptions (the ability to make and evaluate assumptions in estimates and analyses), and communication (the ability to express evidence in support of an argument). Scores reflect students' overall proficiencies in quantitative literacy. Each artifact was scored twice by AAC&U raters to ensure accurate scoring. Inter-rater reliability for the 2017-2018 Quantitative Literacy rubric ranged between a .80 and .89 (very high) in regards to a weighted percent agreement. A weighted percent agreement takes into account adjacent scores (for example, an artifact that received a 1 from scorer 1 and a 2 from scorer 2). Exact agreement reliability scores ranged between a .35 and .5 (where both reviewers scored the artifact the same). A sample of 100 artifacts was chosen to allow for the results to be generalized across an institution. In 2018, UND submitted 126 artifacts. A total of 353 artifacts were submitted for scoring by five institutions.

Although the VALUE Institute was founded on peer-reviewed, decade-long research and went to great lengths to ensure instrument reliability and validity, there are several considerations when interpreting the results.

Considerations

The expectation for a student's score is based on the major and the number of relevant required courses in the major. A benchmark (score of 1) or milestone (score of 2 or 3) rating may be acceptable for certain majors. For example, a history major is expected to score lower than a biology major due to the

quantitative requirements in their major. The more coursework a student had specifically addressing quantitative literacy, the more likely it was for them to score higher on the rubric. Most ES quantitative reasoning validated courses are at the 100 and 200 level at UND, so a milestone score is an appropriate target for most students.

In addition, the alignment of the artifact/assignment to the VALUE Rubric and the students' motivation to complete the assignment is an important consideration when evaluating results. UND's submitted assignment for Quantitative Literacy was not fully aligned with the AAC&U rubric, nor was it a graded assignment. The artifacts submitted were from a voluntary assignment developed from the previous in-house developed rubric that was only based on some, not all, aspects of the VALUE Rubric for quantitative literacy. This misalignment to the rubric and the fact that it was not graded likely diminished students' motivation to seriously engage in the assignment which may have resulted in lower scores. AAC&U recommends that all artifacts are graded assignments to ensure the highest level of student motivation. AAC&U also recommends that all submitted assignments should have taken the VALUE Rubric into account when made to ensure the appropriate levels of alignment for scoring.

Due to the misalignment and possible low student motivation, it is recommended that this year's results be viewed as a pilot study for future administrations of the VALUE Institute. At the least, caution should be used when interpreting these data.

Results

The results of the AAC&U VALUE Institute assessment provide a snapshot of the aggregated data collected from five public universities that participated in the quantitative literacy assessment during the 2017-2018 academic year in addition to the scores of UND students. The participating universities in the aggregate included:

- University of North Dakota
- Southern Oregon University
- University of Kentucky
- Northern Kentucky University
- Vincennes University

The graphs below represent the demographics for gender, race, and discipline from which artifacts were collected, and the breakdown of scores by dimension and category (UND and Aggregate). UND submitted 126 artifacts, but only 100 of these were randomly selected for the aggregate sample. The numbers of responses in the graphs below varies because demographic reporting was optional.

AAC&U recommends that scores should be interpreted based on benchmarks established by each institution and that scores should not be compared to other institutions due to the individual emphases place on specific learning objectives, connection between assignment and rubric (not all assignments may have contained all portions of the rubric), and the inability to control the make-up of specific peer groups. The aggregate data are presented to provide institutions with a sense of an average that may be used to help establish a benchmark if one has not yet been established. For this reason, the focus of this report is based on the UND scores and not that of the aggregate.

Sixty-three percent of UND participants were male (Figure 1) and eighty-three percent were white (Figure 2). The majority of UND artifacts (53%) were provided by physical science majors (Figure 3). The

numbers of responses are not static due to the demographic reporting being optional. Some students may not have provided responses for gender, race, or major.

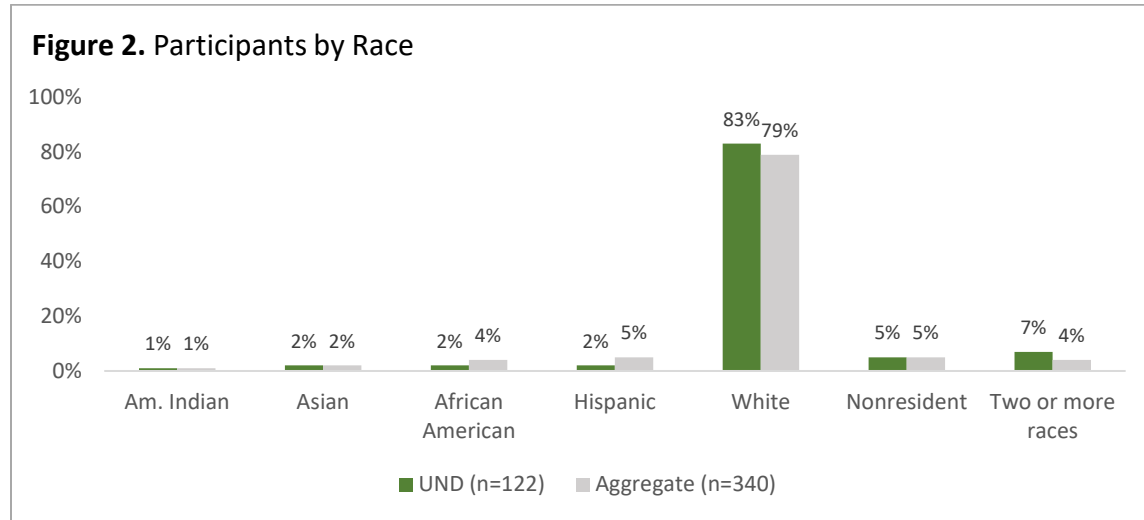
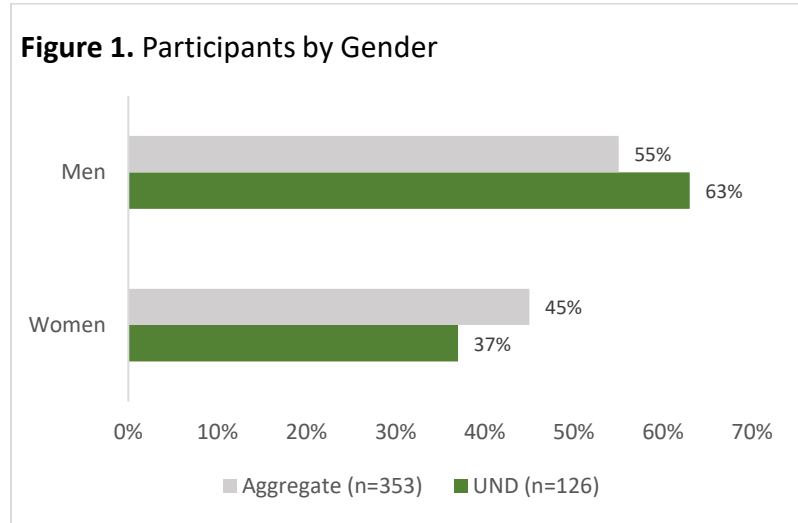
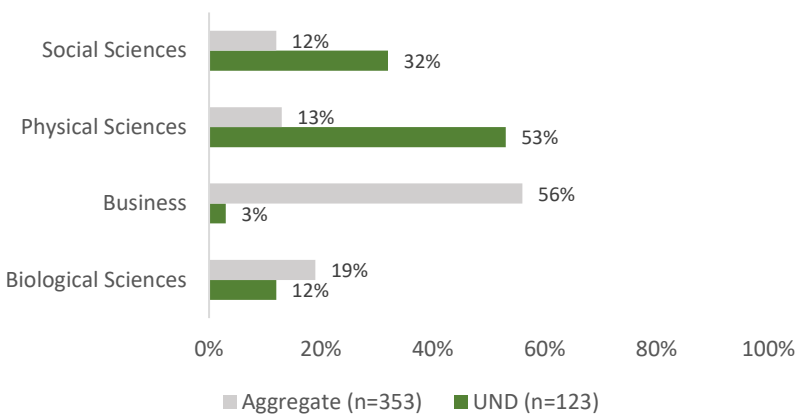
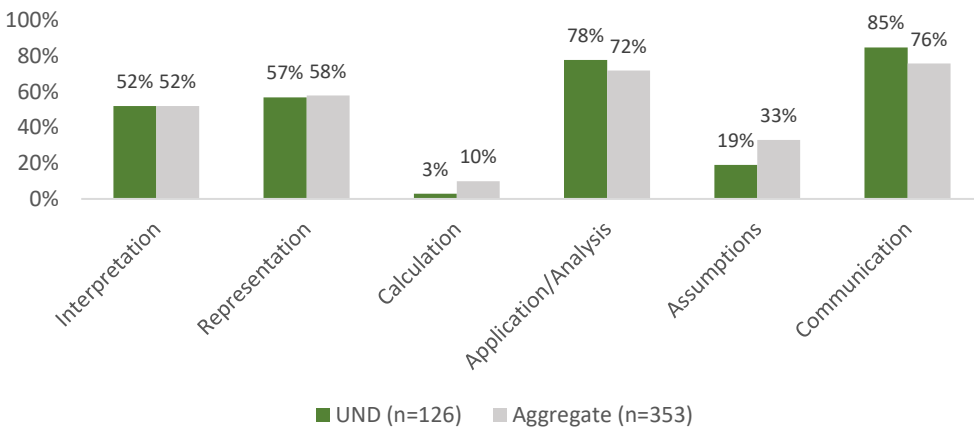


Figure 3. Course Disciplines from Which Assignment Were Collected



In figure 4, we see that 52% of students showed evidence of interpretation, 57% of students scored in representation, and 78% demonstrated evidence of application and analysis. The majority of students communicated their results (85%). The lowest of all scores were 3% for calculation and 19% for assumptions. It can be determined that calculation scores were low because it was not clearly stated in the assignment for students to show their work. The assignment chosen by UND had clear connections to interpretation, representation, application/analysis, and communications, but did not specifically task students with making assumptions to estimate or model data, which would account for the low number of students receiving scores in this dimension.

Figure 4. Quantitative Literacy Evidence by Dimension with Scores of 4, 3, 2, or 1



UND scored lower at the three and four levels (Figure 5), which may be because of a lack of student motivation due to the absence of a grade or the relation to the levels of ES courses (100 and 200 levels). The majority of UND students who demonstrated evidence scored in the milestone range of two or three (Figure 7), which is appropriate for this assessment.

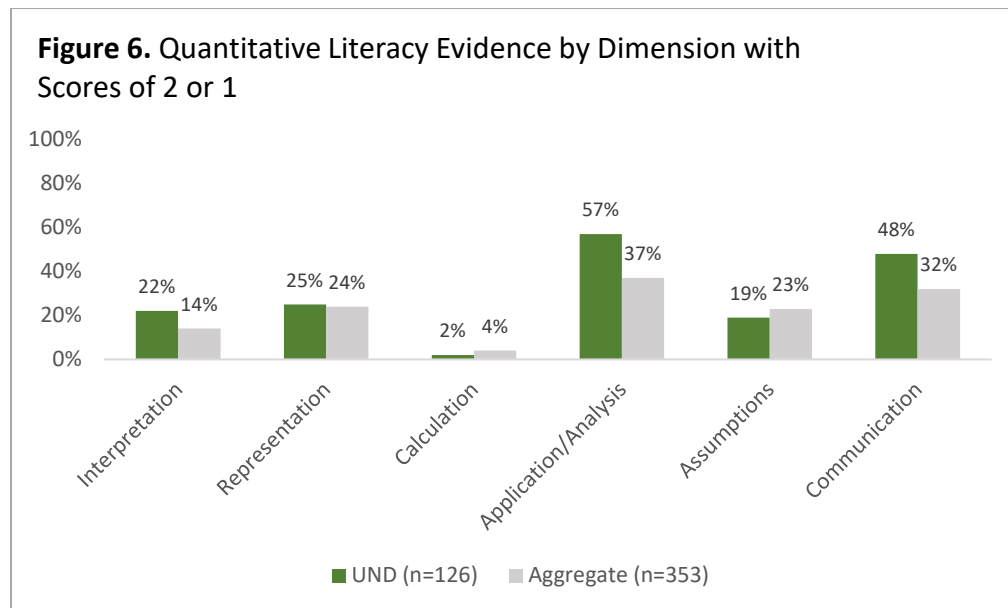
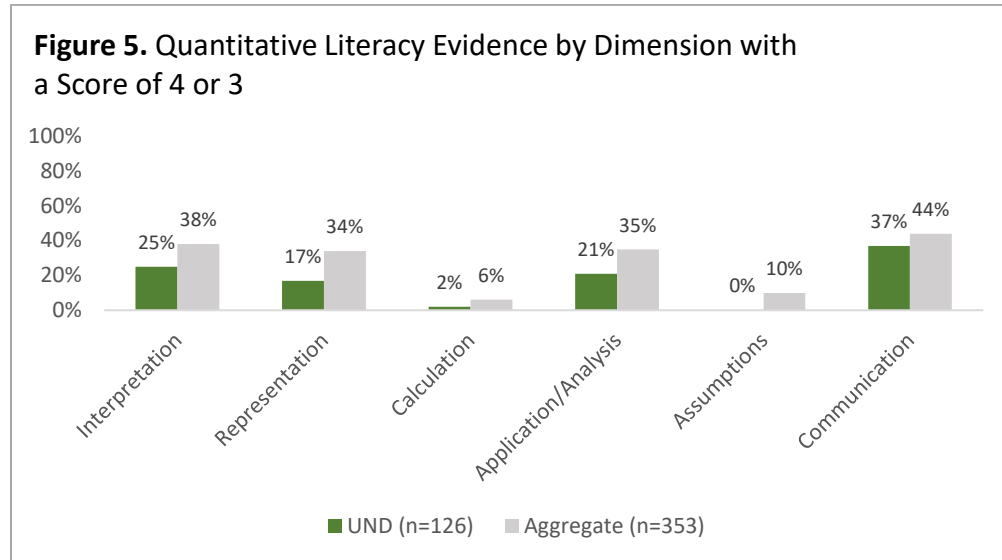
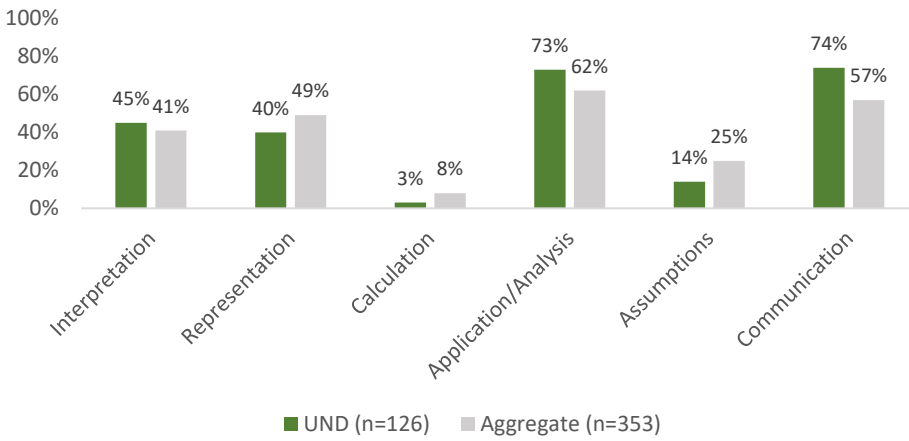
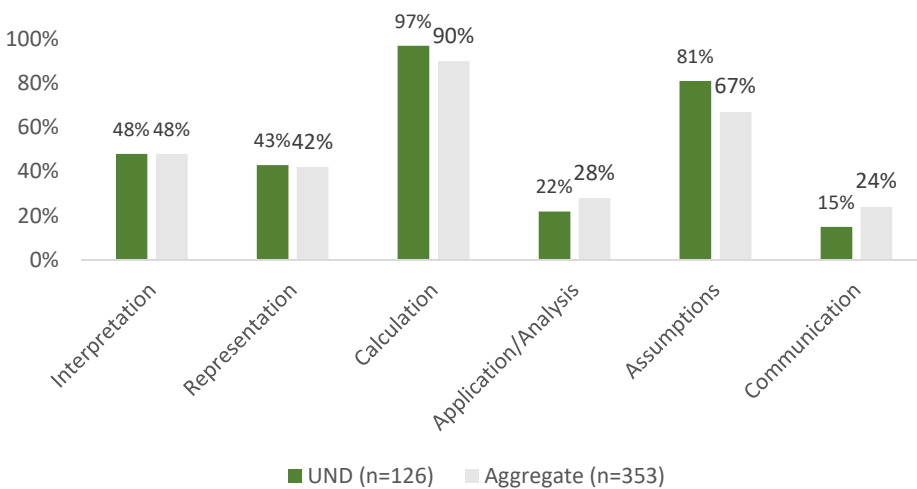


Figure 7. Quantitative Literacy Evidence by Dimension with Scores of 2 or 3



Although UND students who demonstrated evidence scored appropriately, there was a high number of students who did not provide any evidence in many of the dimensions and received a score of zero. This data may provide the best insight on where to make changes for improvement. Excluding calculation and assumption scores because of their disconnect to the scoring rubric as stated above, there is significant room for improvement in the dimensions of interpretation and representation. Forty-eight percent of UND participants did not provide evidence of interpretation. Forty-three percent of UND participants did not provide any evidence representing the data (Figure 8). A large majority of students did provide evidence in applying/analyzing the data and communicating the results.

Figure 8. Quantitative Literacy - No Evidence (Score of 0)



Next Steps

The results from the VALUE Institute assessment provided UND with useful information on where to focus efforts to improve the quantitative literacy skills of students. The following are four primary actions we will take to improve UND's performance and assessment of ES goals across the university:

1. The first action is to improve the alignment and quality of artifacts. To do so, ES designated courses should include at least one assignment that uses an AAC&U VALUE Rubric as the primary scoring measure. To achieve this, a formal motion will be made to the ES Committee in September of 2019 that ES special emphasis and capstone courses will be required to use the appropriate VALUE Rubric on at least one of the course assignments. Data will be collected on the dimensions of each VALUE rubric a course is meeting when they select a particular learning goal. For example, if a course is being validated or revalidated with a learning goal of oral communication, they will be asked to identify which of the dimensions of the oral communication VALUE rubric the course meets.
2. The second action is to ensure all ES new courses that are submitted for quantitative literacy and all existing courses that are revalidated for quantitative literacy address interpretation and representation skills. Department faculty who submit courses without sufficient support of these two dimensions will be asked to modify their courses to address these areas of need. Modifications can occur in the way of redesign or by adding additional assignments to reinforce these concepts. To assist, departments will be encouraged to work with the Teaching Transformation and Development Academy to improve current assignments or develop new assessments to ensure these dimensions are appropriately addressed.
3. The third action is to recommend that each undergraduate program adopts one ES based goal to their program assessment plan, in which overall rubric scores will be used to provide overall performance and assessment of the selected ES goal at the program level. This will allow for programs to compare their performance to the overall institutional performance of the same goal. It is the recommendation of the Director of Assessment and Accreditation that each undergraduate program adopts an ES goal in order to better align program outcomes to the various ES goals that are being assessed within their programs. By aligning ES goals with program outcomes, department chairs will be more aware of their faculty members' ES responsibilities. This recommendation will be made during the Fall 2019 assessment meeting with the dean and department chairs of each college.
4. The fourth action is to communicate the results of this assessment to all faculty members teaching a quantitative literacy ES course and UND students (primary stakeholders). It is imperative for faculty members to understand where student deficiencies are primarily occurring as well as to understand student strengths. The results will be shared with the ES committee in the first ES meeting in the Fall of 2019 and made available electronically on the ES website.

Conclusion

UND's initial participation in the AAC&U VALUE Institute provided an external assessment of our current quantitative literacy ES goal. UND students who demonstrated evidence scored mostly at a level that would suggest students are performing at the milestone level or above. The milestone level reflects coursework primarily taken at the 200 or 300 level. Since the sample of work came from students across

several disciplines, ranging from music to engineering, this can be viewed as an appropriate outcome. Although UND students participated on a voluntary basis and the assignment was not directly linked to the VALUE Rubric, students still performed at an acceptable level.

In the future, as assignments are taken from graded coursework that align with the appropriate VALUE Rubrics, it is expected that UND students will perform at higher levels. Dimensions that had low evidence or zero scores can be improved by continuing to evaluate ES courses and ensuring appropriate measures are taken to address any deficiencies. The VALUE Institute provides UND with useful information regarding student learning outcomes and should be continued as a means to meet the goals set forth by the Strategic Plan. As with any new process, time is needed to properly implement and adjust for maximum efficiency and performance. By meeting the four goals set forth in this report, UND will have an accurate, timely, and efficient process to measure all ES goals and to ensure the highest level of quality continuous improvement.