"Many Hands Make the Load Lighter":
Haitian Creole and Technology-Enhanced Active Learning
Toward Quality Education for All in Haiti

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Making technology-enabled education available to *all* around the world.

The title of the LINC 2013 conference is: *Realizing the dream: Education becoming available to all. Will the world take advantage?* This title brings to mind the situation of Haiti where education has never been available to all because of brutal socio-economic barriers, including a well-entrenched language barrier—that is, French spoken by a tiny élite (no more than 10% and perhaps as low as 3%) vs. Haitian Creole aka "Kreyòl" spoken by all. My contention in this article is that the Haiti case should serve as a key lesson for current efforts to make technology-enabled education available to all around the world.

Under the leadership of Dr. Vijay Kumar (Director, MIT Office of Educational Innovation and Technology[2]) and myself, and with the help of colleagues from MIT and Haiti, we've begun, since 2010, an "MIT-Haiti Initiative" to develop, evaluate and disseminate Kreyòl-based and technology-enhanced resources for education in Science, Technology, Engineering and Math aka "STEM." In Kreyòl, we call these resources "Resous pou edikasyon san baryè" (that is, resources for education without barriers). Based on new educational technologies that have been developed at MIT, we are working toward the creation and dissemination of high-quality resources that use Kreyòl as an indispensable tool toward improving change the educational system in Haiti. So doing will, in turn, strengthen Haiti's educational system. This is the first

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time that experts have created various materials and technologies in Kreyòl for active learning in STEM at the university and high-school levels.

The LINC call-for-papers states:

> "With today's computer and telecommunications technologies, every young person can have a quality education regardless of his or her place of birth or wealth of parents."

But what about the *language(s)* spoken by those young persons' parents and peers, the *language(s)* spoken in their homes and communities? My hunch is that, if designers of technology-enabled educational resources do not pay due attention to the world's linguistic diversity (including local languages such as Kreyòl), technology-enabled education will not, and *cannot*, become available to all. More over, by ignoring the world's linguistic (and cultural) diversity, we also miss out on the opportunity to learn as much as we could about different ways of learning. Indeed, online learning offers a great opportunity for "a global laboratory for rigorous learning about learning" (in the words of MIT President Rafael Reif) and such laboratory can be greatly enriched by the world's cultural diversity when it comes to learning—an additional opportunity not to be missed.

These challenges set up the larger context for this paper: How to address the linguistic impediment to education for all? How to mine the world's cultural diversity for pedagogical assets to enrich online learning? We take Haiti as our case study to answer this challenging question, one that is particularly relevant to efforts such as MITx/EdX whose well advertised goal is to reach billions of students.

An unfinished revolution in Haiti: the élites versus the masses

Let us begin with the history of Haiti. Haiti's national motto is "L'union fait la force" which means "Unity Makes Strength," evocative of the Haitian Creole proverb "Men anpil, chay pa lou" ("Many hands make the load lighter"). This motto comes from the Haitian Revolution in the 18th century, during which blacks and mulattoes, enslaved and free people came together to show the world that each person, no matter their race and accidents of history, is indeed human and deserves freedom and equality.

In the history of Haiti, from the end of the 18th century onward, there have been a variety of personalities who have fought toward equality for all. We can cite, for example, Toussaint Louverture and Jean-Jacques Dessalines. Nonetheless, inequality still exists in Haiti to this day: the majority of Haitians are still struggling to get by. This was clearly shown in the aftermath of the January 12, 2010 earthquake. The *Boston Globe* spoke frankly about this inequality in an article dated January 31, 2010:

> "The question now is whether the wealthy élite that controls the bulk of the economy will help rebuild Haiti and create a thriving middle class. Eighty percent of Haitians live in poverty, while a handful of often light-skinned descendants of the French, who ruled the country's coffee and sugar slave plantations until Haiti declared independence in 1804, and other groups control most of the wealth."

But it is not only light-skinned Haitians who have placed barriers before the masses. It is among the élites in general—among those who are light-skinned, those who are of darker complexion, wherever their ancestors hailed from—that we continue to find influential Haitians who continue

to place barriers before the masses. They consider Haitians who speak only Kreyòl as inferior to Haitians who know how to speak French, and by words and by deeds, they continue imposing French as *the* language for academic and socio-economic success in Haiti.

"An upside-down school in an upside-down country"

Let's look at a brief example of the problems that arise when children who don't speak French are made to learn *in* French, most often with teachers who themselves are not (fully) comfortable in French and most often without any prior systematic opportunities for them to learn French.

The following scenario is one that I witnessed first-hand in 2011 in a public elementary school in La Gonave, in a unit on natural sciences in a third-grade classroom. The teacher wrote on the blackboard this multiple-choice question, in French: « Qu'est-ce qu'un arbre? Les arbres sont des: a) êtres vivants; b) êtres non vivants; c) êtres passedant des pieds. » [*What is a tree? Trees are: a) living beings; b) nonliving beings; c) beings* "passedant" *feet.*]

How did the teacher come up with « êtres passedant des pieds. »? "Passedant" is not a French word. The teacher may have intended to write "possédant" [*possessing*] though he didn't seem to notice the mistake when the word was pointed out to him and he was asked what it meant. And where did "des pieds" [*feet*] come from? And why would he write "possessing feet" as one possible choice alongside "living beings" and "nonliving beings"?

The explanation is simple once we take into account the fact that the teacher is primarily a Kreyòl speaker with limited fluency in French. Whereas in French, they say "un oranger" (*an orange tree)*, in Kreyòl we say "yon pye zoranj." And "pye" in Kreyòl also means "foot/feet." In French, when they say "un bananier" (*a banana/plantain tree*), in Kreyòl we say "yon pye bannann." And the Kreyòl word that corresponds to the French word "arbre" [*tree*] is "pye bwa" (literally: foot wood). So for that teacher, it made sense to ask the students if a "tree" could be defined as something that has feet ("possédant des pieds").

Let us analyze the reaction of a student who responded B to the question. That is, the student picked the answer whereby trees are "êtres non vivants" (i.e., non-living beings). I asked the student, in Kreyòl: "A tree, is it alive or not alive?" The student thought about it, and replied in Kreyòl: "An orange tree produces oranges, it produces leaves, it dies, it grows. So, it's alive!" So the student perfectly understood that a tree is a living thing, and he fully understood what the correct response should be. But why did he write that a tree is a "être non-vivant" (i.e., a non-living being")? In Kreyòl we use the expression "kretyen vivan" (literally "living Christian") to refer to human beings, and to *human* beings only. With that in mind, one can reasonably hypothesize that the student made a connection in his mind between the Kreyòl expression "kretyen vivan" and the French word "vivant"—Kreyòl "vivan" and French "vivant" have the exact same pronunciation. Then the student concluded that, since a tree is not a human being, it's not a *kretyen vivan* (in the Kreyòl sense), and, therefore, not a *vivant* (in his Kreyòl-based interpretation of the French word "vivant"). So he chose the response that was logical to him: a tree is not an "être vivant" given his understanding of the Kreyòl phrase "kretyen vivan" and the French word "vivant." In all likelihood, the student's response was based on his Kreyòl knowledge. Given the one language that he's immersed in (i.e., Kreyòl) it is not surprising that he did not know that in French the word "vivant" can be used to refer to trees as it can be used to refer to human beings and other living things. This is a normal consequence of this child's

linguistic and scholastic environments: this student is a child who only speaks Kreyòl at home. He is a child who is living in a community in which the majority of people speak Kreyòl only, a community in which the word "vivan" is used to describe *people*, not trees. And his teachers too have limited knowledge of French.

What do we see here? We see that both the teachers and the students are using the knowledge of the one language they speak fluently (i.e., Kreyòl) to design assignments and to respond to these assignments, even if the assignments themselves are written in French. Such paradoxes have led my friend and colleague Yves Dejean to write his book *Yon lekòl tèt anba, nan yon peyi tèt anba* [*An upside-down school in an upside-down country*], a major book in Kreyòl that analyzes such problems. In this book, Dejean makes two very important remarks that are germane to our reflection. First, when we look at countries that have been independent for more than one hundred years, Haiti is one of the rare countries in which all citizens speak one single language, yet the schools in that country don't use that language as the main language of instruction and examination. This situation has created barriers that impede students' progress, a situation that makes them unable to get a good education.[3] Second, Dejean explains that this "upside-down" use of French in the country blocks the country's development.[4]

Education for all—*really*—and a plan that is truly "operational"

There are already valiant efforts on the way to change the current situation where education is only for the few. The most recent and most talked about effort is the Haitian government's "Programme de Scolarisation Universelle Gratuite et Obligatoire" (PSUGO) started in 2011 toward a free and obligatory universal schooling program. How do these programs fare vis-à-vis the language barrier that has long blocked education for all in Haiti?

Consider, for example, several documents that were written after the 2010 earthquake in Haiti with the goal of diminishing social inequality and promoting Haitian cultural values and heritage through education. In the 2010-2015 Operational Plan, the government announced the goal of "balanced bilingualism" whereby the whole country would eventually become fluent in both French and Kreyòl. But let us recall again the proverb that says, "the Constitution is made of paper, bayonets are made of steel." There's also this saying: "Words and actions are two different things." So let's ask: What has really come out of all those calls to reduce social inequality in Haiti? Given abject poverty levels and other challenges to development in Haiti, how can a country in which more than 90% of people speak only Kreyòl become a country in which everyone speaks two languages fluently?

Unfortunately, despite the Haitian Constitution's eloquent statement (in Article 5) about Kreyòl being the only language that cements all Haitians together, despite all the other eloquent statements in various plans to rebuild the country, despite a long list of eloquent articles on the uses of our national heritage in education, Haitian schools continue to impose French as *the* main

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[3] More information on this problem can be found in a UNESCO document: World Data on Education. Haiti : http://www.ibe.unesco.org/fileadmin/user_upload/archive/Countries/WDE/2006/LATIN_AMERICA_and_the_CARIBBEAN/Haiti/Haiti.pdf

[4] Also see Stephen Walter's 2008 article "The language of instruction issue: Framing an empirical perspective" in *Handbook of Educational Linguistics* (Blackwell Publishers, 2008) and Benjamin Hebblethwaite's 2012 "French and underdevlopment, Haitian Creole and devlopment: Educational language policy problems and solutions in Haiti" in *Journal of Pidgin and Creole Languages*, 27.

language of instruction and examination, even when the children do not stand a chance of becoming fluent in French, and even when the professors themselves do not speak French fluently. This is certainly not the right approach to any sort of "balanced bilingualism."

Worse yet, in many places, the students who are taking their "Certificat" exams (to enter secondary school) or their "Baccalauréat" exams (to enter university) don't have access to the Kreyòl versions of these exams. And even when they have access to the exams in Kreyòl, many prefer to take the exam in French, because they have already memorized the corresponding materials in French (typically students do not have access to a full range of books in Kreyòl, and especially not in science and math at the more advanced levels). Very often, the only exam they take in Kreyòl is the exam *on* Kreyòl. For all the other exams, the majority of students complete them in French—often by regurgitating texts in French that they have memorized *by heart*.

Kreyòl-speaking students are still punished and humiliated (they are given a "symbol"[5]) when they speak Kreyòl in school—except in the courses where they are taught about Kreyòl! This is a repressive system that interferes with the skills and creativity of Haitian students, especially those that come to school speaking Kreyòl only. Research shows that among ten children who enter the first grade, only a single one (that is to say, 10%) will finish school.[6] Interestingly, 10% is one of the percentages that have been reported for the proportion of Haitians in Haiti who speak French in addition to Kreyòl.[7]   This language barrier is one of the reasons for Haiti's underdevelopment, just as in many other countries in a similar situation—countries where schools do not make systematic use of the language spoken by the population. An educator named Stephen Walter did a large study that showed a strong correlation between undeveloped countries and countries in which the national language is not the principal language of the schools (see notes 3 and 4).

An "Operational Plan" with good tools and methods for teaching science and mathematics

Let us now move from theory to practice. We would like to describe an "MIT-Haiti Initiative" whose objective is to introduce new technologies and new methods for instruction in schools and universities. The rationale for that Initiative started with the work that I began at the Lekòl Kominotè Matènwa ("LKM"), a primary school in Matènwa, La Gonave. At LKM, we have seen how children enjoy mathematics in their own language, with the software we have installed for them.[8] This is not surprising. Scholars who have done in-depth research in education have already shown how active learning helps students to build knowledge. Such active learning— with observation, experimentation, project- and inquiry-based collaborative tasks, etc.—can help students understand and construct complicated concepts. Moreover, when students use a

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[5] A "symbol" ("senbòl" in Kreyòl) is a form of public punishment in which students are given a symbolic item (such as a tag to affix on their shirts) to humiliate them if they are caught speaking Kreyòl at school. Teachers often ask students to keep lists of their peers who speak Kreyòl, and these lists are used to give out the "symbols" to the students found in violation of the no-Kreyòl policy. Such forms of repression and public humiliation as punishment exist in many Haitian schools despite ongoing efforts to promote the use of Kreyòl as language of instruction.

[6] *Pour un Pacte National pour l'Éducation en Haïti,* Groupe de Travail sur l'Éducation et la Formation (Port-au-Prince: Bibliothèque Nationale, 2010)

[7] Yves Dejean (2010) "Creole and education in Haiti" in *The Haitian Creole Language: History, Structure, Use, and Education*, edited by Arthur Spears & Carole M. Berotte Joseph (Lexington Books/Rowman & Littlefield, Lanham, MD)

[8] There is a video on YouTube: http://www.youtube.com/watch?v=CU4NuFcK8D0

language they already know to build their knowledge, it allows their ideas to be clearer and their linguistic competence to become even stronger. Such students are able to more comfortably report what they observe, as they develop their scientific hypotheses and test to see if those hypotheses are correct and adequate.[9]

The majority of scientific activities that children should master at school depends on those children's ability to communicate clearly with themselves and with others. For that reason, science and math classes should use the questions, practical experience, observation and experimentation that come from the students' own lives. And the students should use the language that they speak best, so they can explain their ideas and exchange these ideas with others—be it other students like themselves, their teachers or other people in their communities.

In active learning, it's crucial that pedagogical practice be based on concrete experiences, on experimentation and on using the language that is spoken regularly in the students' community. This is a principle that has already been discovered in major research on the role of language in active learning for better education. Furthermore, when we use the mother tongue to build the foundations of knowledge through active-learning methods in reading, writing, science and math, the student will be able to more comfortably and more ably transfer that knowledge to any other language she later learns, be it French, English, Spanish, or another.

This principle has a logical consequence that is also important: If we wish to create a solid system for active learning and for in-depth research and innovation in Haiti, a system that allows all primary and secondary school and university students to become proficient in science and math, we must do it in Kreyòl, and the materials must be written in Kreyòl. In such a system, more students will have the opportunity to become scientists, engineers or mathematicians who are better prepared to tackle and solve their own problems and problems that affect their communities and their country. Without such a system, it is only a tiny handful of Haitians who will continue having access to quality education. This will continue blocking our country's development.

In the pilot project at LKM, we observed how comfortable and happy the children were when doing math with manipulatives and computer games. Manipulatives are pedagogical materials that the students can touch, materials they can manipulate, materials that allow them to build their knowledge while interacting with pedagogical materials, thus, to learn better. At LKM, the students at LKM use manipulatives such as Cuisinaire rods—concrete wooden rods or virtual rods through digital resources. They have access to software tools that make learning mathematics easier, more dynamic and more enjoyable. For example, there is a soccer game in which the children score a goal whenever they get the right answer for a math problem. And the most important part is that the interface to the computer-based activities is all in Kreyòl. But the work doesn't end there...

Notwithstanding our best efforts at the primary-school level, those efforts won't achieve much if the teachers themselves are not comfortable with the active-learning technology in Kreyòl. In the MIT-Haiti Initiative led by Dr. Vijay Kumar (Director, MIT Office of Educational Innovation & Technology[10]) and myself, we are developing tools and methods that use Kreyòl for active learning in science and math in university and secondary schools. These resources can

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[9] See, e.g., Webb, P. 2010. "Science Education and Literacy: Imperatives for the Developed and Developing World." Science 328, 448; DOI: 10.1126/science
[10] http://mit.edu/vkumar/www/ , http://oeit.mit.edu

help in the training of teachers, so that they become proficient in the theory and practice of science and mathematics, according to the goals of the 2010–2015 Operational Plan. We have taken software tools in which one can do virtual genetic experiments (for example, on genetic crossing), and we have translated them into Kreyòl. We have done the same with a range of other resources: software tools to visualize proteins, software tools to simulate physics experiments (in electromagnetism, electricity, movement, etc.), software tools to visualize the solutions of certain mathematical equations (for example, differential equations), and so on. We have integrated these tools with other active-learning methods and pedagogical resources, all in Kreyòl.[11]

The university and secondary-school faculty who are participating in this program have explained to us how their students have a great deal of difficulty, even those who speak French, when confronted with problems in biology, physics, or mathematics: very often, they can't solve these problems properly because they are so accustomed to memorization. This is perhaps one reason why there is not yet any major research program in Haiti in any scientific field. When we introduce software tools in Kreyòl for active learning, we see very quickly how teachers and students alike come to understand principles that they had difficulty understanding before that. That is why we are using these new technologies in Kreyòl, so that the students can truly understand what they are learning. The language that students speak at home and in their community is the language that will best help them express their thoughts so they can practice good scientific and mathematical reasoning, so they can apply their knowledge to solve concrete problems in their community and their country.

The Kreyòl-based digital active-learning technology that is being developed by the MIT-Haiti team is completely different from the old system of memorization that exists in Haiti and many other places. When students are learning science and math in a language that they haven't mastered, they have to learn by heart, without deep understanding. The majority of the teachers have learned according to the rote-memorization tradition. This is the reason that we decided to work with faculty who are in the fields of science and math at university. Because it is these universities who should be training the teachers who will teach science and math at all levels—primary school, secondary school and higher education...

There is another important reason that we should conduct science and math in Kreyòl at university in Haiti. According to the United Nations, every person on earth has the right to enjoy the benefits of science.[12] But in Haiti, this has never come to be. The majority of Haitians have never enjoyed the right to adequately study science—that is, they have never had access to science in their own language. The use of French from primary school to university is a barrier to the study and advancement of science in Haiti, it is a barrier to the enjoyment of the benefits of science and its applications, and it is a barrier to the development of the country as well. Before the MIT-Haiti Initiative began, there were no Kreyòl-language online materials for university-level science and mathematics. We have found a remedy for that ill. It is a remedy that uses online Open Education Resources. These resources will help us spread science and math in Kreyòl for free on the Internet—or else on USB drives for remote areas that do not yet have Internet access.

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[11] A sample of these resources is available online on the website of the MIT-Haiti Initiative: http://haiti.mit.edu

[12] According to Article 15 of the *International Covenant on Economic, Social and Cultural Rights*. http://www.unhcr.org/refworld/docid/3ae6b36c0.html

We at MIT are collaborating with several partners in Haiti and in the United States. Thanks to this team, the MIT-Haiti Initiative is doing something that has never before been done. As far as we know, this is the first time that Kreyòl-language materials in science and math have been developed for higher education. We are currently at the stage where we are testing the quality of these materials before we try to spread them throughout the country.

So, how did we choose which materials to develop? How did we decide what we would do in Haiti with these active-learning tools? In October 2010, MIT and the Foundation for Knowledge and Liberty ("FOKAL") in Port-au-Prince organized, at MIT, a planning symposium with a group of MIT faculty interested in global education and faculty and education leaders from Haiti who are working to improve higher education in Haiti.[13] What were our goals? We were trying to find the most constructive areas of synergy between MIT's and Haitian universities' respective assets and needs. We organized this symposium in order to plan our collaboration so that MIT and Haiti could each learn from the other and mutually benefit. That is how we decided to develop various sets of Kreyòl-based and technology-enhanced tools and other materials in Kreyòl for active learning in different fields: physical sciences, life sciences and mathematics. All the materials we've produced are completely in Kreyòl, and tools for virtual experimentation, visualization, simulation, and modeling are all in Kreyòl. When we conduct training workshops in Port-au-Prince, all the sessions are translated into Kreyòl. In these workshops, we've observed how the participants are completely and joyfully engaged in the active-learning activities, collaborating and learning from each other—unlike the traditional French-based Haitian classroom experience where only the professor speaks and where students passively copy notes in their notebooks.

Obstacles and Opportunities – "I think, therefore I am."

But, things are not easy. There are great obstacles we must overcome to truly succeed in this project. The first challenge is: How should we create a new vocabulary for science and mathematics in Kreyòl? This vocabulary does not yet exist at the most advanced levels of these fields. It is all of us engaged in this Initiative who are creating the vocabulary as we work on this project. Unfortunately there has never been a national policy that encourages scholars and professors to produce works in Kreyòl. As a consequence, scientific documents in Kreyòl are rare, and those that do exist are often lacking in quality. This is not surprising if we consider that, as compared to the big presses that produce books in French, the small presses working on Kreyòl materials do not get substantial subsidies from the Haitian government or from major donors. But as linguists, we know that a language's vocabulary is like a muscle: vocabulary develops as one uses it. The more one uses it, the larger it gets, and the more strength it will acquire so it can do what we need it to do...

There is another challenge as well: How can we change the habits of the too many faculty and students who have become so steeped in the rote-memorization tradition? We must try to create a new set of habits, a culture of creativity and innovation that promotes active-learning methods in order for the teachers and students to engage in in-depth studies and research in science, mathematics and other subjects in Kreyòl. We are indeed trying to create a set of habits that will allow students to delve as deeply as possible into their academic disciplines.

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[13] More details can be found at: http://haiti.mit.edu

We have already taken the first step toward these goals. Our MIT-Haiti Initiative—which includes MIT faculty and staff, faculty and administrators in Haiti and at several partner institutions—have already begun to create math and science materials in Kreyòl, and we have begun to use them in training workshops on high-quality tools and techniques for active learning.

There are many people—intellectuals, policy makers, educators, linguists, parents, etc.—who seem convinced that science and math cannot be done in Kreyòl. They believe that in Haiti it is only French that is sophisticated enough to teach complex concepts. But they seem to have forgotten one important historical fact. If we look back many years, to the time when scholars in Europe wrote mostly in Latin or Greek, no one used the vernacular language of the people to teach or write about science (consider, for example, French in the Middle Ages). A language like French in the Middle Ages, like Kreyòl nowadays, lacked many terms for math and science. In 1637, the French philosopher René Descartes was one of the first scholars to publish their scientific work in French. At that point in time, French was still considered a "vernacular," that is, a "vulgar" and un-sophisticated language as compared to Latin and Greek. Back then, French was such a poorly regarded language that professors would whip students at the Université de Paris for speaking French.

In 1637, when Descartes published his *Discourse on the Method* in French instead of Latin, it was because he wanted to "vulgarize" his scientific methods so that more people in France could learn from his work. That was why he sought to write his book in a language that was as clear as possible, in a language that his compatriots would understand more easily than Latin. He did not wish to share his knowledge with only the small élite of scholars who knew Latin. In the same book in which Descartes presented his beautiful philosophical conclusion "Je pense, donc je suis" ("I think, therefore I am"), he also said:

> "And if I write in French, which is the language of my country, rather than Latin, which is that of my teachers, it is because I hope that those who use only their unalloyed natural reason will be better judges of my opinions than those who swear only by the books of the ancients. And as for those who combine good sense with application, whom alone I wish to have as my judges, I am sure they will not be so partial to Latin that they will refuse to grasp my arguments because I express them in the vulgar tongue." (*René Descartes. A Discourse on the Method of Rightly Conducting One's Reason and of Seeking Truth in the Sciences*.[14])

In Descartes's argument from 1637 about French vs. Latin, we find yet another reason why we Haitians must create our own pedagogical materials in Kreyòl if we want to spread knowledge among the majority of Haitians in our country. This use of Kreyòl will permit students in Haiti to use their "natural reason" and "good sense" to learn, instead of continuing to memorize by heart, with little understanding, texts in French. This use of Kreyòl will also help the language develop a richer vocabulary and sets of conventions so that it can be used, as it should be, in all fields of knowledge. That is how French, too, developed new words for science and other types of knowledge, when scholars began to write in French in the Middle Ages even before Descartes, instead of continuing to write in Latin or Greek. This is why we, in the MIT-Haiti Initiative, are helping prepare a new vocabulary and new tools and methods for science and math education in Kreyòl, a new culture of thinking about higher-level studies in Haiti.

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[14] *A new translation by Ian Maclean,* Oxford University Press, 2006, p. 62–63.

This new culture of learning is completely different from the outdated habits that are still being promoted in Haitian schools. Yes, these new methods of learning are completely different from the tradition of rote-memorization of French contents—learning like a mimicking parrot, learning texts and formulas that only a small portion of students can understand well... or badly.

But, for us to truly succeed, we must obtain the cooperation of the following institutions so we can work together to realize the objectives of EFA: the Ministry of National Education, the organizations that finance educational programs, school principals (especially schools where students are still punished for speaking Kreyòl), government offices, courts, NGOs, and so on. These institutions can help us change the old prejudices that exclude Kreyòl from serious matters like science, math, State examinations, administration, justice, etc. We now already have the support and collaboration of many universities, and we've recently secured the support of the Haitian State and its Ministry of Education.[15] So it does seem like the best is yet to come.

In any case, we see the great benefits that our Initiative can create for the future in Haiti and beyond. The first great benefit is for the millions of other people on Earth who speak local languages like Haitian Creole and who need to benefit from the new products of technology-enabled education. There are lots of students among those people who are thirsty for true mastery of science, and who need access to materials in their own languages so they can learn better. Our Initiative will serve as an example for them as well.

This example can also address the question whether a small and poor market such as Haiti can justify the costs of translation. This question touches on the very theme of this LINC meeting: "Education becoming available to all." If the take "all" in its most inclusive sense (to include, say, populations who don't speak English), this goal entails that we must find cost-effective solutions to any problems posed by translation, even as we build local capacity so that technology-enhanced educational resources can be developed right off the bat in local languages, without the extra step of translation from English or other international languages. So our work in the MIT-Haiti Initiative is tracing an example for the positive answer to the question "Will the world take advantage?"—with the assumption that not every student in the world speaks an international language. Furthermore, the costs of a failed education system, with its correlation with under-development, certainly exceed the costs of translation (see notes 3 and 4). The acute-on-chronic failure of Haiti's education system becomes even more of an aberration when we consider the millions of dollars that have been, and are still being poured, by agencies such as the U.S. Agency for International Development, the World Bank, the Inter-American Development Bank, etc.

In a related vein, another benefit is that our project will show how linguists, scientists, educators, engineers, computer scientists, and others can collaborate to tackle on a variety of problems that affect millions of children, millions of students in this world. This is MIT's *Mens et Manus et Mundus* at his best: it shows the way for how new online initiatives such as MITx and EdX can maximize their global outreach to benefit populations that have for far too long fallen on the wrong side of the digital or linguistic divide.

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[15] http://web.mit.edu/newsoffice/2013/mit-haiti-initiative-0417.html
http://tech.mit.edu/V133/N20/haiti.html
http://online.wsj.com/article/PR-CO-20130417-913181.html
http://www.caribjournal.com/2013/04/23/lamothe-we-would-change-the-approach-that-people-have-to-haiti/
http://www.lenouvelliste.com/article4.php?newsid=115781

Principles and Objectives

We will conclude by saying that our objective is to help develop better teaching methods in Haiti. These methods rest on two central principles:

First: We must use Haitian Creole ("Kreyòl") to make learning truly *active* for Haitian students. Active learning in science and mathematics requires a great deal of reasoning, collaboration and communication. This cannot be done in French or English or any other language that the students do not speak fluently. In Haiti, it is only in Kreyòl that the majority of students can truly participate in active learning.

Second: We use technology to improve STEM education, according to active-learning methods. Thanks to these technologies (for example, a variety of software tools for virtual experimentation, simulation, visualization, modeling, etc., available on the Internet or on USB drives), faculty and students in Haiti will have access to virtual laboratories on their own computers or on the computers of their classmates or colleagues. If there are not enough computers among the students in any particular class, the teacher can use her own computer or the school's computer, with a projector to project the images onto a screen so the whole class can see the experiments being conducted. This will allow the students to conduct experimentation and other practical work properly, so they can learn in greater depth. Such active learning will strengthen their understanding of a variety of complex and abstract concepts.

One of the core ambitions of the MIT-Haiti Initiative is to increase the capacity of higher education in Haiti. Thanks to this project, Haitian faculty will become more knowledgeable in active-learning methodology that is based on new technologies. The teachers who participate in the MIT-Haiti workshops can then spread their new knowledge so that many other teachers and students can learn better—and this has already started with workshops being conducted by faculty at the École Normal Supérieure, Haiti's main teacher-training institution. The eventual goal of these efforts is to establish a large network of pedagogical resources, without barriers, throughout the country, and to have these methods and resources integrated in the country's official curricula—this is one of the main goals of a recent agreement between our MIT-Haiti Initiative Haiti's Ministry of National Education (see note 15). These resources are in Kreyòl, so they can truly be "without barriers"—in a language that the students are completely comfortable in. These types of local efforts—led by Haitian educations in Haiti—will give the project a greater guarantee of having deep and sustainable roots. It is more efficient to develop local resources instead of relying on foreign-based resources only.

This approach (Kreyòl + technology → active learning in science & math → research & innovation) will help us create a smarter Haiti, a Haiti that can lead itself toward sustainable development, a Haiti that can show the rest of the world an example of technology-enabled education made available to "all"—with "all" taken in its most inclusive sense, beyond language barriers. [16]

Only when designers of digital-learning resources start paying due attention to linguistic diversity will we be able to realistically envisage a world where "every young person can have a quality education regardless of his or her place of birth or wealth of parents." Furthermore the MIT-Haiti Initiative has opened up the pool of potential online learners—to students who

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[16] Refer to these sites for more details and references about the Initiative and its rationale and history: http://haiti.mit.edu and http://mit.edu/degraff

otherwise would have no access to English-based resources such as those currently available via MITx and EdX. Such efforts will help insure that technology-enabled education can, at least in principle, have truly *global* reach to the extent that it makes it possible for us to reach, and learn from, linguistically and socially diverse groups, thus incorporating diverse ways of learning into our methods for online learning. One welcome consequence is that such an initiative promotes diversity and inclusion with a profound transformative impact for all parties involved. We help educate a diverse world, as we in turn become educated by the diversity of the world we engage in.[17] A win-win proposition!

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[17] Iiyoshi, Toru & M. S. Vijay Kumar. 2008. *Opening up education: the collective advancement of education through open technology, open content, and open knowledge*. Cambridge, Mass: MIT Press. http://mitpress.mit.edu/books/opening-education