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Language, Technology, and Engagement in the Haitian Classroom: An Interim Report on the MIT-Haiti Initiative

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Abstract: Since 2013 I have been traveling to Haiti as part of the "MIT-Haiti Initiative."[1] This initiative, led by Professor Michel DeGraff of the MIT Department of Linguistics and Philosophy, aims to encourage active learning strategies, enabled by technology when possible and appropriate, and strongly stresses the importance of the use of the one language spoken by all Haitians, namely Haitian Creole (or *Kreyòl*). To use a Haitian metaphor, these three components form the three stones on which the cook-pot of our educational approach rests. We have focused our attention on the higher education sector.

In this note I will begin with a review of the educational landscape that forms the background for our efforts. Then I will describe the work of the MIT-Haiti Initiative and some of the efforts undertaken in Haiti by participants in our workshops. I will discuss the mathematical material developed for these workshops and what we learned in leading them, and then describe the findings of a site visit to a campus of the State University of the Haiti. I will end by discussing how the typography of equity spelled out by Gutiérrez [10] applies in the Haitian educational setting.

1   The political and educational background

The Haitian educational landscape is both complex and resource constrained. Only around 15% of the K-12 education is funded by the government; the rest is either offered by small for-profit organizations or comes from charities of various sorts, mainly Protestant or Catholic religious institutions. This basically eliminates the possibility of governmental

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[1]Much of the material created under the auspices of this Initiative is collected on the website `https://haiti.mit.edu`. This website contains parallel English and *Kreyòl* pages.

accreditation of either institutions or teachers. There are also great disparities between urban and rural education, and, of course, between wealthier and poorer institutions. Overall, there is an enrollment rate of around 88% in primary school, 20% in secondary school, and 1% in university level study.[2] Many students from the elite high schools go abroad (to Dominican Republic, Canada, Mexico, Cuba, the US, and elsewhere) [6],[12, p. 4].

Issues of language play a critically important role in determining who receives an education in Haiti. Despite the fact that only 5% of the population speak French as a mother tongue (alongside *Kreyòl*), a great deal of Haitian education, even at the primary level, is conducted in French rather than in *Kreyòl*,[3] and high-stakes examinations are invariably written in French.[4] This is a major factor in the very low educational level in the country overall, and effectively disenfranchises the large majority of Haitian citizens. A *Kreyòl* expression for the French language is *lang achte* (the "bought language") whereas *Kreyòl* is considered *lang rasin* (the "language of roots") [2, p. 570].

Haitians place a high value on education. Any visitor to Port-au-Prince or other Haitian cities will notice the many storefronts offering instruction in computer technology, business, or English. School uniforms are the rule in elementary schools even in remote sections of the country. This very faith in the value of education somewhat paradoxically poses its own obstacles. Parents are not mistaken in their conviction that acquisition of French is a prerequisite for advancement in most professions in Haiti today. They see a very narrow window in which fluency in French can be acquired: Only a fifth of Haitian school children graduate into secondary school. This lends credibility to the argument that formal education, even at the elementary level, should be conducted in French; what could be better than an immersive experience for young children? Besides, the vast majority of available textbook material is published in French.

There are crippling flaws with this approach, however. The cognitive demands imposed by interpreting a language one is not fluent in compete and conflict with the process of learning subject matter. Most Haitian K-12 educators are not comfortable with the French language themselves. The textbooks in use exemplify French culture, not Haitian, and the references they contain are either meaningless to Haitian students or re-inforce a negative cultural self-image [16, p. 34], [7], [14]. Most critically, the use of a foreign language in the classroom discourages student creativity, especially since it is often coupled with

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[2]https://en.wikipedia.org/wiki/Education_in_Haiti

[3]It is hard to get accurate statistics on the predominance of the use of French in Haitian classrooms, partly because it varies widely from one school to another and from one instructor to another. Some relatively current insight can be gleaned from an entry in an "operational plan" [9] published by the Haitian Ministry of Education. Among the problems facing the Haitian educational system, there is a "pronounced imbalance in bilingualism (predominance throughout of the use of French, generally poorly mastered by teachers, over Creole)." Later, this document prescribes an "equilibrium" between French and Creole. Despite the neutral tone of this diagnosis, and unrealistic vision of the cure, the document has some revealing comments later on (p 43): "Finally, if the education system is not at the origin of the crisis of individual and collective identity, it contributes to at the least accentuating it, on the one hand, by [contributing to] the prevailing confusion as regards the use of Creole and French in education and, on the other hand, by promoting the knowledge of national history without making room for the beliefs and customs of the population. This set of findings …makes even more palpable a certain paradox in the analysis of the Haitian educational system, namely: it confers little use to individuals, but remains very socially relevant." (My translations.)

[4]…with the signal exception of the exams on *Kreyòl* itself!

an authoritarian and rote pedagogical style. We often heard it said that if the goal was understanding, the teacher would use *Kreyòl* ; if discipline was the aim, then French was the language of choice.

There are important Haitian examples of enlightened educational models in K-12 education. One, which is affiliated with the MIT-Haiti Initiative, is the Matènwa Community Learning Center,[5] MCLC, or, in *Kreyòl, Lekòl Komiotè Matènwa, LKM*. Its location on the island of Lagonav means that it serves a distinctly rural population. Founded in 1996, the school states that "Our mission is to be a democratic model of hands-on education that reflects the learning and growing possible in one's local environment. MCLC uses methodologies that have been tailored to their culture through experimentation, evaluation, and modifications, resulting in the present implementation of highly successful practices." Its associated Institute for Learning offers training in the methods they have developed. At this school, all education begins in *Kreyòl*, with French taught as a second language. A careful comparative study [3] shows substantially larger learning gains – in speed of reading and in comprehension – at MCLC than at traditional schools.

There has been a long succession of attempts to improve the educational system in Haiti.[6] A governmental initiative known as the "Bernard Reform" contained one of the first official recognitions of the importance of the use of *Kreyòl* in education. Promulgated in 1979 with effect intended for 1982, it was in part a genuine response to an ossified educational system and in part intended to shore up international support for the dictatorship of Jean-Claude "Baby Doc" Duvalier.[7] It ran into inevitable political obstacles and most of its provisions were never widely implemented; "Indeed, the different actors (ministry executives, school directors, teachers, parents and pupils) on which the process of setting up this educational reform should be based were not sufficiently imbued with the aims and contents of the new curriculum. This gave rise to the expression and organization of some very fierce resistance, particularly regarding the official integration of Creole into the curricula as a language of instruction and language to teach."[8, p. 81] (my translation).

Be that as it may, "the Bernard Reform was … the first attempt to develop a language policy for teaching in Haiti. According to the regulations established by this reform, it is essential that teaching 'be in a language that the child understands, in this case Creole.' " [8, p. 81] (my translation). The document continues: "The first and second cycle Creole communication program includes knowledge, skills, attitudes and habits that one wishes to develop in the child, particularly the ability to express oneself properly in one's mother tongue and to acquire the mental mechanisms that are at the base of all knowledge: to listen, to speak, to read and write. On the other hand, the recommendation is made for French to be taught as second language at the first and second cycles, with a focus on oral in the early years."

The higher education sector is no less complex. We quote from a study done soon after the 2010 earthquake. "While precise statistics are unavailable, it is clear that the pre-earthquake higher education system served only a tiny fraction of secondary school

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[5]https://www.matenwa.org
[6]For an excellent general history of Haiti, see [5].
[7]For accounts of the history of this reform see [1, 16, 11].

graduates. In 2007, the Ministry of National Education and Professional Formation (*MENFP*) reported the university population of Haiti was approximately 40,000 students. Of this number 28,000 (70%) were in public universities and 12,000 (30%) in private ones." [12, p. 4] "Before the January 12, 2010 earthquake, the Haitian system of higher education comprised at least 159 institutions .... This system was divided into disparate public and private sectors. The former consisted of a small network of 14 public, government-run institutions of higher education (*Instituts d'enseignement supérieur, IES*) including the State University of Haiti (*Université d'État d'Haïti, UEH*). The *UEH* has 18 campuses, of which 11 were located in the metropolitan area of Port-au-Prince, and 7 located outside the capital .... Besides the *UEH*, the public university sector also includes 13 *IES* either affiliated with or independent of *UEH*. In contrast, the private higher education sector consists of a vast array of 145 institutions of varying quality. Of the 145 private universities, 10 provide high quality, accredited education; of the remaining 135 (often religious-based institutions), 67% (97) do not have permission to operate from the governmental Agency of Higher Education and Scientific Research (*DESR*)." [12, p. 93].

The recognition of the central place of *Kreyòl* in Haitian society was strongly affirmed in the 1987 Constitution,[8] adopted during a period of military rule following the deposition of Jean-Claude Duvalier. It contains the following clauses:

> *Article 5*: All Haitians are united by a common language: Creole. Creole and French are the official languages of the Republic.

> *Article 40*: The State has the obligation to publicize in the oral, written and televised press in the Creole and French languages all laws, orders, decrees, international agreements, treaties, and conventions on everything affecting the national life, except for information concerning national security.

Though the 1987 Constitution was duly published in both *Kreyòl* and French, adherence to the requirements of Articles 5 and 40 over the past thirty years has been spotty at best. Even the amendments, in 2011, to the 1987 Constitution were written in French only, thus violating the very Constitution that was being amended!

2   The MIT-Haiti Initiative

The fact that elementary and secondary schools are often failing Haitian students in their choice of language and pedagogy cannot be used as an excuse for inaction in higher education. The MIT-Haiti Initiative set out to work with university level faculty, because this is our area of expertise. But in fact many university faculty members also teach in primary or secondary schools or in teaching colleges, so our work has had an impact at many educational levels.

A turning point in Haitian history occurred on January 12, 2010, in the form of a catastrophic earthquake. Centered near the capital, it killed hundreds of thousands of people and left large parts of the city in ruins. Most of the institutions of higher education

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[8]Translation by http://pdba.georgetown.edu/Constitutions/Haiti/haiti1987.html.

were located in Port-au-Prince and were heavily impacted both by destruction of physical infrastructure and human casualties. It is estimated [12, p. 137] that 90% of the higher education infrastructure in the capital was destroyed. The economic cost of this disaster was immense and long-lasting, and generated a great deal of international attention. While the failings of much of the international relief and rebuilding response are well-documented,[9] one of the more hopeful outcomes has been an upsurge in contributions to their homeland by the large Haitian diaspora, often by returning to Haiti to work. The increased awareness of the needs of the Haitian population was a precipitating factor in the creation of the MIT-Haiti Initiative.

2.1 Kickoff Symposium and NSF grant

The MIT-Haiti Institute was launched by a Symposium in Cambridge, MA, on October 21 and 22, 2010, nine months after the earthquake. Funded by MIT and the Port-au-Prince-based Foundation for Knowledge and Liberty, *FOKAL*, it brought a highly distinguished group of Haitian leaders, including a former prime minister, deans from the Faculty of Sciences at the University of Haiti, rectors or presidents from a number of private institutions, and high tech industry representatives, together with MIT educational leadership and faculty. Momentum was born, and based on ideas emerging from the Symposium Michel DeGraff along with then director of MIT's Office of Educational Innovation and Technology Vijay Kumar (now Associate Dean for Open Learning at MIT) applied for and won an NSF grant entitled INSPIRE: Kreyol-based Cyberlearning for a New Perspective on the Teaching of STEM in local Languages.[10] This grant has underwritten the bulk of the activities of the MIT-Haiti Initiative over the past six years.

2.2 Workshops

Over the life of this grant we conducted seven academic workshops – five in Port-au-Prince and two at the *Campus Henri Christophe de Limonade, CHCL*, a branch of the *UEH*, occupying a beautiful new campus in the north of the country near Cap-Haïtien.

Our approach has been to work with individual faculty members directly, rather than through institutional or governmental agencies. This reflects a realistic assessment of the historical effectiveness of reforms promulgated by these structures, as well as a faith in the enormous potential of human resources in the country. We required of our participants at least a Masters Degree or enrollment in a Masters Degree program, though we made some exceptions to that rule. A number of our participants had received PhDs from various institutions. Altogether we had over 250 participants from 146 institutions.

The seven workshops had the following enrollments [4, p. 142]:

	3/2012	1/2013	8/2013	3/2014	1/2015	8/2015	6/2016
Attendance	47	58	38	22	74	31	39
Returnees		8	29	13	22	8	20

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[9]See for example [13].

[10]https://kreyonomi.com/2018/08/31/derive/

Figure 1: Group photo of the MIT-Haiti Initiative Workshop at SHCL in August, 2015. Credit: Kendy Verilus.

One of our principal objectives was to contribute what we could to the formation of a community of educators with a common experience and approach. The high number of returning participants suggested that we have had some success in this. See Figure 1.

Our workshops followed a common pattern. They would last three or four days. We would typically open with a demonstration of an engaged classroom. As an example, Peter Dourmashkin, Senior Lecturer in the MIT Department of Physics, came with a bag of yoyos and handed them out to groups of three or four participants. He carefully set up the following experiment. Put the yoyo down on a horizontal flat surface, with the string coming up from underneath. Here is the question: When you pull the string, will the yoyo roll towards you or away from you? This is a great question, for many reasons. There is no right answer: It turns out to depend on the angle the string makes with the table, as you can see by examining extreme cases. Then it becomes quantitative: what is the critical angle? This has a very simple and verifiable answer, relying on a basic principle of mechanics.

Each day, much of the morning was taken up by a lecture to the entire group, by Dr. Glenda Stump (then Associate Director for Assessment and Evaluation of MIT's Teaching and Learning Laboratory, now Education Research Scientist at MIT's Open Learning), in which the principles of modern educational theory were brought out, and general ideas about how to implement them in the classroom were discussed.

The afternoons were largely devoted to disciplinary sessions in Mathematics, Physics, Biology, and most recently Chemistry. This was a time when active learning techniques could be modeled and participants could develop lesson plans for use in their own classroom.

The pedagogical and disciplinary sessions were conducted in English with consecutive translation (except for the Physics sessions run by Dr. Paul Belony, a native *Kreyòl* speaker). We depended on the services of a superb group of translators, who contributed immensely to the vibrancy and excitement of the classroom. The Workshop in January 2015 was opened by Nesmy Manigat, then head of *MENFP*, and that office provided some financial

support and simultaneous translation at that workshop. Overall, however, our interaction with *MENFP* was difficult to say the least, and confirmed our sense that it was better to work independently of the government.

In two of the workshops we organized panel discussions: In one, participants at earlier workshops reported on activities they had put into effect in their classrooms; in the other, several leaders in Haitian education described some of their work and vision.

The workshops would end with a communal wrap-up. These events elicited passionate and moving testimony to the importance of this work, and expressions of commitment and optimism that played a critical role in maintaining the momentum of the MIT-Haiti Initiative.

2.3   Fellowship and Konbit

The MIT-Haiti Initiative workshops were by design brief and broad-based. A number of participants came to several workshops in succession, and we wanted to provide them with more opportunities to develop material for use in their classrooms. We invited a group of six of these most committed participants to visit MIT. All six accepted this invitation, and spent two weeks at MIT in September 2015. We designed a rich menu of talks and classroom observations, and spent a lot of time working with these individuals on refining their skills at creating student-engaged lesson plans in their respective subjects.

When this group returned to Haiti, five of the six formed an organization they called the "*Konbit MIT-Ayiti*." This is one of the most significant outcomes of the MIT-Haiti Initiative to date. This group, augmented more recently by a sixth member, consists of the following educators.

- Abdias Augustin, Physics and Chemistry, *UEH/Faculté des Sciences (FdS)*

- Jean Genis Dorvilien, Mathematics, *Catts Pressoir and Lycée de Cité Soleil*

- Jimmy Fedna, Biology, Quisqueya University and *UEH*

- Étrenne François, Chemistry, *Lycée Toussaint Louverture* and *MENFP*

- Guerda Jean-Guillaume, Mathematics, *Centre de Formation pour l'École Fondamentale*

- Adler Thomas, Physics and Chemistry, *UEH/FdS* and *Faculté de Médecine et de Pharmacie*

In the year following their visit to MIT this group ran four workshops in Haiti, including one at *LKM* on Lagonav, and are still very active in disseminating the principles of the MIT-Haiti Initiative.

2.4   Leadership and Teamwork Workshop

In June 2014, then Prime Minister Laurent Lamothe visited MIT with several of his deputies to prepare the way for a workshop later that month. This three-day workshop was conducted in Port-au-Prince under the leadership of MIT Sloan Professor Deborah

Ancona, Michel DeGraff, and MIT Sloan Executive Education Project Manager Rebecca Roseme Obounou. This extraordinary workshop reached a leadership group within the Haitian government whose membership transcends Haiti's endemic political turbulence, and made a real contribution to a progressive stabilization of the Haitian administrative structure.

2.5   CHCL Consultancy

The MIT-Haiti Initiative came to know the *Campus Henri Christophe at Limonade (CHCL)* branch of the *Université d'État d'Haïti (UEH)* in detail through a week-long consultancy in June 2016. This visit, following one of our standard workshops at that campus, was initiated by then *CHCL* President Jean-Marie Théodat and consummated by his successor Audalbert Bien-Aimé. It operated under a grant from the US Embassy in Port-au-Prince. We made a detailed study of the program of study at that university, especially the "*Propédeutique*" or foundational program. We visited many classrooms, interviewed faculty and administration, and wrote a report on our findings. This experience greatly deepened our understanding of the challenges facing Haitian institutions of higher education, and, we hope, helped the *CHCL* faculty improve their program. We will summarize some of what what we learned below.

2.6   Port-au-Prince Symposium

In March 2017 a Symposium was held in Port-au-Prince, bookending the NSF grant and opening the way for the next stages of the MIT-Haiti Initiative. It attracted many participants from our workshops, but also representatives from a wide range of academic administrators, language rights activists, NGOs, and publishers. Working groups on various topics were formed, and at least one, on translation, has become a major social media presence. The leader of that translation working group, Stevens Azima, is now helping us with the *Kreyòl* translation of an online calculus course on MITx (see below, in Section 2.9).[11] Material from that symposium is available on the MIT-Haiti website.

2.7   Library Project

As we ran our workshops, a major need quickly became clear and was reinforced repeatedly by our participants: there is very little textbook material written in *Kreyòl*, and a great demand for more at all levels and in all subjects – especially in STEM disciplines at high-schools and universities. This is not a need that the MIT-Haiti Initiative can address; this is work that has to be done by Haitian educators with first hand knowledge of the social and curricular demands that must be addressed. But as material for use in our workshops, we did produce quite a body of modern educational theory, and examples of how it can be put into practice in STEM disciplines (many produced by Haitian participants in the workshops, with specific classes in mind). We would always have all of this loaded onto memory sticks that were distributed to the participants. We encouraged our participants

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[11]Azima has also created *Kreyòl* introductions to various mathematical concepts; see for example https://kreyonomi.com/2018/08/31/derive/, where the notion of the derivative is introduced.

to disseminate this material at their own institutions. Much of it is available now on the MIT-Haiti website. But we felt that it could be better organized, and formed into something appropriate for guidance in teaching practice more generally. Moreover, we discovered that hard copy is still more accessible in many places than electronic formats. So we are currently in the process of producing a series of pamphlets — on Biology, Chemistry, Mathematics, Physics, and Pedagogy — containing material developed for or during our workshops. These will be mirrored and enriched by web-based versions.

2.8 *Kreyòl* Glossary

In each of the workshops, and in subsequent work, the MIT-Haiti Initiative has assembled an extensive glossary of *Kreyòl* technical terms. This is available on the Initiative website and some of it will appear in the Library pamphlets. It is also being integrated into the Google Translate lexicon.

2.9 Calculus Translation

Under a grant from MITx, the MIT-Haiti Initiative is overseeing a *Kreyòl* translation of Calculus 1A: Differentiation. This prize-winning online course will be made available in a variety of formats for use for free by *Kreyòl* speakers.

3   The Mathematics Workshops

The experience of running workshops in Haiti has been both rewarding and surprising.

In support of my own undergraduate teaching, I had developed, with Hubert Hohn, of the Massachusetts College of Art, the "MIT Mathlet" collection.[12] I have used these tools regularly in lecture, and just about every homework assignment requires students to explore some concept or algorithm using the Mathlets. They are not simulations. I prefer to call them computational manipulatives, with reference to the Montessori learning tools. Students adjust parameters and witness the effect. The student acts with power, controlling many aspects of a mathematical situation by means of sliders that can be grabbed and adjusted. This agency contributes to the learning impact of these tools. The Mathlets also provide a variety of representations of the same data, and observing how these representations change together reinforces the connections between them. Keyboard entry is replaced by continuous adjustment of parameters. The effect is to situate any given example within a general family of examples that together produce a visualization of a "general" case. More recently, these tools have been seamlessly integrated into the MITx presentation of this course, used both residentially and in a MOOC setting.

Part of what I felt I could contribute to university-level education in Haiti was an awareness of this resource and some training in how to use it effectively in lecture and in support of group or individual work by students. We translated a half dozen of the Mathlets into *Kreyòl*. (See Figure 2.)

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[12]http://mathlets.org

IZOKLIN　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　- èd

Nou ka chwazi yon ekwasyon diferansyèl avèk meni dewoulan [v].

Lè nou mete kisè a sou fenèt grafik la, aplèt la ap afiche kòdone pwen yo pou nou. Lè nou kenbe bouton souri a sou fenèt grafik la, aplèt la ap afiche yon solisyon avèk kondisyon depa li pou nou. Nou ka pase sou lòt solisyon avèk deplasman kisè a etan nou kenbe bouton souri a. Solisyon an ap rete la menmsi nou lage souri a.

Nou kapab ajiste klate chan pant la sou klè, sou dim oubyen sou Òf avèk bwat [Chan pant] la.

Pran glisyè [m] nan pou aplèt la ka afiche izoklin yo. Lè nou lage glisyè izoklin nan ap rete nan fenèt grafik la.

Pi fò ekwasyon diferansyèl yo gen yon paramèt _a_ nou ka fikse avèk yon glisyè. Lè nou deplase glisyè a, izoklin yo ak tout koub soulisyon yo vin ajiste sou nouvo vale paramèt la.

Avèk kley yo ki anba a, nou kapab efase solisyon yo, izoklin yo, oubyen tou de ansanm.

Sa a se yon adaptasyon zouti Izoklin ki nan "Interactive Differential Equations", IDE, pwodiksyon Addison Wesley, otè sa yo kreye: Hohn, Cantwell, West, McDill, avèk Strogatz.
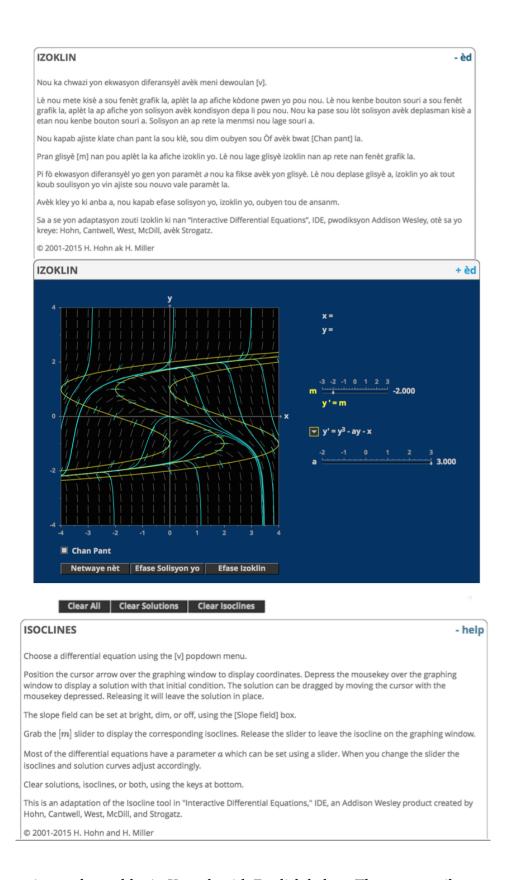
Figure 2: A sample mathlet in Kreyol, with English below. These are easily accessed at
https://haiti.mit.edu/resources/mathlets/

One of the pedagogical and aesthetic principles underlying the design of the Mathlets was that they should be simple and direct. They often picture physical systems – spring-mass-dashpot systems or RLC circuits for example – but the screen contains very few words. The result is a minimization of cultural references, and this served us well when we came to export them to the Haitian context. (One cultural reference that we had to remove was the image of a thrown football. By this we meant American football, of course. But in Haiti as in many other countries in the world, "football" means "soccer," a sport in which the ball is thrown only in special situations. We learned from this and improved the main English collection by renaming the Mathlet "Ballistic trajectory.")

The Mathlets were first designed for and implemented in a course in ordinary differential equations. This course is taken by 75% of MIT undergraduates, and consequently has an engineering slant. Subsequently Mathlets have been written to support learning in Calculus, Linear Algebra, Probability and Statistics, among others.

So at the outset the Mathematics workshops in Haiti were focused on the use of Mathlets, especially in a differential equations course. I chose to focus on the standard "LTI package," computing the complex gain and hence gain and phase lag of a system controlled by a linear constant coefficient differential equation. This was partly because it was central to the differential equations course I taught at MIT, partly because the concepts and methodology were well illustrated by Mathlets, and partly because I thought it might correspond to a use-oriented syllabus in Haitian university curricula.

I discovered, however, that my participants did not teach differential equations. They taught courses in calculus or analysis; or in pedagogical practice to education majors; or more basic mathematics in primary and secondary schools. It was also unclear how frequently they would be able to actually use computer technology of any kind in their own teaching. In subsequent workshops the focus shifted away from technology and subjects typically taught in the first year of university in the United States, and more towards promulgating progressive pedagogical practice. We did enlarge the collection of *Kreyòl* Mathlets, including several built following suggestions made by participants in our workshops ("Graphing Rational Functions," "Linear Programming").[13] We added an introduction to the widely used package of mathematics tools GeoGebra,[14] and provided *Kreyòl* translations of a dozen GeoGebra Worksheets based on Judah Schwartz's excellent geometric explorations. In March 2014 Drs. Jeremy Orloff and Jonathan Bloom used their newly developed syllabus[15] on basic probability and Bayesian statistics as a basis for modeling an active learning classroom.

The faculty coming to these workshops almost always carried several jobs. The faculty we worked with in Limonade, for example, typically taught there on Monday and Tuesday, took a bus to Port-au-Prince on Wednesday, taught there on Thursday and Friday, and bussed back to Limonade over the weekend. The energy and commitment required to organize attendance at a four-day workshop in the face of these demands was impressive.

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[13]These were both subsequently rendered in English and entered into the Mathlets website: http://mathlets.org/mathlets/graphing-rational-functions, http://mathlets.org/mathlets/linear-programming.

[14]https://www.geogebra.org

[15]A description of this course and the courseware for it can be found at https://ocw.mit.edu/courses/mathematics/18-05-introduction-to-probability-and-statistics-spring-2014/.

Figure 3: Guerda Jean-Guillaume guiding students in a classroom at *ESIH*. Credit Guerda Jean-Guillaume.

We have little information about what aspects of our message were brought back into the classrooms of our participants. One striking piece of evidence was provided by a video made by Guerda Jean-Guillaume of a class in which she formed the students into groups and led them through a script using the Mathlet "Graph Features[16]" in a first year Management class at *Ecole Supérieure d'Infotronique d'Haïti, ESIH*. (See Figure 3.)

And there is evidence [4] that the Workshops had the effect of increasing participants' comfort with using *Kreyòl* in teaching and in technical discussion.

4   The CHCL Program

The week in June 2016 spent at the *Campus Henri Christophe de Limonade (CHCL)* was very revealing of real educational conditions in Haiti, at least at this campus of the *Université de l'État d'Haïti*.

We were struck by the analogies between *CHCL* and our own home institution, MIT. Both are largely but not exclusively engineering schools. (One important difference is that *CHCL* has a large population of students preparing to be teachers, something MIT lacks.) Both institutions have a collection of courses that are required of all students. In both institutions, many of these courses are science or mathematics courses taught by scientists and mathematicians.

Admission to *CHCL* is very competitive: only around 20% of the students who take the entrance exam ("*concours*") are admitted. At the time of our visit, applicants were linearly ordered by a weighted sum of their scores on six exams (in mathematics, physics,

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[16] http://mathlets.org/mathlets/graph-features/

chemistry, biology, earth science, and French, with mathematics given four times the weight of the others), and the top group (400 in the year we studied) were accepted. This system had the virtue of clarity and simplicity, but it produced a student body with a very wide range of preparation and ability. About 100 rejected students actually achieved scores on the mathematics exam that were above the median score achieved by the accepted students; and, conversely, fully 10% of the accepted students scored below the median of the scores achieved by the rejected students. The range of total scores among the students admitted on the basis of the 2014-2015 concours was quite wide: A factor of 2 separated the top scores from the bottom, and within the mathematics test the separation was by a factor of 10. These data all bear witness to the extreme variation in mathematics preparation within the applicant pool. The faculty expressed great concern about how best to bring weaker students up to par, revealing a belief that it is their responsibility to help all students admitted to *CHCL*.

The *CHCL Propédeutique* or *Cycle Préparatoire Integré (CPI)* mathematics syllabus seemed to be based on a traditional French *école préparatoire* model. It was relentlessly formal, beginning with the general and gradually becoming more specific. Great emphasis was placed on precise notation and definitions.

Classes were typically lectured in *Kreyòl* with blackboard writing and worksheet material in French. Lectures were often augmented by "*travaux dirigés*," sometimes taught by the lecturer immediately following the lecture, in which students, perhaps in groups, worked on problems illustrating the concepts introduced in the lecture.

All the lecturing we witnessed was well-organized, clear, and energetic. The students were by and large attentive. We noted two common traits that are shared by university teachers across the world. There was a tendency to lecture to the top group, the most attentive group, and let the back of the class drift; and quite often the problems students were asked to work on seemed repetitive. We found ourselves wishing that the faculty would propose activities developing cognitive skills higher in Bloom's taxonomy, offering students more developmentally appropriate challenges.

We found that the performance expected of students in examinations was much more conceptual and challenging than what was expected in the classroom. Given this disparity, we were actually quite impressed with the level of performance on the examinations we saw. Indeed, some of the students struck us as simply brilliant, based on their examination performance.

5   Equity

An interesting framing of the notion of equity spelled out by Rochelle Gutiérrez [10] illuminates the importance of efforts such as ours. She identifies four "dimensions," or poles, of the concept of equity: *Access* and *Achievement* form the ends of the "dominant axis," which intersects the "critical axis" that terminates in *Identity* and *Power*.

Linguistic barriers form extremely effective obstacles to access, perhaps especially to education. As Gutiérrez points out, aspects of access within mathematics education include "resources that students have available to them to participate in mathematics, including such things as: quality mathematics teachers, adequate technology and supplies in the

classroom, a rigorous curriculum, a classroom environment that invites participation, and infrastructure for learning outside of class hours." All of these are for the most part available to only a tiny élite student group in Haiti.

Access makes achievement possible, but of course more is required. The example of *LKM* shows that the introduction of French as a second language results in higher achievement than early school immersion does. The linguistic barrier is one part of a broader characteristic of the Haitian educational system, as we understand it: much of it seems to be designed as a filter not a pump. Examinations are systematically set to be very difficult, for example, with low passing rates.

The critical axis captures underlying societal structures, of which the dominant poles are symptoms. Gutiérrez posits that identity "...includes whether students have opportunities to draw upon their cultural and linguistic resources (e.g., other languages and dialects, algorithms from other countries, different frames of reference) when doing mathematics, paying attention to the contexts of schooling and to whose perspectives and practices are 'socially valorized' ...." This describes the alienating presumptions present in much of Haitian education. We have spent much effort encouraging incorporation of local cultural references and the rich supply of *Kreyòl* idioms. *Kreyòl* is in fact at the very core of Haitian identity.

And Power is to Identity as Achievement is to Access. From the educational perspective, power has various faces. The existing structures are maintained through the exercise of power, from positions that are generally accessible only to the élite. At the level of the classroom, the power imbalances that permeate the dominant contemporary educational model in Haiti leave little room for personal agency, well known as a key student motivator. Systematic use of a language not easily spoken by the students is a principal cause of this limitation. A shining exception to this is the *LKM* system.

Overall, the suppression of *Kreyòl* in the Haitian educational system presents a textbook example of *elite closure*, in the terminology of the linguist Carol Myers-Scotton [15]: "Elite closure is a type of social mobilization strategy by which those persons in power establish or maintain their powers and privileges via linguistic choices." These methods are both powerful and difficult to combat.

6   Conclusion

We found in Haiti an energetic and committed cadre of university-level teachers, eager to learn about and put into practice "active learning" methodologies in the Haitian mother tongue *Kreyòl*. They often face serious political, administrative and cultural hurdles in implementing these ideas, but we also encountered forward-looking administrators eager to advance this agenda.

We look forward to further collaboration with these individuals, and enlarging the scope of our efforts. We see several very attractive opportunities.

- One of the most impressive outcomes of our work to date was the formation of the *Konbit*. The two week visit to MIT had a dramatic long-term effect. We would like to do this again, learning from the first experience, to expand the capacity of the team working full time in Haiti.

- There is enormous need for courseware that is culturally relevant, supports active learning pedagogies, and is available in *Kreyòl*. The ideal goal would be to create courseware in *Kreyòl* that is simply better than what is available in French.

- One way to support the creation of this material is to arrange for semester long visits by Haitian academics to US institutions. This would tap into untested creative potential. One model might be to have the visitor follow an existing course, learning the strategies and philosophy in detail and adapting it in real time to the Haitian local context.

- We hope to maintain our relationship with *CHCL*, and extend our engagement to other institutions. Institutional commitments in Haiti can be fragile, but are nevertheless critical if reforms are to take root. We came to feel that a combination of direct contact with faculty and collaboration with administration is the most effective approach.

Haiti is by no means alone in suffering from this form of linguistic apartheid; it is estimated[17] that some 40% of children in the world receive education in a language other than their mother tongue. The typical situation involves rather localized languages, spoken by just a fragment of the national population. Haiti, in contrast, is blessed with a national language, spoken by all Haitians. This is a major untapped national resource, and exploiting it constitutes a great opportunity for Haiti. The MIT-Haiti Initiative represents a modest contribution to the movement to unlock this potential.

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