

Africa Information Technology Initiative (AITI)

Summer 2009 Summary Report

Summary

MIT's Africa Information Technology Initiative (AITI) is a student-run organization that promotes economic development in Africa by cultivating young technology entrepreneurs. During MIT's summer recess and IAP, AITI sends MIT student/instructors to Africa to hold courses at African universities. Our courses focus on mobile technologies, and are structured so that our students are awakened to the commercial possibilities of the technologies. Components of the course include detailed technical curriculum, funded business competitions, guest lectures, and networking events, all to help our students develop and realize their ideas. Furthermore, AITI seeks to positively influence education on the continent by transferring teaching expertise to our African partner universities so that they can incorporate components of our courses with little intervention. AITI provides our MIT participants with international education, technology, and entrepreneurship experience, and the program is often described as life changing. Since 2000, AITI has sent nearly 100 MIT instructors to teach over 1200 African students, resulting in the creation of African businesses and the addition of course offerings at our partner universities.

Kenyan Program (June – July 2009)

This past summer, AITI organized a course in focusing on mobile phone application development and entrepreneurship. The course was taught by five MIT student/instructors (1 graduate, 4 undergrads). The course was held from June 8 – July 20th, approximately 6 weeks. The team arrived one week early to prepare for the course. In addition to teaching, the team developed new curriculum focusing on aspects of mobile application development that are underserved in the African university setting. The course was attended by 30 gifted students from five Kenyan universities: Strathmore University, University of Nairobi, Jomo Kenyatta University of Agriculture and Technology (JKUAT), Kimathi University, and Catholic University of East Africa. The students were selected by the faculty of their respective schools based on achievement in programming.

The course was held at Strathmore University in Nairobi because it is centrally located, and because it has serviceable lab equipment. AITI has held courses at Strathmore since 2000. Each non-Strathmore student was provided with a stipend of \$200 USD to defray the cost of travel and housing during the course. Classes were held 5 days a week for 8 hours a day.

The course was organized into 4 units:

1. The course began with a fast, though in-depth, introduction to the Java programming language, assuming the student had prior programming experience. The unit continued through intermediate Java concepts such as object-oriented programming (OOP), exceptions, and generics. Lectures were held daily for 1-3 hours per session; labs reinforced Concepts.
2. After this foundational material was covered for 2 weeks, the course narrowed its focus to mobile application development beginning with SMS (TXT) messaging-based services, covering both an overview of the appropriateness of the technology plus service-side considerations. There was a heavy emphasis on user-interface design because SMS-based services are quite constrained when considering the user interface. Lectures were held in the approximately every 3 days; labs reinforced concepts.

The SMS unit ended with a group project that split the students into groups to design real-world SMS-based services. Students were first tasked with brainstorming service ideas as groups were progressively enlarged and ideas were refined. Next, the students developed the technology behind their service ideas and presented them to the class. Representatives from Google Africa were in attendance during the presentations and were quite impressed.

AITI distributed USB GSM modems so that the students could deploy their services and test them. For a detailed account of the project ideas please visit: http://aiti.mit.edu/wiki/index.php?title=SMS_Final_Projects.

3. The next unit focused on local mobile applications built using J2ME, a subset of Java used to program mobile phones. Nokia temporarily provided us with 13 mobile phones to distribute to the class, and many of the students' phones could run J2ME applications. As with SMS, the J2ME unit focused heavily on user interface considerations and real-world application considerations. Lectures were held in the approximately every 3 days; labs reinforced concepts. Mini-lectures were also developed to cover some of the advanced features of J2ME including location awareness, media, and Bluetooth.
4. During the final 2 weeks of the class (overlapping with the previous unit) the students were asked to develop their entries for the Mobile Application Competition (see below).

Michael Gordon presented most of the lectures, while the MIT undergraduate instructors acted as lab assistants (as did Michael while not lecturing). Each undergraduate instructor presented at least one lecture or mini-lecture.

In addition to the mobile application programming technical curriculum, the course built entrepreneurial skills by presenting entrepreneurship lectures specific to a Kenyan audience. Zachary Stauber led this initiative. Also, AITI incorporated guest lecturers with expertise in the Kenyan technology market. The guest lectures gave our students a real-world perspective on entrepreneurship and allowed them to develop contacts in the VC community. Our guest lecturers:

1. Dr. Kevit Desai (IEEE rep. for Kenya, Director of the Kenya ICT Board, CEO of the Kenya Private Sector Alliance, and Director of Engineering for Centurion Systems)
2. Njeri Rionge (Founder and Executive Director of Ignite Consulting. She was also instrumental in mobile operator Orange's re-branding)
3. Richard Bell (Venture Capitalist)
4. Will Mworira (AITI 05 graduate, previously Microsoft, currently working on a startup)

The course culminated with a Mobile Application Development Competition. The competition asked the student groups to develop a viable, mobile-predicated business idea. First, the students were tasked with creating business plans for their proposed business. The competition centered around a judged event where the students presented their business ideas and demos of their technologies to a distinguished panel of judges:

1. Denis Gikunda (Localization Project Manager, Google Kenya)
2. Jeremiah Kamau (Geographic Specialist, Google Kenya)
3. Jack Maina (Head of Solution Development, Safaricom)
4. Will Mworira (Mobile Application Development Expert (previously Microsoft and AITI 2005 Graduate))
5. Isis Nyong'o (Business Development Manager, Google Kenya)
6. Jackie Rajuai (Geographic Consultant, Google Kenya)
7. Dr. Joseph Sevilla (Faculty of Information Technology, Strathmore University)
8. Andrew Wachira (Technical Support Associate, Google Kenya)

The winning team was awarded \$2000 USD to apply to their business. The business plans and presentations from the competition can be found online here: http://aiti.mit.edu/wiki/index.php?title=MAC_Kenya_2009.

During the course, AITI was asked to help organize Strathmore's second annual Mobile Bootcamp. This aim of this 3-day event was to promote mobile technologies to Nairobi-area undergraduate students. Approximately 120 individuals attended the event. Michael Gordon delivered 2 plenary talks and led the intermediate J2ME breakout sessions. African students from the AITI course acted as lab assistants for the beginning J2ME breakout session and the intermediate J2ME breakout session.

AITI recognizes the need to maintain contact with our students. We do not want to sever all ties with our students once our stay at the host university is complete. Towards this goal, AITI developed a social networking site with forums where our individuals can ask and answer questions (<http://aiti.mit.edu/forums>). Before class began, AITI, with the help of Google Code Africa, recruited 30 Google engineers to help answer questions on the forum. The students posted questions when class was not in session. Also, the instructors asked students to post questions in which the Google engineers would have more experience than the MIT instructors.

Needs Addressed and Outcomes

AITI addresses multiple needs in the African community. AITI delivers courses that cover appropriate technologies; much of our material is not available to the African computer science student. Unfortunately, most universities in Africa do not offer computer science courses appropriate to the African student. The courses offered are outdated, and cover technologies not available to most Africans. For AITI, appropriate technologies are defined as technologies that are inexpensive and widely available; technologies our Africa students can use to solve local problems, take advantage of local opportunities, and create businesses. Mobile technologies fit this profile. Of course, technologies change, so AITI also focuses on foundational computer programming concepts to allow our students to learn new technologies. AITI seeks to scale its impact by encouraging our partner universities to offer AITI-style courses. Finally, AITI promotes entrepreneurship and small business development in Africa.

Our outcomes for the past summer were incredibly positive. By the end of our course, our students could develop complex SMS and J2ME mobile services, and more importantly, many students developed an entrepreneurial mindset. The course fared extremely well in our final (anonymous) survey. In the survey, students were asked to evaluate their skills on completion of the course; 16 students responded. All students noted that they had gained a solid understanding of Basic Java, SMS, and J2ME. At the beginning of the course, less than 40% of the respondents felt that they had good or very good programming skills and experience. However, after taking the course, the entire sample rated their skills as good or very good.

The role played by the instructors in helping the students understand course material was pivotal. The students described instructors as knowledgeable regarding class content, helpful and adept at the use of relevant illustrations, labs and projects. 15 out of 16 responses noted that the head instructor was very effective in laying out concepts in a progressive manner, from basic to advanced stages. Some commented positively regarding his use of suitable illustrations to clarify concepts. Additionally, students felt that the teaching assistants were very helpful and patient with students who had difficulties grasping certain content. Students appreciated the informative nature of guest lecturers, as these individuals were drawn from diverse business sectors.

The practical nature of the course encouraged the students to develop viable service and business ideas, and then turn these ideas into real businesses. All students felt that the AITI equipment, consisting of phones and modems, helped them learn. Labs, which were unanimously described as challenging but well written, were another useful learning tool. The entrepreneurial component of the course built the students' confidence in their ability to create their own mobile businesses. 88% of the students felt confident or very confident regarding their entrepreneurial skills. Through their respective teams, participants were exposed to a collaborative environment. Their experiences with teammates were mixed, but overall the exercise provided a useful simulation of the collaboration necessary in a business environment. In conclusion, the students felt that exposure to mobile programming and technologies was worthwhile and that they would recommend it to anyone.

However, surveys do not speak of AITI impact on the community. AITI must be judged on how it changes African undergraduate education, and whether it promotes business development. In both areas, this past summer was a resounding success. In only the few short months since the class, MobiTechno, the team that won first prize at our Mobile Application Competition, developed their AITI project into a registered Kenyan company. They have also copyrighted their idea. More exciting, their service is now hosted in Kenya with an SMS service provider. The service has an SMS shortcode that allows users to access their service via SMS with a short, 5 digit number. They are meeting with advisors and venture capitalists, contacts they made through the AITI course. The service is currently being tested through a limited rollout.

Furthermore, Simon Ndunda, a distinguished graduate of our Kenyan 2009 program has started a business with 3 colleagues. Simon describes the business as "a software development business where we are focusing on SMS solutions among other IT services". The name of the company is Equisoft Technologies (<http://www.equisoft.co.ke/>). Simon writes: "My gratitude to AITI, and more so the group that came to Kenya this year, is not measurable."

In addition to the founding of 2 Kenyan companies, AITI's summer 2009 program has achieved successes in terms of influencing African computer science education. First, during the time the MIT participants were in Kenya, AITI organized the Strathmore Mobile Bootcamp as mentioned above. AITI provided speakers and material for the bootcamp. More importantly, AITI's Kenyan students acted as lab assistants for the breakout sessions, effectively helping others with problems, and passing on the knowledge they acquired in AITI's course.

Second, Samuel Kamochu, a distinguished graduate of our 2009 Kenya program, has spearheaded an initiative to offer an AITI-like course at JKUAT, Kenya's top engineering university. The course will employ AITI's Mobile Application Development curriculum, and it will be structured in much the same way as our 2009 Kenya course. The course will be

instructed by Samuel, a JKUAT alum, and two other JKUAT graduates: Isaac Oteyo and Andrew Kinai. Of course, the instructors are receiving help from the faculty of JKUAT. At this time, the instructors have already selected their students based upon recommendations from JKUAT faculty. 30 second-year JKUAT students are enrolled. The course will be offered 3 days per week for 2 hours a day, 1 hour for lecture and 1 hour for lab time. The course begins September 15th. AITI is very pleased to support extension programs such as this one. AITI is nurturing a new generation of technology leaders and educators, and our impact is magnified by our students' devotion to spreading their knowledge.

The final positive outcome of the summer is our thriving social network and forums that includes our former students, instructors and Google engineers. As mentioned above, AITI deployed a social networking site with forums so that we could maintain contact with our students. This network has seen steady traffic since the team left Kenya. Former students post questions and receive help from their classmates, Google engineers, and/or AITI participants. This network is a step towards AITI's vision of organizing a large network of young technology entrepreneurs and software developers across Africa.

Lessons Learned

AITI was definitely a life-changing experience for each of its participants. Zachary Stauber writes:

It was the first time in Africa for the majority of the team as well as being the first longer-term and more technical teaching experience for us. Every day we learned something new; from daily life for Africans to a new way to write a merge-sort algorithm. We learned from each other, from our students, and from people we met along the way.

Regarding the effectiveness of the course, there are two lessons learned. First, this past summer we had difficulty maintaining the attendance of the African instructors that were attached to the course. This is because these instructors are paid little and teach many classes at once. They did not have time to attend our course. In the future, we are going to pay the Africa instructors to attend our course so that they can learn the material and teach AITI-style courses at their respective universities.

Second, some aspects of the Mobile Application Competition greatly challenged our students. All the students in our class were computer scientists. The competition asked them to think as entrepreneurs, marketers, accountants, and businessmen. Some students struggled with these aspects, and the (non-technical) quality of the entries suffered because the students lacked experience and education in these fields. In the future, we are going to have multi-disciplinary teams for the Mobile Application Competition. The schools with which we partnered have plenty of business, marketing and accounting students; it is time to incorporate them into AITI.

Local Knowledge Accumulated

We stayed in Mimosa Court Apartments on Ngong Road in Nairobi, Kenya. Although it was the winter, the temperature was always quite moderate, in the high 60s up to the low 80s so pack clothes accordingly. The team relied heavily on taxis; they are reasonably priced (around twenty US dollars). Though, we did employ public transportation at times. There are a number of ATMs throughout the city and you can access your US bank account. We experienced only a few instances of the power going out while in Nairobi, a few times in class, which caused our students to lose their work. There are countless things to do over the weekends. There are hundreds of restaurants in Nairobi, all being quite cheap relative to US prices. For consistent moderately priced food, Java House was a staple for us. We also hired a cook for a couple weeks to free our evenings so we could work.

Participants

1. Michael Gordon (Head Instructor, AITI President, PhD Candidate)
2. Michelle Marcus (Instructor, BS EECS MIT)
3. Julian Yuen (Instructor, Sophomore MIT)
4. Cory Smith (Instructor, Junior MIT)
5. Zachary Stauber (Instructor, Sophomore MIT)

More Information

For a near-daily account of the program, please visit AITI's blog: <http://aiti.mit.edu/blog>. In the archives covering June – July 2009, you will find detailed updates and pictures written by the participants.