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 × 10 × 10 LARGER than a unit 1 kilo = 1,000 units	10 × 10 LARGER than a unit 1 hecto = 100 units	10 LARGER than a unit 1 deca = 10 units	**Meter** (length) **Gram** (mass/weigh t) **Liter** (Liquid Volume)	10 SMALLER than a unit 10 deci = 1 unit	10 × 10 SMALLER than a unit 100 centi = 1 unit	10 × 10 × 10 SMALLER than a 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	1000,000	$1*10^{6}$
giga (G)	Billion	1000,000,000	$1*10^{9}$

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.

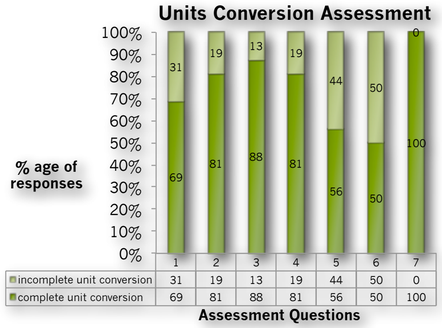
- Distance between Chicago and New York
- The distance to the nearest star (Proxima Centuri)
- The distance between Bronx Community College and Brooklyn Bridge.
- Distance from Roscoe Brown Center to Library within Bronx Community College
- Length of wine glass

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)



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.

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