Numeracy among Under Represented Minorities in Community College Education

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Abstract

Numeracy is the ability to understand and interpret numbers. The numeracy skills are required and relevant across all disciplines and especially in STEM majors. The diverse group of underrepresented students from two-year community college was assessed on the knowledge of basic units of measurement and unit conversions in this study. The student performance was assessed in a lesson plan administered during The Numeracy Infusion for College Educators (NICE) Program at Bronx Community College. The students were assessed to identify different units; to be able to perform basic unit conversions; to recognize the scale of bigger and smaller units; and associated vocabulary. The learning goals aimed at developing thinking skills in reading graphs, trends or patterns and develop a habit of comparing the values of measurement in one unit system to another system of units. The students were provided tools to remember the increasing and decreasing trends in the scale of units. The real-life examples were incorporated into the learning process. The assessment was administered at different stages of learning in this lesson plan. This study will present the assessment results of lesson plan administered to a diverse group of underrepresented students from various majors in community college education. The student performance assessment in this lesson plan highlights the urgency to incorporate tools and techniques for numeracy skills across the curriculum in various disciplines of higher education.

ED41C-1122 Numeracy among Under Represented Minorities in Community College Education
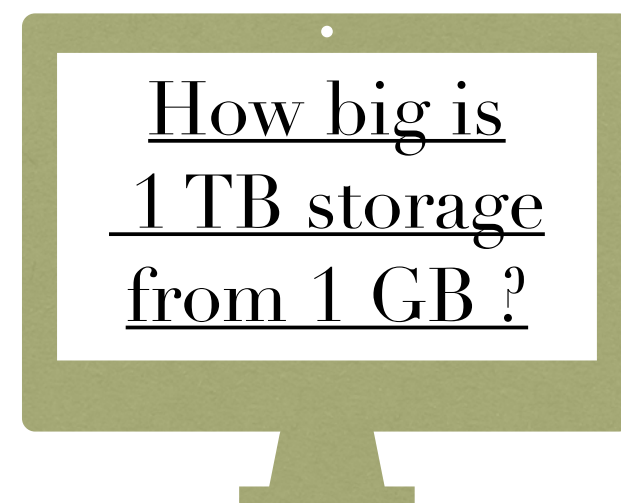
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"Numeracy" refer to "the ability to understand and use numbers and data in everyday life" (Madison 2003, 3).

Numeracy around us in 21st century

How small is 32 MB storage from 64 GB ?

How big is 1 TB storage from 1 GB ?

Why Numeracy is important in Geosciences?

Knowledge and Conceptual understanding:

Identify representation of mathematical numbers and associated vocabulary, and representation of a number in a scientific notation.

Thinking and other skills:

To develop Quantitative literacy (QL) and Quantitative Reasoning (QR) skills by recognizing the scale of bigger and smaller units in metric system such as kilo (10^3), milli (10^{-3}), million (10^6), billion (10^9), micro (10^{-6}), and nano (10^{-9}) to develop thinking skills in reading graphs, trends or patterns to understand the data.

Attitude, value, disposition and habits of mind:

To develop a habit of comparing the values of measurements in different metric units.

Numeracy instruction infused in introductory level science courses in AAS degree.

Units conversion in measurements

King	Henry	Died	Unusually	Drinking	Chocolate	Milk
Kilo	**Hecto**	**Deca**	***Unit***	**Deci**	**Centi**	**Milli**
$10 \times 10 \times 10$	10×10	10	**Meter** (length)	10	10×10	$10 \times 10 \times 10$
LARGER than a unit	LARGER than a unit	LARGER than a unit	**Gram** (mass/weight)	SMALLER than a unit	SMALLER than a unit	SMALLER than a unit
1 kilo = 1,000 units	1 hecto = 100 units	1 deca = 10 units	**Liter** (Liquid Volume)	10 deci = 1 unit	100 centi = 1 unit	1,000 milli= 1 unit

King Henry Died Unexpectedly Drinking Chocolate Milk. (n.d.) *TheFreeDictionary.com.* (2019).

➔ **MULTIPLY numbers by 10 if you are getting smaller**

⬅ **DIVIDE numbers by 10 if you are getting bigger**

Quantitative Literacy (QL):
Identify scale in metric system of units

Prefix	In words	Multiply by	Factor
nano (n)	Billionth	1/1000,000,000	1×10^{-9}
micro (µ)	Millionth	1/1000,000	1×10^{-6}
milli (m)	Thousandth	1/1000	1×10^{-3}
centi (c)	Hundredth	1/100	1×10^{-2}
deci (d)	Tenth	1/10	1×10^{-1}
		1	
deca (da)	Ten	10	1×10^{1}
hecto (h)	Hundred	100	1×10^{2}
kilo (k)	Thousand	1000	1×10^{3}
mega (M)	Million	1,000,000	1×10^{6}
giga (G)	Billion	1,000,000,000	1×10^{9}

Assessment Questions

Assessment question 1 : Convert 4.5 m to cm.

Assessment question 2 : Convert 3.25 g to kg.

Assessment Question 3: Convert 5gigameters (Gm) to meters.

Assessment Question 4: Convert 6micrometers (µm) to meters.

Assessment Question 5: Convert 11 light year (ly) to Km.

Assessment Question 6: Convert 9.4×10^6 Km to light year (ly).

Assessment Question 7: The final assessment will evaluate if students can arrange the following lengths in the correct order from smallest to the largest estimated distance/length.

- Distance between Chicago and New York
- The distance to the nearest star (Proxima Centuri)
- The distance between Bronx Community College and Brooklyn Bridge.
- Distance from Roscoe Brown Center to Library within Bronx Community College
- Length of wine glass

Units Conversion Assessment

	1	2	3	4	5	6	7
incomplete unit conversion	31	19	13	19	44	50	0
complete unit conversion	69	81	88	81	56	50	100

% age of responses — Assessment Questions

Sample Size = 16 students in AST 111 course

Fig 1: The % age of responses provided by students after the lesson plan was administered to 16 students in AST 111 course. The dark green is % of complete and correct unit conversion responses. The light green is % of incomplete response to a question.

Conclusion

There is need to bring the basic maths operations using the higher (million, billion etc.) and lower scales (nano, micro) in community college curriculum. The unit conversions and correct unit representation in basic measurements such as distance, mass, time, etc. needs to be reviewed in community college education at the entry level.

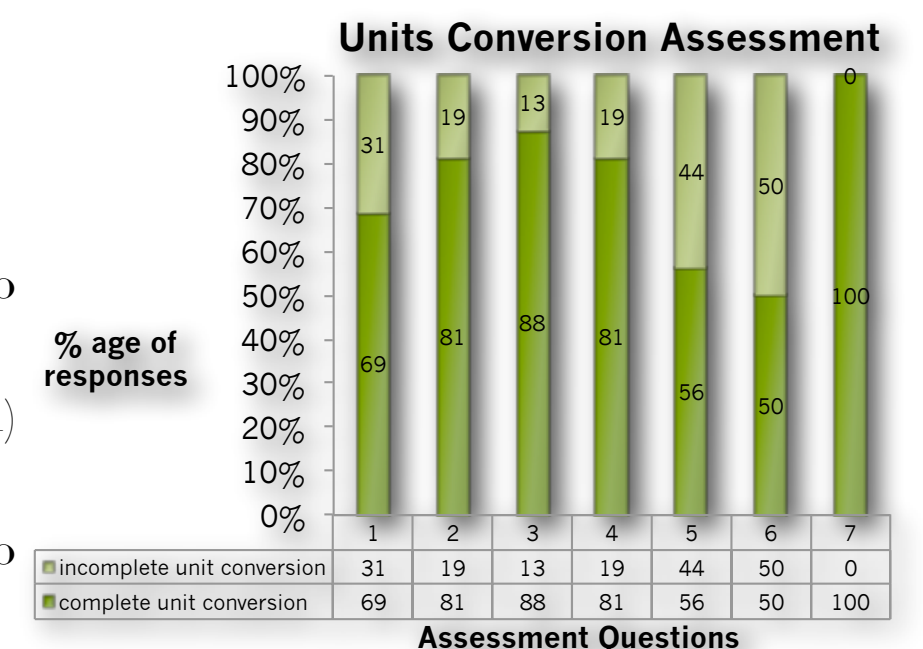### Bronx Community College Fact Sheet-Spring 2018

Total headcount enrollment 10,477

Latino/Hispanic 6,365 61% ,   Black, Non-Hispanic 3,455 33% , White, NonHispanic 227 2% ,   Asian/Pacific Islander 403 4% American Indian 27 0%

Source: CUNY OIRA Institutional Research Database (IRDB)

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