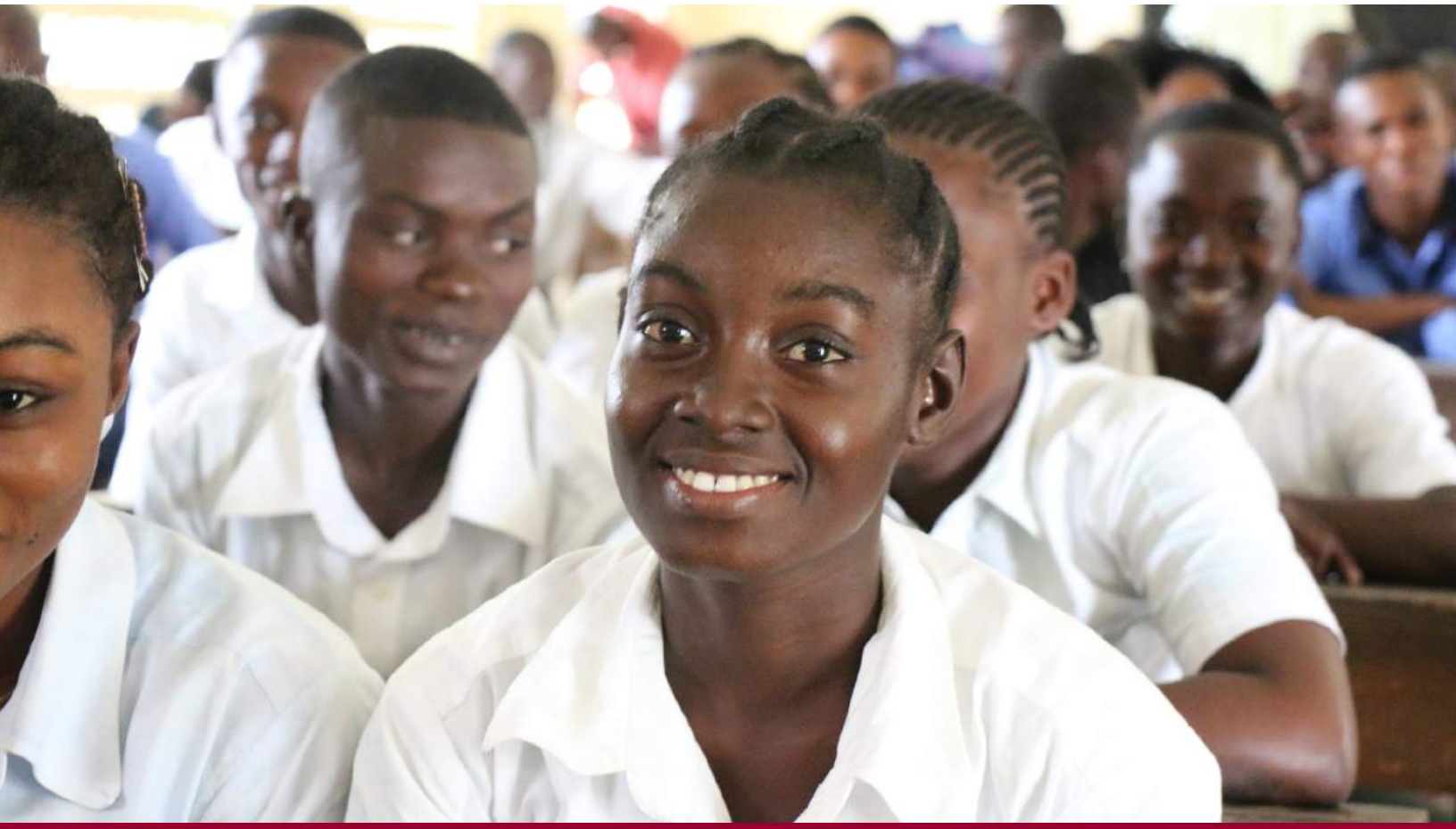
NORTHWEST NAZARENE UNIVERSITY

Doceō Center

Inspire. Educate.



Liberia Afterschool Programs: A Pilot Study Using KA-Lite in a Remote Rural County

Year Two Report

Doceō Center
Northwest Nazarene University

July 2017

Doceō Center Director
Dr. Eric Kellerer

Report Authors
Dr. Eric Kellerer
Dr. Paula Kellerer
Dr. Heidi Curtis


Samuel
Morris
Scholars
Program

JULY, 2017

Liberia Afterschool Programs: A Pilot Study Using KA-Lite in a Remote Rural County

Executive Summary

This report presents the results from the second year of an independent evaluation of a pilot program initiated by Innovative Education Liberia (IEL) in a remote, rural county of Liberia during the 2015-2016 academic year and continuing through the 2016-2017 academic year. The original aim of the pilot was to find and evaluate instructional methods that have the potential to accelerate the learning processes of Liberian students by introducing a personalized approach to mathematics education using KA-Lite, an off-line version of Khan Academy. The second year of this pilot sought to utilize the lessons learned during the first year of the pilot as well as maximize the use of technology that has become available during the interim. During the first year of the pilot, schools were provided laptops which had access to KA-Lite and the components of mathematics from math basics through college-level math. In some cases, upgraded technology was added to their supply, but the basic concept of what was provided to the schools stayed the same. Schools were given enough laptops so that one laptop could be shared with two students, and every student in the impacted grade levels would have adequate access throughout the week.

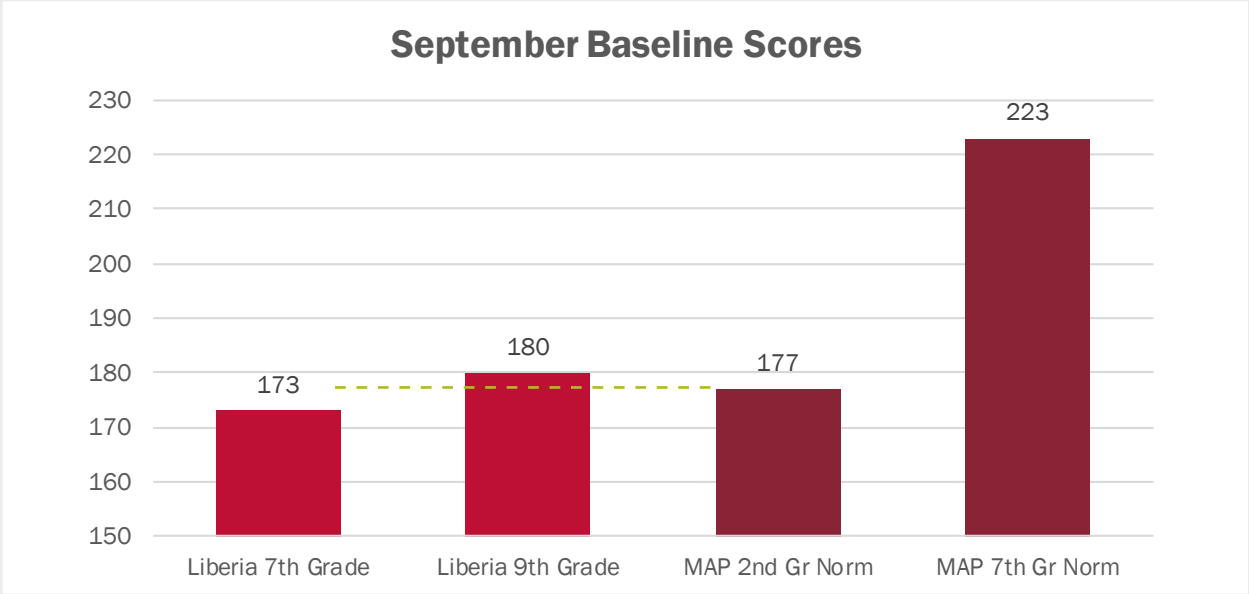
In the first year of the pilot, access to KA-Lite for most of the year happened after school only, with most students receiving one or two hours on the computers per week. Only one pilot school had access during the regular school day in the last quarter of the year. During the second year, schools were encouraged to use the KA-Lite program as part of their daily curriculum. In addition, a large percentage of students were given access to KA-Lite during a summer school session in 2016.

The year-two independent evaluation was conducted by Northwest Nazarene University's Doceō Center between September 2016 and May 2017. The Doceō Center applied a research design that utilized quantitative methods primarily. The over-arching question the researchers sought to answer was: ***Can Liberian students in grades seven and nine, using KA-Lite as a resource, experience notable gains in mathematic scores?*** NWEA's Measures of Academic Progress (MAP) assessment was used to evaluate growth throughout the year.

The results of this study were derived from the quantitative data of 295 pilot students from 6 schools in a rural county of Liberia.

The year-one study of both pilot and control students in the beginning of the 2015-16 academic year confirmed that Liberian students in the 5th, 6th, 9th and 12th grades were far behind their expected level of math competencies in comparison to their international counterparts. This was confirmed during this year-two study among 7th and 9th grade students.

Figure 1



As seen in Figure 1, the mean score of seventh-grade students in this pilot began the year slightly below mean score for second-grade students in the US.

This year-two study did not include control students because, according to IEL, the results of the year-one study showed that the control groups were getting almost no instruction. Therefore, the architects of the pilot allowed control students from year-one to become pilot students for year-two research.

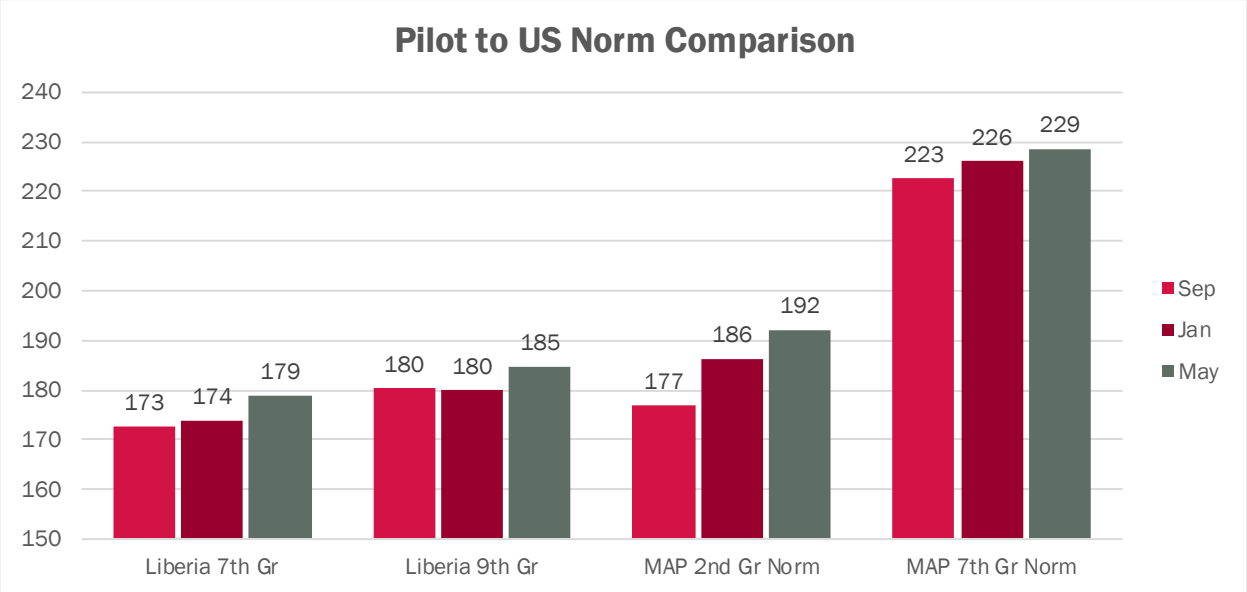
Researchers recognize that there are serious limitations in this study. In all educational research, there are a number of variables which impact learning, however, the factors in Liberia are extreme. Two of the more important factors which researchers were unable to control for are:

1. Absenteeism. Both students and teachers are absent from school often. Attendance records are taken, but researchers quickly discovered that these records are inaccurate. A simple headcount of students seemed to indicate that only about 60% of the students attend class on any given day. It also appears that approximately one-fifth of the teachers are absent from the classes they teach each day, leaving the class unsupervised and without an instructor.

2. Poverty. There are many studies that would indicate that lack of proper diet, shelter, and other environmental considerations can have an adverse effect on the ability for a child to learn. All of those factors are to be considered as part of the Liberian situation.

Quantitative results were mixed, but have shown a positive influence on math scores for the pilot students. Significant growth was noted throughout the entire academic year with the strongest growth between January and May 2017. The growth in comparison to their US counterparts continued to show a significant difference (Figure 2) This strong growth in the last half of the year was attributed to the participation of four Liberians hired as classroom monitors to guide and encourage students.

Figure 2



The research question for the year-two pilot was as follows: ***Can Liberian students in grades seven and nine, using KA-Lite as a resource, experience notable gains in mathematic scores?*** Based on the research, KA-Lite alone does not seem to make a significant difference. Students appear to need the adult direction and encouragement given by the monitors of the classroom in order to progress in their mathematics ability. As stated in the introduction, Liberian students are facing many challenges. The multiple challenges require a complex set of solutions, but IEL is working to address the needs of the community and those attempts appear to be making a difference.

Recommendations based on this study — YEAR 2

1. The presence of the classroom monitors appears to be making a difference. Whether their presence increases the time a student spends on KA-Lite, increases their focus, or decreases the interruption due to computer problems, it would appear advantageous to continue to place people as monitors with the laptops in the schools. These monitors need not be certified teachers or trained mathematicians. They need to be able to solve basic computer problems and they need to be a consistent, encouraging presence in the classroom each day.

2. Continue to follow the seventh and ninth-grade students into next year. Evaluate the student's growth to determine if they will continue to accelerate in their learning growth after they have become completely comfortable with this new style of learning.

3. Increase the amount of professional development given to teachers and the frequency of that professional development throughout the year. We recommend that teachers receive regular instruction (at least quarterly) in the use of the computers in education, but also in areas of classroom management and other instructional strategies that would support this method of education. This professional development should be offered to all teachers, not just the math teachers in the pilot.

4. Each school must find a way to increase the attendance of their students and their teachers. Many days, up to half of a class may be absent. Students notice that their teachers also are not coming to class.

Table of Contents


NWEA MAP TESTING
Northwest Evaluation Association
IEL

Introduction

Many students in Liberian schools have had interruptions to their education. From 1989-2003, civil war kept many students from attending school regularly. The war has been over for more than 14 years, but infrastructure and the habits of consistent schooling have been slow to rebound. The median age of citizens in Liberia is 17.9 years of age (World Fact Book, 2014[1]), and almost 95% of people live on less than two dollars per day (World Bank, 2016). As Liberia is listed as one of the four poorest nations in the world (Global Finance Magazine/ www.gfmag.com), resources for schools are scarce, and teacher training and development are lacking. In many cases, the teachers in elementary and secondary schools have only a basic high school diploma with little or no preparation in formal teacher training programs.

In 2014, a series of Ebola outbreaks again disrupted consistent schooling for Liberian teachers and students. Schools were officially closed for six to eight months, and many students were left without parents or to deal with the deaths of family and friends in their communities. Teachers and school systems have worked to rebound from these tragic events, but progress can be slow.

In September of 2015, Innovative Education Liberia (IEL) started the Samuel Morris Scholars Program in eight schools in rural Liberia. In the first year of the pilot, IEL provided 13-18 laptop computers, a Remote Area Community Hotspot for Education and Learning (RACHEL) server loaded with educational applications (including KA-Lite) that did not require internet. Three of those schools also received a generator. Students in designated grades at each school participated in the Measures of Academic Progress (MAP) test three times during the school year.

In year-two of the pilot, control schools from year-one were added as pilot schools, but no additional schools were added as control schools. While this is a limitation of the study, it was determined by IEL that any gains in MAP RIT scores would be considered a positive outcome.

In the rural county being studied, there are 7 high schools. One school in Monrovia was also given laptops and instruction, but it is not part of this year-two study for two reasons. First, it was noted that the urban environment made it difficult to compare results to the rural environment. Second, it became evident after the first semester of the pilot that the school leaders and teachers were not making it possible for their students to spend the necessary time learning through the computer.

Of the 7 rural county schools selected to participate in the year-two pilot, 2 schools had the majority of their laptops stolen during the fall term. The laptops in one of those schools were not replaced. They were unable to participate fully in the pilot program without the needed technology for most of the academic year. The second school had their laptops replaced after 2 months, but it is likely that the disruption in their learning schedule had an impact on their processes.

The six schools that remain in the study (this includes the school who had 2 months without laptops) began the year with a similar plan. That plan was to invest ample time in professional development for teachers and then let KA-Lite become the curriculum for the students during 4 out of 5 days each week. By mid-year, however, it was determined that the teachers were not yet clear on their role and classroom monitors were brought in to four of the schools by IEL. Later in this paper, the role of the classroom monitors will be described.

The year-two pilot included students in grades 7 and 9. This was a change from the year-one pilot. The purpose of the pilot was to find and evaluate instructional methods that have the potential to accelerate the learning

[1] *See https://www.cia.gov/library/publications/resources/the-world-factbook/geos/li.html*

processes of Liberian students by introducing a personalized approach to mathematics education using KA-Lite, an off-line version of Khan Academy. After adjusting for the lessons learned in the year-one pilot, instructional strategies were applied and tested.

In September 2016, students in each of the schools were given basic computer instruction and practice navigating and selecting items using the track pad on laptops. Following the instruction, students were given the NWEA MAP assessment in mathematics. Students were given an additional two hours of training in the use of KA-Lite. Teachers were given 4 hours of instruction on KA-Lite and instructions on using it as a curriculum.

Based on the January MAP scores and observations, IEL chose to place one classroom monitor at 4 school locations for the remainder of the year to increase the time spent on those computers each day. The purpose of the monitor was to set up the equipment each day and encourage and guide students as they worked at the computers. The classroom monitors were not trained teachers, nor were they especially gifted in mathematics. The intervention that took place in these 4 schools provided the researchers a unique challenge in maintaining statistical integrity.

The study of both pilot and control students in the beginning of the 2015-16 academic year confirmed that Liberian students in the 5th, 6th, 9th and 12th grades were far behind their expected level of math competencies. This information was confirmed in the year-two study. The Fall 2016 mean score for all 7th graders in the pilot was 172.57. In comparison, the Fall mean score for 7th grade students in the United States is 223 points.

Although the RACHEL server includes hundreds of resources for education, this pilot during the 2016-2017 academic year focused solely on the mathematics resources from KA-Lite. Pilot teachers were encouraged to have two students work at a computer together. Students were paired based on teacher assigned test scores so that more advanced students worked together and less advanced students worked together. These pairings allowed more students access to the computers each day, and IEL believed that students would encourage each other to move forward in their learning.

Each of the pilot classes were encouraged to interact with KA-Lite 4 times per week for 60 minutes. The reality, however was far less in some of the schools, especially from September to January. Many factors reduced the time students had on the computer. There were periodic technical problems that caused computers to be out of order. Generator failures and lack of funding for fuel caused problems. Absenteeism also contributed to decreased time on the computers. After attending classes, researchers observed many classes often had 40-50% of the students absent.

In addition to the mathematics instruction, teachers in the year-one and year-two pilot were asked to present short character building lessons based on the life of Samuel “Kaboo” Morris. Morris was a young Liberian who migrated to the United States in the 19th Century and had a passion to return to his people and bring peace and the Christian message. Morris was unable to return to Liberia, but his dreams and life lessons were captured in a book containing 36 lessons on character development. The lessons were designed to allow teachers to read a 5-10 minute story about Samuel Morris each week and then hold discussions around aspects of character development. Throughout the 2015-2016 year and as far as January 2017, researchers noted teachers were inconsistent in using this resource with their students, but students who were interviewed did have a fairly consistent understanding of who Samuel Morris was and were inspired by his example to Liberian students.

An additional character building program began in January 2017 when IEL invited members of Youth for Christ to form Y-Clubs in each of the pilot schools. IEL later took on the leadership of these out-of-school programs to encourage strong character development among the students.

Several key groups combined resources to make this pilot initiative possible. The following is a brief glossary of key contributors:

Innovative Education Liberia (IEL)[2], in partnership with Ambassador Enterprises, Inc. and Innovative Education International, launched the Samuel Morris Scholars Program in 2015 to improve math education and bring computer-based learning to students in Liberia. If the pilot program is successful in demonstrating a sustained growth in math education, IEL hopes to pilot with other educational providers within Liberia to reach more than 211,000 students in grades 7-12.

World Possible[3] is a nonprofit organization that provides education support for individuals and communities in challenged communities of the world. One tool that World Possible has created is the Remote Area Community Hotspot for Education and Learning (RACHEL). The RACHEL server enables a wide variety of educational content to be delivered in digital form to communities that do you not have access to the internet.

Khan Academy[4] is a nonprofit organization that desires to provide a free, world-class, education to anyone in the world with a desire to learn and who has access to the Internet. Initially, Khan Academy became well-known for its instructional videos on many topics, and it now offers a nearly endless supply of exercises in mathematics that give students instant feedback and support in the learning process. The pilot program in Liberia does not utilize Khan Academy directly because the schools in Liberia do not have access to the Internet, but instead uses KA-Lite.

Learning Equality[5] is a nonprofit organization dedicated to taking educational tools that are available only on the Internet, such as Khan Academy and package them in an offline format that is open-source. KA-Lite is the offline version of Khan Academy created by Learning Equality.

Youth for Christ[6] is a nonprofit Christian ministry dedicated to developing young men and women as leaders and to encourage those who believe in Christ to become stronger in their faith.

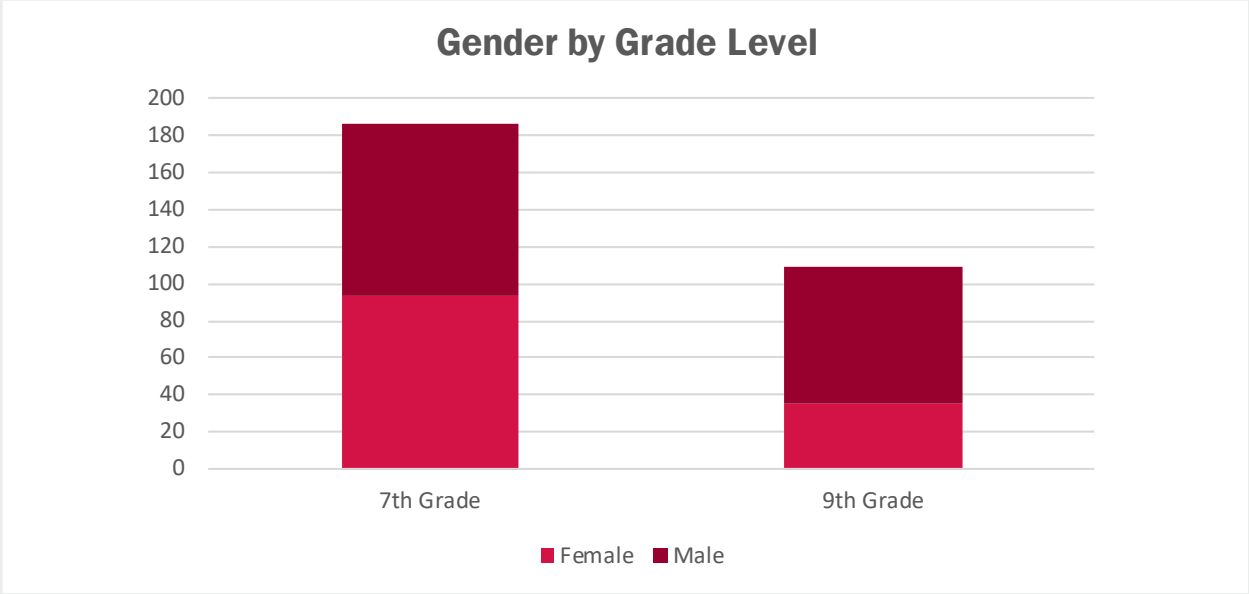
Methodology

As part of the Samuel Morris Scholars Program, students in a rural county of Liberia, participated in the Measures of Academic Progress[7] (MAP) assessment in September of 2016, January of 2017, and May 2017. The MAP is an adaptive, computerized assessment that is often used by teachers and school officials in the United States and internationally to determine student growth over time. Students involved in the pilot were mainly in grades 7 and 9, which aligned with the high stakes West African Examinations Council (WAEC) exams given each spring to students in grades 9 and 12. The goals for providing the MAP test to students systematically was to determine if the addition of technology would accelerate student learning in mathematics.

[2] Additional information can be found at www.IELiberia.org .
[3] Additional information can be found at www.worldpossible.org .
[4] Additional information can be found at www.khanacademy.org .
[5] Additional information can be found at www.learningequality.org/ka-lite .
[6] Additional information can be found at www.yfc.org .
[7] Additional information can be found at www.nwea.org .

The study included data from a total n of 295 students. 186 students in grade seven and 109 students in grade nine. 128 students were female and 167 were male (Figure 3). Students who did not complete at least 2 of the assessments during the year were excluded from the analysis.

Figure 3

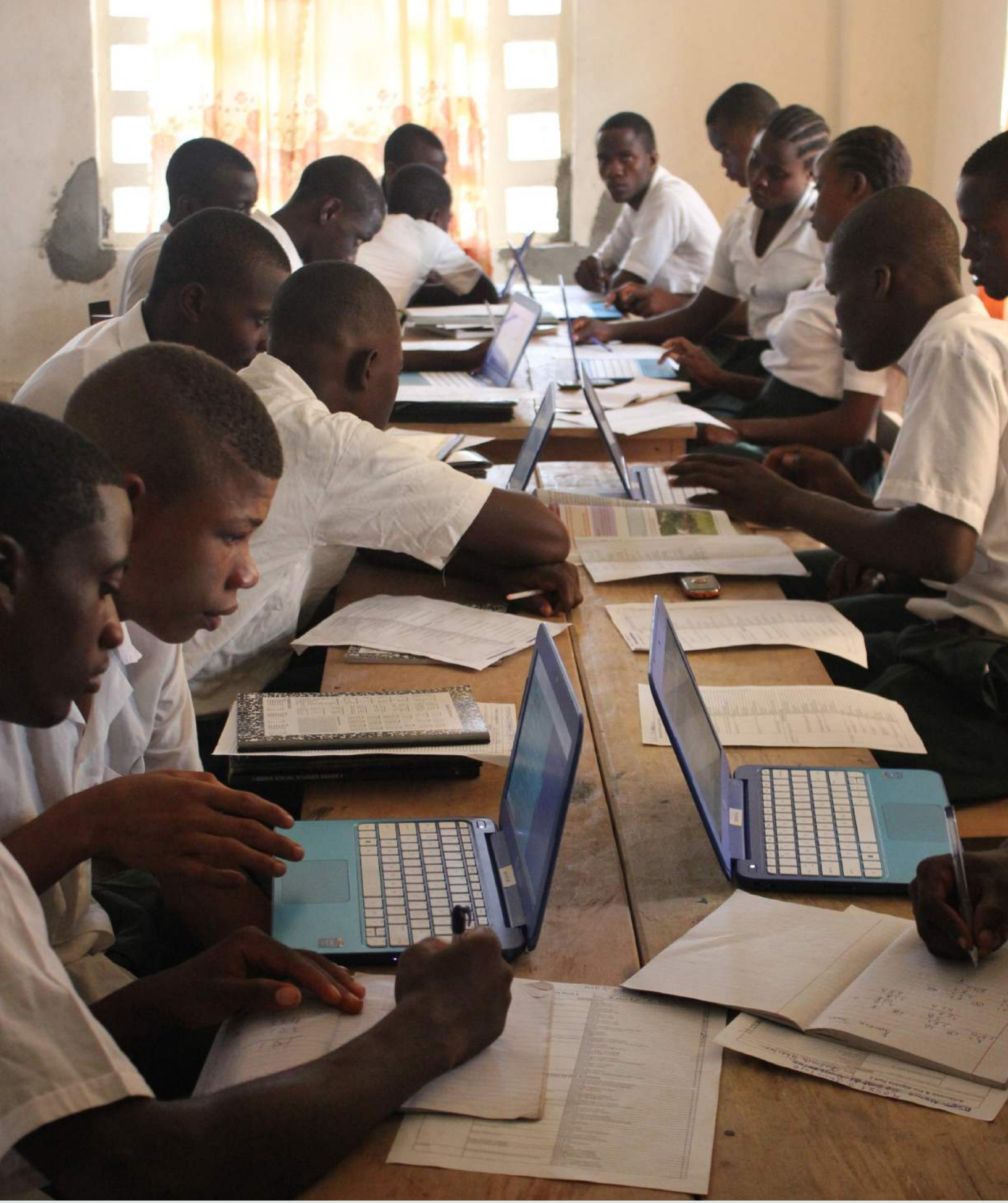


Quantitative Results

General Linear Model with Repeated Measures analysis was used to check for significance in the results of the pilot group. Data was disaggregated to consider differences between male and female students, grade level performance, and school differences.

Quantitative results were measured through growth using NWEA's Measure of Academic Progress (MAP). MAP provides a Rausch Unit (RIT) score in which each individual question is rated for its difficulty and complexity. NWEA has provided normed data against more than 35 million students across the United States. Additionally, NWEA has reported comparisons of more than 100,000 students assessed in mathematics outside of the United States. For the purposes of this report, when comparisons are drawn, students assessed in the Liberian pilot program will be compared with normed data from the United States.

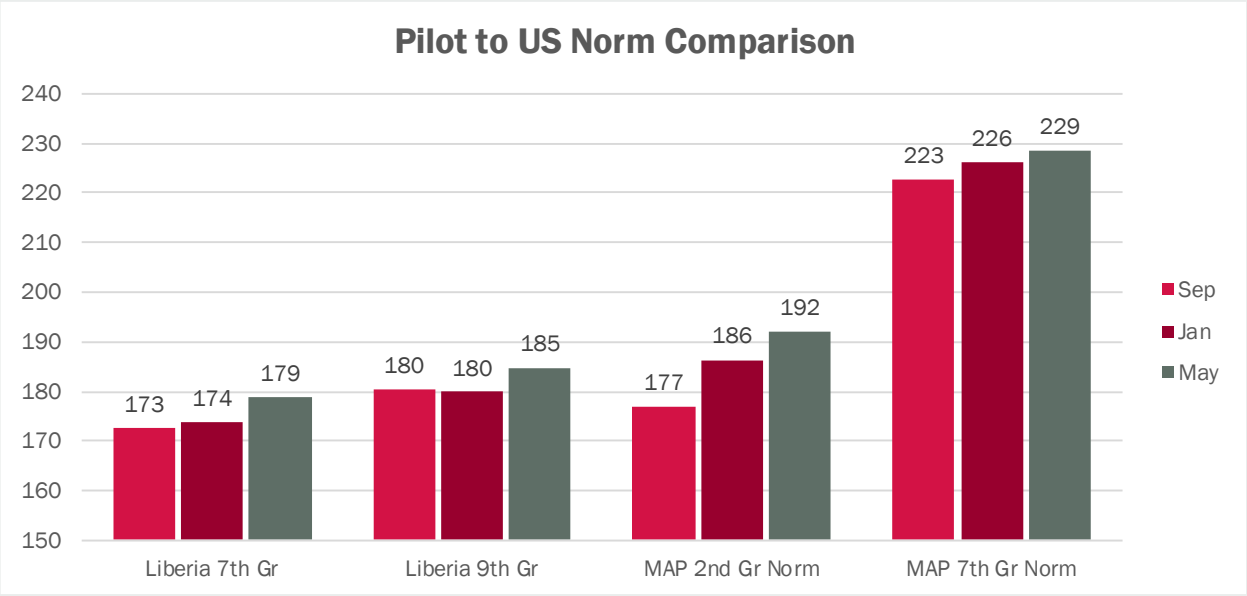
Overall, there were 295 records associated with students that were somehow connected with the pilot group for the study. Out of those records, 220 students had September RIT scores, 291 had January RIT scores and 295 had May RIT scores. A total of 216 students had a complete battery of RIT scores (September, January and May) and 295 students had at least 2 of the three assessments completed.



Overall RIT Scores

Analysis of overall RIT scores was completed, comparing growth of pilot groups by grade level, gender and school. Analysis of RIT score means by grade level in comparison to the US MAP normative data is documented in Figure 4.

Figure 4



Pilot to US Norm Comparison

In comparison to the US Normative Data produced by the Northwest Evaluation Association (NWEA) in 2015, the mean RIT score for second-grade students in September in the United States (US) is 177 and the mean score for seventh-grade students in the US is 223 for that same period. In comparison, the pilot students in seventh-grade began their year with a score of 173 (below the 2nd grade mean) and the ninth-grade students in the Liberia pilot began the year with a score of 180 which is above the beginning-of-year mean for a second-grade student but below that of the mean score of 3rd grade students in the US (3rd Grade September mean RIT score equals 190.4).

The seventh and ninth-grade students in the pilot continued to grow at a relative similar rate as their US counterparts in grades seven and nine, but with their starting point much lower.

Growth from September to January and from January to May was examined. And finally, growth across the entire academic year (September to May) was examined. A paired samples t-test was used to compare these growth scores. As indicated in Figure 4, there was statistically significant growth recorded at the end of the September to May test period (p=.000), with the greatest growth occurring during the time span of January to May. Minimal growth occurred during the September to January testing period with no statistical difference (p=.286).

Additionally, researchers examined the growth scores to see if differences could be explained due to gender,

grade or school. It was determined that there was no significant difference between gender (p=.430) or between seventh or ninth-grade (p=.989) or between school (p=.420) (Table 1).

Table 1

Multivariate Tests[a]

Effect	Value	F	Sig.	Observed Power [c]
Factor1	.010	1.039	.356	.230
Factor 1* School	.001	.124	.883	.069
Factor 1 * Gender	.021	2.216	.112	.449
Factor 1 * Grade	.012	1.241	.291	.268

a. Design: intercept + School + Gender + Grade
b. Computed using alpha =.05

From these findings, researchers concluded that gender, grade, and school variables can be set aside as variables impacting the growth of the student and focus on the group of students as a whole. Furthermore, recognizing that the greatest growth took place after January, researchers were drawn to ask the question: What intervention was introduced in January that caused a dramatic shift in growth among the pilot students?

January Intervention

In January 2017, IEL hired 4 Liberian individuals to monitor the laptop usage, encourage students, and organize the availability of the laptops to maximize their usage. IEL explained the reason for this intervention as follows:

1. Absenteeism of teachers. Researchers were unable to gather statistics on teacher attendance in class, but the observations during the time that the researchers were in Liberia indicated that teachers frequently missed class or arrived late.

2. Teacher reluctance to deviate from the approved curriculum on schedule. Teachers indicated that they felt obligated to progress through the assigned curriculum whether or not the students understood the material therefore there was not enough time to allow students to use the laptops for learning.

3. Teachers were uncomfortable with the use of computers. If something unexpected happened during a laptop session, they did not feel comfortable fixing it or advising the students.

The Liberian individuals who were hired to monitor the lab are not trained as teachers. They are not certified mathematicians. According to IEL Executive Director, Gary Friesen, they were selected based on a "consistent depth of character and an aptitude to learn." Friesen believed that if students were encouraged to consistently try in their learning process, the KA-Lite exercises and videos would help them to learn.

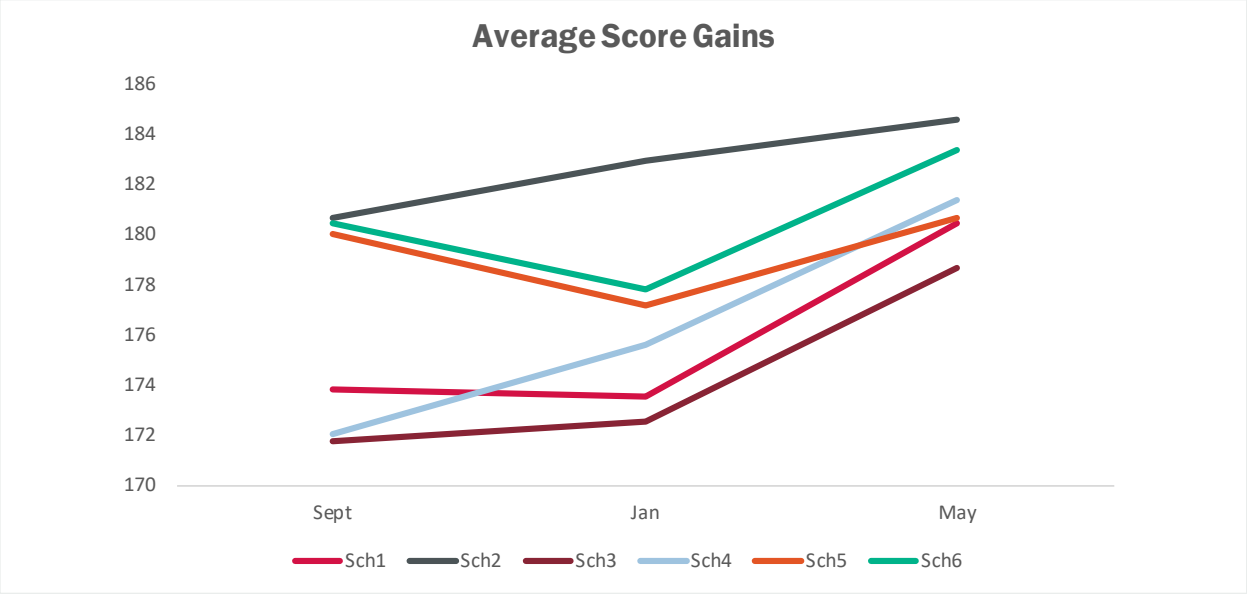
There were 2 other factors that were introduced in January. While they are of less importance, researchers believe that they are factors that need to be considered. First, students received a refresher orientation to the computers before they took the January MAP assessment. Having already used the computers since September, this orientation may have been beneficial for them in the second semester of their learning. Second, a Christian club was introduced after school by IEL. While this club was not directly related to the academic work taking place in the school, the relationships formed with the classroom monitors and with each other could have influenced the learning process.

The difference in growth from September to January (0.86 RIT gain) and then from January to May (5.02 RIT gain) would indicate that the intervention of these 4 individuals did make a significant (p=.000) difference.

Figure 5 illustrates the gains across each of the 6 schools throughout the year. Sch2 (in Grey) started the year with the highest scores and had the least amount of growth through the year. Sch2 is the largest school in the pilot, but their students were without computers for 2 months due to theft and received the least attention from the classroom monitors.

Sch4 had the greatest growth during the September to January testing period. This school had their own classroom monitor and did not need to have IEL's classroom monitor. Sch1,3,5 and 6 experienced little growth and sometimes negative growth during the September to January testing period, but when the classroom monitor intervention was introduced in January, these schools realized significant gains in their MAP RIT scores.

Figure 5



Conclusion of Findings

The research question for the year-two pilot was as follows: ***Can Liberian students in grades seven and nine, using KA-Lite as a resource, experience notable gains in mathematic scores?*** Based on the research, KA-Lite alone does not seem to make a significant difference. Students appear to need the adult direction and encouragement given by the monitors of the classroom in order to progress in their mathematics ability. As stated in the introduction, Liberian students are facing many challenges. The multiple challenges require a complex set of solutions, but IEL is working to address the needs of the community and those attempts appear to be making a difference.

Limitations of the Research

This report has some limitations. One of the limitations is that students in Liberia are not required to attend school, whereas school attendance in the United States is compulsory. It is difficult for the researchers to discern how consistently students in Liberia attend school, so a comparison of average growth on the MAP may not be an equitable one.

An additional limitation when making comparisons of Liberian high school students to the norms that are provided by NWEA for the MAP assessment is that on average students in Liberian schools are much older than their counterparts in the United States, and many have had far less schooling due to beginning school at a later age or because of interruptions. Also, when looking at expected growth, researchers looked at expected growth of their age- appropriate grade level or the grade level where students are performing on the test.

Finally, it was very challenging to control for the variation of time students in the pilot spent on KA-Lite. Researchers attempted to gather information of time-on-task from the KA-Lite database, but discovered that the database did not contain accurate information with regard to time. It is clear the from January to May, students were much more consistent in their use of KA-Lite because Liberian workers were in the classroom at all times.

Recommendations Based on This Study

1. The presence of the classroom monitors appears to be making a difference. Whether their presence increases the time a student spends on KA-Lite, increases their focus, or decreases the interruption due to computer problems, it would appear advantageous to continue to place people as monitors with laptops in the schools.

2. Continue to follow the seventh and ninth-grade students into next year. Evaluate the student's growth to determine if they will continue to accelerate in their learning growth after they have become completely comfortable with this new style of learning.

3. Increase the amount of professional development given to teachers and the frequency of that professional development throughout the year. We recommend that teachers receive regular instruction (at least quarterly) in the use of the computers in education, but also in areas of classroom management and other instructional strategies that would support this method of education. This professional development should be offered to all teachers, not just the math teachers in the pilot.

4. Each school must find a way to increase the attendance of their students. Many days, up to half of a class may be absent.

NORTHWEST
NAZARENE
UNIVERSITY

Doceō Center

Inspire. Educate.

623 S. UNIVERSITY BLVD. • NAMPA, IDAHO 83686
877.NNU.4YOU • **DOCEO.NNU.EDU**