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KEEPING EDUCATION IN PERSPECTIVE - USING THE HOSTOS GENERAL CORE COMPETENCIES TO PROMOTE REFLECTION ABOUT THE PURPOSE OF EDUCATION

The beauty and diverse benefits of studying mathematics is captured in the following excerpt by Prof. Jung Hang Lee, who joined the Mathematics Department at Hostos Community College in the Fall of 2018:

It might not be everyone's dream to become a great mathematician, but strong mathematical knowledge is an essential skill in stretching one's mind toward full capacity. Pursuit of a pure academic curiosity might reward one's heart and mind with overflowing satisfaction. Yet, it also must have some very delightful byproducts, such as innovative minds, acute reasoning and unimaginable imaginations.

Between the lines of numbers and formulas, young minds will begin their journey to search for a logical world. By attempting to understand and apply, the minds of men and women will grow beyond their understanding. This is the true secret and joy of mathematics and its educators.

Logic will fly to the moon and explore the universe and beyond. Formulas will build the bridges not only between both sides of a river, but also between dreams and realities. Innovative minds will lead the way and conquer the unknown, and eventually overcome their limitation and more. Numbers are not just numbers; they will be solutions for many.

One might teach mathematics, but many will learn more.

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I have observed a common denominator among my students: a sincere desire to understand, and in many cases a skepticism about the relevance and importance of mathematics in their lives, academics, and professional endeavors. "When will I use this in real life?" "Why do I need to take this class? It is not even part of my major", "I just need a C." These are some of the questions that inspired the creation of the Annual Mathematics Day @ Hostos Community College three years ago. Since then, Mathematics Day has been very successful in allowing students to explore mathematics within different disciplines and in providing answers to these types of questions.

There is plenty of research that indicates that the study of mathematics positively affects the expansion of the human intellect and its capacities. Making this information and understanding part of students' academic lives would promote their interest in the subject, enhancing their motivation to do the work required to learn the subject. While educators and researchers are well aware of the benefits of studying mathematics, the academic conversation on mathematics

with students, in early stages of their higher education, appears to be limited to explaining/understanding its principles, procedures, and applications. This situation narrows students' perception of the importance of studying mathematics.

Evidence of this can be found upon further examination of the questions formulated by the students. On one hand, students want to know the practical applications of information acquired in the classroom; "When will I use this in real life?" "Why do I need to take this class? It is not even part of my major." On the other hand, statements such as, "I just need a C" may be translated into "I just need to get this class out of the way." This reveals that there is a lack of a deeper and more fundamental understanding, the understanding of the importance and relevance of studying mathematics independent of the practical applications of mathematics in a chosen field of study and independent of whether one enjoys the subject or not. That is, "How does learning mathematics contribute towards one's general education?"

I have been asked to look into the Hostos General Education Core Competencies (Gen.Ed.C.C)[1] many times, mostly in meetings about assessment and in General Education Committee meetings. Reading the Gen.Ed.C.C. motivates me to reflect on the value of my teaching and contribution to students' lives when I teach a mathematics or an engineering class, and on the added value of activities in class that help students accomplish much more than gaining knowledge in the subject. For instance, group work in a mathematics class is an optimal opportunity for students to "Exhibit an appreciation, understanding, acceptance and respect for human differences"(Gen.Ed.C.C.-D2) [1] while "Utilizing deductive and inductive reasoning skills with special emphasis on problem-solving, analysis and clarity of understanding" (Gen.Ed.C.C.-A1) [1]. This could be a challenging situation at times given that in a mathematics class we find the same rich diversity that characterizes Hostos in every way. In addition to a multicultural setting, students find themselves interacting with individuals of all ages, different motivations to learn mathematics, and different levels of proficiency with the subject. In exercising patience and open-mindedness within a diverse learning group, students gain insight into conducting themselves as global citizens, a trait that is of great value in their everyday lives and in their future professional lives. Furthermore, students learn and experience mathematics as a universal language that transcends languages and cultures, and like Prof. Jung Hang Lee stated, a language that allows us "acute reasoning", "unimaginable imaginations" and bridges "between dreams and realities", greatly expanding their intellectual capacities.

I find the Gen.Ed.C.C to be a valuable document in promoting and guiding this reflection about education and the additional values, beyond the mathematical aspect, of the activities that I propose in class. The Hostos Gen.Ed.C.C is a document of high quality and meaningfulness, which I consider, can be used in academia to broaden understanding of the value of teaching and learning a particular subject. I too believe that to keep education in perspective, students, not just faculty, should also explore the understanding derived from reflecting on how the study of a subject can promote the Gen.Ed.C.C. in a person's life. Perhaps this is a way to broaden the academic conversation with our students about mathematics (and other subjects), and to decrease attitudes such as "I just need a C" while increasing attitudes of self-motivation to learn and of making education an essential part of growing as a human being for a lifetime (as opposed to just attaining a grade at a particular instance).

In my classes, on the first day, students receive the Hostos Gen.Ed.C.C. with the General Education Core Competencies Assessment Matrix shown in table1. Students are asked to score each of the Hostos Gen. Ed.C.C. from 1 to 5 depending on how much they think the class will promote each competency (1 if weakly or none, through 5 if strongly). Students are encouraged to

Table 1: General Education Core Competencies Assessment Matrix designed by Clara Nieto-Wire, Ph.D.

	Weak	Below Average	Average	Above Average	Strong	Total
A.1	1	2	3	4	5	
A.2	1	2	3	4	5	
A.3	1	2	3	4	5	
B.1	1	2	3	4	5	
B.2	1	2	3	4	5	
C.1	1	2	3	4	5	
C.2	1	2	3	4	5	
C.3	1	2	3	4	5	
C.4	1	2	3	4	5	
C.5	1	2	3	4	5	
D.1	1	2	3	4	5	
D.2	1	2	3	4	5	
D.3	1	2	3	4	5	
D.4	1	2	3	4	5	
D.5	1	2	3	4	5	
Total						

be honest and are ensured that their answers will not affect any grade. This activity is performed twice during the semester: on the first day of classes, before they have experienced the class, and towards the end of the semester (if time permits), to provide another opportunity of reflection after they have experienced the class.

I have been conducting this activity for the last four semesters in my mathematics and engineering classes. Students' responses are very diverse. Some score all of the competencies equally very high; others grade them all very weakly, while others relate the class strongly to only few competencies and weakly to most competencies. There are no right or wrong answers as they are a reflection of the students' views at a point in their academic journey; therefore it is not in my interest to report data trends at this time. The main observation from this activity is that it has been successful in promoting reflection among students about the importance of studying mathematics. The classroom becomes very quiet, and students seem concentrated while recording their scores. Also, students have a positive attitude towards the activity, and most of the times they request extra time to complete the activity. They never expect this type of activity in a mathematics or engineering class.

They find the Hostos Gen.Ed.C.C. interesting; some have reported having seen a few of the Hostos Gen.Ed.C.C in a syllabus from another class, and only two students have reported having seen the entire document with all Hostos Gen.Ed.C.C. Some students have even commented that they will keep the sheet listing the competencies to look at them again. This is an innovative activity for the first day of class that provides extra information about what the students think and their expectations (beyond subject content). This activity promotes students' reflection on the relation between class objectives and the greater (more global) educational objectives. Data collection and interpretation are simple for this activity. Finally, this activity takes only 10 minutes of one class time and provides students with an opportunity for a meaningful reflection on the purpose of education.

A last thought. Thinking at a greater scale outside the classroom, at the scale of the institution: Table 2 shows the enrollment breakdown by program [2] for Fall 2017, and the mathematics course requirement per program [3]. Out of the 29 programs, 8 programs have mathematics courses as part of their major requirements. Within the programs with mathematics courses as major requirements, 3 programs, Business Management, Community Health, and Forensic Science, have a single

mathematics course as a major requirement [3]. That is, students enrolled in these majors only need to take one mathematics course as a major requirement. Enrollment in these 3 programs accounted for 7.77% of the total student enrollment. Shaded entries in table 2 show the program requirements for STEM programs, which involve a series (sequence) of mathematics courses (about 5 courses). These STEM programs are Electrical Engineering, Civil Engineering, Mechanical Engineering, Mathematics, and Chemical Engineering. Enrollment in these 5 STEM programs accounted for 3.98%. Students enrolled in the remaining 21 programs (88.25%) where mathematics courses are not a major requirement, take mathematics courses as a general education course either as a required or flexible common core course, or as a major elective, in which case, it is not guaranteed that the mathematics elective course will be taken (even if it is a course of the major). These percentages do not change abruptly from term to term under "normal conditions" (no economic recessions, etc.) Hence, a reasonable assumption is that the current state of program enrollment, percentage wise, is not far from the state of enrollment per program from the fall 2017 term.

Students who take a mathematics course as a general education course, instead of as a major requirement are more likely to perceive a mathematics course as a course to "get out of the way." Could this mean that in

Table 2: Hostos Academic Programs: Enrollment and Mathematics Course Requirements - Fall 2017 Term [2,3]

Academic Programs	Common Core		Major		Enrollment	
	Req.	Flexible	Req.	Elect.		
1 A.A./Liberal Arts & Sci.	X			X	2,043	28.3%
2 Nursing	X				767	10.46%
3 Non-Degree					671	9.3%
4 Criminal Justice	X				511	7.1%
5 Early Childhood Educ.	X				443	6.1%
6 Dental Hygiene					437	6.1%
7 Business Mgmt.			X		419	5.8%
8 Radiologic Tech.	X				343	4.8%
9 A.S./Liberal Arts & Sci.	X	X		X	217	3.0%
10 Game Design	X				212	2.9%
11 Digital Design & Animation	X				156	2.2%
12 Community Health	X		X		109	1.5%
13 Accounting	X				108	1.5%
14 Accounting A.S.	X				93	1.3%
15 Electrical Engineering	X		X		89	1.2%
16 Office Technology	X				79	1.1%
17 L.P.N. (Cert.)					79	1.1%
18 Civil Engineering	X		X		74	1.0%
19 Digital Music	X				71	1.0%
20 Aging and Health Studies	X				53	0.7%
21 Mechanical Engineering Science	X		X		46	0.6%
22 Mathematics	X		X		46	0.6%
23 Public Administration	X				39	0.5%
24 Chemical Engineering	X		X		32	0.4%
25 Forensic Science	X		X		32	0.4%
26 Paralegal Studies	X				15	0.2%
27 Food Studies	X				11	0.2%
28 Forensic Accounting	X				7	0.1%
29 Police Science	X				6	0.1%
Total (Program requirement: 1 math course)					560 (~7.77%)	
Total (Program requirement: a series of math courses)					287 (~3.98%)	
Total					7,208	99.6%

our institution about 6,361 students (88.25%) out of 7,208 students may perceive a mathematics course as a course to “get out of the way”? Could it be that students have this attitude towards other subjects that are taken as general education courses as well? Could it be that these many students (6,361 out of 7,208) don't have a clear idea why a mathematics course is part of the list of courses he/she needs to take to graduate?

Understanding students' perception toward having to take general education courses becomes very important at the community college level where many students

need to take several remedial/developmental courses to fulfill one college level mathematics course that is presented as a general education course; many are first generation attending college; many are trying to decide what major to pursue; and many others need to work and provide for their families while attending college. No wonder why at times socioeconomic mobility through education is confused with simply obtaining grades and a diploma in the minimum amount of time. Perhaps the Hostos Gen. Ed.C.C. could provide to students a glimpse of the greater value of education and what the journey at Hostos could bring into their lives.

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About the Author

Dr. Clara Nieto-Wire received her Ph.D. in Electrical Engineering from the CUNY Graduate Center in May 2012, and her B.E in Electrical Engineering from the City College of New York, CUNY. She is an Assistant Professor in the Mathematics Department at Hostos Community College since Fall 2012 and currently she is the Mathematics Department Representative at the Hostos General Education Committee. Dr. Nieto-Wire taught at the Grove School of Engineering of The City College of New York for over three years and at City Tech before joining HCC. She has over nine years of experience teaching freshman through senior engineering classes, including theoretical, experimental, and computing applications, and over six years teaching mathematics including remedial through college level mathematics at Hostos Community College. Dr. Nieto-Wire's technical research interests include control systems with applications to aeronautics, robotics, and Artificial Intelligence. Dr. Nieto-Wire has developed several projects where she combines education theory with engineering/STEM undergraduate research at early stages to provide meaningful learning spaces within informal education frameworks for students who are interested in engineering and/or STEM fields in general. Her research interests in education also include metacognition for high performance in STEM education. Dr. Nieto-Wire is a recipient of the Alliances for Graduate Education and the Professoriate (AGEP) Fellowship, a CUNY President's MAGNET Fellowship for doctoral student, the LSAMP Bridge to the Doctorate Scholarship, and the Latino Honor Society Award in Mathematics.