

General Education Competency Assessment Results, 2018

Quantitative Literacy and Written Communication

November 27, 2018

Overview: General Education Competency assessment data were collected during the 2017-2018 year and fall 2018 term for **Quantitative Literacy** and **Written Communication**. Assessments were administered to incoming First Years and graduating Seniors.

Quantitative Literacy

Faculty Champion: Dr. Justin Post, Department of Statistics, jpost2@ncsu.edu

Definition (AAC&U definition adapted by NCSU faculty): Competency and comfort in working with numerical data. Individuals with strong quantitative literacy 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, and mathematical equations, etc., as appropriate).

Instrument:

- The *HEIghten Quantitative Literacy Assessment* from Educational Testing Services¹
 - 25 questions (multiple choice, numeric entry, fraction entry)
 - 45-minutes, timed and proctored
- Content areas include:
 - **Number & Operations**
 - **Algebra**
 - **Geometry & Measurement**
 - **Probability & Statistics**

Sample:

- **First Years** were recruited through First Year-only sections of HES courses;²
- All graduating **Seniors** were recruited through emails, digital signage, and faculty partnerships.

Scoring:

- The Office of Assessment worked with ETS to develop a report providing detailed information at the content and problem solving skills levels.
- To measure effort, students completed the Student Opinion Survey (Thelk, Sundre, Horst, & Finney, 2009).³ Only students who indicated neutral or positive effort were included in the analysis.

Key Findings:**Overall**

- A higher percentage of Seniors (55%) scored "Advanced" proficiency than First Years (46%).

Content Areas

- Overall, First Years and Seniors had highest percent correct responses in **Geometry and Numbers and Operations**; room for improvement in **Algebra and Probability & Statistics**.

¹ Information on the validity and reliability of the instrument can be obtained through the Office of Assessment.

² Special thanks to the Department of Health and Exercise Studies and DELTA Testing Services for the significant role they continue to play in supporting General Education Competency assessment.

³ Thelk, Amy & Sundre, Donna & Horst, Sonia & J Finney, Sara. (2009). Motivation Matters: Using the Student Opinion Scale to Make Valid Inferences About Student Performance. *Journal of General Education*. 58. 129-151. 10.1353/jge.0.0047.

Subscales of Content Areas

- **Algebra**
 - First Years had higher percent correct than Seniors in subskill area **Function, types, & properties**.
 - Overall percent correct for First Years and Seniors across **Algebra** subskills was between 53-66%.
- **Geometry & Measurement**
 - Roughly equivalent performance between First Years and Seniors
 - Overall % correct for First Years and Seniors across **Geometry** subskills between 69-91%.
- **Number & Operations**
 - This content area had the highest percent correct in subskills for both First Years and Seniors
 - Seniors strongly outperform First Years in 4/5 subskill areas
- **Statistics, Probability, Data Interpretation**
 - Roughly equivalent performance between First Years and Seniors
 - **Basic probability** lowest percent correct of any subskill of any Content Area for *both* First Years and Seniors (~55% correct for both groups)
 - **Data interpretation & representation** had highest % correct of any subskill of any Content Area for *both* First Years and Seniors (~85% correct for both groups)
- **Problem Solving Skills:**
 - Lowest to highest scoring Problem Solving Skills:
 - Strategic Knowledge & Reasoning
 - Modeling
 - Interpretation
 - Communication

Results:

Table 1. Quantitative Literacy Proficiency Classifications by Class Status and Content Area, 2018.

HElghten Quantitative Literacy Assessment: Proficiency Levels by Class Status				
Proficiency Level (Holistic Score)	First Years		Seniors	
	N	%	N	%
Developing	7	1.9	8	1.6
Proficient	192	52.3	215	43.2
Advanced	168	45.8	275	55.2
Total	367	100.0	498	100.0

Table 2. Percent of Questions Answered Correctly by Class Status and Content Area Subskill, 2018.

HElghten Quantitative Literacy Assessment						
Content Subskill	First Years			Seniors		
	Total Test Takers	Count Correct	Percent Correct	Total Test Takers	Count Correct	Percent Correct
Content Area: Algebra						
Equations, inequalities	841	514	61.12	1,125	710	63.11
Functions, types and properties	353	233	66.01	496	309	62.30
Variables, algebraic expressions	725	389	53.66	994	572	57.55
Total	1,919	1,136	59.20	2,615	1,591	60.84
Content Area: Geometry & Measurement						
Geometric figure measurements	1278	892	69.80	1,746	1,215	69.59
Geometric figures in one, two, and three dimensions	185	169	91.35	246	221	89.84
Units and systems of measurement	468	357	76.28	619	489	79.00
Total	1,931	1,418	73.43	2,611	1,925	73.73
Content Area: Number & Operations						
Arithmetic operations on real numbers	832	693	83.29	1,123	954	84.95
Financial Mathematics	805	545	67.70	1,117	852	76.28
Proportional reasoning	1,199	846	70.56	1,611	1,223	75.92
Real numbers, order properties, and physical quantities	280	221	78.56	379	296	78.10
Total	3,116	2,305	73.97	4,230	3,325	78.61
Content Area: Statistics, Probability & Data Interpretation						
Basic probability	809	450	55.62	1,119	619	55.32
Data interpretation and representation	559	470	84.08	750	642	85.60
Descriptive statistics	841	548	65.16	1,125	729	64.80
Total	2,209	1,468	66.46	2,994	1,990	66.47

Table 3. Percent of Questions Answered Correctly by Class Status and Problem Solving Skill, 2018.

HElghten Quantitative Literacy Assessment						
Problem Solving Skill	First Years			Seniors		
	Total Test Takers	Count Correct	Percent Correct	Total Test Takers	Count Correct	Percent Correct
Strategic Knowledge & Reasoning	3,025	1,998	66.05	4,109	2,792	67.95
Modeling	3,130	2,117	67.64	4,232	2,976	70.32
Interpretation	2,653	1,907	71.88	3,611	2,632	72.89
Communication	367	305	83.11	498	431	86.55

Written Communication

Faculty Champion: Dr. Casie Fedukovich, Director of First Year Writing, cjfeduko@ncsu.edu

Definition: Written communication is the purposeful development, expression, and revision of ideas in writing for specific audiences. Effective written communication follows appropriate genre conventions and may include a combination of text and other media. Written communication abilities develop through multiple and sustained experiences across the GEP. ENG 101 provides a foundation for written communication. It is expected that the communication-in-the-major co-requisite provides additional support to build upon that foundation.

Instrument:

- Locally developed instrument (by team of diverse NCSU faculty led by Dr. Chris Anson)
- Scenario-based assessment based on a common prompt
- Supplemental resources are provided to students to aid in the drafting of their response
- Students submit a first draft, second draft, and reflection online
- The assessment is untimed, takes roughly 1-1.5 hours to complete

Sample:

- **First Years** were recruited through faculty partners teaching fall 2018 sections of ENG 101.⁴
- **All graduating Seniors** were recruited through emails, and through faculty partnerships. Seniors completed the assessment in spring 2018.

Scoring:

- Final drafts were scored by NC State faculty from the Department of English with a common rubric after receiving training on using the rubric through norming sessions.
- Rubric dimensions include:
 - **Context of and Purpose for Writing**
 - **Genre and Task Conventions**
 - **Sources and Evidence**
 - **Student's Position (perspective, thesis/hypothesis)**
- To measure effort, students completed the Student Opinion Survey (Thelk, Sundre, Horst, & Finney, 2009). Only students who indicated neutral or positive effort were included in the analysis.

Key Findings:

- Minimal difference in First Years and Senior mean scores except in the dimension "Genre & Task Conventions."
 - Seniors received a higher percentage of 3s and 4s in all rubric dimensions except "Genre & Task Conventions."
- Senior and First Years mean scores are highest in the same rubric dimensions: "Content of & Purpose for Writing" and "Student's Position."
- Senior and First Years mean scores are lowest in the same rubric dimensions: "Sources & Evidence" and "Genre & Task Conventions."

Results:

⁴ Special thanks to our faculty partners in English 101 who administered the assessment to their students and scored final drafts.

Table 4. Mean Scores by Rubric Dimension and Class Status, 2018.

Written Communication Assessment						
Dimension	Min Possible	Max Possible	First Years N=137		Seniors N=170	
			Mean	Std. Dev	Mean	Std. Dev
Context of and Purpose for Writing	1	4	2.65	0.721	2.66	0.683
Genre & Task Conventions	1	4	2.58	0.79	2.44	0.782
Sources & Evidence	1	4	2.46	0.78	2.49	0.823
Student's Position	1	4	2.64	0.686	2.65	0.763
Holistic Score	1	4	2.58	0.747	2.56	0.768

Table 5. Frequency of Rubric Scores by Dimension and Class Status, 2018.

Written Communication Assessment				
Rubric Score	First Years N = 274*		Seniors N=340*	
	N	%	N	%
Context of & Purpose for Writing	Mean = 2.65		Mean = 2.66	
Rubric Score= 1	13	4.7	12	3.5
Rubric Score= 2	112	40.9	140	41.2
Rubric Score= 3	106	38.7	140	41.2
Rubric Score= 4	43	15.7	48	14.1
Genre & Task Conventions**	Mean = 2.58		Mean = 2.44	
Rubric Score= 1	25	9.1	42	12.4
Rubric Score= 2	108	39.4	142	41.8
Rubric Score= 3	97	35.4	119	35.0
Rubric Score= 4	44	16.1	37	10.9
Sources & Evidence	Mean = 2.46		Mean = 2.49	
Rubric Score= 1	31	11.3	48	14.1
Rubric Score= 2	121	44.2	119	35.0
Rubric Score= 3	88	32.1	130	38.2
Rubric Score= 4	34	12.4	43	12.6
Student's Position	Mean = 2.64		Mean = 2.65	
Rubric Score= 1	5	1.8	26	7.6
Rubric Score= 2	129	47.1	121	35.6
Rubric Score= 3	99	36.1	139	40.9
Rubric Score= 4	41	15.0	54	15.9

*Note: Each student artifact was scored twice.

**Note: There is a statistically significant difference between First Years and Seniors mean scores in the dimension "Genre & Task Conventions" at 0.05.

APPENDIX

Appendix 1. Abbreviated Proficiency Classification Descriptions, HEIghten Quantitative Literacy Assessment.

Proficiency Classification Descriptions	
Proficiency Classification	A typical student at this proficiency level may:
Developing	<ul style="list-style-type: none">• Reason through single-step word problems• Recognize basic algebraic techniques and Euclidean geometry facts• Perform four basic operations with integers• Interpret simple quantitative relationships• Identify that terminology/notation are needed to communicate results
Proficient	<ul style="list-style-type: none">• Reason through simple multi-step word problems• Apply solution strategies to a particular context• Use basic algebra & Euclidean geometry facts• Compute basic percents and positive percent change• Perform the four basic operations with integers and decimals• Interpret simple quantitative relationships and some complex data representations• Recognize correct terminology/notation for communicating results
Advanced	<ul style="list-style-type: none">• Reason through complex multi-step word problems• Apply solution strategies to a variety of contexts• Use and understand algebra & Euclidean geometry facts• Compute and interpret percents and percent change• Perform four basic operations with integers, decimals, and fractions• Interpret complex quantitative relationships and data representations• Use correct terminology/notation for communicating results

Appendix 2. Description of Content Areas, HEIghten Quantitative Literacy Assessment.

HEIghten Quantitative Literacy Assessment	
Content Area	Description
Number & Operations	<ul style="list-style-type: none">•Real numbers, order properties, and physical quantities•Arithmetic operations on real numbers•Estimation•Proportional reasoning•Financial mathematics
Algebra	<ul style="list-style-type: none">•Variables, algebraic expressions, and their use in representing quantities•Function, their types and properties, and their use in solving problems•Equations, inequalities, and their use in solving problems
Geometry & Measurement	<ul style="list-style-type: none">•Geometric figures in one, two, and three dimensions•Geometric figure measurements (e.g., area, distance, length, volume, angles) for solving a problem•Units and systems of measurement
Statistics & Probability	<ul style="list-style-type: none">•Data interpretation and representation•Descriptive statistics•Basic probability

Appendix 3. Written Communication and Critical Thinking Rubric and Outcomes

	4	3	2	1
Context of and Purpose for Writing <i>Includes considerations of audience, purpose, and the circumstances surrounding the writing task(s).</i>	Demonstrates a thorough understanding of context, audience, and purpose that is responsive to the assigned task(s) and focuses all elements of the work. Issue/problem to be considered critically is stated clearly and described comprehensively, delivering all relevant information necessary for full understanding.	Demonstrates adequate consideration of context, audience, and purpose and a clear focus on the assigned task(s) (e.g., the task aligns with audience, purpose, and context). Issue/problem to be considered critically is stated, described, and clarified so that understanding is not seriously impeded by omissions.	Demonstrates minimal attention to context, audience, purpose, and to the assigned tasks(s) (e.g., expectation of instructor or self as audience). Issue/problem to be considered critically is stated without clarification or description.	Demonstrates general incoherence: purpose and focus are not clear or are inappropriate for audience and task.
Genre and Task Conventions <i>Formal and informal rules inherent in the expectations for writing in particular forms</i>	Demonstrates detailed attention to and successful execution of a range of conventions particular to the writing task(s), including organization, content, presentation, formatting, and stylistic choices.	Demonstrates consistent use of important conventions particular to the writing task(s), including organization, content, presentation, and stylistic choices.	Attempts to use a consistent system for basic organization and presentation. (May ignore adaptations to the writing task(s).)	No discernible pattern of organization is apparent.
Sources and Evidence	Demonstrates consistent use of relevant sources to support ideas that are situated within the rhetorical context. Information is taken from source(s) with enough interpretation/evaluation to develop a coherent analysis or synthesis. Viewpoints from sources are subject to questioning.	Demonstrates an attempt to use relevant sources to support ideas that are appropriate for the rhetorical context. Information is taken from source(s) with some interpretation/evaluation, but not enough to develop a coherent analysis or synthesis. Viewpoints from sources are taken as mostly fact, with little questioning.	Demonstrates an attempt to use sources to support ideas in the writing. Information is taken from source(s) without any interpretation/evaluation. Viewpoints from sources are taken as fact, without question.	Too little information is given to achieve the writer's purpose, or the writing is a jumble of facts which do not support a single purpose or thesis.
Student's position (perspective, thesis/hypothesis)	Specific position (perspective, thesis/hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/hypothesis) are acknowledged. Others' points of view are synthesized within position (perspective, thesis/hypothesis).	Specific position (perspective, thesis/hypothesis) takes into account the complexities of an issue. Others' points of view are acknowledged within position (perspective, thesis/hypothesis).	Specific position (perspective, thesis/hypothesis) is stated, but is simplistic and obvious.	Specific position is not clear; writing launches into another subject or purpose unrelated to the task.