

## QUANTITATIVE REASONING - SPRING 2013

### BRIEF SUMMARY

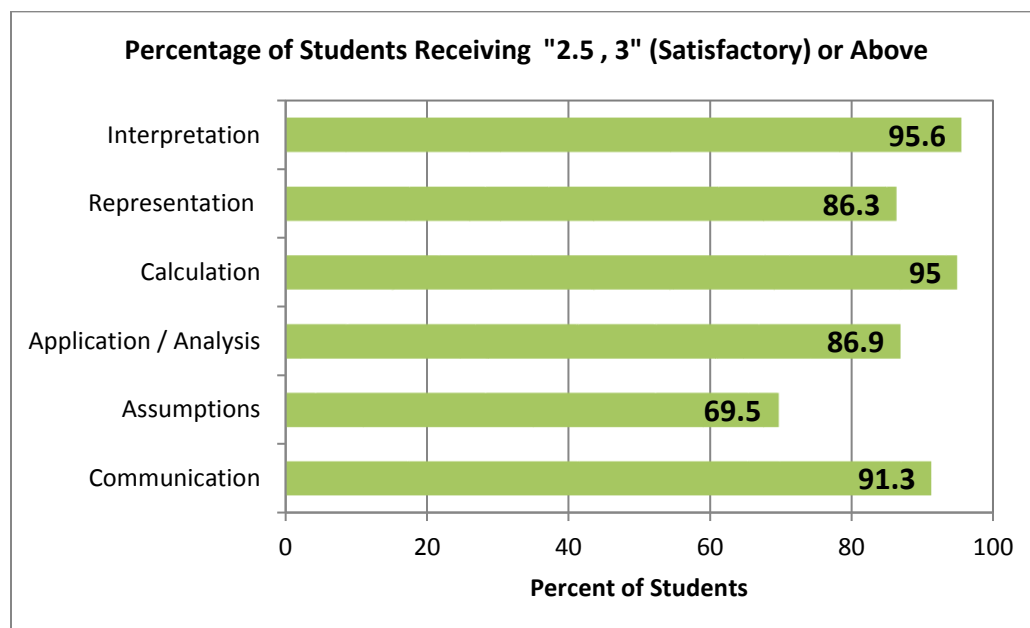
In NECC's fourth year of institution-level assessment, The HOAP (Help for Outcomes Assessment Plans) Committee, comprised of faculty and administrators, decided to assess Quantitative Reasoning (QR). The method chosen was to collect student work prepared in response to classroom assignments - products which would subsequently be graded by the instructors. AAC&U's Quantitative Literacy (QL) VALUE rubric was selected for product evaluation, in that the outcomes defined for NECC's QR skill were derived from the QL rubric.

The students whose products were collected were those who had earned between 45 – 60 credit hours at NECC, exclusive of developmental coursework, prior to the beginning of the spring 2013 term. Three raters were recruited, each having expertise in QR, and experience working with the QL VALUE rubric. The rules governing the rating of samples were as follows:

1. Each product would be independently rated twice on the 5-point QL rubric.
2. If the ratings from the two readers differed by more than one point in *any* of the criteria, the product would receive a third reading.
3. Because of the wide variation in the goals and requirements of assignments, a rater might conclude that certain criteria were not able to be rated. In those instances, the rater would check the "UTR" ("Unable to Rate") column. A "UTR" in any category also triggered a third reading.

In this assessment, although the final sample size was 28, raters could only make judgments on between 20 to 23 of the products, depending on the criterion, because in many instances readers felt compelled to use the UTR designation in one or more categories.

**Ratings results** - For the purposes of analyses, we gave the benefit of the doubt to the student; that is, if the student's average score fell between two categories, it is represented in the higher category in the graph below. Average ratings of 1 were categorized as "Unsatisfactory"; 1.5 and 2 as "Developing"; 2.5 and 3 as "Satisfactory"; 3.5 and 4 as "Superior"; and 4.5 and 5 as "Exceptional".



**Limitations** - As noted above, one of the problems we encountered in this assessment was the mismatch between the rubric and the assignments, which was revealed by the use of UTR rating. Although the rubric was distributed to faculty, the scope of the rubric is not conducive to a cursory look and we did not ask or expect instructors to substantially change their assignments. In addition, faculty participation was severely limited, resulting in a low number of product submissions, and a final extremely small student sample size, as indicated in the table below:

Number of...	
Classes identified as having students who met the criteria	464
Faculty associated with those classes	231
Duplicated students who met the criteria in those classes	1064
Unduplicated students who met the criteria in those classes	341
Faculty indicating they would participate	19
Number of faculty actually participating	9
Classes associated with the participating faculty	13
Samples actually collected	31
Unduplicated samples for final analyses	28

In this assessment:

- Just 9, or 3.9% of the 231 instructors initially identified participated.
- 2.8% of the 464 classes identified were represented.
- 8.2% of the 341 unduplicated students identified were represented in the final sample.

**Overall summary points include that:**

- **The extensive faculty non-participation severely limits the ability to generalize across all students.**
- **The instances of assignment – rubric mismatch resulted in an inability to rate all products on each of the criteria, which further reduced the effective sample size.**
- **This low number of samples rated per criterion combined with the finding that just 8.2% of the identified students were included in the 28 results in the conclusion that it is highly unlikely that the students whose products were rated are representative of the NECC students identified for this project. Therefore, it is not possible with any level of confidence to draw any institutional-level conclusions concerning students' QR skills.**

**Recommendations going forward include increasing faculty familiarity with the rubrics through professional development activities. In the long run, this may increase:**

- **Faculty participation** because they now have a suitable product,
- By extension, **the number of students represented** in the sample collected, and
- **The number of products that can be successfully evaluated** because more rubric criteria will be addressed.

## **FULL REPORT: YEAR IV INSTITUTIONAL LEVEL ASSESSMENT: QUANTITATIVE REASONING - SPRING 2013**

### **Background**

**Development of core academic skills for assessment.** During 2008, a committee of faculty and administrators reviewed the three existing college-wide associate degree competencies, with the goal to revise and update them as necessary. This work resulted in the identification of six core academic skills that students were expected to develop in the course of their studies. These are:

- Global Awareness
- Information Literacy
- Oral Communication
- Quantitative Reasoning
- Science and Technology
- Written Communication

In spring of 2009, members of the Core Academic Skills Assessment Committee developed measurable outcomes for each of the core skills, and a process to assess these outcomes.

**Year I institutional assessment pilot.** Written Communication was chosen for the spring 2010 pilot of the process. For details on the process and the results, see *Report on Year I Institutional Level Assessment – Communication (Writing Skills) - Spring 2010* at <http://facstaff.necc.mass.edu/wp-content/uploads/2010/02/201001-IAR.pdf>.

The major issue identified by the raters of the collected student writing products was the wide variability in the type and length of student products, and the level of detail provided in the assignments. Raters recommended that for the next assessment of this skill, a uniform writing assignment be provided. This could help eliminate some product variability which may have clouded students' actual skills and interfered with raters' ability to fully apply the rubric criteria.

**Year II institutional assessment.** In Year II, two skills - Global Awareness and Quantitative Reasoning – were assessed. For the full report, go to: <http://facstaff.necc.mass.edu/faculty-resources/program-review-outcomes-assessment/institutional/global-awareness-and-quantitative-reasoning-assessment-2010-11-academic-year/>.

Based on conclusions from the Year I assessment, a uniform assignment was developed. Class instructors who participated administered the assessment to students in their classes. Issues identified for this assessment included the difficulty recruiting faculty to participate given that they had to surrender class time. Even when faculty agreed, it sometimes happened that the identified students were not in class on the day of assessment. Also of concern was the issue of student motivation to complete this assignment, perhaps especially in the absence of any incentives, including grades, and the likely disconnect of the topic from the particular class.

**Year III Institutional Assessment.** In Year III, Information Literacy was assessed. In light of the difficulties experienced in Year II when a uniform assignment was created, the method chosen was to collect student research projects prepared in response to classroom assignments. AAC&U's Information Literacy VALUE rubric was selected for product evaluation because

with little modification, it aligned with the Information Literacy criteria defined by NECC's Core Academic Skills committee.

Problems encountered include instances of “mismatch” between the rubric criteria and the assignments which resulted in the need to use the “Unable to Rate” category, the small number of participating faculty members, and the small percentage of students represented in the final sample which affected our ability to draw any institutional-level conclusions concerning students' Information Literacy skills. In addition, while the number of pages in collected reports ranged from 0 to 13, the highest frequency (reflected in work submitted by 26 students) was 2 pages. This leads us to wonder whether the research projects collected were substantial enough to display meaningful research skills. (See <http://facstaff.necc.mass.edu/faculty-resources/program-review-outcomes-assessment/institutional/information-literacy-assessment-%e2%80%932011-12-academic-year/>).

### **The DHE Vision Project and NECC's Institutional Assessment**

In the fall of 2012, the DHE began planning for a pilot study focused on collecting a sample of Massachusetts public colleges and universities student products which could be evaluated using the LEAP VALUE rubrics of Critical Thinking, Quantitative Literacy (QL), and Written Communication. The study was implemented in the spring of 2013, with NECC selected to participate. Consequently, spring 2013 institutional-level assessment at NECC involved:

- For the state pilot study, collecting products by March 15 related to the three skills.
- For the local institutional assessment, collecting products by the end of the term related to Quantitative Reasoning (QR).

The simultaneous conduct of the two initiatives required that some notices to faculty include mention of both projects.

One difference in the projects concerned criteria for student participation. While the required **number** of credit hours was the same, the **state criteria included transfer hours**, while **NECC's excluded transfer credits**. Products eventually included in NECC's study were carefully screened to ensure that the requirements were met.

The information presented below focuses on just the local institutional assessment of QR, although relevant documents included in the Appendices may reference both projects.

### **Method**

**Development of method.** As with the Year III assessment of Information Literacy, The HOAP (Help for Outcomes Assessment Plans) Committee, comprised of faculty and administrators, assisted in planning and implementing the process. Over the 2012-13 AY, in addition to informal exchanges, the Committee met five times to plan and review the pilot study and institutional assessment process.

- One of the first tasks was to decide **how to obtain student work to evaluate**. The approach used was to collect student products prepared in response to classroom assignments – products which would subsequently be graded by the instructors. This was the approach also being used for the state pilot. A timeline for notifying instructors of

our plan was developed, starting with a general notification and ending with notifications to just those instructors with targeted students.

- Next was to consider **how the collected products would be evaluated**. Committee members decided to adopt the AAC&U's VALUE rubric on QL as written, with two formatting modifications. One was to include a column indicating that the criteria were not met at all. The other was to include a column signaling that the product was not able to be rated on the criterion, as it wasn't required in the assignment and therefore not demonstrated by the student. In addition, the numerical rating categories were assigned descriptive labels. With these changes, the tool to evaluate was now in place (see Appendix 1).
- Our **criterion for inclusion of students in the product collection efforts** was that they would have earned between 45-60 credit hours at NECC prior to the beginning of the spring term, exclusive of any transfer and developmental credit hours. In late February 2013, after the registration "freeze" date, a list was obtained of all students who met the credit hours criterion for assessment. Students identified were organized by classes in which they were enrolled, with some students being enrolled in more than one of the classes.
- An **"opt-out" note was prepared for students**, informing them of the assessment process, and that they had a right to decline participation (see Appendix 2).
- The **process of faculty notification** included the following:
  - To enable faculty to possibly plan ahead with respect to QR assignments, on December 10, 2012, all faculty (full-time, half-time, and DCE) were sent an email to generally inform them about the work being planned for the spring term. The general criteria contained in the QL VALUE rubric were listed (see Appendix 3).
  - On February 5, 2013, all faculty were again sent an email with more detail about the project, including further details about the collection process and with the QL VALUE rubric attached (see Appendix 4).
  - On February 12 and 13, 2013, faculty who had at least one of the identified students in their class or classes were sent individualized emails asking them to let us know in which of the classes named, if any, a QR assignment was being given, and whether they were willing to participate in this institutional assessment (see Appendix 5). The number of classes detailed per instructor ranged from 1 to 9. **Someone is teaching 9 classes? Scary!**
  - On March 26, 2013, after the pilot study collection had ended, an individualized reminder email was again sent to each of the identified faculty members, encouraging them to respond as to their participation in this project (see Appendix 6).
  - On April 1, 2013, an individualized email was sent to faculty members who had agreed to participate. This email included the student "opt-out" note (see Appendix 7).

- On April 26, 2013, another email was sent to all agreeing faculty members reminding them to submit the products, and the associated assignments, for those students identified in their classes (see Appendix 8).
- In addition to the above formal, documented notifications, there were many other informal, personal contacts to remind faculty and to encourage participation.

**Product collection and results.** Collection efforts included meeting faculty to retrieve and copy products from identified students, and receiving via email electronic copies of products.

The overall summary of samples targeted and collected is represented as follows:

Number of...	
Classes identified as having students who met the criteria	464
Faculty associated with those classes	231
Duplicated students who met the criteria in those classes	1064
Unduplicated students who met the criteria in those classes	341
Faculty indicating they would participate	19
Number of faculty actually participating	9
Classes associated with the participating faculty	13
Samples actually collected	31
Unduplicated samples for final analyses	28

Overall, the number of pages in collected reports ranged from 1 to 28.

**Preparation of samples for rating.** All samples collected were logged in and assigned a unique identifier. After identifying information related to students, faculty, and classes was removed from the products and the attached assignments, copies were made for the raters.

**Raters and rating process.** In May, faculty with expertise in QR and experience using the QL VALUE rubric were invited to serve as raters of the collected products.

On May 31, the three raters participated in a norming session. At this meeting, the rubric was reviewed and sample products rated and discussed in order to establish a consensus on how each criterion should be interpreted and scored. After that, raters commenced rating the products.

The rules governing the rating of samples were as follows:

1. Each product would be independently rated twice.
2. If the ratings from the two readers differed by more than one point in *any* of the criteria, the product would receive a third reading.
3. Because of the wide variation in the goals and requirements of assignments, a rater might conclude that certain criteria were not able to be rated. In those instances, the rater would check the “UTR” (“Unable to Rate”) column.

After a reading, the student product was marked with the rater's initials to ensure that the second or third readings would be done by different faculty members. Raters were instructed to keep the rubric separate from the sample, and to record the student identifier on the rubric. The rubrics were regularly reviewed by session leader to determine if a third reading would be required.

**Post-rating feedback from raters.** In brief reports prepared following the rating session, raters provided their feedback about the rating experience (see Appendix 9 for full reports). The major recommendations represented in their comments were that:

- **Faculty receive training on the QL VALUE rubric**, via scoring or norming sessions because greater familiarity with the rubric can assist faculty in developing assignments that more adequately align with the criteria, and which demand rubric related skills from students. Example comments in this area include:
  - *Scoring sessions are an excellent form of staff development. The scorers (if they have the right mindset) have the opportunity to learn so much from the rubrics, from the variety of assignments offered from different disciplines, and from the discussion/feedback from their colleagues. Once the scoring session is over, it is a chance to look back on your practice as an educator and re-assess what works well and what could be improved in your classroom instruction and assignments. This provides an excellent opportunity to partner with professional development activities in the future at NECC.*
  - *The rubric is the key for good project/rating; we should provide some training / workshop for faculty interested.*
  - *(Recommend) Faculty workshops on using the rubrics - normalizing sessions*
- **Along with the assignments, for QR assessments, faculty provide answer keys.**
  - *(Recommend) Answer key supplied for each project- many reviewers can be outside the discipline and would need a guide to better rate the projects.*

**Data decisions.** To determine the overall score for each criterion, the two ratings were averaged. If three readers were required for any sample, the two ratings which were closest for each criterion would be averaged (i.e., if Rater One gave a score of 1, while Raters Two and Three gave scores of 2, the overall score for that criterion would be 2, the average of Raters Two and Three). If all 3 scores for a criterion differ and are *equally* close, the average of the two lowest scores would be used **This seems to contradict the practice mentioned earlier of erring on the positive side** (i.e. Rater One gave a score of 1, Rater Two gave a score of 2, and Rater Three gave a score of 3, the average overall score would be 1.5, the average of Raters One and Two).

Third readings were also done when one of the criterion ratings was “Unable to Rate” (UTR). If the third reader also assigned a “UTR”, then the overall rating for that criterion was “UTR.” Otherwise, the assigned ratings were treated as above.

Each student was to be represented by a single writing **QR?** sample. Many of the samples submitted, however, were duplicate or in two cases, even triplicate entries for the same students,

submitted from the same or different classes. In cases of multiple entries, the one product selected was the one which had the overall highest ratings total, the rationale being that if the student could produce at that level once, they likely have that level of ability.

**Ratings results.** For the purposes of analyses, average ratings of 1 were categorized as “Unsatisfactory”; 1.5 and 2 as “Developing”; 2.5 and 3 as “Satisfactory”; 3.5 and 4 as “Superior”; and 4.5 and 5 as “Exceptional”.

During the rating process, raters frequently mentioned having difficulty rating the particular product they were working on with the rubric due to a mismatch between the assignment, and what was therefore being asked of students, and the criteria being used to rate the product. Consequently, raters expressed that they often used the “UTR” column. When the frequency of “UTR” ratings was examined, it was found to range from 18 to 29% across the criteria. (See Table 1.) Most frequently, “UTR” was used for the criterion, “Calculation”. In the absence of an answer key, raters were unable to determine in many cases whether a calculation was “successful” or not. Because “UTR” represents an absence of a rating, these ratings were excluded from the final analyses. Consequently, the effective sample size for each criterion was reduced from 28 to between 20 and 23.

TABLE 1: SUMMARY OF RATINGS INFORMATION (N = 28)

Criteria	Number/Percentage of Final Scores Signifying “Unable to Rate”	Number/Percentage of Final Scores With a Rating Other Than “Unable to Rate”
Interpretation	5 / 17.9%	23 / 82.1%
Representation	6 / 21.4%	22 / 78.6%
Calculation	8 / 28.6%	20 / 71.4%
Application / Analysis	5 / 17.9%	23 / 82.1%
Assumptions	5 / 17.9%	23 / 82.1%
Communication	5 / 17.9%	23 / 82.1%

**Definitions of categories** displayed in the above table:

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

**Representation** – Ability to convert relevant information into various mathematical forms (e.g., equations, graphs, diagrams, tables, words)

**Calculation**

**Application/ Analysis** – Ability to make judgments and draw appropriate conclusions based on the quantitative analysis of data, while recognizing the limits of this analysis.

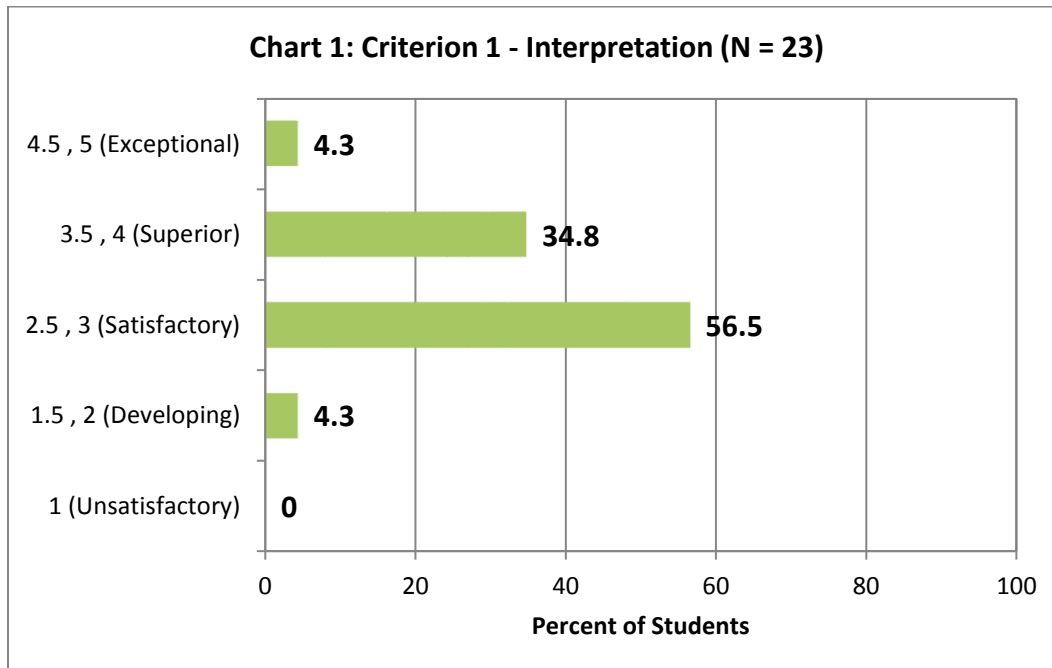
**Assumptions** – Ability to make and evaluate important assumptions in estimation, modeling, and data analysis



**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)

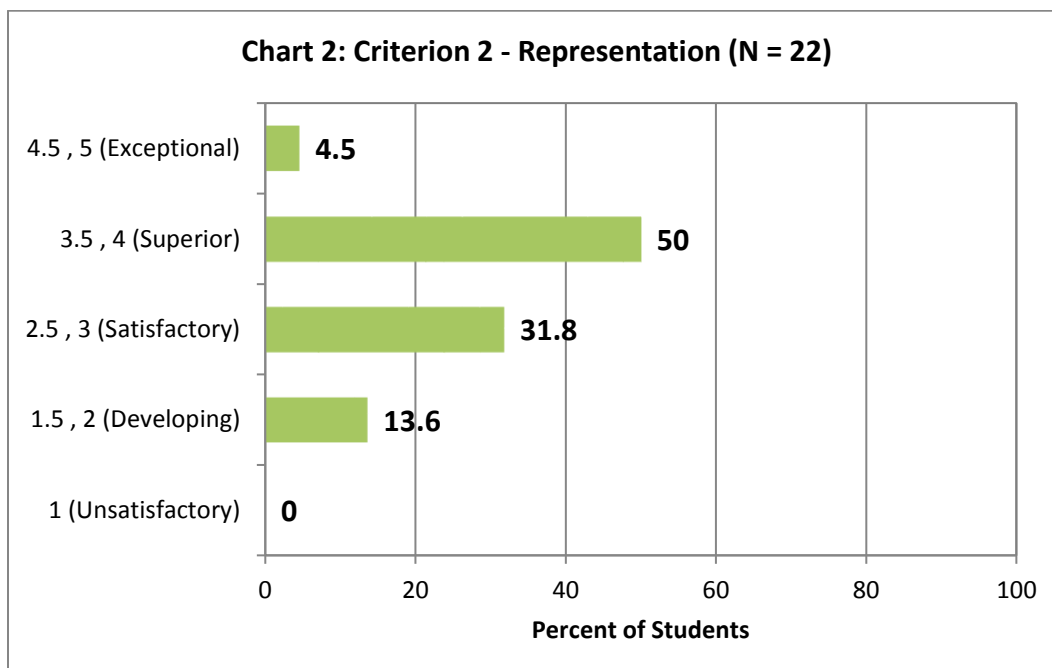
Charts 1-6, presented below, show the percentages of products receiving ratings in each of the five ratings categories for each criterion. The percentages of products rated as “Satisfactory” or above accompanies each table.

CHARTS 1-6: BY CRITERION, OF STUDENTS RATED, PERCENT WHO RECEIVED AN AVERAGE SCORE OF ...

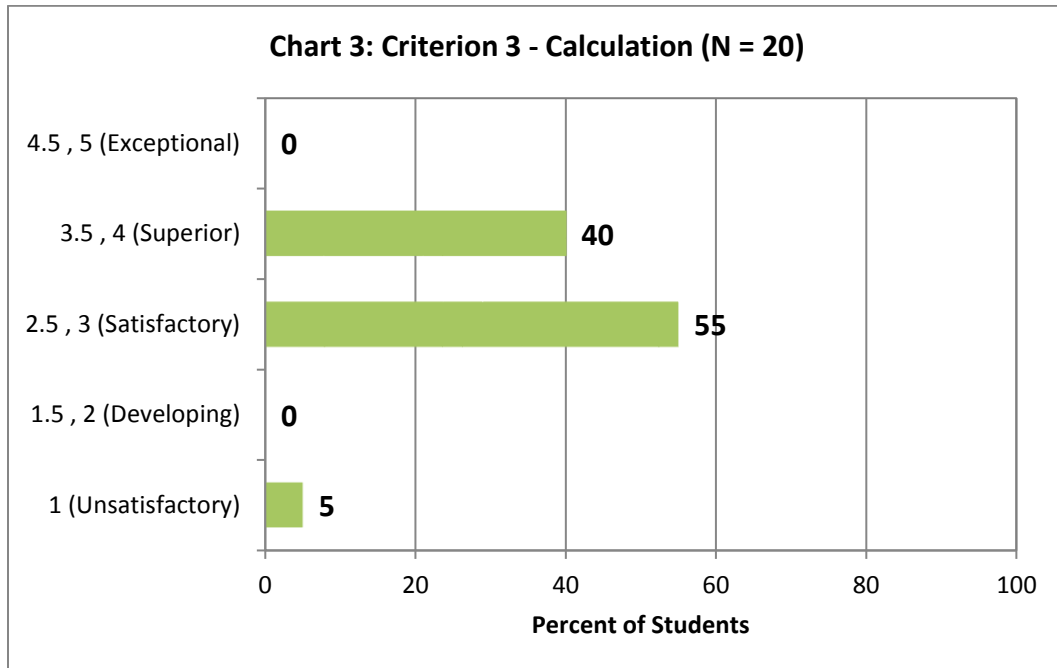


*Percent receiving “2.5, 3” (Satisfactory) or above = 95.6*

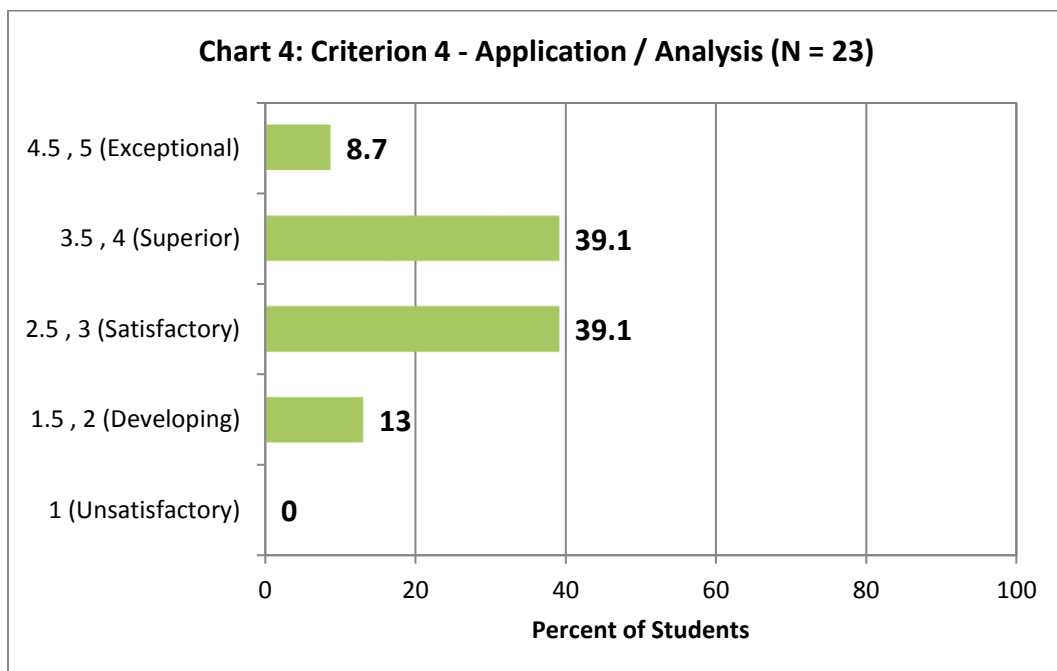
*Percent receiving “3.5, 4” (Superior) or above = 39.1*



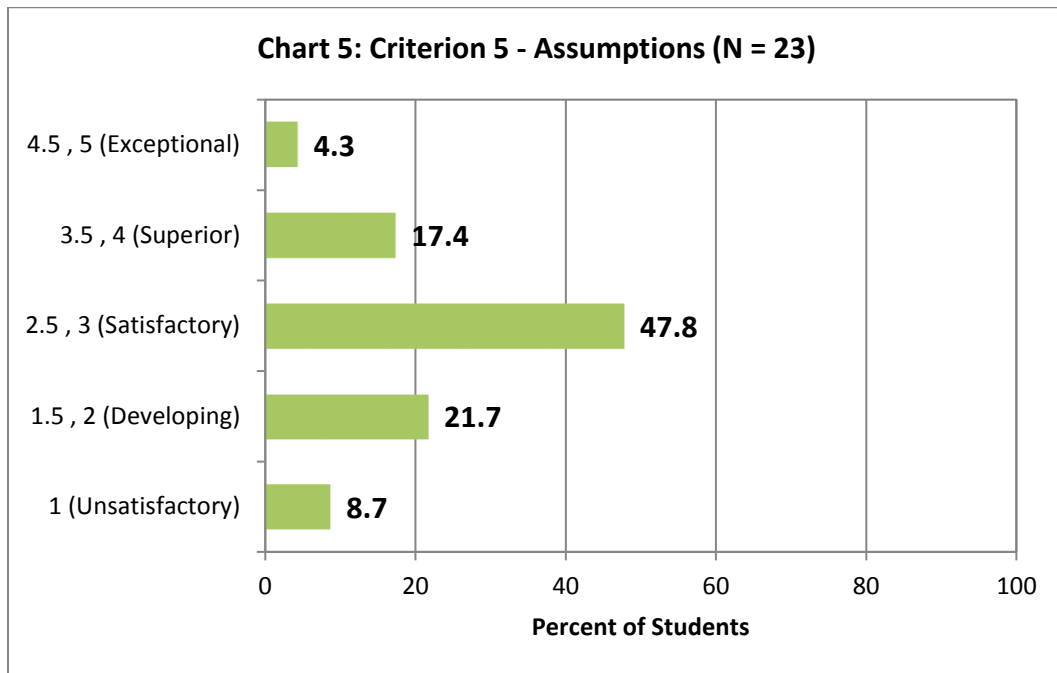
**Percent receiving "2.5, 3" (Satisfactory) or above = 86.3**  
**Percent receiving "3.5, 4" (Superior) or above = 54.5**



**Percent receiving "2.5, 3" (Satisfactory) or above = 95**  
**Percent receiving "3.5, 4" (Superior) or above = 40**

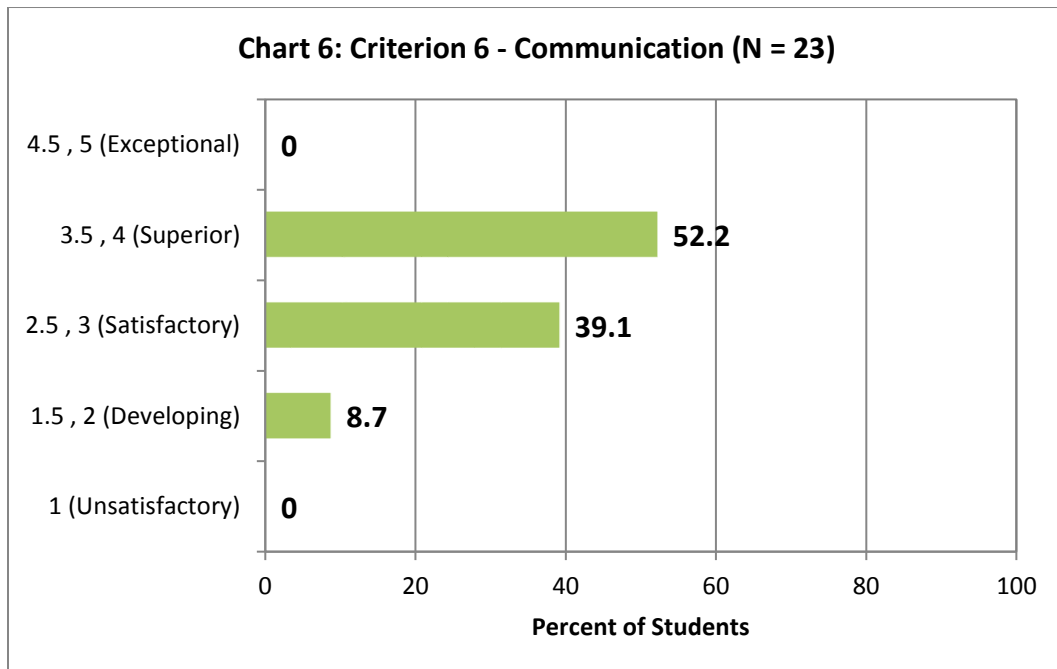


**Percent receiving "2.5, 3" (Satisfactory) or above = 86.9**  
**Percent receiving "3.5, 4" (Superior) or above = 47.8**



*Percent receiving "2.5, 3" (Satisfactory) or above = 69.5*

*Percent receiving "3.5, 4" (Superior) or above = 21.7*

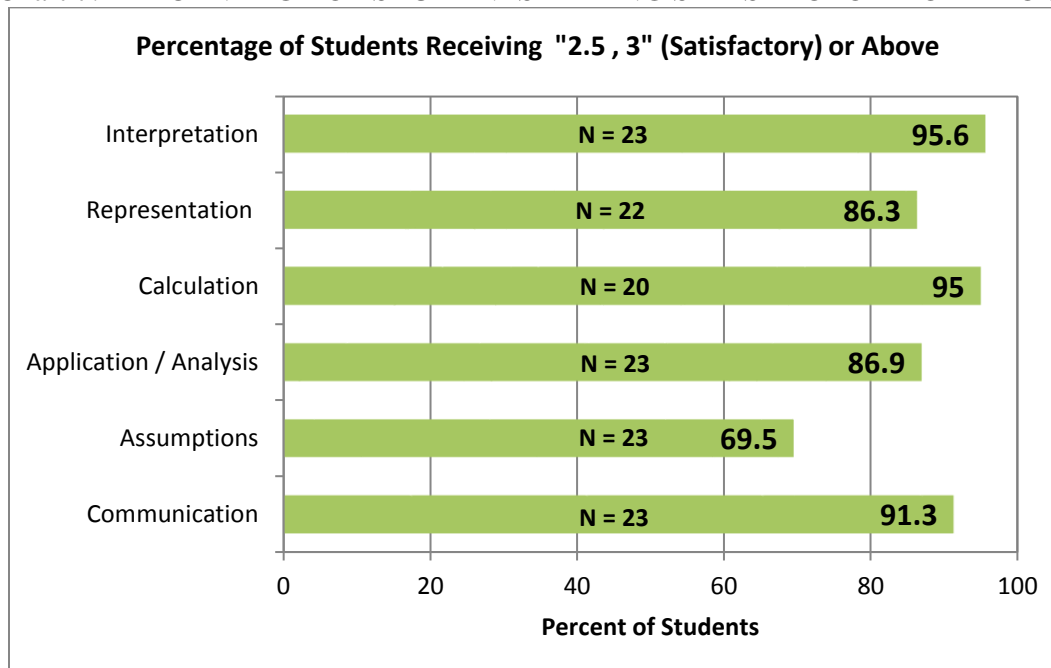


*Percent receiving "2.5, 3" (Satisfactory) or above = 91.3*

*Percent receiving "3.5, 4" (Superior) or above = 52.2*

Chart 7 presents for each criterion, the percentage of products rated as “Satisfactory” and above.

Chart 7: PERCENTAGE OF STUDENTS RATING SATISFACTORY OR ABOVE



**Standards.** For the first institutional-level assessment, which was of Writing Skills, in order to determine an acceptable standard against which to judge our students’ performance and evaluate the ratings results, faculty input was requested. An email was sent to all faculty asking them to share their opinions as to what percentage of the samples (students) evaluated should fall into the “Skilled” category as well as into a combination of the “Competent” or “Skilled” categories. (Note: the categories used for rating the writing samples differed somewhat from those used in this current assessment.)

For this assessment of QR, we applied the same standards used for the Writing Skills and Information Literacy assessments. That is, the standard would be at least 20% for evaluating the percentages of products scored in the “Superior” or “Exceptional” categories combined, and at least 80% as the standard for the “Satisfactory”, “Superior” and “Exceptional” categories combined.

**Standards and ratings results.** Focusing on the percentage of products rated as “Superior” or “Exceptional”, and using the standard of at least 20%, findings include that the standard was met with respect to each of the six criteria.

Concerning the percentage of products rated as “Satisfactory” and above, and using at least 80% as the standard, findings include that the standard was met for all criteria (percentages ranging from 82.1 to 88.3) except “Assumptions: Ability to make and evaluate important assumptions in estimation, modeling, and data analysis” (69.5%).

## Overall Discussion and Summary

**Faculty participation.** All four institutional-level assessments have depended on faculty who volunteer to participate, either by submitting student work or giving class time. In situations where products are to be submitted, a certain amount of participation is precluded when there are no class assignments planned that relate to the skill(s) being assessed. When not all faculty participate, then not all identified students are represented.

In this assessment:

- Of the 231 instructors initially identified, just 9 or 3.9% participated.
- 2.8% of the 464 classes identified were represented.
- 28, or 8.2% of the 341 unduplicated students identified were represented in the final sample.

**This extensive faculty non-participation severely limits the ability to generalize across all students.**

**Assignment-rubric mismatch.** During the ratings, and again in the context of the comments provided, raters frequently noted the mismatch between assignments and the VALUE rubric being used to evaluate them. This assignment mismatch was also noted by raters in the first assessment of Writing Skills, and the third of Information Literacy. **When there is this mismatch, raters cannot fully assess the product, which further reduces the effective sample size for the rubric criteria.**

**Size of student sample.** In this assessment of QR, sample size was already an issue, because only 34 products were collected in total. In some cases, identified students failed to submit the work, or had stopped coming to class.

When these 34 products were examined by the raters, three were found to be “not usable”; one because it was the product of a group so individual skill attainment could not be discerned, and the other two because the assignment was judged to be completely unrelated to QR. Of the 31 samples rated, three were eliminated because they were completed by students who also had other products submitted. Only one assignment per student was maintained, leaving the sample size at 28.

For the 28, there were instances where certain criteria could not be rated, leaving the effective sample size across the six criteria ranging from 20-23. **This low number of samples rated per criterion combined with the finding that just 8.2% of the identified students were included in the 28 makes it highly unlikely that the students whose products were rated are representative of the NECC students identified for this project. Therefore, it is not possible with any level of confidence to draw any institutional-level conclusions concerning students’ QR skills.**

**Recommendations going forward.** One approach to address the “mismatch” issue that was recommended by raters in the Year I assessment of Writing, and again in this Year IV

assessment of QR is to have a uniform assignment available. As noted above, this approach was used in Year II, but ended up with its own set of problems. The difficulty of taking class time might be addressed with having take-home assignments. But to address the “no consequence because not graded” issue, instructors would have to agree to grade the assignment and include the grade in all of the students’ final grades. Typically, however, only a small number of these students would qualify for institutional assessment. And it is not certain that any “uniform assignment” would fit in with content over a wide variety of classes, nor that instructors would be agreeable to grading such an assignment.

**It does seem that faculty development to increase familiarity with rubrics, the approach recommended by the three faculty raters and by campus DHE pilot project leaders, might offer the most promise to improve institutional assessment results.** Rubric training often leads to faculty reflection, and intentions to improve or craft specific course related assignments which align with rubric criteria. **In the long run, this may increase:**

- **Faculty participation** because they now have a suitable product,
- By extension, **the number of students represented** in the sample collected, and
- **The number of products that can be successfully evaluated** because more rubric criteria will be addressed.

Even though the findings from this assessment are not directly usable in terms of estimating the QR skill levels of NECC students, the work has value if it stimulates discussion, reflection, and increased assessment and rubric-related professional development opportunities for faculty. Each of the core skills now has a developed rubric to be used to guide assignment development, classroom instruction, and assessment. Increased efforts in those directions may eventually produce higher product yields for institutional assessment, but more importantly, result in a richer educational experience for students vis-a-vis the core skills - skills that as an institution, NECC has concluded are central learning outcomes for degree seeking students.

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## **APPENDICES**

## APPENDIX 1: RUBRIC FOR 2012/13 INSTITUTIONAL ASSESSMENT OF QUANTITATIVE REASONING

	5 EXCEPTIONAL	4 SUPERIOR	3 SATISFACTORY (Meets expectations)	2 DEVELOPING	1 UNSATISFACTORY (Does not meet expectations)	0 UNABLE TO RATE – N/A	RATING
<b>Interpretation</b> <i>Ability to explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words)</i>	Provides accurate explanations of information presented in mathematical forms. Makes appropriate inferences based on that information. <i>For example, accurately explains the trend data shown in a graph and makes reasonable predictions regarding what the data suggest about future events.</i>	Provides accurate explanations of information presented in mathematical forms. <i>For instance, accurately explains the trend data shown in a graph.</i>	Provides somewhat accurate explanations of information presented in mathematical forms, but occasionally makes minor errors related to computations or units. <i>For instance, accurately explains trend data shown in a graph, but may miscalculate the slope of the trend line.</i>	Attempts to explain information presented in mathematical forms, but draws incorrect conclusions about what the information means. <i>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.</i>	Unable to explain information presented in mathematical forms.		
<b>Representation</b> <i>Ability to convert relevant information into various mathematical forms (e.g., equations, graphs, diagrams, tables, words)</i>	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.	Unable to convert relevant information into various mathematical forms.		
<b>Calculation</b>	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.	Calculations are not attempted.		
<b>Application / Analysis</b> <i>Ability to make judgments and draw appropriate conclusions based on the quantitative analysis of data, while recognizing the limits of this analysis</i>	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.	Unable to make judgments and draw appropriate conclusions based on the quantitative analysis of data.		
<b>Assumptions</b> <i>Ability to make and evaluate important assumptions in estimation, modeling, and data analysis</i>	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.	Unable to make and evaluate important assumptions in estimation, modeling, and data analysis.		
<b>Communication</b> <i>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)</i>	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.)	Unable to Express quantitative evidence in support of the argument or purpose of the work.		



## **APPENDIX 2**

Spring 2013

### **NECC Institutional Outcomes Assessments Note for Students**

Northern Essex Community College's commitment to student success involves the evaluation of student work to help ensure that students are achieving the learning outcomes identified by our college. This process may involve the collection of student classroom products for evaluation at the college level. When collected for this purpose, students' names will be removed from the products so that the assessing is done anonymously. Evaluations carried out at the college level will not impact students' course grades. The process of assigning grades will continue to be the responsibility of the course instructor.

If you do not wish to participate, please notify your instructor.

## APPENDIX 3

December 10, 2012

To: All NECC Faculty Members

From: Help for Outcome Assessment Plans Committee (HOAP) (*Judi Ciampi, Joanna Fortna, Nancy Garcia, Kerin Hamidiani, Rick Lizotte, Habib Maagoul, Gail Stuart, Suzanne VanWert, Ellen Wentland*)

Re: **Early notice – Spring 2013 Institutional Assessment of Quantitative Reasoning**

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**For this spring's institutional assessment of Quantitative Reasoning (QR), we need your help!**

We rely on faculty members to supply student products submitted in response to class assignments, and we would like to encourage and help you in **including QR in your assignments – regardless of discipline.**

**Do you ask students to do any of the following in one or more of their assignments?**

1. Decipher and explain information presented in mathematical forms such as graphs, diagrams, or tables.
2. Convert relevant information into various mathematical forms such as equations, graphs, diagrams, or tables.
3. Interpret and evaluate statistical data or other quantitative data.
4. Use quantitative information to support assertions and/or to solve real world problems.
5. Successfully perform calculations required to solve a given problem.
6. Write a report or document presenting data appropriately.

**We are sending this early notice so that if you don't already have QR assignments in your syllabi, you can plan them for the spring. If you are willing to participate, but need some help, contact us!**

**We can:**

- *Provide sample QR assignments*
- *Send faculty members to help design assignments*
- *Send faculty members to help evaluate and/or tweak existing assignments*
- *Provide teaching tips for including QR*

## APPENDIX 4

Draft – February 5, 2013

From: NECC Announcements [college@necc.mass.edu]

Sent:

To: Faculty - Staff NECC

Subject: [Announcement] Spring 2013 College Assessment – Massachusetts Pilot Assessment

Dear Faculty Member,

In December, we sent you a note letting you know that **our institution-level assessment this spring will be of Quantitative Reasoning (QR – also termed Quantitative Literacy).**

**In addition to our local assessment, Northern Essex is one of seven campuses selected for participation in a spring 2013 Pilot Study for a Model for Statewide Assessment.** We expressed interest in the project because we are proud of our assessment efforts and believe that collaborative work on learning outcomes assessment is extremely important. We are pleased that our campus has been chosen to be among the first in this initiative. The pilot study involves collecting student products at the institution level for eventual inclusion in state level collaborative assessment. Data collected in this pilot will not be publicly reported.

The state pilot study will focus on assessing three student competencies: **Critical thinking, Written Communication, and Quantitative Literacy (which corresponds with our local assessment).** Following a detailed process which has been approved by NECC's Institutional Review Board, samples of student work will be collected at the campus level and assessed at the state level by experienced faculty scorers drawn first and foremost from the participating campuses in the pilot. Student work will be assessed using the American Association of Colleges and University's (AACU) LEAP VALUE rubrics (attached).

Briefly, **for both projects – ours and the state assessment – we will identify students** who have earned between **45 and 60** credit hours as of the first day of the spring semester 2013. Faculty with one or more of these students enrolled in their class(es) this semester will be contacted and asked if they are giving an assignment that addresses one or more of the three competencies noted above. If so, the faculty member will be asked if they are willing to submit student work completed for this assignment. A sample of students and corresponding student work will be drawn from faculty who indicate they are **willing** to participate.

**For the state project, we need to collect student products by March 15 which address *at least in part* Critical Thinking, Quantitative Literacy, and/or Writing.**

**For our own NECC assessment, however, we can collect QR products until the end of the spring term.**

**If you have students who meet the criterion in your class, you will receive an email in early February concerning the spring projects.**

For now, we hope you will think about your class assignments and whether any can be used to evaluate students' Critical Thinking, Quantitative Reasoning, and/or Writing, and which students are required to submit on or before March 15, or later in the case of QR for Northern Essex.

We want to assure you that all identifying information will be removed before samples are sent to the state for evaluation by faculty raters. Student work will not be able to be traced back to the student, the class, or the faculty member.

**While we plan to impose very little on your time, your participation in this process is crucial.** As noted by Bill, "...while this approach to assessment may seem laborious (although not in reality for the faculty at NECC), it gets at authentic student learning MUCH BETTER than a standardized test. The DHE is willing to give this approach a shot and we should help make it work!"

As indicated above, the VALUE rubrics that will be used by faculty raters for the state project are attached for your perusal, but you may find the attached *Guide* helpful in determining your ability to provide student products. Note: The Quantitative Literacy VALUE rubric will also be used for our local assessment.

If you have questions about this process, please feel free to contact the Project Team Leader, Ellen Wentland ([ewentland@necc.mass.edu](mailto:ewentland@necc.mass.edu)) or the campus Task Force Representative, Suzanne Van Wert ([svanwert@necc.mass.edu](mailto:svanwert@necc.mass.edu)).

Thank you very much.

William Heineman  
Vice President of Academic Affairs

Ellen Wentland  
Associate Dean of Academic and Institutional Effectiveness

Suzanne VanWert  
Professor of English

## APPENDIX 5

February 2013

Dear Colleague;

In our February 5<sup>th</sup> email, we explained that, this spring, NECC is conducting two projects:

- our local institutional assessment of **Quantitative Literacy** (also known as Quantitative Reasoning), and
- the state pilot study of **Written Communication, Critical Thinking and Quantitative Literacy**.

For both projects, we have identified students who have earned between *45 and 60* credit hours as of the first day of the spring semester 2013. One or more of your classes has been identified as having one or more of these students.

**Are you giving an assignment that addresses *at least in part* one or more of the three competencies noted above?**

For help with this question, please see the assignment guide sent in your February 5 email. The VALUE rubrics for these learning outcomes were also attached to your February 5 email, again, to help you determine whether your assignment(s) address(es) any or all of the criteria included in the rubrics. **If so, we are asking for your willingness to share with us student work from the assignment(s).**

**For the state project, we need to collect student products by March 15. For our own NECC assessment, however, we can collect QR products until the end of the spring term.**

At this time, **we are just asking if you have any appropriate assignments**, and are willing to share your student products. **Collection for our assessment and for the state project will not be done until you say the products are ready.**

In the table below, you will see the class(es) identified for you. **Please hit “REPLY” and then for each class listed, please provide the information requested in the table.**

<b>INSTRUCTOR NAME:</b>		
		<b>CLASS</b>
		<b>CRN =</b>
<b>YES, I HAVE THESE ASSIGNMENTS TO SHARE:</b>		
	<b>CRITICAL THINKING:</b> To be collected by <b>March 15</b>	
	<b>WRITING:</b> To be collected by <b>March 15</b>	
	<b>QUANTITATIVE LITERACY:</b> To be collected by <b>March 15</b>	
	<b>QUANTITATIVE LITERACY:</b> To be collected by <b>end of spring 2013 semester</b>	
	<b>Date assignment will be collected</b>	
<b>NO, I DO NOT HAVE ASSIGNMENTS TO SHARE</b>		

***For tracking purposes, we ask that you **REPLY** by Friday, February 22*** even if you are not giving any competency focused assignments.

If you have any questions, please contact the project leaders, Ellen Wentland, at [ewentland@necc.mass.edu](mailto:ewentland@necc.mass.edu) or Suzanne VanWert at [svanwert@necc.mass.edu](mailto:svanwert@necc.mass.edu).

*Thank you very much for your cooperation and support of these projects!*

## APPENDIX 6

March 26, 2013

Dear Colleague:

First, we want to thank those of you who forwarded Writing, Critical Thinking, and Quantitative Reasoning products for the state pilot study which ended on March 15th. NECC is a leader in institutional assessment among our sister schools, and we are proud that, with your help, we were able to make an ample contribution to the study.

As you know, this spring NECC is also conducting our institutional-level outcomes assessment of Quantitative Reasoning - QR. **Some of you have already responded that you will have QR student products at the end of the spring term.** Please use this email to affirm that response.

For those of you who haven't yet responded, please do so, because we need your help! **We cannot successfully evaluate our students' QR skills without your help in submitting student products.**

For this project, we have identified students who have earned between *45 and 60* credit hours at NECC. **One or more of your classes has been identified as having one or more of these students.**

**Are you giving an assignment that addresses QR *at least in part*? Do you ask students to do one or more of the following in their assignments?**

1. *Decipher and explain information presented in mathematical forms such as graphs, diagrams, or tables.*
2. *Convert relevant information into various mathematical forms such as equations, graphs, diagrams, or tables.*
3. *Successfully perform calculations required to solve a given problem.*
4. *Use quantitative information to support assertions and/or to solve real world problems.*
5. *Interpret and evaluate statistical data or other quantitative data.*
6. *Write a report or document presenting data appropriately.*

At this time, we are just asking if you have any appropriate assignments and are willing to share your student products. **Collection for this assessment will not be done until the end of the spring term.**

The table below shows the class(es) identified for you. **Please hit "REPLY", and then for each class listed, provide the information requested in the table by putting an "X" in the appropriate box.**

<b>INSTRUCTOR NAME:</b>		
	<b>CLASSES</b>	
	<b>CRN =</b>	<b>CRN =</b>
<b>YES, I have QR assignments to share</b> by the end of the spring 2013 term		
<b>NO, I will not have QR assignments to share</b> by the end of the spring 2013 term		

*For tracking purposes, we ask that you **REPLY** by Friday, April 5 even if you are not giving any QR assignments.*

If you have any questions, please contact Suzanne VanWert at [svanwert@necc.mass.edu](mailto:svanwert@necc.mass.edu) or Ellen Wentland, at [ewentland@necc.mass.edu](mailto:ewentland@necc.mass.edu).

*Thank you for your cooperation and support of our institutional-level assessment project!*



## APPENDIX 7

April 1, 2013

Dear Colleague,

We are delighted that you are willing to participate in this semester's assessment of Quantitative Reasoning!

The next step in this process is to inform students that they have the right to exclude their project from the institutional assessment process. Attached to this e-mail, you will find an electronic copy of a note which explains this option. This information should be provided to ***all*** students (even though we won't be asking you for papers from all of them) and may be done at any time before collecting papers.

You may forward the note to students via e-mail, or if you prefer, you may distribute paper copies of the note. If you would like help making copies of the student note, you may phone (x3725) or email Perry Lara ([plara@necc.mass.edu](mailto:plara@necc.mass.edu)), and she will arrange to get you copies.

Please let us know what date you will be collecting the assignments, so we can provide the student names to you in advance of that date. We will arrange to pick up the ones we need. At that time, you can let us know which of your students, if any, have declined. In the meantime, please don't hesitate to contact us with any questions.

Once again, thank you –

Ellen and Suzanne

## **APPENDIX 8**

April 26, 2013

I'm contacting you in regards to this semester's institutional assessment of quantitative reasoning. Can you please let me know if you will still have student assignments available for the assessment and when they will be available for pick-up?

Thanks so much for all your help!

## **APPENDIX 9**

June 3, 2013: Feedback from spring 2013 raters of Quantitative Reasoning products

### **RATER 1**

1. Scoring sessions are an excellent form of staff development. The scorers (if they have the right mindset) have the opportunity to learn so much from the rubrics, from the variety of assignments offered from different disciplines, and from the discussion/feedback from their colleagues. Once the scoring session is over, it is a chance to look back on your practice as an educator and re-assess what works well and what could be improved in your classroom instruction and assignments. This provides an excellent opportunity to partner with professional development activities in the future at NECC.
2. Answer keys should be provided for Quantitative Literacy assignments.
3. Faculty should receive training on the rubric and reminded that this is not a grading activity but an assessment activity. There is a difference.
4. I would suggest that we think about removing the headings and just having numbers on our rubric like they do at the state level. When you look at the headings, you can catch yourself scoring rather than assessing. It is the content in each cell that is more important.
5. I would also suggest that each scorer has a type of "crib sheet" available to help them stay focused on assessing rather than grading, reminding them to focus on "habits of mind" and all the key phrases within the cells. Additionally, it would help to keep scorers focused on "not able to rate" versus a 1 or a 2. A lot of this process depends on what the professor assigned; for example, calculation or no calculation.

### **RATER 2**

Here are my recommendations:

1. Participants must provide an answer key for each submitted project
2. Faculty should familiar themselves with rubric (important)
3. Student's project should be built according to the rubric (leading questions need to be good, deep and detail oriented)
4. Questions on the project should be writing according to the rubric (emphasizing critical thinking)
5. The rubric is the key for good project/rating; we should provide some training / workshop for faculty interested.

### **RATER 3**

1. Rubrics given at the first meeting instead of latter meetings.
2. Answer key supplied for each project- many reviewers can be outside the discipline and would need a guide to better rate the projects.

3. Faculty workshops on using the rubrics - normalizing sessions
4. Interested faculty will have to incorporate/revise syllabi to include QR core skills, as well as teach and encourage QR skills in their course.
5. When developing class projects, the student questions should be clear and concise. This will help with student responses and the ability to support their assumptions and improve their communication skills.