MIT African Internet Technology Initiative (AITI), Kenya 2007

Lawrence Chan, Stephanie Dudzic, Michael Gordon, Gleb Kuznetsov, and Zawadi Lemayian

February 28, 2009

Contents

Part I

Executive Summary

Chapter 1

Purpose of this document

Technology has proven to be one of the ways that societies can advance both economically and socially in order to compete in a global market. The lack of technology in many developing countries has made improving the economic and social conditions difficult.

The Africa Internet Technology Initiative is one of MIT's efforts to bridge the technical gap beginning with Kenya, Ghana, Zambia and Ethiopia. In these countries, teams of approximately five MIT students develop a curriculum and implement an intense six week course in Java along with an entrepreneurship component. After finishing the course, students not only leave with a strong foundation in Java, but also new perspectives on problem solving and other valuable skills. At the end of the course, students are motivated to use and apply their new technological and entrepreneurship skills to contribute and change their communities.

This years AITI Kenya team was composed of four undergraduate and one graduate MIT student. The students backgrounds ranged from physics, to computer science, to management and business. After being selected, the team immediately reviewed the curriculum and began making preparations for the summer.

The Kenya team taught at both Strathmore University in Nairobi and also at Alliance Boys High School in Kikuyu. While the summer proved to be extremely challenging in many ways, it also was an amazingly rewarding experience as we had the chance to not only observe, but also to become a part of the educational system and culture of Kenya. We interacted with and motivated the students by not only teaching them, but also by providing them with advice about pursuing careers in technology and choosing among various academic paths in Kenya and and the United States.

Chapter 2

Summary of this document

The comprehension level varied greatly amongst the students at both Strathmore and Alliance. We were constantly adjusting the curriculum and our teaching techniques to adapt to these differences and also to maximize the experience for each of the students. We also faced other difficulties, such as minimal teaching time at Alliance High School and also a lack of functional computers, so we quickly adjusted our curriculum and teaching styles to deal with these issues.

While in Kenya, while we were not teaching, planning, creating exams and projects, we also spent time exploring Kenya and seeing as much of the culture as we could. We had a chance to travel to Mombassa on the coast, Nakuru national Park and even another country, Tanzania.

// TODO : Interact with students outside of class

Although our team is proud of the work that we accomplished and the impact we made on the Kenyan community, we do have some recommendations about how the program can be enhanced for not only the team members, but also for the students and participants in the program. The late selection process greatly restricted our ability to plan, get to know our teammates and also discover the strengths and weaknesses of the team before we headed abroad. In addition, there were a few logistical problems as well when we arrived in Kenya.

Part II

Program Description

Chapter 3

Overview

3.1 General Program Description and Program Objectives

The MIT-AITI program was started by a group of MIT students. MIT-AITI is an innovative approach by MIT students to integrate computers and Internet technology into the education of students in African schools. This summer, the program sent MIT students to 2 African countries, Ethiopia and Kenya, in order to teach students programming in JAVA and real-life applications of their programming language and entrepreneurship through intensive classroom and lab sessions over a period of six weeks. The program s objectives include imparting knowledge to the students, in the hope that they will be able to apply this knowledge when they go out to the job market, start community development initiatives and even hone their entrepreneurial skills.

The main objectives of the program are to:

- Enable MIT students apply their technical expertise from their various fields of specialization so as to enable the advancement of Internet technology in Africa.
- Create an opportunity for future MIT undergraduates to participate in community development initiatives that benefit society.
- Create and establish what we hope will be lasting relationships between members of the MIT community and their African counterparts through cultural and educational exchanges.

3.2 Country and School Information

Kenya is a country that is located in East Africa and has a population of almost 34 million people. In terms of communication networks, the country has approximately 300,000 land line users in contrast to 6.5 million cell-phone users. There are 2420 Internet hosts and approximately 2.8 million Internet users. Internet users are primarily from the commerce sector, academic/research institutions, non-governmental organizations (NGOs) and the government.

MIKE: include something on the economic conditions of the population

The summer program in Kenya was carried out at the Strathmore University in Nairobi and Alliance High School, in Kikuyu. Strathmore University came into being in 1961, when it was started as an Advanced-level Sixth Form College offering Science and Arts subjects. It prides itself in being Kenya's first racially integrated institution of higher learning. In January 1991, an

Information Technology (IT) section was added to run computer courses and this was followed up in January 1992 by a Distance Learning Centre designed to offer correspondence courses in Accountancy to students who were unable to attend lectures. In August 2002, the Commission of Higher Education in Kenya awarded Strathmore a letter of interim authority to operate as a University with a Faculty of Commerce and a Faculty of Information Technology. Strathmore University expects to qualify for the award of a university charter during the calendar year 2007.

Currently, the University offers undergraduate degrees in commerce and information technology and also has an MBA program. TheUniversity is developing degrees in other subjects as well, such as business administration, hospitality management, and liberal arts. Strathmore also provides extensive professional courses leading to certificates and diplomas. There are around 600 degree candidates and over 4000 certificate and diploma candidates in a variety of business and management subjects. According to its strategic plan, Strathmore contemplates significant expansion as part of its fulfillment of requirements for university status and its efforts in the service of Kenya and Africa for the creation of wealth and eradication of poverty, improvement of governance, the empowerment of women, and the elimination of AIDS. The institution is managed by the Strathmore Education Trust, a non-profit trust incorporated in Kenya. The MIT-AITI program worked in collaboration with the Faculty of Information Technology.

Alliance High School was founded in 1926 and was the first institution to offer secondary school education to Kenyans. It is a very competitive institution that is highly reputed for the quality of its education and its consistent levels of academic excellence in the Kenya Certificate of Secondary Education examinations each year. It is an all boys school with a student population of about 1000. The students are admitted from a pool of talented applicants that are drawn from diverse socio-economic backgrounds nationwide with the aim of offering them sterling education, designed to mold them into leaders who will contribute to the development of Kenya. The rigorous and highly competitive academic community fosters an environment where students are dedicated in their pursuit of excellence and commitment to serving humanity in the spirit of the school motto: "Strong to Serve."

Alliance High School follows the country's 8-4-4 syllabus, which constitutes 8 years of elementary/primary schooling, 4 years in high school and 4 years at a tertiary institution. The 8-4-4 syllabus offers a rigorous college preparatory program following the Kenya Certificate of Secondary Education curriculum. Under this system, the following subjects are offered at the school; Mathematics, Chemistry, English, Geography, History, Christian Religious Education (C.R.E.), Kiswahili, Social Education and Ethics, Biology, Computer Studies, Agriculture, Physics, Power Mechanics, Drawing and Design, Electricity, French, Music, German, Accounting and Commerce.

3.3 History of AITI in Kenya

The MIT-AITI project was developed in 1999 by a team of African students at MIT. In the summer of 2000, a pilot projects was performed at Strathmore College in Kenya. Two former students of Alliance High School, Timothy Mureithi (AHS 1993) and Martin Mbaya (AHS 1995) both graduates of MIT in Electrical Engineering/Computer Science and Mechanical Engineering/Computer Science and Mechanical Engineering/Computer Science respectively, were part of the inaugural team in 2000 that played various roles in taking the program from concept to reality. A team of 4 MIT undergraduates taught lessons in JAVA programming, HTML and the basics of UNIX. In addition, leading executives from the computer industry in Kenya delivered guest lectures to students. The

knowledge of the students was evaluated through community-oriented projects completed towards the end of their training. In June 2001, MIT-AITI ventured into the African high school scene with a pilot project at Alliance High School, for the first time. The second project at Achimota School in Ghana started in August of the same year. Over the years, the MIT-AITI program has grown into a highly resourceful outreach organization and is becoming increasingly popular with students at MIT, Strathmore and the Alliance High School.

Chapter 4

Preparation

4.1 Cirriculum-building

Preparing for the program was essential. While there was still a lot of material from the AITI Kenya 2006 team and this provided a good structure or outline, we often ended up rewriting a lot of the material, formulating our own projects and labs, and also changing the slides to become more in depth. Since the team was assembled so late in the program, we were not able to plan ahead and personalize the curriculum as much as we had hoped for. However, we maintained a fluid curriculum, which turned out to be quite an asset during the course.

4.2 Logistical Preparation

Logical preparation seemed to be pretty good this year compared to previous years. The biggest problem we had was just transportation between our home to Strathmore, and the changing of the drivers. We also had a variety of different drivers taking us from Strathmore to Alliance High School. Sometimes the drivers would come early, while other times they would come later than expected because of other commitments. It would have helped our team to know about the changes in schedule so we could adjust our day to them as well.

4.3 Team Building

Since we were assembled so late in the semester, our team did not have as much of a chance to meet and begin the team building process as much as wanted. However, we did meet as many times as we could before we left for Kenya and also remained in constant email contact throughout the final weeks.

4.4 Interaction with Team Leadership

Due to time constraints, this was rather limited. We were able to email any questions to the executive board. We also had a person from the previous AITI Kenya team talk to us at one meeting, telling us what the team had done last year.

4.5 Success, Problems Encountered and Future Recommendations

It was great that we had material from last years team to work with. This year while making the curriculum or weekly reports we tried to document our work with the idea in mind that future teams might rely on our experience and knowledge. Also, if selections could be made earlier, the team could prepare very well and be even more successful with the program. While we did face a lot of challenges in the program, we did realize that being flexible and resilient is a part of the AITI experience. One must be able to improvise and work with any back-up plans.

Chapter 5

Java Curriculum

5.1 Strathmore University

5.1.1 Overview

AITI is advertised to Strathmore students as a "'Java Internet Programming Class"'. Our original concrete purpose was to satisfy this description by holding a series of lessons familiarizing students with programming using the Java language. Students enrolling in the class claimed various levels of previous experience (C++, Visual Basic, and MySQL were common), but it soon became clear that our class would be demanding more than a mastery of syntax, but more importantly we wanted to help students develop independent problem solving abilities. In this spirit, the curriculum would evolve as the material became tougher with assignments and projects quickly becoming more open-ended and demanding of student creativity and research abilities. We found it necessary to narrow the scope of the material covered in order to ensure a higher level of mastery at each level. Standard introductory lessons in Java were conducted up through fundamentals of object-oriented programming with a J2ME mobile development unit at the end.

5.1.2 Schedule and Class Operation

- Week 1: Introduction, Variables, Control Structures, Arrays
- Week 2: Methods, Classes
- Week 3:

5.1.3 Delegation of Responsibilities within Team

- General description of each person's role

5.1.4 Curriculum

```
* Overview
** Began with the curriculum as given to us by Kenya's 2006 team.
** Included powerpoint presentations for major java topics (e.g.,
variables, arrays, classes, awt)
```

*** Looked to be borrowed from ocw course??
** Included labs for each topic
*** Unknown origin
*** impressions: not debugged, showed good progression in later labs, not very interesting (grade book example), labs did not reinforce the material
** Included some projects that appeared not to be fully realized
** The main problem was that it was not designed with the intended audience in mind
** The curriculum did not teach the students any useful skills/concepts except java

* Cell Phone programming via J2ME
** during preparation we wanted to include cell phone programming due to the popular/accessible technology of kenya
** based on the book?
** would require the students have a good grasp of basic and intermediate java concepts
** Saman advised michael to talk to nokia research about getting phones.

* Lectures
** Initially we corrected/edited the lectures given to us from the previous year and projected those.
** asked questions of students
** little class participate or interaction or feedback
** labs reinforced that students were not absorbing the material
** Early on, we found the lecturing method to be inadequate
*** The lab room was not conducive to lecturing (too long, too many distractions, too loud)
*** The students would not give us any clues as to their comprehension
*** They would blankly stare at the screen and ask a few questions
*** We were forced to hold many impromptu reviews
** After the performance on the first exam we decided to reduce our reliance on powerpoint and lecture mostly from the board
** we began lecturing each day with emphasis placed on reviewing past concepts and answering question and examples
** we tried to explain why one would use an idiom, not just how
** lectures became longer and more interactive
** we coded while projected, so that students could see us changing the application
*** students impressed by our typing speed ;-)
**
** At the four week mark we decided to focus on cell phone programming

and do whatever necessary to get to the subject, dropping superfluous material including awt, exception, etc
** we decided that j2me would be a good introduction to graphical user interfaces. it is more constrained than the full awt (which few use) and it is easier to learn.

* outline of topics covered and something about each one:
** Introduction to Java
*** why use java, define java buzz words
** Variables
** Operators
** Control Structures
*** Loops (Separate Lab)
** Arrays
** Methods
** Scoping (no powerpoint)
** Classes and Objects (multiple lectures)
*** The most confusing topic of the curriculum
*** really should not be included in an introductory course
*** we didn't get across why/when to use a class
** References (no powerpoint)
*** necessary to understand the finer points
** Static and Final
** Inheritance
** Abstract Classes
** Interfaces
*** Self learning
** Intro to J2ME
** J2ME GUI

* Labs
** Decided to stick with jcreator
** already installed at strathmore and easy to use but lacking features
** Cheating rampant (see below)

* discuss each lab, goal, grading, difficulty, problems, etc.
** Lab 0: Hello World
** Lab 1: Variables and Operators
** Lab 1 Extra Credit
** Lab 2: Control Structures
** Lab 2 Extra Credit
** Lab 3: Loops
** Lab 3: Extra Credit

** Lab 4: Arrays
** Lab 4 Extra Credit
** Lab 5: Methods
** Lab 6: Object Oriented Programming
** Lab 7: Inheritance
** Lab 8: Interfaces
** Lab 9: Introduction to J2ME
*** introduction to the tool chain including jwt
** Lab 10: J2ME, Bus Booking
*** Final project for most students

*** We confronted students and gave 0's
*** We found out later that the students had set up a network folder
in order to share assignments, although some swear that they were
using the assignments as reference and only when in dire straits

* Mid term project
** Fake cell phone applications using a text-based menu system
** solidify concept already covered
*** functions, arrays, classes, objects, etc.
** introduce them to concepts required for cell phone application
development:
*** interface design
*** flow of an interactive application
***
** three parts, progressively increase difficulty
*** complete nearly finished code and understand the code
*** complete skeleton of contact list
*** complete something of your own
** tried to discourage cheating by having the students s
** grades
** comments
*** many students had trouble finishing this project on time
*** we gave extensions
*** but we were gone for 3 days during the project (mombasa)
** Grades and comments

* Tests
** because cheating was present, we needed tests to distinguish
** see appendix
** grades for tests
** possible language barrier problem (see problems/recommendations)
** many students showed a total lack of java programming skills
** many students did not understand what the question was asking

exactly

5.1.5 Final Project

Bus Booking
* final lab turned into final project
* most students did not finish final lab with enough time to allow
them to work on a final project
** describe other ideas we had for a final project
*** Lawrence's document

* describe bus booking lab

* For final projects we encouraged the students to devise their own
idea for a cell phone project. a few students did propose
applications but they were either too difficult for a final project or
unrealistic for other reasons.
** kamau proposed a game and Michael gave him permission to work on a
game after he completed the assign final project/lab
*** describe game

* also encouraged students to add more features/functionality to bus
booking app
* One student Claire headbob, used the persistent store...

5.1.6 Contribution

What does this section even mean? If its the same as the delegations subsec then i suggest we merge them. -LLC

5.1.7 Successess and Problems

* Overall
** Successful in teaching syntax, concepts, and conventions
** Problem solving skills improved, but not as much as we would have liked
*** Cheating was an easy route for avoiding problem solving
** Independent research skills were emphasized
** Inspired forward thinking in an IT mindset
** Did not have full curriculum ahead of time, so designed as we went

```
*** Some labs were disasters
*** Less sense of coherence and continuity in curriculum

* J2SE
** Almost 100% success with basic programming concepts
*** At the very least they will leave the class with knowledge of variables, operators, methods
*** Very few had good planning/designing/organizational skills, maybe something to improve on?
** Satisfactory grasp of Java syntax
*** Some still struggled with simple syntatical errors (semicolons/capitalization)
*** Most were at a level where they could improve on their own with time
*** Indentations and style were, in general, horrible; need more emphasis in the future

* J2ME
** Successfully programmed, tested, and ‘‘deployed’’ basic J2ME programs/packages
** Demonstrated the commercial viability of J2ME programs with the bus booking project
*** Saw more excitement/enthusiasm than in the J2SE portion of the class
*** GUI stuff seemed to keep them interested
```

5.2 Alliance High School

5.2.1 Overview

```
* Rough week-by-week agenda
* Goals were to cover a ton of material but only got through very basics.
* Many more problems than at Strathmore
```

5.2.2 Schedule and Class Operation

Course calendar

5.2.3 Delegation of Responsibilities within Team

List of them

5.2.4 Curriculum

```
* Lectures
** Same as Strathmore (?)

* Labs
** Lab-by-lab, same as strathmore on most

* Final Project
** Space invaders project
```

¡++¿

5.2.5 Final Project

```
* Objective
** Teach analytical skills and have the students learn to read others' code
** Debugging
** Following directions

* Overview and Description
** Desc of basic game (similar to space invaders, etc)
** Outline of basic steps taken
** Room for creativity at the end
*** Kennedy and his crazy skillz

* Success and Failure
** Most were able to implement the described modifications
*** Some needed hand-holding, however
** Usually one dominant coder per group
** Only one group did anything moderately interesting
```

5.2.6 Contribution

See above, i think its the same as the delegations subsec. -LLC

5.2.7 Successess and Problems

```
* Overall
** Somewhat successful in teaching rudimentary programming concepts
** Shallow understanding of programming
*** Shaky foundation (variables/operators/control structures)
*** Not enough time for deeper topics
** Failed to cater to individual needs
*** Group-based labwork is inherently flawed
*** Far less time for each individual than at Strathmore (less of us and less time)
** Problems with gaming/surfing
*** Spent time addressing these issues
*** Need more help from the Alliance side on this
** Due to less time and more quiet/timid atmosphere, did not bond as much with students
```

Chapter 6

Self-learning Initiative

6.1 Strathmore

* Due to lack of resources we did not have ample time to devote to an organized self-learning (advanced) initiative
* we prepared extra-credit problems for the early labs for anyone that completed with the regular labs
** few finished these (get exact numbers)

* Early in the course it was recognized that most students lacked the necessary skills to undertake a self-learning initiative
* deficient skills mainly included internet searching but they also lacked knowledge of what the broader IT field so they didn't know where to begin independent study
*towards the first deficiency, we created a lab that forced students to learn on his/her own and submit a document describing the process
** learn interfaces without instruction or peer interaction
** what resources were good/bad, what helped the most
** have to read these assignments!
** could be the basis for the future inclusion of curriculum focused on effective internet researching skills

* only one student was consistently advanced and interested in learning more about computer technology: Kamau
* Kamau was an exception student possessing enthusiasm for information technology
* Kamau has diverse interests in IT and began teaching himself java a few months before the program
* Michael attended to kamau's questions on/problems with
** java networking
** internet technologies (including IP, TCP, etc.
** linux
** j2ee

** graphics
** threads
** j2me
* Michael attempted to defeat his defeatist attitude (‘‘that cannot be done in Kenya’’)
** give example of email to sms!

* For final projects we encouraged the students to devise their own idea for a cell phone project. a few students did propose applications but they were either too difficult for a final project or unrealistic for other reasons.
** kamau proposed a game and Michael gave him permission to work on a game after he completed the assign final project/lab
*** describe game

* also encouraged students to add more features/functionality to bus booking app
* One student Claire headbob, used the persistent store...

* Also relevant
** many students showed an interest in linux and we handed out linux distributions.
** many students showed an interest in developing for java at home and we distributed sdks and java ides

6.2 Alliance

Chapter 7

Entrepreneurship

7.1 Purpose

Entrepreneurship was added to the AITI program in 2005 to facilitate bridging the gap between IT theory and its application. Students are guided in finding the means to realizing their ideas using the technical skills they learn in this and other courses. It was stressed that students should take assignments and the business plan competition seriously as they could potentially attempt to start a real business with these very ideas.

7.2 Curriculum

The curriculum consists of a set of lectures building up to the development of a team business plan. Students are exposed to general entrepreneurship concepts, anecdotes of successful tech start-ups, and guest speakers from the local community as they form an understanding of the process of realizing an idea.

7.2.1 Team Business Plan Competition

The team business plan competition provides both practice and motivation for the entrepreneurship curriculum. Teams of up to four students were decided by the students themselves. Each team was then responsible for collectively completing the assignments leading up to development of a complete business plan. The final business plans were judged according to business potential, benefits to local community, viability, and presentation. Submissions ranged from product-oriented websites to consulting firms. The winning team was awarded a certificate which they may be able to cite on a resume.

7.2.2 Lectures

Lectures explore general entrepreneurship concepts as well as anecdotes of successful tech start-ups as taken from the book **Founders at Work** by Jessica Livingston. At Strathmore, many students had encountered similar material in general business contexts. Topics include:

- (Entrepreneurship Lecture 1: Intro to Entrepreneurship)

- (Entrepreneurship Lecture 2: Management Team & Product/Service)
- (Entrepreneurship Lecture 3: Marketing)
- (Entrepreneurship Lecture 4: Objectives and Executive Summary)

7.2.3 Assignments

Assignments are based around brain-storming and writing parts of the business plan. Breaking down the business plan into these components allows students to look at the plan from a modular perspective to more clearly define the differences between each component. Eventually, students look at the relationships between each component as they merge their work from the assignments into a complete business plan.

7.2.4 Guest Lectures

We were able to get in contact with two local entrepreneurs this year to come in and speak to the class about their experience. This may have been the most inspirational component of the Entrepreneurship curriculum as students asked many questions, ranging from highly-specific to very broad.

Ken Njoroge (ken@cellulant.com) is an alumnus of Strathmore University who has started two cellular technology related companies within a decade of graduating from Strathmore. His current endeavor, Cellulant, sells ring tones and other content to customers in Kenya, Nigeria, and the UK. Ken talked about the importance of setting goals, performing extensive research, and looking for paradigm shifts in markets. He was happy to come in and talk and would be a great lecturer for years to come.

Njeri Rionge (njeri.rionge@igniteconsulting.co.ke) is CEO and Founder of Ignite Consulting & Investment Limited, and Director and Co-founder of Wananchi Online Limited, an IP technology provider. While Njeri's lecture complemented Ken's in many ways, she offered a somewhat different perspective on business, stressing the importance of leadership and communication as typified by her central phrase "'attitude over aptitude"'. Njeri offered another great anecdote of an individual who was able to overcome bureaucratic barriers in growing a business in Kenya. She is a powerful speaker and would be happy to speak again.

7.3 Delegation of Responsibilities within Team

Gleb and Zawadi drove the Entrepreneurship Curriculum, developing lectures and assignments with the aid of previous years' materials and resources on writing business plans.

7.4 Successes, Problems Encountered

This year was arguably the most successful year for the Entrepreneurship component of AITI based on the fact that all teams were able to submit complete business plans. This success was based on building the lectures and assignments around developing the business plan, providing motivation for both learning the material and creating the final product. Many students were aided by having

previously developed business plans, but through modular development and extensive feedback, the business plans became stronger, with several highly-viable plans resulting.

The biggest problems encountered were time-constraint and lack of specific resources to give to students. The resource problem was not immense as students were encouraged to search the Internet for examples and tutorials on writing business plans; however, in order to standardize the curriculum a bit, it would be good to have a resource available in advance. It is essential to commence the Entrepreneurship curriculum as early as possible to allow for maximum time. Additionally, it may be a good idea to add some level of implementation to the competition to give students the experience and confidence in materializing a plan. Other suggestions include a tangible prize for the competition, previous years have proposed a cash prize to be used toward starting the business; it may be more useful to arrange a meeting with some sort of VC or consulting firm to really help the students get the idea off the ground.

Chapter 8

Additional Activities

Part III

Future Recommendations and Problems Encountered

Chapter 9

Problems Encountered and Recommendations

MIT AITI Kenya 2007 encountered a multitude of problems during the program. Many problems were the result of lack of preparation, but many could not have been foreseen and could not have been avoided. This chapter covers the problems that surfaced during the program and recommendations for the future that will hopefully prevent the problems we encountered and other problems. We feel that the recommendations will result in a more effective AITI for all parties, the participating teachers and African students.

Before we begin presenting our experiences and recommendations, we need to discuss a contradiction in the goals of the MIT AITI program. Obviously, the program strives to be an effective vehicle for teaching and promoting information and communication technology (ICT) in Africa. Also, the program looks to better the MIT participants by placing them in a dynamic environment requiring rapid adaptation and learning. Towards this end, many MIT participants are not selected based on their pre-program qualifications, but selected assuming they will learn from the experience. We feel that the current officers of AITI have placed too much emphasis on this second goal, to the detriment of the Kenyan students.

The African students should be the primary beneficiaries of the program. Promoting ICT in Africa should be the main goal of the program. If the officers of AITI feel that the program is mainly for bettering MIT students, producing students that are dynamic and adaptable, then many of our recommendations can be ignored. Otherwise, our recommendations will help the effectiveness of the program in promoting ICT in Africa.

The team recognizes the limitations of this program and the demands placed on its officers. The officers are volunteers who are also students at MIT. They are past participants in AITI. In their free time they arrange the program. We do not wish to be too critical of them and we would like to take this opportunity to thank them for their hard work.

We organize the problems faced and the solutions proposed into four categories: Group selection, Preparation, In Country, and Beyond the Classroom. The remainder of this chapter will be divided into sections covering these categories.

9.1 Group Selection

The most important requirement of a teacher is that she be experienced in the subject matter being taught. The participants of AITI must be experienced in the subjects covered by the AITI curriculum. If Java continues to be the main focus of the curriculum, most, if not all, participants need to experienced Java programmers. This experience could include having successfully completed an MIT course that requires Java (e.g., 6.170) or having had a job or internship position that used Java. This would be less of a problem if the participants were selected earlier as the participant would have time to build the necessary Java knowledge and experience (see next section). However, nothing substitutes for actual programming experience, be that experience from a class or a job. If the Entrepreneurial curriculum persists, at least one participant should be a business major with experience writing and evaluating business plans.

Another important requirement of a teacher is excellent communication skills. Furthermore, a teacher must organize and present the material in a manner that will promote learning. To ensure these requirements, AITI participating teachers should have prior teaching experience. The AITI program is extremely demanding of a teacher and should not be a participant's first teaching experience. The program requires rapid adaptation. Material must be presented in a manner appropriate to the audience. Prior teaching experience helps immensely in tailoring the presentation for the African audience.

Less tangibly, many of the MIT participants should demonstrate an interest in development issues relating to developing countries. Obviously, it cannot be required that each of the participants have prior interest and experience in promoting ICT in developing countries, as the participants are mostly undergraduates. However, an enthusiasm for reducing the discrepancy in quality of life between first-world and developing countries should be sought in all participants.

Having a Kenyan as a member of our team was invaluable. Zawadi was an indispensable resource for local knowledge that helped us with class and extra-curricular issues. For example, she reviewed classroom materials for appropriateness to our Kenyan audience: deciding if lab/exam/project narratives were suitable and substituting any unfamiliar English words. She helped the other members to learn the customs and institutions of Kenya. This eased the transition to living in and exploring a new country.

Each future team should include a member with local knowledge of the destination. We understand that this is a difficult requirement, but it does not have to be achieved solely by including a national of the destination country. A former AITI member who served in the destination country can also be a member of the team. Having a veteran member would help the effectiveness of the program as this member could guide the inexperienced members and apply lessons learned from his/her first experience.

9.2 Preparation

```
** Choose the participants earlier (including group assignments)
** Choose the countries earlier
** More participation required from previous years' teams
** All participants should become familiar with their destination
country, its customs, cultures, problems, demographics, technology,
etc.
```

*** They should come from interaction with previous years' teams and through readings
** Better/more complete curriculum given to teams
** force/encourage teams to meet with each other
** participants should be instructed on how to interact with members of a different (developing) culture
*** tactfulness, acceptance, embracing of differences

9.3 In Country

* Leave for the country one week in advance to get work out the details of the program.
** set up computers and programs at host schools
** set up apartment infrastructure including networks/internet
** meet with faculty at host schools, sit in on classes, talk to students
* Language barrier was a problem. Our material used the unambiguous, technical style reserved for problem sets at mit. The students might benefit from a less formal presentation.

Strathmore:
* with current resources (5 people group), impossible to cater to both normal and advanced students without prior preparation
* we need to decide if this is a course that everyone can take, therefore hurting the advanced students
** although there were maybe 8 students that we would consider suitable for an advanced track

* student selection should be more selective ;-)
** pass a test?
** minimum typing speed!
** minimum gpa? (although we don't know about the grade dist. at strathmore)
** we need students who have enthusiasm for the material and are willing to work hard for the 6 weeks

* curriculum changes needed
** should not be so focused on java
** infact why teach java, it is a horrible teaching language. it is too complex, what about python?
** introduce internet technologies, cell phone technologies, etc.
** should be focused more on self-learning and projects

Alliance:
* Need curriculum tailored to alliance.

** Slower pace
** more interesting
** more focused on concepts versus hard java implementation
** more introductory topics such as anatomy of a computer, internet technologies, cell phone networks...

* The computing facilities were a major problem
** although new computers arrived, they were unstable and were not administered properly
** Alliance must improve the administration of their computers
*** centralized administration using either windows or linux
*** more here!
*** This would enable more stringent grading practices
** have someone go over during iap and help them setup their computing facilities

* Classroom discipline problems
** students doing other things during class time
** unsatisfactory class attendance
** The class must count toward the GPA

* Class size was a major problem
** could not get to know students
** impossible to take attendance
** not enough computers
** smarter, more aggressive students would monopolize computers
** either reduce class size or have 2 sections that alternate instruction with lab time

* separate classroom required for lecturing

* Develop curriculum that would continue where the previous year left off but would be formatted as self-learning. The instructors could meet with these advanced students once a week to answer questions and provide encouragement.

9.4 Beyond The Classroom

Other
* create a better website
** allow students to register, post updates, interact

9.5 Lawrence

* Mike i didn't read all of that but judging by the length you probably covered every possible combination of criticisms and recommendations

* Mine are:
** Earlier selection
** More interaction with previous team(s)
** Development of courseware throughout the year
** Teaching skills/experience more important than java skills because anyone can learn java at least as fast as the curriculum
*** Counter to mike's argument, i dont think crazy java experience is necessary for everyone, as long as theres two or three solid ones
** More team bonding before crunchtime
** Interaction with the school admins/liasons before arrival
** Restructuring everything Alliance

and most importantly,
KNOWLEDGE OF JAVA HOUSE

9.6 Stephanie

More time at Alliance High School, time that was actually allotted, students would often miss dinner to work. Computers and technology still a problem. Need a different curriculum or focus. Maybe have students who had a consistent background. Many of the students had taken some basic logic computer classes, others haven't. Have someone from a more entrepreneurial background, perhaps work with professors here ahead of time before leaving?

Impacts and Benefits -Interest and gained experience with teaching, specifically in the technology field. Gained a different perspective on teaching and it's role in society and culture. Gained experience working with people of different working styles. Exposure to new perspectives and cultures. Still talking with students about their lives and application process and helping find resources to match their technological needs.

(maybe mike talked about how he helped students with resumes etc)

Part IV

Impact and Benefits

Chapter 10

Students and Kenya

The program benefits the students and Kenya in a number of ways as outlined below. The programming and entrepreneurship skills that are imparted to the students empower them with knowledge that assists them in future endeavors, for example those who choose to pursue careers in the IT industry or opt to become entrepreneurs.

The self-learning opportunities that were provided to the students enabled them to learn how to research and find reliable information on their own, a skill that is becoming increasingly today. The students were also able to make customized application using J2ME, providing an opportunity for them to delve into cell phone programming, a particularly useful skill in Kenya and other developing countries where cell phones are more accessible than computers. Such applications would therefore provide a foundation for the development of mobile phones that are tailored to meet the needs of the local populace and that can also be used elsewhere.

By teaching the basics of Java programming at the Alliance High School, we were able to spark interest in the boys in IT and hopefully help them make more informed decisions when deciding what careers they want to choose. The college application information session also provided the students with an opportunity to learn about available learning opportunities outside Kenya and the procedures to be followed in the college application process.

On a large scale, programs like MIT-AITI provide the basis for socio-economic development by facilitating the integration of the country into information society. In addition, the knowledge and skills gained by the students provide more efficient ways to share information and knowledge.

Chapter 11

Instructors

11.1 Michael Gordon

* Problems with life in america (brief)
  * superficiality/consumerism/marketing
* Problems with grad life at MIT:
  * solitude as a grad student in the EECS department of MIT
  * lack of sense of bettering the world and helping fellow man
  * lack of sense of reward from work due to inability to see results of work.
  * Boredom of the day to day routine
* This program was the cure to all those problems
  * rewarding social interaction with enthusiastic students
  * finally applying knowledge towards greater good
    * not just programming, but showing students that with hard work, many things are possible.
* My future direction:
  * reinforced my belief that I am an effective/dedicated teacher
  * refocused my concerns with the developing world
  * was able to make many contacts that could help me with my pursuits
* Continuing to follow my interests in bringing technology to developing world
* Showed me that there is an alternative to the consumer culture that dominates the west. But i digress...
* Destroyed my misguided conception of africa as a land of violence and chaos.
* Encounters reaffirmed my belief that humans are generally good.
  * We had so much selfless help along the way in the program and in our travels
* Showed me what is really important in life
  * accomplished by living without many things that I assumed were essential.

11.2 Stephanie Dudzic

-interest in teaching
-practical teaching experience
-Saw teaching at both university and high school level
-gained more confidence in technical abilities and personally
-learned to be more assertive
Experience another part of the world
See what Africa/Kenya really was like
-saw a different way of life and culture

Chapter 12

Program

```
* Questionable efficacy of program in the past.
  * Based on knowledge/performance of past participants at Alliance
  * Based on the early lack of success of the curriculum given to us
  * Based on the performance of the students last year???
    *  Although many of our students did not do so well.
* Improved curriculum (although we cannot prove this)
  * The curriculum from last year was not effective as taught
  * Improved powerpoint lectures from last year
    * fixed errors
    * added examples
  * Recommendations for teaching style
    * less reliance on dry regurgitation of powerpoint slides
    * more dynamic lectures in a classroom with many questions
  * Added new content to curriculum including:
    * mobile device programming using J2ME
  * Improved inherited labs and added new ones
    * important lab on nested loops added
  * Placed a focus on how to learn independently (Strathmore)
    * all students were forced to learn some concepts independently
    * one assignment forced this and asked the students to write about
      his/her experience.  We were able to provide feedback on the
      students' searches.
  * Created new class projects
    * Strathmore mid-term project reinforced oo programming in java
      and introduced concepts pertinent to cell phone programming
      (e.g., user interface design, menus, api adherence)
    * Strathmore final project modeled a real world killer application
      for cell phone programming.  Students were able to test their
      project on donated N70 cell phones from nokia research.
  * Reintroduced the entrepreneurial component of the class
    * students completed business plans
    * similar to other endeavors in Kenya
```

    * bettered the reputation of AITI because it is not so narrowly
      focused on computer programming
* Focus of program shifted to topics that
  were more suited to Kenya and developing countries.
  * Cell phone programming
  * thoughts about startups and other programs that graduates could
    begin
* Strathmore University was a success and news spread of the success.
  * We increased the prestige of the program and its visibility.
  * Our students enjoyed/benefited from the program and are sure to
    tell their friends/colleagues about the program
* Alliance High School was less of a success due but we expressed our
  commitment to bettering the program
* Team 2007 include individuals dedicated to the advancement of the
  program:
  * Not a commentary on prior participants of AITI
  * We want to be more involved in the process of helping next year's
    participants prepare for the program.
  * We want to help begin other programs that could be beneficial to
    Kenya and thus increase the visibility of AITI because we are past
    participants of the program.
  * We want to work on program materials that will help us get more
    funding.
* Expanding program:
  * More high schools taught by AITI graduates.
  * Take curriculum developed this year and apply it to sat. programs.
* This is just a beginning.
  * If we had more time to develop the curriculum and knew what we
    were to expect, we could have been more effective.
  * Now that we have time and knowledge of Kenya, we can help build a
    more effective program.

-Different focus of program at high school level, perhaps on problem solving and teaching
-figure out how to integrate entrepreneurship at high school level

Part V

Appendix

Appendix A

Syllabus and Schedule

A.1 Java Syllabus and Schedule at Strathmore

Don't forget to uncomment the syllabus!

A.2 Syllabus and Schedule for Self-learning

Appendix B

Entrepreneurship Syllabus and Schedule

Appendix C

Student Feedback

Appendix D

Grade Analysis

D.1 Strathmore University

D.2 Alliance University

Appendix E

Instructor Information

E.1 Michael I. Gordon

He's the old sketchy guy.

E.2 Lawrence L. Chan

The asian one.

Appendix F

Names of Students

This section lists the names of the students who satisfactorily completed the course. The students who were awarded "Excellence Awards" are noted. The students are arranged in decreasing order of final grade for the course.

F.1 Strathmore University

1. Kamau King'ora (Excellence)
2. Edwin Conrade Mbogo (Excellence)
3. Claire Mumbi Gichuki (Excellence)
4. Kimani Bob Chege
5. Wakasyaka Emmanuel Lusweti
6. John Deche Mwatsuma
7. Kipkirui Obed Terer
8. Joseph Njuki Nthia
9. Nicholas O Omosa
10. James Fondo Konde
11. Muthoni Grace B Wanjah
12. Njoroge Ngonyo Carolyne
13. Timothy Mwenda Gitonga
14. Eva Migogo Mulache
15. Serfine Atieno Akumu
16. Isaac Kimani Mungai

17. Mark Wambugu Kaigwa
18. Jimmy Gathage Maina
19. George Githaiga Gathaga
20. Muchina Eric Kanyi
21. John Wachira Kibui
22. Murithi Henry Muchiri
23. Gabriel Ng'ang'a Njogu
24. Esther Nelima Watakah
25. Gladys Kigen Kitony
26. Wanjama Kevin Muchiri
27. Mokembo A. Wallace
28. Evelyne Njeri Wainaina
29. Joseph Victor Owuor Ojuka
30. Mwangi Peter Simon
31. James Sudi Nabangi
32. Ngugi Njehia Timothy
33. Kiprono Chumo Rugut
34. Tevulo Elizabeth Kavindu

F.2 Alliance High School

1. Kennedy Mwenja Kenda (Excellence)
2. Mark Maugo (Excellence)
3. Andrew Cheruiyot (Excellence)
4. Raymond Machira (Excellence)
5. Anthony Otieno
6. Mounde Stephen Arisi
7. Shadrack Kioi
8. Kelvin Mureithi

9. Michael Asiago
10. Michael Mureithi
11. Francis Kyalo
12. Fidel Assesor
13. Robert Mutembei
14. Joshua Mwange Musyoka
15. Jonathan Murangiri
16. Francis Muasya
17. Bryan Odindo
18. Francis Karani
19. Michael Kamau
20. Alex Momanyi
21. Cheruiyot .K. Collins
22. Ali Noor Mohamed

F.3 Names of Students Participating in Self-Learning Initiative

F.3.1 Strathmore University

1. Kamau King'ora (kamaukingora@gmail.com)
2. Claire Mumbi Gichuki (clarita_mumbi@yahoo.com)

F.3.2 Alliance High School

1. Kennedy Mwenja Kenda

Appendix G

Pictures