Institutional Student Learning Outcome (ISLO) Assessment Summary Report Academic Year: 2021-2022 ISLO4: Quantitative Reasoning

Quantitative Reasoning

Students will analyze quantitative material that may be presented in a variety of formats (words, tables, graphs, mathematical equations, etc.) from a wide array of contexts, interpret results, and communicate reasoned arguments supported by quantitative evidence.

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Report submitted on October 1, 2022

Executive Summary

***SCOPE**:*

Courses from which assessment data was gathered (# of sections): MAT 107 (2), MAT 109 (3), MAT 110 (3), MAT 118 (14), MAT 132 (1), MAT 184 (5), NUR 112 (2), NUR 213 (2), PAR 106 (1), PSY 221 (2)

Participating faculty and academic department:

- AHBS: S. O'Neill
- BHS: K. Rybacki
- MCS: P. Basile, M. Bastian, T. Cirrincione, D. Cook, P. Darcy, S. DeGuzman, R. DeJesus-Garcia, C. DelTreste, B. Dolansky, J. Halsey, B. Jones, R. Mulder, G. Nagelhout, T. Powell-Kopilak, M. Roland, S. Taylor
- NUR: I. Hunter, N. Moskowitz

Total # of Sections: 35

Total # of Students: Valid data collected for 343 out of 667 possible assessments (288 in Fall 2021; 55 in Spring 2022)

RESULTS:

- Assessment focused largely on 100-level MAT courses, meaning drawing conclusions about where and how ISLO4 skills are reinforced in programs was difficult.
- Disparities in how the rubric was used and the assessment tools employed led to difficulties in analyzing the data fully, as well as in drawing more concrete conclusions.
- Outcomes for Interpretation were stronger than those for Application and Analysis.

CONCLUSIONS AND RECOMMENDATIONS:

The assessment team proffered the following conclusions and recommendations.

Result/Conclusion	Recommendation for Action
Assessment focused largely on 100-level MAT courses, meaning drawing conclusions about where and how ISLO4 skills are reinforced in programs was difficult.	For the 2024-2025 assessment of ISLO4, encourage the use of more 200-level courses, as well as courses in disciplines other than Math to allow for broader conclusions to be drawn. Consider the possibility of using a

	non-Math course as a baseline outcome to compart to other courses.
Disparities in how the rubric was used and the assessment tools employed led to difficulties in analyze the data fully, as well as in drawing more concrete conclusions.	The Faculty Assessment Leader (FAL), along with the potentially newly named Discipline Leader for ISLO4, work on crafting stronger guidelines for the use of the rubric and lead discussions on the development of a potential common tool to be used for the 2024-2025 assessment.
Outcomes for Interpretation were stronger than those for Application and Analysis.	FAL will consult with the Director of the Math & Science Center, the MCS faculty, and the chair of the PSDC to develop workshops on best practices in building Application and Analysis skills in students.

ACTION PLAN:

Recommendation for Action	Potential Resources Required
For the 2024-2025 assessment of ISLO4, encourage the use of more 200-level courses, as well as courses in disciplines other than Math to allow for broader conclusions to be drawn. Consider the possibility of using a non-Math course as a baseline outcome to compart to other courses.	FAL to consult with faculty on best courses to use for the 2024-2025 assessment.
The Faculty Assessment Leader, along with the potentially newly named Discipline Leader for ISLO4, work on crafting stronger guidelines for the use of the rubric and lead discussions on the development of a potential common tool to be used for the 2024-2025 assessment.	Creation of new Discipline Leader for ISLO4 (with reassigned time) to assist FAL and the faculty in crafting assessment tool(s). Potential resources to compensate part-time faculty to participate in this work.
FAL will consult with the Director of the Math & Science Center, the MCS faculty, and the chair of the PSDC to develop workshops on best practices in building Application and Analysis skills in students.	Time and resources to assist faculty in preparing and leading such workshops.

Table of Contents

1 State the specific question(s) asked

The 2018-2019 assessment of ISLO4-Quantitative Reasoning served as a starting point for a revised approach to both how this learning outcome will be assessed going forward and the different ways students might display its skills in their work at the College. For that assessment cycle, faculty decided to shift the rubric from the one created during the College's initial efforts in defining and assessing institutional learning outcomes to one employed and normed nationally—the Valid Assessment of Learning in Undergraduate Education, or VALUE, rubric created by the American Association of Colleges & Universities (AAC&U). That choice was made to improve the reliability and validity of the outcomes; however, given that it was the first cycle to use this rubric, making comparisons to outcomes from previous cycles became impossible, so the 2018-2019 assessment was now viewed as a new baseline for this particular ISLO.

An important recommendation from the 2018-2019 cycle was to review the definition of the ISLO and suggest revisions to better align it with the new rubric, as well as to broaden the scope by which the skills could be assessed. In consultation with the Departments of Mathematics and Computer Science and Allied Health and Biological Sciences, the Faculty Assessment Leader drafted a new definition, which was then presented to and discussed at meetings of the Committee on Student Learning and Assessment (CSLA), which approved the new definition in the Spring 2020 semester. The Professional Staff Organization (PSO) codified that approval in May 2020, and the new definition was officially adopted.

Other significant recommendations from the 2018-2019 cycle included a reconsideration of how the VALUE rubric was used, a revision of the common tool used in Math courses for that cycle, and a broadening of the disciplines that participated in these assessments. While each of these recommendations were considered for the current cycle, the following report will show that more can be done to improve in these areas, and so that work should continue as the College moves towards the next assessment of this outcome in 2024-2025.

As part of the planning for this assessment, the Faculty Assessment Leader misunderstood the intent of some of the faculty who had discussed the creation of a new common tool to be used in the majority of the courses being assessed. Therefore, that tool was developed late in the process and was perhaps vetted less stringently than the faculty would have liked. For the next cycle, the Faculty Assessment Leader recommends work on a common tool begin now to allow for more consideration and input from different disciplines. Furthermore, while efforts were made to include a wide range of courses for this assessment, enrollment declines and the continued impact of the pandemic on pedagogy and course development led many faculty outside of the mathematics discipline to hold off on participating. However, a common tool was chosen and used by all the Math courses assessed, while a number of faculty outside that discipline used

assignments from their courses to score student work, and this report will discuss the outcomes of those efforts.

Faculty developed the following specific questions to answer:

Research Questions:

1. Where should students have developed the skills assessed in ISLO4? Their high school careers? Introductory courses? And in a related question, what role does student placement information play in ISLO4 assessment?

2. Is there improvement in student outcomes from introductory courses to ones later in programs?

3. What impact have the changes to remedial math courses (from prerequisites to corequisites) had on ISLO4 skills for the students enrolled in those courses?

4. What impact do writing-based quantitative assignments have on the development of ISLO4 skills?

2 Describe the methods used to answer the question(s)

An outline of the methodology is provided below:

- A preliminary planning workshop was held on January 14, 2021, via Zoom. Faculty in attendance discussed the recommendations from the previous cycle, the new definition of the ISLO, the VALUE rubric, potential research questions, and the process for collecting and analyzing data for the assessment.

- Faculty reconvened at another planning workshop on May 14, 2021, to finalize plans for the upcoming assessment. The definition and rubric were once again reviewed, and faculty agreed to use the VALUE rubric. Research questions were discussed, which led to those listed above. Further discussion was held regarding the courses that would be used for the assessment, but given enrollment concerns, some faculty outside of the Department of Mathematics and Computer Science were wary of committing their classes.

- In the end, in consultation with department and program chairs, the following courses were chosen as part of the assessment of ISLO4 for 2021-2022: MAT107; MAT110;

MAT117; MAT118; MAT132; MAT184; NUR212; NUR213; NUR215; PAR106; PSY221.

- As noted earlier, faculty chose to continue the use of the VALUE rubric for Quantitative Literacy (see Appendix A). The faculty in the Department of Mathematics and Computer Science (MCS) chose a common tool (see Appendix B) for use in all Math courses. That tool addressed two distinct areas on the VALUE rubric: Interpretation and Application/Analysis. Faculty outside of MCS used assignments from their courses, and most input outcomes from a range of skills listed on the rubric; however, given the comparatively low sample sizes within those courses, the overall results will need to focus on only those two areas assessed in the Math courses so as to generate more complete conclusions.

- Faculty in AHBS were awarded an assessment grant to support part-time instructors in the assessment of PAR106.

- During the academic year, faculty input data gathered in TracDat/Nuventive (which allowed assessment results to be associated with a student and student information in Banner). At the end of the academic year, the rubric data was downloaded and tabulated by the Associate Director of Institutional Research, Planning, and Assessment (IR), who performed further statistical analyses. The Faculty Assessment Leader downloaded all narrative data from faculty, in which they provided their own perspectives on the assessment outcomes, the procedures they used to collect and analyze data, and other insights, and analyzed that qualitative data in search of common themes.

- Using the above information, the Faculty Assessment Leader prepared a draft report of the assessment and provided it to participating faculty for their review. Faculty provided continued feedback for revision of the draft via an August 2022 workshop and through email and conversation with the Faculty Assessment Leader through September 2022.

- The final report was submitted on October 1, 2022.

3 Summarize the Results

3.1 Total Tabulated Data and Comments

There were 667 possible assessments across 35 sections. Valid data was collected for 343 assessments (288 in Fall and 55 in Spring), a rate of 51.4%. Statistics exclude sections where no data was collected.

The rubric shared by all faculty assessing this ISLO (see Appendix A) comes from the Association of American Colleges and Universities (AAC&U) VALUE rubric for Quantitative Literacy. It includes six (6) assessment items as provided in Table 1 below. Each item is referred to in the results using the identifier indicated in the table.

Table 1 Assessment Items/Categories for ISLO4

Item	Identifier	Abbreviated Description
1	Interpret	*Interpretation.* Ability to explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words)
2	Represent	*Representation.* Ability to convert relevant information into various mathematical forms (e.g., equations, graphs, diagrams, tables, words)
3	Calculate	*Calculation.* Successful and sufficiently comprehensive calculations used to solve the problem at hand
4	Analysis	*Application/Analysis.* Ability to make judgments and draw appropriate conclusions based on the quantitative analysis of data, while recognizing the limits of this analysis
5	Assume	*Assumptions.* Ability to make and evaluate important assumptions in estimation, modeling, and data analysis
6	Comm.	*Communication.* Express quantitative evidence in support of the argument or purpose of the work (in terms of what evidence is used and how it is formatted, presented, and contextualized)

However, ISLO 4 rubric items/categories were not consistently assessed across course disciplines. MAT faculty assessed Interpret and Analysis (items 1 and 4). NUR faculty assessed Analysis (item 4) in NUR112 and Interpret and Calculate (items 1 and 3) in NUR213. PAR and PSY faculty assessed all six items. Given the disparity among course disciplines, analyses focused on the MAT courses (which comprised 62% of the sample) separately from the other courses. The results are therefore presented separately below.

Overall Ratings

For MAT courses, the overall average ratings using the shared rubric were 3.47 for Interpret and 2.53 for Analysis (n=212), where 4.0 represents the highest rating. Table 2 provides the percentage of students in those courses scoring each of the five ratings.

Table 2 Percentage of students scored for each individual rating

	Interpret	Analysis
4 = advanced competency	61.3%	18.9%
3 = moderate competency	27.8%	31.1%
2 = modest competency	7.5%	38.7%
1 = developing competency	2.8%	7.1%
0 = skill not demonstrated	0.5%	4.2%

Table 3 provides the percentage of students in MAT courses who either met or exceeded expectations for each ISLO item, as well as the percentage of those who did not meet college expectations.

Table 3 Percentage of students scored 0/1 vs 2/3/4

	Interpret	**Analysis**
2/3/4 = did meet expectations	96.7%	88.7%
0/1 = didn't meet expectations	3.3%	11.3%

Inter-item reliability was assessed using Pearson correlations and Cronbach's alpha. The ISLO items were minimally correlated with one another ($r = .261$, $p < .001$) and inter-item reliability was negligible ($\alpha = .40$). These results are as expected – MAT faculty previously noted that the ISLO items addressed different skill sets.

Finally, the means (provided in Table 4, along with standard deviations) for each item were compared using a paired t-test. There was a significant difference between the items [$t(211) = 12.23$, $p < .001$] in that student outcomes for Interpret were higher than for Analysis.

Table 4 Overall Ratings (Mean Scores and Standard Deviations)

	Interpret	**Analysis**
Overall Ratings (n=212)	3.47 (0.79)	2.53 (1.01)

For the other courses (non-MAT courses), the aggregated results are provided in Table 5 for descriptive purposes only, as no inferential statistics were computed.

Table 5 Overall Results in non-MAT Courses.

	Interpret	**Represent**	**Calculate**	**Analysis**	**Assume**	**Comm.**
NUR 112 (n=51)				3.25 (1.13)		
NUR 213 (n=47)	1.32 (1.73)		1.32 (1.73)			
PAR 106 (n=4)	3.75 (0.50)	4.00 (0)	3.75 (0.50)	3.75 (0.50)	1.75 (1.50)	0.00 (0)
PSY 221 (n=29)	2.07 (0.75)	1.94 (1.12)	1.79 (1.01)	1.62 (1.05)	1.38 (1.05)	1.69 (0.89)

3.2 Types of Assignment Data and Comments

All MAT courses used a common assessment tool (see Appendix B), which consisted of nine multiple choice questions, each one associated with Interpret or Analysis. The number of correct answers within each group of questions correlated to a rubric score. In the other disciplines, student skill was assessed in a variety of ways, from course assignments to tests. Samples of those tools are also provided in Appendix B.

3.3 Student Academic Experiences

Campus assessments often focus on students' previous academic experiences to ascertain whether differences in those experiences shed light on the outcomes. In order to do that, student characteristics that might impact their experience (such as full-time versus part-time enrollment) were examined in relation to performance on the assessment criteria. Several hypothesis testing procedures were conducted. Groups with small/disparate Ns were excluded from analyses. Again, these results focus on only the outcomes in the MAT courses.

3.3.1 Student Characteristics

The students' higher education history (i.e., whether they were new/continuing/transfer/high school) was analyzed. The numbers in each group were as follows: New First-time (n=63), Continuing (n=140), New Transfer (n=8), and High School (n=1). Given the small sample sizes for transfer and high school students, those results were ignored. Using independent t-tests, New First-time and Continuing students were compared, but no significant group differences were found (see Table 6).

Table 6 Higher education history (HEH).

	Interpret	**Analysis**
New First-time (n=63)	3.57 (0.71)	2.49 (0.97)
New Transfer (n=8)	3.75 (0.46)	2.50 (0.53)
Continuing (n=140)	3.40 (0.84)	2.54 (1.06)

Students were also grouped into full-time (FT) and part-time (PT) enrollment status. Again, independent t-tests revealed no significant differences (see Table 7).

Table 7 FT/PT status

	Interpret	**Analysis**
Full-time (n=152)	3.49 (0.79)	2.49 (1.00)
Part-time (n=60)	3.42 (0.81)	2.65 (1.04)

Analyses were performed to test for differences between students who passed the course in which they were assessed and those who had not. Again, independent t-tests revealed no significant differences (see Table 8).

Table 8 Course passed

	Interpret	**Analysis**
Yes, passed course (n=167)	3.51 (0.76)	2.54 (1.02)
No (n=45)	3.29 (0.89)	2.49 (0.99)

Specific research questions asked about other student academic experiences, both in their high schools and with developmental mathematics courses. In order to gather some data for those questions, students high school GPAs were compared to their outcomes in the assessment using Oneway ANOVA, but no significant differences were found (see Table 9). There were also no significant correlations found between the students' high school GPAs and the outcomes on the assessment. Furthermore, whether or not a student had taken a developmental Math course, either before or during the semester being assessed, was considered using an independent t-test, and those who had taken such a course scored lower than those who had not, but only in Interpret [$t(210) = 2.42$, $p = .016$] (see Table 10).

Table 9 High school GPA

	Interpret	**Analysis**
0.00-2.49 (n=33)	3.36 (0.70)	2.52 (1.28)
2.50-2.99 (n=73)	3.36 (0.84)	2.32 (0.97)
3.00-4.00 (n=74)	3.54 (0.81)	2.65 (0.88)

Table 10 Outcomes for students who had/had not taken developmental math

	Interpret	**Analysis**
Yes, had remedial MAT (n=51)	3.24 (0.89)	2.57 (0.88)
No (n=161)	3.54 (0.75)	2.52 (1.06)

Grades from the course in which the students were assessed were transformed to the 4.0 GPA scale (note that withdrawals and other grades not included in GPA calculations were included). There was a small positive correlation between Interpret and course grades [r (212) = .21, p = .002]. Faculty teaching these courses have, in the past, stated that they do not feel those correlations are relevant, but given faculty narrative data (discussed below), it seemed important to at least note the statistically significant result here.

Finally, data was collected on the type of degree the student was pursuing at DCC, but the sample size for students not in associate's degree programs was so small (n=12) that inferential analyses could not be performed.

3.3.2 Course Characteristics Data and Comments

In order to answer specific research questions about outcomes in different course levels and within the sequence of programs, statistical analyses were performed to test for differences based on course characteristics. However, the results of those analyses did not reveal significant differences. A major issue was the low sample sizes in non-MAT courses, as all MAT courses assessed were at the 100-level. Table 5 above provided the outcomes for non-MAT courses; Tables 11 and 12 provide the data for each individual MAT course.

Table 11 Course (for descriptive purposes only)

	Interpret	**Analysis**
MAT 107 (n=21)	3.14 (1.15)	2.43 (0.81)
MAT 109 (n=25)	3.40 (0.65)	2.08 (1.47)
MAT 110 (n=24)	3.50 (0.78)	2.58 (0.72)
MAT 118 (n=108)	3.56 (0.75)	2.57 (0.94)
MAT 132 (n=4)	3.50 (0.58)	2.50 (0.58)
MAT 184 (n=30)	3.40 (0.77)	2.80 (1.13)

Table 12 Course type

	Interpret	**Analysis**
100-level no prereqs (n=163)	3.50 (0.74)	2.54 (1.08)
100-level with prereqs (n=49)	3.35 (0.95)	2.51 (0.74)

One difference was revealed within instructional methods. Traditional in-person courses and hybrid classes, which include an in-person component, were compared with fully online courses

using independent t-tests. Results reveal that student outcomes in online courses were higher than the outcomes in the in-person courses for Analysis [t (210) = 2.30, p = .023] (see Table 13).

Table 13 Instructional method

	Interpret	**Analysis**
Traditional / Hybrid (n=97)	3.46 (0.80)	2.36 (1.06)
Online (n=115)	3.47 (0.79)	2.68 (0.95)

3.4 Current Assessment Cycle Compared to Last Cycle

With nearly every assessment conducted at DCC, faculty express interest in comparing the current cycle to the previous one. There are some issues in doing that comparison because the items assessed were rather different. In 2018-2019, faculty assessed Represent, Calculate, Analysis, and Assume. However, in 2021-2022, the vast majority of faculty only assessed Interpret and Analysis.

Table 14 provides the percentage of student outcomes that met or did not meet college expectations for the four categories assessed in 2018-2019 and 2021-2022. Sample size varies widely for the 2021-2022 cycle because faculty differed in which ISLO categories they assessed. It should also be noted that the courses in which the skills were assessed were not consistent from cycle to cycle. That said, it appears a higher percentage of students assessed in 2021-2022 met or exceeded expectations for Analysis than in 2018-2019.

Table 14 Percentage of students meeting expectations

	Represent	**Calculate**	**Analysis**	**Assume**
AY1819 (N=330)	98.5%	73.0%	79.7%	86.7%
AY2122 (N=343) *	65.0% (n=20)	50.0% (n=80)	85.5% (n=296)	48.5% (n=33)

Using independent t-tests, the average ratings for each category were also compared between the cycles. Ratings for Represent, Calculate, and Assume were lower in the 2021-2022 cycle than they were in the previous one [ts > 3.98, ps < .05], but again, the Ns differed widely by item. For Analysis, the only item here that had similar sample sizes from one cycle to the next, there was no significant difference across cycles (see Table 15).

Table 15 Average Ratings, 2018-2019 v. 2021-2022

Average ratings	**Represent**	**Calculate**	**Analysis**	**Assume**
AY1819	2.90 (0.39)	2.24 (1.19)	2.56 (0.82)	2.67 (0.77)
AY2122	2.35 (1.31)	1.61 (1.55)	2.58 (1.12)	1.42 (1.09)

3.5 Assessment Results Disaggregated by Program

ISLO4 outcomes within MAT courses were disaggregated by program (see Table 16). To help program chairs determine whether the major-specific data is generalizable to the program as a whole, Appendix C provides an accounting of the courses students were assessed in for each program and how many students were in each of those courses.

Table 16 Results by Program

	Interpret	**Analysis**
ARC (n=4)	3.50 (0.58)	2.50 (0.58)
AVI (n=1)	4 (0)	4 (0)
BAT (n=36)	3.56 (0.94)	2.72 (0.94)
BUS (n=6)	2.67 (1.21)	2.33 (0.52)
CDC (n=1)	2 (0)	2 (0)
CIS (n=4)	3.50 (0.58)	2.50 (0.58)
COM (n=4)	4.00 (0)	2.25 (1.71)
CPS (n=9)	3.67 (0.50)	3.56 (0.73)
CRJ (n=3)	3.67 (0.58)	1.67 (1.53)
CRT (n=6)	3.50 (0.55)	2.50 (0.84)
ECH (n=2)	3.00 (1.41)	2.50 (0.71)
EDH (n=1)	4 (0)	3 (0)
EDL (n=1)	4 (0)	2 (0)
EDS (n=1)	4 (0)	3 (0)
EED (n=19)	3.05 (1.18)	2.42 (0.84)
ELT (n=6)	3.33 (0.82)	2.17 (1.33)
ENR (n=2)	3.50 (0.71)	2.00 (0)
ESW (n=3)	3.33 (0.58)	2.67 (0.58)
GSP (n=50)	3.48 (0.68)	2.32 (1.02)
HMS (n=14)	3.79 (0.43)	2.29 (1.14)
LAH (n=8)	3.50 (0.53)	2.88 (0.99)
LAX (n=8)	3.50 (0.53)	3.00 (1.07)
MLT (n=2)	4.00 (0)	3.00 (1.41)
PAL (n=1)	2 (0)	2 (0)
PBH (n=1)	3 (0)	2 (0)
PFA (n=1)	3 (0)	0 (0)
UND (n=11)	3.82 (0.40)	3.00 (0.89)
VAT (n=7)	3.14 (1.07)	2.29 (1.38)

3.6 Assessment Results Relevant to Diversity, Equity, and Inclusion

Beginning with the assessment cycle of 2020-2021, the Diversity Council at Dutchess Community College requested data based on student demographic information be collected as part of the assessment process to shed light on how well DCC is reaching its goals of helping all students meet the institutional student learning outcomes. To that end, outcomes based on gender, race/ethnicity, age group, and Pell status are presented below with analysis. Again, these results reflect outcomes in the MAT courses.

Gender. Used independent t-test. There were no significant group differences.

Table 17 Results by Gender

	Interpret	**Analysis**
Male (n=92)	3.53 (0.73)	2.61 (1.14)
Female (n=120)	3.42 (0.84)	2.48 (0.91)

Race/Ethnicity. Used Oneway ANOVA. An overall significant difference was found for Analysis, $F(2,181) = 4.74$, $p = .010$. Bonferroni-corrected pairwise comparisons indicated that White students outperformed Hispanic students ($p = .009$).

Table 18 Results by Race/Ethnicity

	Interpret	Analysis
White (n=120)	3.48 (0.80)	2.68 (1.00)
Hispanic (n=38)	3.32 (0.90)	2.13 (0.91)
Black (n=26)	3.65 (0.56)	2.42 (0.90)
Asian (n=5)	3.60 (0.55)	2.40 (0.55)
Native Haw./Pac. Is. (n=1)	3 (0)	1 (0)
Native American (n=1)	1 (0)	2 (0)
Two or more races (n=8)	3.38 (0.74)	2.25 (1.28)
Nonresident Alien (n=4)	3.50 (1.00)	2.75 (0.96)
Unknown (n=9)	3.67 (0.50)	3.11 (1.45)

Age Group. Used independent t-test. There were no significant group differences.

Table 19 Results by Age Group

	Interpret	Analysis
16 to 24 (n=175)	3.46 (0.79)	2.48 (1.02)
25 or older (n=37)	3.49 (0.80)	2.78 (0.98)

Pell Recipient. Used independent t-test. There were no significant group differences.

Table 20 Results by Pell Status

	Interpret	Analysis
Pell (n=66)	3.53 (0.71)	2.52 (0.95)
No Pell (n=146)	3.44 (0.83)	2.54 (1.04)

3.7 Faculty Perspectives (Summary of Narrative Data Results)

Faculty were asked to provide comments on the rubric results of the assessments as they entered that quantitative data into the TracDat system, as well as other input they had on how students performed, how the skills were taught in their classrooms, and other observations they had relevant to this assessment. A full reporting of that commentary is provided in Appendix D. Below is a summary of the key points from that qualitative data as analyzed by the Faculty Assessment Leader. These summaries reflect the input from all courses assessed.

- **Strong Interpretive Skills—Application and Analysis Need Attention:** The faculty found that most students showed strong skills in interpretation. This perspective remained consistent across the disciplines in which the assessment took place. However, also rather consistent was a belief that students struggle with application and analysis. These latter skills are more challenging, and so this outcome was not necessarily surprising to the faculty, but some did note that they have noticed a steady decline in student abilities in those areas over the years. At the same time, faculty posited that the stronger outcomes in interpretation likely derived not only from its comparative ease to application and analysis, but also from the direct instruction regarding that skill that occurs within these classes. At least one faculty revealed that the analysis of quantitative data was not taught in the course assessed; in another course, the relatively stronger outcomes in analysis were seen as a direct result of the attention paid to that skill in the

course, with an emphasis on it in lecture and clear examples and practice provided in class.

- **Issues with the Assessment Tool:** All Math courses assessed for this cycle used a common tool with the intention of improving the reliability of comparing all outcomes. There were some noted concerns with this particular tool, though, that will need to be addressed moving forward. Many faculty indicated that question #9 on the tool was faulty and difficult for the students to answer. The multiple-choice format also led a few faculty to wonder whether students were simply guessing. At least one faculty member opined that using work directly from the course might be useful. For other disciplines, the tool chosen was also a point of concern, as some wondered how well that tool connected to the rubric, and whether they were truly qualified to assess the effectiveness of that tool for quantitative analysis. These points lead to the need for a larger discussion on the benefits of a common tool, its construction, and its effectiveness across disciplines, which will happen prior to the next cycle.

- **Response Rate:** Connected to the issues with the assessment tool, many faculty expressed concerns over low response rates. Enrollment declines and attrition within courses certainly impact this point. Further, the common tool used in Math courses was presented often as voluntary or extra-credit rather than an assignment within the course, perhaps leading to some students feeling it was unnecessary to complete. Again, these concerns regarding the planning of the assessment itself will be addressed prior to the next cycle.

4 Summarize Conclusions Drawn and Action Plan for Improvement

While the 2021-2022 assessment of ISLO4-Quantitative Reasoning included a total of 343 valid assessments, and some conclusions can certainly be drawn from that data, the disparities in what was assessed by discipline, the small sample sizes outside of the MAT courses, and the concerns about the assessment tools used all mean drawing concrete conclusions is difficult. However, the discussion below reflects what faculty believe can be gleaned from this cycle and some suggestions for improvements moving forward.

Certain conclusions are presented relative to the specific research question asked.

Where should students have developed the skills assessed in ISLO4? High school? Introductory courses? And in a related question, what role does student placement information play in ISLO4 assessment?

The collected data from this assessment, both in its quantitative and qualitative form, cannot directly answer the main research question here. It is perhaps most accurately determined by

faculty perspectives on where ISLO4 is best introduced and reinforced within the College's programs. MCS faculty are confident that students are placed appropriately into their Math courses when multiple measures are used for advisement. The breakdown of how the 2021-2022 cohort of students at DCC placed into each level of Math competency is provided in Table 21 below.

Table 21 Placement of DCC Students into Math courses, 2021-2022

MAT Placement	N	%
Level 1	1089	20.2%
Level 2	1923	35.7%
Level 3	691	12.8%
Level 4	556	10.3%
Level 5	201	3.7%
No data	932	17.3%
Total	**5392**	**100.0%**

Students who score at Level 1 are not yet ready for college-level mathematics courses, and are therefore placed into the developmental sections of MAT094/MAT098. Level 2 placement allows students to enroll in MAT099, a course meant to prepare students for college-level algebra. As noted above, more than 50% of the students enrolled for the 2021-2022 academic year were placed into these two levels. Level 3 includes students who have passed a NYS Mathematics Regents exam and are ready for college-level math courses, including MAT107, MAT110, MAT132, and MAT184. The upper two levels are for students who are prepared to take Pre-Calculus or Business Calculus (Level 4) or to move directly into a STEM Calculus course (Level 5).[1]

While high school GPA appeared to have no bearing on the outcomes, it does play a part in which course the student enrolled in, and therefore impacts the overall sample used for the assessment, as many students who enter DCC with stronger quantitative reasoning skills place directly into Levels 4 and 5 (14% of the students in this particular cohort). That fact means a sizeable portion of students who might perform well on the assessment of ISLO4 were not part of the pool, unless they were also enrolled in the few non-MAT courses that were assessed. Creating a wider breadth of disciplines assessed for ISLO4 in the future should help to capture more of those students and potentially reveal a more accurate assessment students' quantitative reasoning skills college-wide.

Faculty suggested that a non-Math course might be used in future assessments to serve as a baseline for comparison with outcomes in other courses. One possible course suggested was BHS103, which most students take their first semester at DCC, and for which a common tool could be crafted that a) addresses the different relevant points of the ISLO4 rubric and b) could

[1] The full placement chart can be found here: https://sunydutchess.edu/assets/MathPlacementTable_March2021rev.pdf

be tailored with questions appropriate to that course's content. Then, 200-level courses taken later in programs could also participate in ISLO assessment and be compared with results from the baseline course to determine how students' quantitative reasoning skills develop while at DCC.

Is there improvement in student outcomes from introductory courses to ones taken later in academic programs?

The rubric data cannot adequately answer this question because of the lack of assessments at the 200-level, as well as the disparities in what was assessed in those different courses. The qualitative data suggests that students continue to struggle with quantitative skills within their programs, but it remains impossible to truly ascertain just how much those perspectives remain anecdotal. Future assessments should once again encourage faculty to use courses at the 200-level that rely on quantitative skills, but it will take further planning to agree upon the best tools to use to do that assessment. Faculty also suggested that more capstone courses or experiences within programs would help find the appropriate places to assess students later in their DCC careers, so program chairs could be encouraged to use those courses/experiences in the next assessment, or to consider creating them if they do not currently exist.

What impact have the changes to remedial Math courses had on ISLO4 skills for the students enrolled in those courses?

The changes in what was assessed from 2018-2019 to 2021-2022 mean the data can only allude to possible impacts of those changes. We can say that students who had taken a developmental Math course scored lower on Interpretation than students who had not taken such a course. Given that the former students entered college with some deficiency in their quantitative skills, it should not be a surprise that this outcome occurred; however, it seems equally important to note that scores for the former students were on par with those for the latter in Application and Analysis, which faculty indicated was the more challenging of the two skills. Furthermore, the increase in the percentage of students meeting expectations in Application and Analysis from one cycle to the next, as well as the finding that the average score for that area remained relatively unchanged, despite the apparent belief that students are struggling more in that area, may point to the success of those changes in developmental courses over the last few years. Furthermore, the increase in the percentage of students meeting expectations in Application and Analysis from one cycle to the next, as well as the finding that the average score for that area remained relatively unchanged, suggests that the modifications made to remedial courses over the past few years have been successful. That said, direct assessments of developmental courses would help to provide a clearer conclusion for this research question.

What impact do writing-based quantitative assignments have on the development of ISLO4 skills?

Again, the small sample size that used writing-based assignments for this cycle do not provide a basis for accurate conclusions. If this question remains important to DCC faculty, future assessments should utilize an appropriate tool(s) to gather that data.

General Conclusions:

The main finding of the rubric data coincides clearly with one of the main themes of the faculty narrative data: student outcomes were stronger in interpretation than in application and analysis. If faculty believe their students should have stronger application and analysis skills within their classes, it makes sense to ask where those skills are meant to be introduced and reinforced, as faculty who noted they directly teach those skills saw improved outcomes. Program chairs might consult with MCS faculty on the appropriate courses for introducing and reinforcing those skills within curriculum maps. Further professional development for faculty on best practices in teaching application and analysis skills for greater quantitative reasoning could also address that concern. The Faculty Assessment Leader will discuss those ideas with the Director of the Math and Science Center, the faculty of the Math and Computer Sciences department, and members of the College administration. However, some faculty also noted that, because application and analysis require greater effort than interpretation, students may have simply ignored or dismissed those questions, stressing the need to consider carefully how that particular skill is assessed in future cycles.

The overall difficulties in answering the research questions above lead naturally to questions about the process undertaken to assess ISLO4-Quantitative Reasoning this academic year. The faculty narrative responses indicated concerns about the assessment tools used. The common tool used in Math courses had the potential to improve inter-rater reliability and comparisons in outcomes across courses (and disciplines, if it were to be used outside of Math courses in the future); however, faculty expressed concerns with the particular tool used, as well as the response rate in using it, and so reviewing the benefits and disadvantages of the tool would be in the best interest of the College for the next cycle.

The faculty who performed this assessment believe an inter-cycle collaboration among instructors across disciplines to create a new tool that would be appropriate for many disciplines is needed. They suggested that, since different disciplines might focus more directly on different parts of the rubric, an interdisciplinary panel would help to craft the strongest, most transferable tool, which in turn would allow the faculty to meet the intended goals of improving inter-rater reliability and more robust outcome comparisons across courses.

The 2022-2026 Academic Assessment Plan includes a call for Discipline Leaders in each of the ISLO areas, and once the faculty member is in place for ISLO4, the creation of a new common tool, or a decision to forgo the common tool for the use of classroom assignments instead, should be at the top of their agenda, preferably through the interdepartmental work suggested above. The Faculty Assessment Leader will assist in that work.

Finally, faculty also believe the next cycle should include a student survey, which is already in the works for assessments of other ISLOs; since math anxiety, in particular, is often shown to have an impact on student success in quantitative reasoning activities, gathering input on how much student perceptions regarding the skill affects their confidence in completing these assessments should help provide greater context by which to understand the overall outcomes.

Result/Conclusion	Recommendation for Action
Assessment focused largely on 100-level MAT courses, meaning drawing conclusions about where and how ISLO4 skills are reinforced in programs was difficult.	For the 2024-2025 assessment of ISLO4, encourage the use of more 200-level courses, as well as courses in disciplines other than Math to allow for broader conclusions to be drawn. Consider the possibility of using a non-Math course as a baseline outcome to compart to other courses.
Disparities in how the rubric was used and the assessment tools employed led to difficulties in analyzing the data fully, as well as in drawing more concrete conclusions.	The Faculty Assessment Leader (FAL), along with the potentially newly named Discipline Leader for ISLO4, work on crafting stronger guidelines for the use of the rubric and lead discussions on the development of a potential common tool to be used for the 2024-2025 assessment.
Outcomes for Interpretation were stronger than those for Application and Analysis.	FAL will consult with the Director of the Math & Science Center, the MCS faculty, and the chair of the PSDC to develop workshops on best practices in building Application and Analysis skills in students.

5 Recommendations for Resources Needed to Implement Action Plan

Recommendation for Action	Potential Resources Required
For the 2024-2025 assessment of ISLO4, encourage the use of more 200-level courses, as well as courses in disciplines other than Math to allow for broader conclusions to be drawn. Consider the possibility of using a	FAL to consult with faculty on best courses to use for the 2024-2025 assessment.

non-Math course as a baseline outcome to compart to other courses.	
The Faculty Assessment Leader, along with the potentially newly named Discipline Leader for ISLO4, work on crafting stronger guidelines for the use of the rubric and lead discussions on the development of a potential common tool to be used for the 2024-2025 assessment.	Creation of new Discipline Leader for ISLO4 (with reassigned time) to assist FAL and the faculty in crafting assessment tool(s). Potential resources to compensate part-time faculty to participate in this work.
FAL will consult with the Director of the Math & Science Center, the MCS faculty, and the chair of the PSDC to develop workshops on best practices in building Application and Analysis skills in students.	Time and resources to assist faculty in preparing and leading such workshops.

Appendix A: ISLO4 Rubric

QUANTITATIVE LITERACY VALUE RUBRIC

for more information, please contact value@aacu.org

The VALUE rubrics were developed by teams of faculty experts representing colleges and universities across the United States through a process that examined many existing campus rubrics and related documents for each learning outcome and incorporated additional feedback from faculty. The rubrics articulate fundamental criteria for each learning outcome, with performance descriptors demonstrating progressively more sophisticated levels of attainment. The rubrics are intended for institutional-level use in evaluating and discussing student learning, not for grading. The core expectations articulated in all 15 of the VALUE rubrics can and should be translated into the language of individual campuses, disciplines, and even courses. The utility of the VALUE rubrics is to position learning at all undergraduate levels within a basic framework of expectations such that evidence of learning can by shared nationally through a common dialog and understanding of student success.

Definition

Quantitative Literacy (QL) – also known as Numeracy or Quantitative Reasoning (QR) – is a "habit of mind," competency, and comfort in working with numerical data. Individuals with strong QL skills possess the ability to reason and solve quantitative problems from a wide array of authentic contexts and everyday life situations. They understand and can create sophisticated arguments supported by quantitative evidence and they can clearly communicate those arguments in a variety of formats (using words, tables, graphs, mathematical equations, etc., as appropriate).

Quantitative Literacy Across the Disciplines

Current trends in general education reform demonstrate that faculty are recognizing the steadily growing importance of Quantitative Literacy (QL) in an increasingly quantitative and data-dense world. AAC&U's recent survey showed that concerns about QL skills are shared by employers, who recognize that many of today's students will need a wide range of high level quantitative skills to complete their work responsibilities. Virtually all of today's students, regardless of career choice, will need basic QL skills such as the ability to draw information from charts, graphs, and geometric figures, and the ability to accurately complete straightforward estimations and calculations.

Preliminary efforts to find student work products which demonstrate QL skills proved a challenge in this rubric creation process. It's possible to find pages of mathematical problems, but what those problem sets don't demonstrate is whether the student was able to think about and understand the meaning of her work. It's possible to find research papers that include quantitative information, but those papers often don't provide evidence that allows the evaluator to see how much of the thinking was done by the original source (often carefully cited in the paper) and how much was done by the student herself, or whether conclusions drawn from analysis of the source material are even accurate.

Given widespread agreement about the importance of QL, it becomes incumbent on faculty to develop new kinds of assignments which give students substantive, contextualized experience in using such skills as analyzing quantitative information, representing quantitative information in appropriate forms, completing calculations to answer meaningful questions, making judgments based on quantitative data and communicating the results of that work for various purposes and audiences. As students gain experience with those skills, faculty must develop assignments that require students to create work products which reveal their thought processes and demonstrate the range of their QL skills.

This rubric provides for faculty a definition for QL and a rubric describing four levels of QL achievement which might be observed in work products within work samples or collections of work. Members of AAC&U's rubric development team for QL hope that these materials will aid in the assessment of QL – but, equally important, we hope that they will help institutions and individuals in the effort to more thoroughly embed QL across the curriculum of colleges and universities.

Framing Language

This rubric has been designed for the evaluation of work that addresses quantitative literacy (QL) in a substantive way. QL is not just computation, not just the citing of someone else's data. QL is a habit of mind, a way of thinking about the world that relies on data and on the mathematical analysis of data to make connections and draw conclusions. Teaching QL requires us to design assignments that address authentic, data-based problems. Such assignments may call for the traditional written paper, but we can imagine other alternatives: a video of a PowerPoint presentation, perhaps, or a well designed series of web pages. In any case, a successful demonstration of QL will place the mathematical work in the context of a full and robust discussion of the underlying issues addressed by the assignment.

Finally, QL skills can be applied to a wide array of problems of varying difficulty, confounding the use of this rubric. For example, the same student might demonstrate high levels of QL achievement when working on a simplistic problem and low levels of QL achievement when working on a very complex problem. Thus, to accurately assess a students QL achievement it may be necessary to measure QL achievement within the context of problem complexity, much as is done in diving competitions where two scores are given, one for the difficulty of the dive, and the other for the skill in accomplishing the dive. In this context, that would mean giving one score for the complexity of the problem and another score for the QL achievement in solving the problem.

QUANTITATIVE LITERACY VALUE RUBRIC

for more information, please contact value@aacu.org

Association of American Colleges and Universities

Definition

Quantitative Literacy (QL) – also known as Numeracy or Quantitative Reasoning (QR) – is a "habit of mind," competency, and comfort in working with numerical data. Individuals with strong QL skills possess the ability to reason and solve quantitative problems from a wide array of authentic contexts and everyday life situations. They understand and can create sophisticated arguments supported by quantitative evidence and they can clearly communicate those arguments in a variety of formats (using words, tables, graphs, mathematical equations, etc., as appropriate).

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.

	Capstone 4	**Milestones** 3	2	**Benchmark** 1
Interpretation *Ability to explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words)*	Provides accurate explanations of information presented in mathematical forms. Makes appropriate inferences based on that information. *For example, accurately explains the trend data shown in a graph and makes reasonable predictions regarding what the data suggest about future events.*	Provides accurate explanations of information presented in mathematical forms. *For instance, accurately explains the trend data shown in a graph.*	Provides somewhat accurate explanations of information presented in mathematical forms, but occasionally makes minor errors related to computations or units. *For instance, accurately explains trend data shown in a graph, but may miscalculate the slope of the trend line.*	Attempts to explain information presented in mathematical forms, but draws incorrect conclusions about what the information means. *For example, attempts to explain the trend data shown in a graph, but will frequently misinterpret the nature of that trend, perhaps by confusing positive and negative trends.*
Representation *Ability to convert relevant information into various mathematical forms (e.g., equations, graphs, diagrams, tables, words)*	Skillfully converts relevant information into an insightful mathematical portrayal in a way that contributes to a further or deeper understanding.	Competently converts relevant information into an appropriate and desired mathematical portrayal.	Completes conversion of information but resulting mathematical portrayal is only partially appropriate or accurate.	Completes conversion of information but resulting mathematical portrayal is inappropriate or inaccurate.
Calculation	Calculations attempted are essentially all successful and sufficiently comprehensive to solve the problem. Calculations are also presented elegantly (clearly, concisely, etc.)	Calculations attempted are essentially all successful and sufficiently comprehensive to solve the problem.	Calculations attempted are either unsuccessful or represent only a portion of the calculations required to comprehensively solve the problem.	Calculations are attempted but are both unsuccessful and are not comprehensive.
Application / Analysis *Ability to make judgments and draw appropriate conclusions based on the quantitative analysis of data, while recognizing the limits of this analysis*	Uses the quantitative analysis of data as the basis for deep and thoughtful judgments, drawing insightful, carefully qualified conclusions from this work.	Uses the quantitative analysis of data as the basis for competent judgments, drawing reasonable and appropriately qualified conclusions from this work.	Uses the quantitative analysis of data as the basis for workmanlike (without inspiration or nuance, ordinary) judgments, drawing plausible conclusions from this work.	Uses the quantitative analysis of data as the basis for tentative, basic judgments, although is hesitant or uncertain about drawing conclusions from this work.
Assumptions *Ability to make and evaluate important assumptions in estimation, modeling, and data analysis*	Explicitly describes assumptions and provides compelling rationale for why each assumption is appropriate. Shows awareness that confidence in final conclusions is limited by the accuracy of the assumptions.	Explicitly describes assumptions and provides compelling rationale for why assumptions are appropriate.	Explicitly describes assumptions.	Attempts to describe assumptions.
Communication *Expressing quantitative evidence in support of the argument or purpose of the work (in terms of what evidence is used and how it is formatted, presented, and contextualized)*	Uses quantitative information in connection with the argument or purpose of the work, presents it in an effective format, and explicates it with consistently high quality.	Uses quantitative information in connection with the argument or purpose of the work, though data may be presented in a less than completely effective format or some parts of the explication may be uneven.	Uses quantitative information, but does not effectively connect it to the argument or purpose of the work.	Presents an argument for which quantitative evidence is pertinent, but does not provide adequate explicit numerical support. (May use quasi-quantitative words such as "many," "few," "increasing," "small," and the like in place of actual quantities.)

Appendix B: Assessment Tool/Assignment Samples

Common Tool used in all MCS courses:

1

AIDS rates are higher among blacks than among whites in the United States.

Based on the statement above, which of the following is true?

a. There are more blacks than whites who have AIDS in the United States.

b. The proportion of blacks who have
whites who have AIDS in the United St

c. Blacks are more likely than whites t

d. Whites are more likely than blacks t

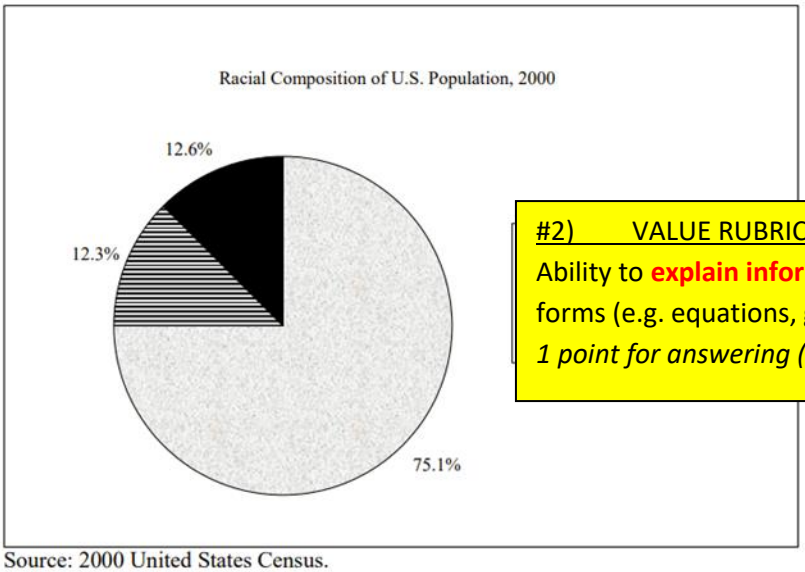
#1) VALUE RUBRIC Interpretation

Ability to **explain information presented** in mathematical forms (e.g. equations, graphs, diagrams, tables, words).

1 point for answering (b), 0 points for any other answer

2

Please answer the following question based on the chart below.



Source: 2000 United States Census.

#2) VALUE RUBRIC Interpretation

Ability to **explain information presented** in mathematical forms (e.g. equations, graphs, diagrams, tables, words).

1 point for answering (c), 0 points for any other answer

Based on the pie chart above, what percent of the U.S. population was non-white in 2000?

a. 12.3% b. 12.6% c. 24.9% d. 75.1%

Please answer the following questions (true/false) based on the table below.

The Demographic Characteristics of Full-time Physicians Ages 25-64 Compared to Full-time Workers, 2000

Race/Ethnicit

	Non-Latino White	Black	Asian	La
Physicians	74.5%	4.5%	14.4%	4.7
Full-time Workers	73.4%	11.9%	4.1%	9.8

N/A = Not Available.
Source: United States Census, 2000

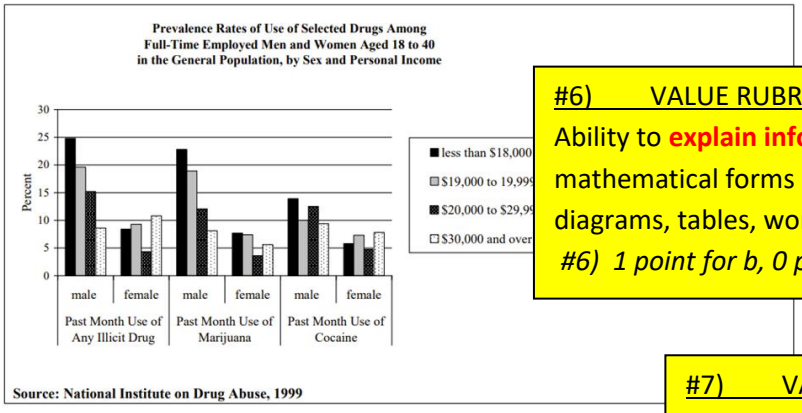
#3 and #4 and #5) VALUE RUBRIC Application/Analysis
Ability to make judgments and **draw appropriate conclusions based on the quantitative analysis of data**, while recognizing the limits of this analysis.
#3) 1 point for TRUE, 0 pt for false
#4) 1 point for FALSE, 0 pt for true
#5) 1 point for TRUE, 0 pt for false

3 True False The ratio of female to male physicians is approximately 1 to 3.

4 True False Approximately 1 in 10 full-time workers is American Indian.

5 True False "The proportion of Asians among physicians is more than 3 times higher (or nearly 4 times higher) than the proportion of Asians among full-time workers".

Please answer the following questions based on the chart below.



#6) VALUE RUBRIC Interpretation
Ability to **explain information presented** in mathematical forms (e.g. equations, graphs, diagrams, tables, words).
#6) 1 point for b, 0 points for any other choice

#7) VALUE RUBRIC Application/Analysis
Ability to make judgments and **draw appropriate conclusions based on the quantitative analysis of data**, while recognizing the limits of this analysis.
#7) 1 point for c, 0 points for any other choice

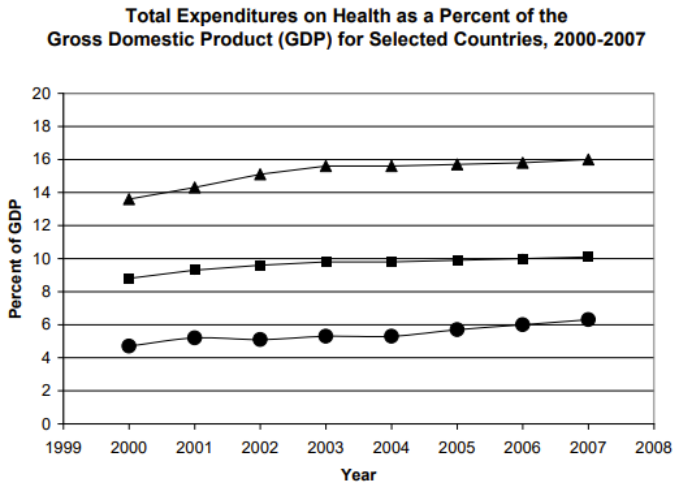
6

Approximately what percent of females earning
a. 0% b. 5% c. 13%

7

Among males, what seems to be the relationship between income and past month use of any illicit drug?
a. There doesn't appear to be any relationship between income and drug use.
b. As the income of men rises, there are greater drug prevalence rates.
c. As the income of men rises, there are lower drug prevalence rates.
d. There is a curvilinear relationship between income and drug use--as income first rises, so does illicit drug use, but in the higher incomes categories there is declining illicit drug use.

Please answer the following questions based on the chart below.



#8) VALUE RUBRIC Interpretation
Ability to **explain information presented** in mathematical forms (e.g. equations, graphs, diagrams, tables, words).
#8) 1 point for a, 0 points for any other choice

Source: Organization for Economic Co-operatio

#9) VALUE RUBRIC Application/Analysis
Ability to make judgments and **draw appropriate conclusions based on the quantitative analysis of data**, while recognizing the limits of this analysis.
#9) 1 point for c, 0 points for any other choice

8

In 2002, approximately what percent o care?
a. 5% b. 6% c. 7%

9

Assuming health care costs continue to rise at the same average rate they did from 2000 to 2007 in the United States, approximately what percent of the GDP will the US be spending on healthcare in 2015?
a. 14 to 16% b. 16 to 18% c. 18 to 20% d. 20 to 22%

TOTAL INTERPRETATION POINTS POSSIBLE: 4 points possible (could we get 1 more point so that we could rate them from 0 to 5 like on the value rubric?

TOTAL APPLICATION/ANALYSIS POINTS POSSIBLE: 5 points possible

Appendix C: Accounting of Students Assessed by Course and Program

Major	Total Students	# students assessed	# assessments conducted	courses with # assessments
ACC	46			
ACR	10			
AMT	17			
APC	15			
ARC	40	4	4	MAT 132 (4)
AVI	37	1	1	MAT 184 (1)
AVM	19			
BAT	444	36	36	MAT 110 (15), MAT 118 (21)
BOK	4			
BUS	189	6	6	MAT 118 (6)
CDC	7	1	1	MAT 118 (1)
CHC	5			
CIS	100	4	4	MAT 118 (3), MAT 184 (1)
CMH	22			
CNC	9			
CNS	27			
COM	129	4	4	MAT 109 (2), MAT 118 (2)
CPS	159	9	9	MAT 118 (3), MAT 184 (6)
CRJ	73	3	3	MAT 109 (1), MAT 118 (2)
CRT	188	6	6	MAT 118 (6)
ECC	1			
ECH	41	4	4	MAT 109 (2), PSY 221 (2)
EDB	9			
EDH	51	1	1	MAT 109 (1)
EDL	33	1	2	MAT 107 (1), PSY 221 (1)
EDM	12			

EDP	1			
EDS	5	1	1	MAT 184 (1)
EDX	2			
EED	147	30	32	MAT 107 (19), PSY 221 (13)
ELT	46	6	6	MAT 118 (1), MAT 184 (5)
ENR	110	2	2	MAT 184 (2)
ESW	101	3	3	MAT 110 (1), MAT 118 (2)
FPT	2			
GSP	1345	60	60	MAT 109 (11), MAT 110 (3), MAT 118 (29), MAT 184 (7), PSY 221 (10)
HMS	319	15	15	MAT 109 (1), MAT 118 (13), PSY 221 (1)
HNT	12			
INM	3			
LAH	356	9	10	MAT 109 (4), MAT 110 (1), MAT 118 (2), MAT 184 (1), PSY 221 (2)
LAM	8			
LAX	239	8	8	MAT 118 (4), MAT 184 (4)
MLT	53	2	2	MAT 118 (2)
MPC	1			
NUR	112	98	98	NUR 112 (51), NUR 213 (47)
PAL	38	1	1	MAT 118 (1)
PAR	33	2	2	PAR 106 (2)
PBH	19	1	1	MAT 110 (1)
PDC	41			
PFA	48	1	1	MAT 109 (1)
PLL	3			
PRR	5	2	2	PAR 106 (2)
UND	435	11	11	MAT 107 (1), MAT 110 (1), MAT 118 (9)
VAT	166	7	7	MAT 109 (2), MAT 110 (2), MAT 118 (1), MAT 184 (2)

WAC	2			

Appendix D: Faculty Narratives

Course	Narrative
MAT110	27 of my MAT110 students took the assessment. They did the worst on #4 (59% got this one correct) and #9 (33% got this one correct). This is a College Algebra class, and #9 is asking them to estimate the height of a graph after more time has passed. I think the question options weren't great since two of the options were pretty close, and students may have estimated a bit off. We could improve this question in the future.
MAT 118	Students seem very strong in interpretation, but are inconsistent with Application. I am not sure the small number of students that participated in this allow for much to be concluded from this data.
	The nine students who participated in this assessment overall did very well on the Interpretation portion, with seven students achieving a 4 and two students achieving a 3. Students did not do as well on the Application/Analysis portion, with two students achieving a 4, one student achieving a 3, and six students achieving a 2. The questions that had the most incorrect answers were #7 and #9. Among those who got these questions wrong, there did not appear to be a single wrong answer that most students chose, so it is difficult to speculate about why students got these questions incorrect or where their misunderstandings lie. The response rate is disappointing, particularly since I had students complete the assessment in class and gave extra credit for completion. Unfortunately, several students were absent on the day I chose to set aside class time for this assessment. Some students who normally attend were not in class that day.
	The samples were very small. Out of 18 possible (currently enrolled at time of assessment) students in one course, only 7 responded by taking the assessment, and in the other section, of 14 possible students, only 7 responded there as well. More students than were currently enrolled (for each course section) at the time the assessment was given were listed in the entry table because students who dropped after the 3rd week of the course. The most commonly missed questions happened to be in the "application" area, but those questions both featured multiple cohorts displayed either as additional rows in a table or as additional lines in a line graph. I am not sure that the students did not have a harder time with the application as they did interpreting the more complex table and graph. Since most students scored at modest or above even in the application section, despite the more complicated table and graph, no action appears necessary regarding this assessment and this particular course. Assessment Method: This was completed in the final five weeks of the semester, given as a "bonus" assignment (extra credit incentive). It was given in an online environment as a multiple choice/true-false quiz that the students completed on their own outside of class. A 30 minute timer was used for the assessment, and students who have accommodations had their maximum time adjusted according to the accommodations given for "regular" course testing in this environment.
	Students that took assessment showed at least minimum competency
	I am not surprised in the least that my students scores were better overall in Interpretation than Application/Analysis. I have been seeing this falloff in analytical skill over years, as more students

	arrive at DCC with weak math skills (that is, the ability to actually DO math, not just talk about the "big picture"). Please see the notes in Action/Modification for a possible way to address this issue. Action/Modification: Students should be required to have recently taken a college-level math course or two at DCC before qualifying to take Elementary Statistics. In prior years, most of my students were close to graduating, understood college- level work, and had a better understanding of algebra and mathematics in general. I am now seeing more students who are in their first semester and/or taking their first college math course. Some can't solve y=mx+b, let alone approach probability and statistics. Others simply have a lack of study habits, having no idea what college-level work requires. What I would like to suggest is a change at the program level that ensures that students are ready for such a challenging course, or have a parallel support course (as we used to do) for freshmen.
	Question 9 was a tricky one for most of my students. Over all, my students did very well. I think having some questions from the actual class would be nice as well. Did every math student take the exact same test regardless of what course they were in?
	22 of my MAT118 students took the assessment. They did the worst on #4 (55% got this one correct) and #9 (46% got this one correct and #7.
	Two of my top students did not score 100%, and my lowest-performing student did surprisingly well. I see that there was not a lot of time spent (about 5-7 minutes per student) so perhaps there was a lot of guessing involved? Or possibly cheating/copying? I can't say for sure because it was not proctored.
MAT184	Majority of my students showed at least competency.
	Too few students completed the assessment to do any analysis.
	Students generally did better with identifying information and interpreting graphs than applying and analyzing data from the information given. This was expected. For the Analysis/ Application portion, the question missed by students varied so no single question stood out as a problem in my small group. In my opinion for the Analysis/Application portion ,students need to continue to be presented with numerical data and practice analysis in many disciplines before they graduate.
NUR112	May, 2022- For the 2022 final exam the results for question #66 were as follows: 86.27 % of the students interpreted the data correctly and 13.73 % incorrectly. This question was revised to reflect current medical standards in how to care for patients experiencing an electrical burn using the American Burn Association protocol. A majority of the students were successful in analyzing the numerical values and interpreting their significance in providing safe patient care. We attribute these results to emphasizing the content in lecture and providing examples on how to interpret the quantitative results in administering IV fluids to a burn victim. Students were given practice questions in class to help explain and retain the knowledge needed to interpret the values and do the computation. The faculty plan to continue to implement the same question next year and to compare the results. The goal is for 100% of students to answer the question correctly in 2023. For question #22, 76.47% of the students interpreted the data correctly and 23.53 % of the students incorrectly. Again, the students were successful in analyzing the numerical values and interpreting

	their significance in providing safe patient care. As a majority of students have been successful, we will continue to provide students with interpretive math content and practice in the classroom and utilize the same question next year. The goal is for 100% of the students to answer the question correctly in 2023. The percentage of students that answered both questions correctly was 66.66%. The faculty would like to see a higher percentage. Question #66 An adult weighing 154 pounds suffered electrical burns and has arrived in the emergency department. The entire left lower extremity, the entire head, and the entire left upper extremity was burned. The physician used the Rule of Nines and the American Burn Association formula and wrote an order for the client to receive 10,080 mL of Lactated Ringers in the first eight hours. The nurse interprets the data and determines the amount should be a. **Decreased to 5,040 mL. b. Increased to 15,500 mL. c. Administered as ordered. d. Decreased to 8,100 mL. Question #22 A client with a deep vein thrombosis is receiving heparin. His aPTT result is 60 seconds. In preparation for discharge the physician orders warfarin 5 mg to be administered daily. The INR is 1. The nurse would a. Contact the physician to hold the warfarin. b. **administer the warfarin as ordered. c. Contact the MD to discontinue the heparin. d. Telephone the prescriber to decrease the heparin dose. (05/11/2022) # students on roster: 52 # withdrawals passing: 1 # withdrawals failing: 0 # passing: 41 # failing: 10 # failing who repeated NUR course: 2 # failing who repeated BIO course: 2 # incomplete: 0 % successful completion: 78.84
NUR213	The students were provided with three mathematical questions that required the students to critical think and utilize quantitative reasoning to reach the final answer. # students on roster: 47 # withdrawals passing: 2 # withdrawals failing: 0 # passing: 47 # failing: 3 # failing who repeated NUR course: 0 # failing who repeated BIO course: 2 # incomplete: 0 % successful completion: 89.79

NUR215	Multiple-choice questions were given which need to use scientific knowledge, use critical thinking, and perform mathematical analysis. The mean score of this assignment was 90.9%. # students on roster: 22 # withdrawals passing: 0 # withdrawals failing: 0 # passing: 22 # failing: 0 # failing who repeated NUR course: 0 # failing who repeated BIO course: 0 # incomplete: 0 % successful completion: 100
PAR106	The students all did well on the assessment. 1 student had no incorrect answers. The other 3 students had different questions they got wrong, except for the question about the assumption of rising healthcare.
PSY221	As expected, students overall performed better on questions that involved the simple reading of quantitative data and basic calculations than they did questions that required analysis. One section performed better than another, mirroring the trends of the class. Due to the nature of the graphs, some questions relied on estimates and therefore it was difficult to establish a cut-off for right or wrong answers. Other questions related to assumptions and communication sometimes had answers that were not anticipated. An evaluation of the assessment tool and grading criteria/answer key by someone whose expertise lies in quantitative analysis would likely yield lead to higher validity. Because I did not explicitly teach the analysis of quantitative data in the class, I did not penalize students for incorrect answers, but gave them full credit for completing the assignment. Because of this, students may not have spent as much time as they otherwise would have. In addition, not all students completed the assessment, and it is reasonable to assume that those who did not would have performed more poorly. Assessment Method: In order to assess the quantitative reasoning skills of students in PSY 221, I created a 20 question assignment that required students to interpret and analyze data that reflected the impact of the COVID pandemic on children. I wanted to provide students with an opportunity to interpret quantitative data in a meaningful context related to the course material. The assignment required that they interpret charts and graphs and make inferences and analytic conclusions.