Camp TechKobwa 2015

Evaluation Report

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Executive Summary

- All Camp TechKobwa lessons were perceived as useful
- Student confidence in ICT increased significantly
- Student mastery of lessons increased significantly in 30 out of 36 subjects
- Teacher mastery was high or complete after camp in 80% of subjects compared to 47% of subjects before camp
- 100% of teachers said that their knowledge of ICT increased
- 100% of teachers said that their ICT skills improved
- 100% of teachers said that their previous knowledge of ICT was strengthened through teaching
- Participants recommend that more girls attend each camp
- Participants recommend longer camps
- Participants recommend more camps each year

CAMP TECHKOBWA 2015

Evaluation Report

Introduction

Camp TechKobwa was conducted over 2 weeks in August 2015. It was the 3rd annual residential summer Information and Communication Technology (ICT) camp for girls in Rwanda hosted by the US Peace Corps in collaboration with IBM, Michigan State University, the Rwanda Ministry of Youth and ICT, and other partners, since its start in 2013.

The camp's goals for young women included: providing a fun, innovative, ICT-rich environment to increase their knowledge, understanding, and experience with computing, engineering, and other STEM concepts, change their attitudes about ICT as a career, increase their confidence, and build community to develop teamwork skills, improve communication, and find mentors.

The camp's goals for teachers included: providing a "training of trainers" model to learn ICT skills, engineering concepts, and innovative methods and materials for teaching at camp, pilot the model, and then inspire them to take materials, methods, knowledges, skills, and abilities back to their home schools to disseminate for continued long-term impact.

Camp TechKobwa brought in experts in computing, ICT, and engineering, mentors, role models, volunteers, NGOs, and government partners to train teachers for 3 days, then help conduct the camp for girls as a team. This approach could be described as a cascading mentoring model (Kafai et al., 2013) because all participants, from organizers to volunteers, and from teachers to students, worked together, shared what they knew and what they had learned, and pledged to keep passing it on to increase ICT literacy, interest, and confidence in a way that might impact individuals as well as families, schools, districts, other students, other teachers, and the nation in its quest to achieve the technology goals of Vision 2020. Vision 2020 was launched in 2000 by Rwandan president, Paul Kagame, to transform the country into a knowledge-based hub, using technology to reduce poverty, increase health, and create new jobs.

Background

Ten teachers were recruited from 10 different schools throughout Rwanda to participate in Camp TechKobwa during the August school break. Teachers arrived on Tuesday, August 4th, and were trained for three days prior to the arrival of 6 girls from each of the teachers' schools on Saturday, August 8th. Schools selected the girls for participation. Travel expenses and all camp expenses, including room and board, were paid by TechKobwa.

A total of 60 girls and 10 teachers participated in the camp. Twenty-two facilitators helped with the camp, including two MSU PhD students, an MSU CS professor, a Distinguished Engineer from IBM, 5 Peace Corps volunteers, including the Camp Director, 5 in-country KOICA volunteers from South Korea, the IT Manager for IPRC West, an IT Manager from Kepler, an evaluator from Peak Research, and 5 volunteers from Creation Hill. Creation Hill (http://www.creationhill.rw/about.html) is a social enterprise in Rwanda which consists of young engineers who provide STEM camps throughout Rwanda. In addition, more than a dozen guests and host-country nationals participated on panels or provided other types of support.

The camp's goals were comprehensive and exceeded traditional professional development or STEM camp goals. Leadership, teamwork, life skills, community, networking, goal setting, and problem solving were also woven into the camp as training was provided in Information and Communication Technology (ICT) to both teachers and students.

Evening activities included Game Night, Movie Night, a Talent Show, Computer Free Time, and a Dance. Sports, a Skype call with an American classroom, a Career Panel, digital photography, and other fun activities were integrated into the lessons and provided breaks from the lessons, making Camp TechKobwa feel like a mix between Summer Camp and college.

A research and innovation team project combined lessons on using the Internet safely, coming up with a research topic for a problem that needs to be addressed and solved, conducting internet research, writing up the problem, proposing solutions on a poster, and finally presenting the proposal as a team and fielding audience questions.

The days were long, starting with breakfast at 7 a.m. The typical camp day featured 6 to 8 hours of technology training, an hour of life skills training, 3.5 hours for 3 meals and a tea break, 1.5 to 3 hours of fun activities, and about 30 minutes for evaluation. Lights Out was at 10 p.m.

For teachers, facilitators, and volunteers, a Staff Debrief was conducted around 9:30 p.m. each night. The teams worked approximately 15 hours per day with few breaks. Teachers stayed with their students at meal times and also during all classes, sometimes teaching, sometimes facilitating.

Girls were assigned to "families" which consisted of 6 girls, each from a different school to increase networking and the scope of community + 2 or more teachers and volunteers. Each family was assigned a beautiful piece of fabric (ibitenge) to wear each day as a family identifier. Families came up with their own names, created cheers to brand their families and increase bonding and unity, traveled to lessons together as a team, worked on research projects in family teams, and also ate all meals together in the dining hall.

Methods

Twenty surveys were developed prior to the 2015 camp to assess student learning pre-post outcomes (10), student pre-post attitudes (2), teacher learning pre-post outcomes (6), teacher attitudes and experiences (1), and the camp overall (1).

These surveys were translated by Camp TechKobwa partner, Creation Hill, mentors, prior to the camp. All student surveys were translated. Teacher surveys were available in both English and Kinyarwanda. All assessments were administered with paper surveys because of technology concerns. It was not known if power, WIFI, computers, survey experience, English literacy, and even typing literacy would be challenges for participation in the evaluation. Every possible barrier to an effective evaluation was removed, making the evaluation very inefficient and labor intensive, but increasing the likelihood of participation without barriers. To conduct the evaluation by paper survey, SPSS databases were created, data were entered manually, and pre-post surveys were manually linked and then de-identified.

Upon arrival at the camp, some additional learning outcomes were added to the surveys, and some items were edited or eliminated, requiring changes to the surveys and databases, as well as new translations provided on-site with help from teachers and volunteers. Some errors may have occurred with these last-minute translations as evidenced by survey results that are not credible, such as zero correct answers on both pre and post-tests for one variable.

All pre-tests were administered to students on the first day of the camp, after registration. As students arrived, evaluation helpers assigned a unique ID number to each participant from the roster and asked them to place both their names and the numbers on each survey.

Students worked their way through a series of 5 short pre-tests with an average of 7 student learning outcome items on each. Students moved from table to table in the dining hall to complete the tests for each day, which helped to track completion rates by survey.

Post-tests were administered after dinner each night for lessons covered each day. Students also completed an Attitude Survey with 27 items, both before and after the camp. Some of these attitude items have been previously validated by Georgia Tech for STEM camps.

Data cleaning consisted of matching pre and post surveys by number and name, randomly sampling 30% of surveys for data quality check, and recording unclear responses as missing. When both pre and post surveys were not available for a given student, for any learning outcomes, those surveys were eliminated from analysis because comparison was not possible.

For the student Attitude Survey, 45 respondents had complete sets of pre and post-test surveys. The number of survey respondents varied by day and item. A survey might have been missed by an individual student if the student was not present after dinner for any reason. Surveys were administered by family table after meals. Students were instructed to do their own work, complete their own surveys, and turn them over on the table when completed. Evaluation helpers walked around and collected surveys or family teachers brought stacks of completed surveys to the evaluator. It was difficult to track survey respondents real time and impossible to confirm that all items had been completed.

Known reasons for missing the M&E surveys after dinner included: illness, checking on people who were not present, taking food to people who missed dinner, and other personal reasons. Participants were extremely gracious about filling out the surveys before camp and also after dinner each evening.

Teacher Results

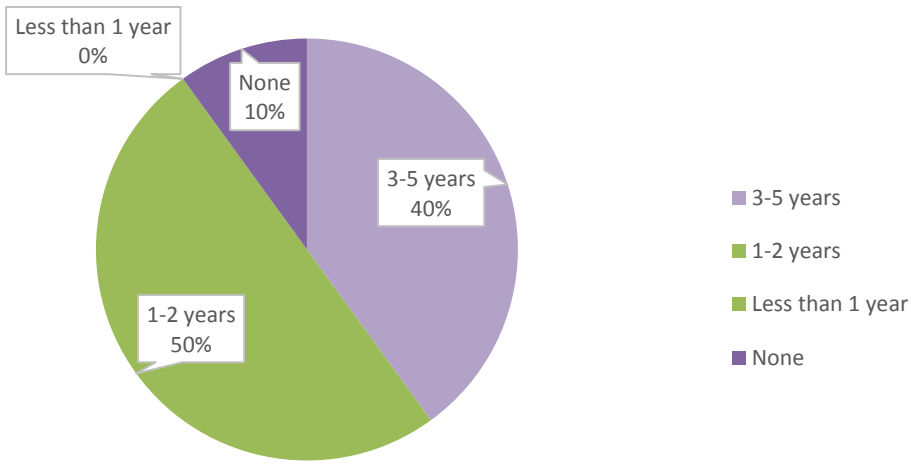
Teachers completed a post-camp survey about their experiences, attitudes, and skills gains. They also completed daily pre and post-lesson knowledge surveys about the subjects in which they had been engaged each day. This section is organized to share the learning outcomes and overall impact of Camp TechKobwa on teachers.

Teacher Experiences

Teachers shared computer and cell phone usage, ICT teaching experience, and rated perceptions of ICT experience pre and post TechKobwa using a method called Retrospective Pre-Post Test or RPT (Lamb, 2013).

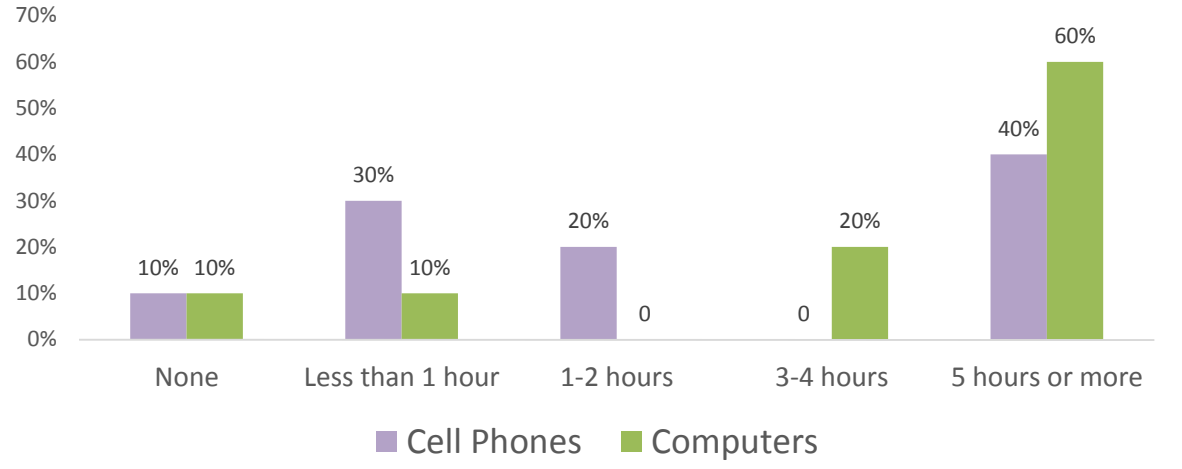
ICT teaching experience was fairly low, with no teachers reporting more than 5 years' total experience. One teacher reported no ICT teaching experience prior to the camp. Fifty percent reported 1 to 2 years' experience. Forty percent reported 3 to 5 years' experience.

Chart 1. ICT Teaching Experience



When asked about computer use in an average week, 80% of teachers reported 3 or more contact hours each week. One teacher reported zero hours. Another reported less than 1-hour computer use each week, showing that there was a gap in teacher access to computers. Twenty percent reported between 3 and 4 hours of computer use, while 60% reported 5 or more hours each week. It would have been helpful to also ask about personal or professional use and access, as well as Internet usage.

Chart 2. Weekly Averages - Cell Phone & Computer Use by Teachers



Weekly cell phone use was, surprisingly, slightly lower, with 40% reporting 5 or more hours each week, 20% reporting 1-2 hours each week, and 40% reporting less than 1 hour or no use.

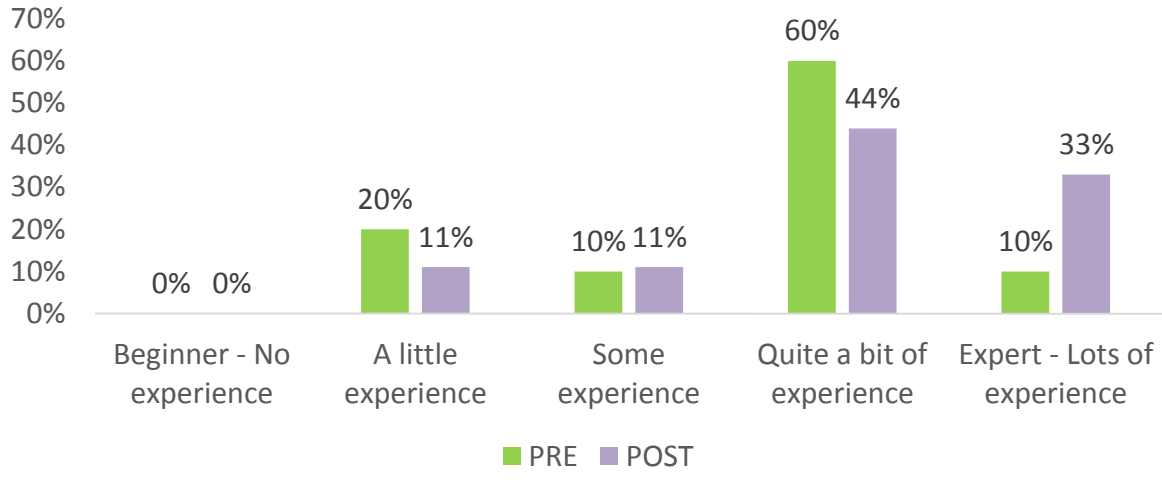
When asked to rate how experienced they were with ICT before Camp TechKobwa, 60% of teachers rated themselves as having "quite a bit of experience" and 10% of teachers declared themselves "expert," with lots of experience. Teachers reported the same mean level of experience both before and after the camp (4.0), but the chart below shows the movement in ratings distributions by individuals.

One of the benefits of the RPT method is the ability of raters to fully understand how much they know or do not know about the rating subject because they provide pre and post ratings AFTER the training. Raters actually "know what they don't know" when this method is used. A weakness of true pre-post design is that beginner level participants tend to inflate their pre training ratings because of limited experience. This, in turn, causes their post-training ratings to show less growth than actually occurred. The RPT method was effective in this context and teachers did not have any trouble understanding the rating concepts.

Teacher perceptions of ICT experience shifted slightly from pre to post-camp, with the least experienced teacher reporting an increase in experience and two teachers with quite a bit of experience moving toward expert level because of the camp experience.

One teacher reported no prior ICT teaching experience and no computer or cell phone use, yet rated personal experience as "little" rather than "no experience." Camp TechKobwa increased perceptions of ICT experience.

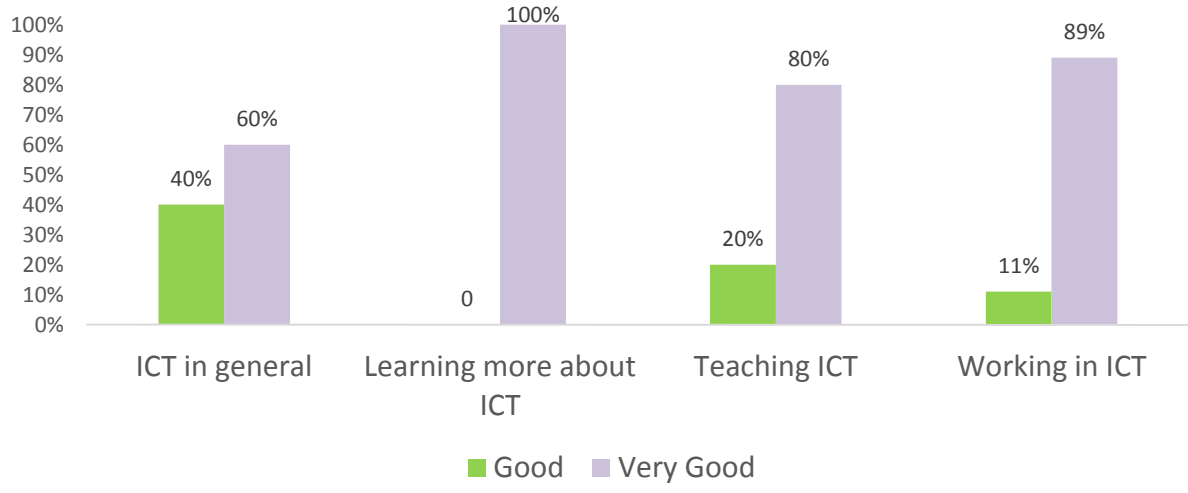
Chart 3. Teacher Perceptions of ICT Experience – Before & After Camp



Teacher Attitudes About ICT

Teachers were asked how they felt about ICT in 4 areas, including ICT in general, learning about ICT, teaching ICT, and working in ICT. Because of limited survey experience, compared to Western teachers, the use of "very bad," "bad," "good," and "very good" rating scales was tested. All ratings on these items were in the "good" to "very good" range. Respondents did not have any trouble with the bad to good rating continuum or other response options used at Camp TechKobwa. Teachers were most positive about learning more about ICT, with 100% reporting that they felt "very good" about this.

Chart 4. Feelings About ICT



Teachers were also very positive about working in ICT, with 89% reporting that they felt "very good" about this prospect. Feelings about teaching ICT were very positive, with 80% reporting that they felt "very good." Ratings of ICT in general were also positive, but not as positive as other areas, with 60% feeling "very good."

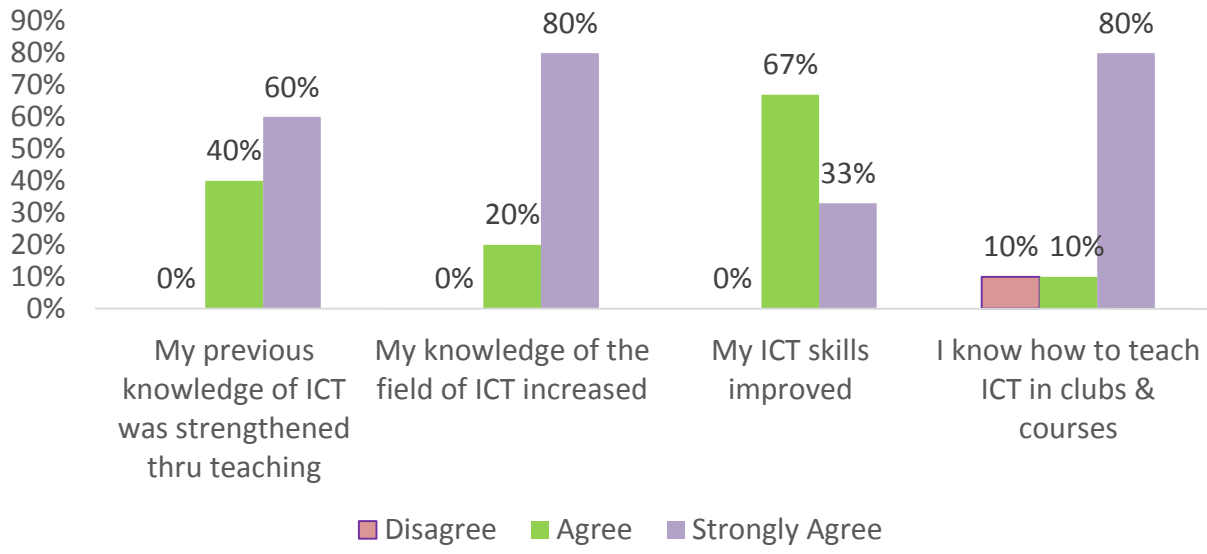
Mean ratings of these ICT attitudes show that teachers felt best about learning more about ICT (4.0/4.0 scale), but working in ICT (3.9), teaching ICT (3.8), and ICT in general (3.6) were all highly rated by teachers, showing a high level of motivation.

Teacher Attitudes About Camp TechKobwa Goals

Teachers were asked to rate their level of agreement on statements about achievement of 4 goals fundamental to TechKobwa. None of the teachers chose to "strongly disagree" with any of the statements. Just one teacher chose to "disagree" with the statement about knowing how to teach ICT in clubs and courses. This TechKobwa goal might benefit from more discussion with teachers about methods to effectively transfer ICT knowledge and teaching approaches to others after the camp.

One hundred percent of teachers "agree" or "strongly agree" that their previous knowledge of ICT was strengthened through teaching at Camp TechKobwa, further validating the model of training teachers and then giving them practice teaching. The mean rating of agreement on this outcome was 3.6 on a 4-point scale.

Chart 5. Teacher Attitudes About Camp Goals



One hundred percent of teachers "agree" or "strongly agree" that their knowledge of the field of ICT increased at Camp TechKobwa. The mean rating of agreement on this outcome was 3.8. One hundred percent of teachers "agree" or "strongly agree" that their ICT skills improved at Camp TechKobwa. Mean rating of agreement was 3.3 on this outcome.

Mean ratings of these goals show high levels of agreement across goals, ranging from a low of 3.3 for skills to a high of 3.8 for knowledge of the field of ICT.

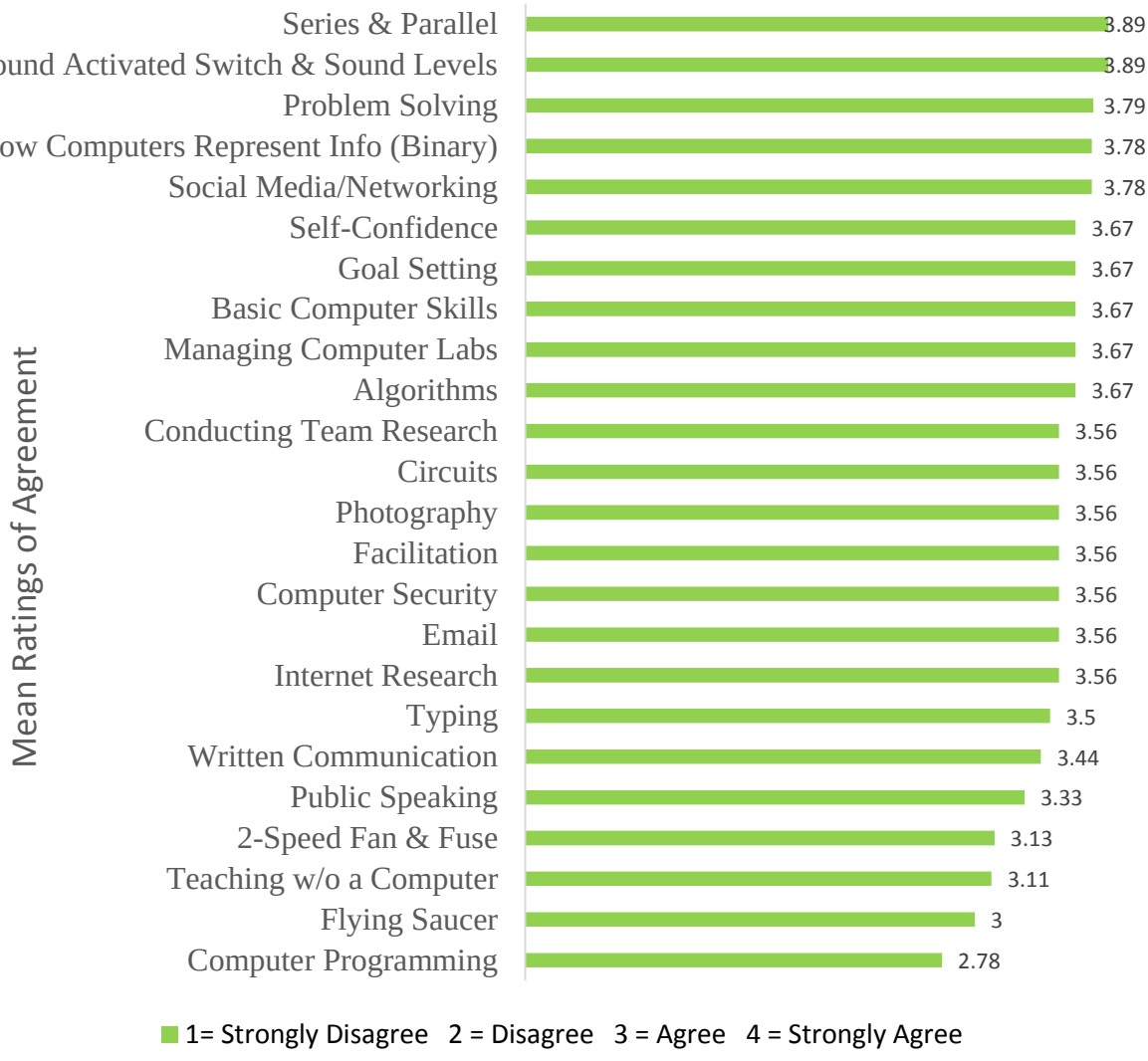
It would be beneficial to ask follow-up questions to teachers within 6 months of the camp on the impact of increased ICT knowledge, skills, and teaching ability on their home schools,

fellow teachers, and students. Also, how have personal goals and opportunities been affected by the Camp TechKobwa experience?

Impact of TechKobwa on Teaching Knowledges & Skills

Teachers were asked if Camp TechKobwa has improved their teaching knowledge and skills in 24 specific areas. Ratings were provided on a 4-point scale from "Strongly Disagree" to "Strongly Agree." Mean ratings of agreement are provided in the chart that follows. All subject areas received positive mean ratings ranging from a low of 2.78 for computer programming to a high of 3.89 for series and parallel and sound activated switches & sound levels. Flying Saucer and 2-speed fan and fuse lessons were not provided to all students. They were created as extra lessons for students who finished other projects early.

Chart 6. Improved Teaching Knowledge & Skills



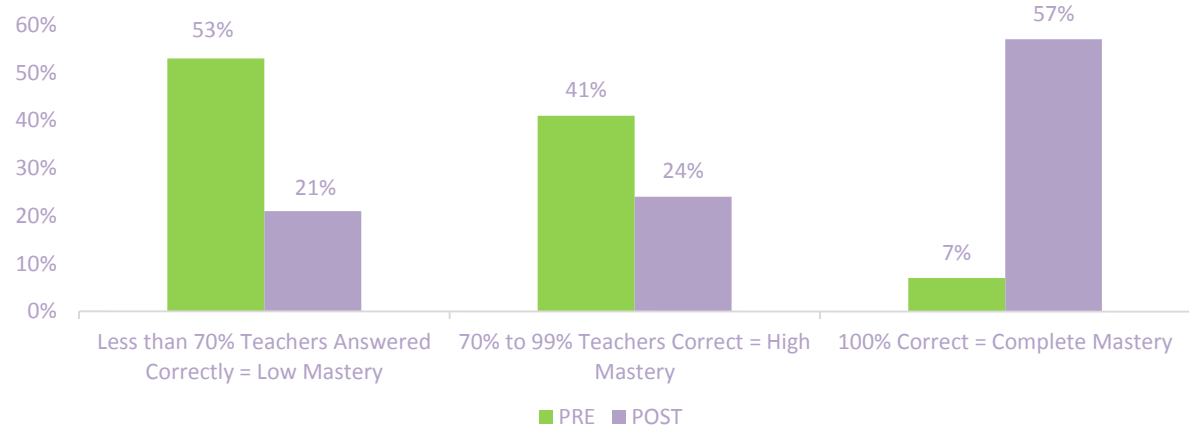
Teachers agreed or strongly agreed that their teaching knowledge and skills improved in all 24 areas. The highest mean ratings of agreement show the areas in which teachers had the highest levels of agreement about improvement.

Camp TechKobwa provided a mix of technical, professional, and personal skills training, effectively demonstrating that there is a balance between these skillsets that may increase success. Teachers improved their technical skills, but also improved teaching knowledge and skills in problem solving, self-confidence, goal setting, facilitation, Internet research, writing, and public speaking.

Teacher Learning Outcomes

Teachers received training in more than 30 subject areas. They completed pre-tests on 30 learning outcomes to assess knowledge levels before the camp. Teachers also completed post-tests each day, after lessons, to determine whether they had mastered the material.

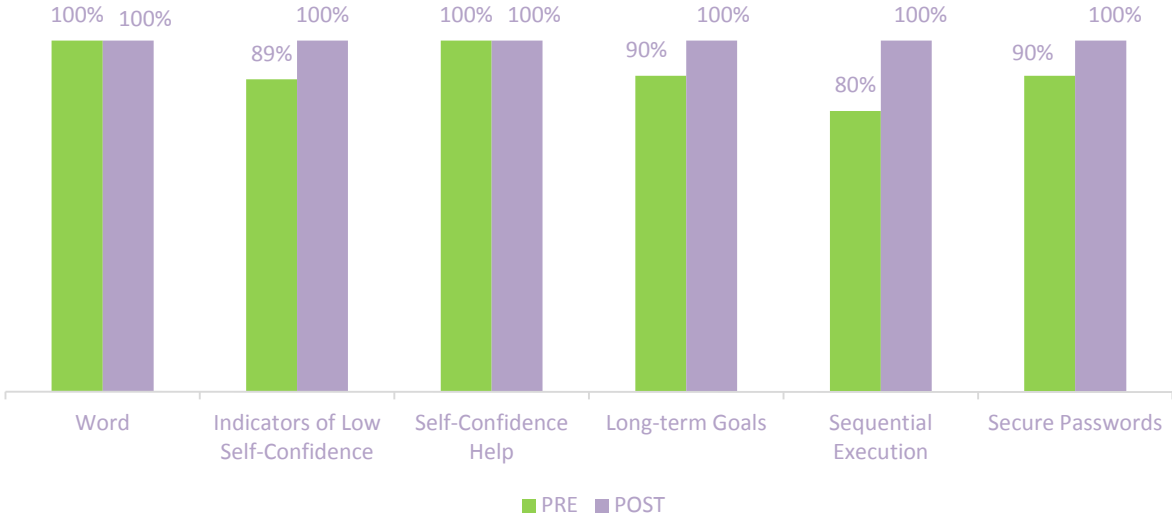
Chart 7. Teacher Learning Outcomes – Pre-Post Levels of Mastery



Significance testing was not appropriate due to the size of the teacher population, so results of learning outcomes are compared pre and post-camp in terms of the percentage of teachers who mastered subject areas. Teacher knowledge or mastery was defined as LOW if less than 70% of teachers answered the item correctly; HIGH if 70-99% of teachers answered correctly; and COMPLETE if 100% of teachers answered the item correctly.

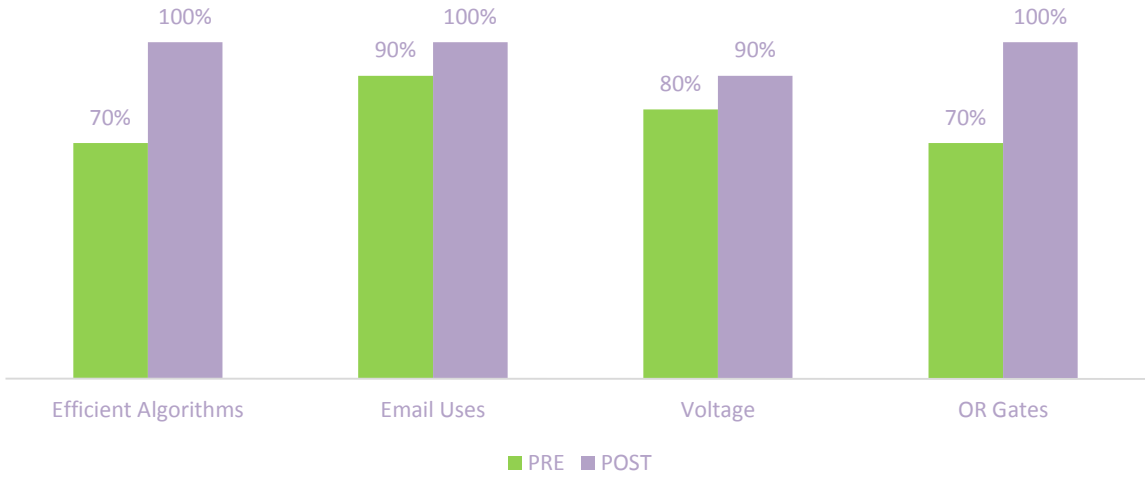
Teacher knowledge or mastery of learning outcomes was **high** or **complete** *before* the camp on less than half (48%) of the subjects taught. Teacher knowledge or mastery of learning outcomes was high or complete *after* the camp on 81% of subjects taught, validating the model utilized by TechKobwa (Chart 7). The train the trainer approach with teachers learning the materials as students and then teaching students proved to be an effective model. This model might also be explored for students, creating a true cascading mentoring model to increase interest and understanding of ICT at home schools beyond the camp.

Chart 8. Teacher Learning Outcomes - High or Complete Levels of Pre-Post Mastery



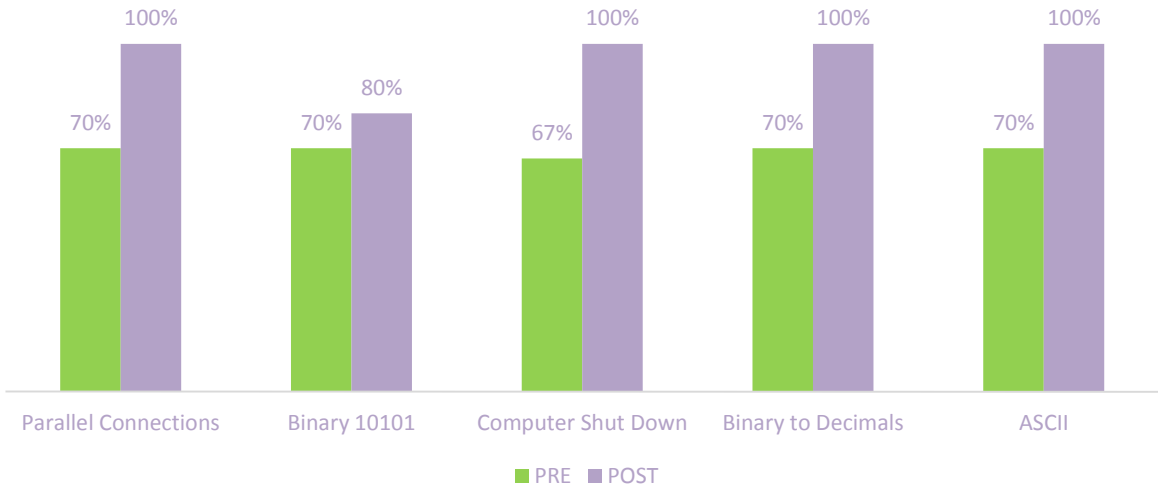
One hundred percent of teachers answered just 2 out of 34 (7%) subject knowledge questions correctly *before* the teacher training. These areas included Microsoft Word and where to go to get help with self-confidence. Teacher knowledge was high before the camp in 12 additional subject areas, with 70%-99% of teachers providing correct answers on the pre-test on 41% of subjects, including long-term goals, sequential execution, secure passwords, efficient algorithms, voltage, OR gates, parallel connections, binary, and ASCII (Charts 7-10).

Chart 9. Teacher Learning Outcomes – High Levels of Pre-Post Mastery



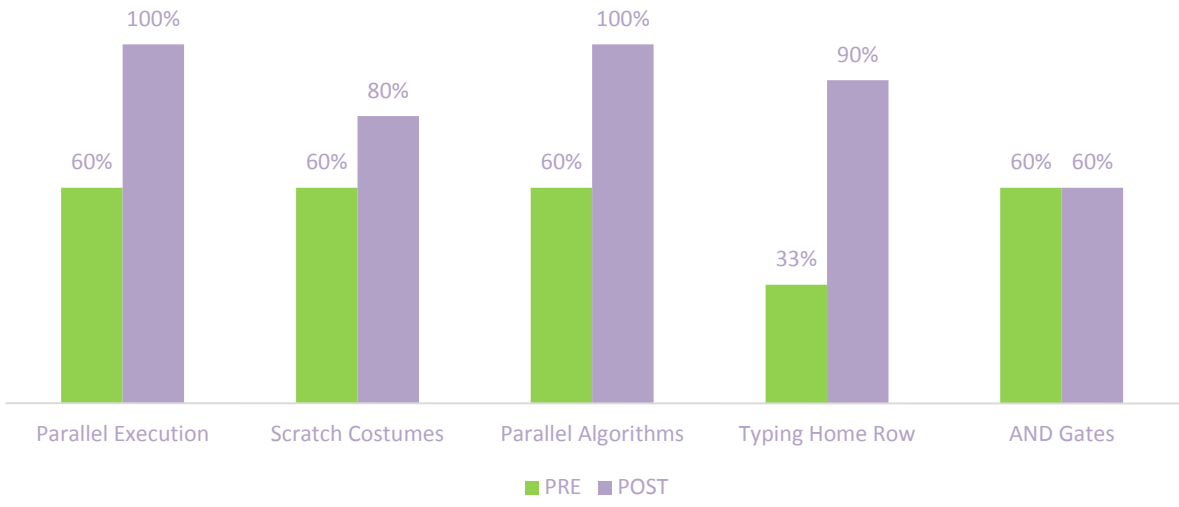
One hundred percent of teachers answered 17 out of 30 (57%) subject area knowledge questions correctly *after* the teacher training. Teacher mastery was high on 6 post-survey learning items, with 70-99% of teachers responding correctly. See Charts 8-12 for subject areas with high levels of Post Mastery.

Chart 10. Teacher Learning Outcomes – High Levels of Post Mastery



Some subject areas, like Run Length Encoding, were completely new to all teachers before TechKobwa, but **all** teachers mastered the concept by the end of the camp. Other subjects, like image resolution, the components of algorithms, converting electricity to sound, and pixels had few teachers with understanding or knowledge before the camp, but **most** teachers had mastered the material by the end of camp (Chart 12).

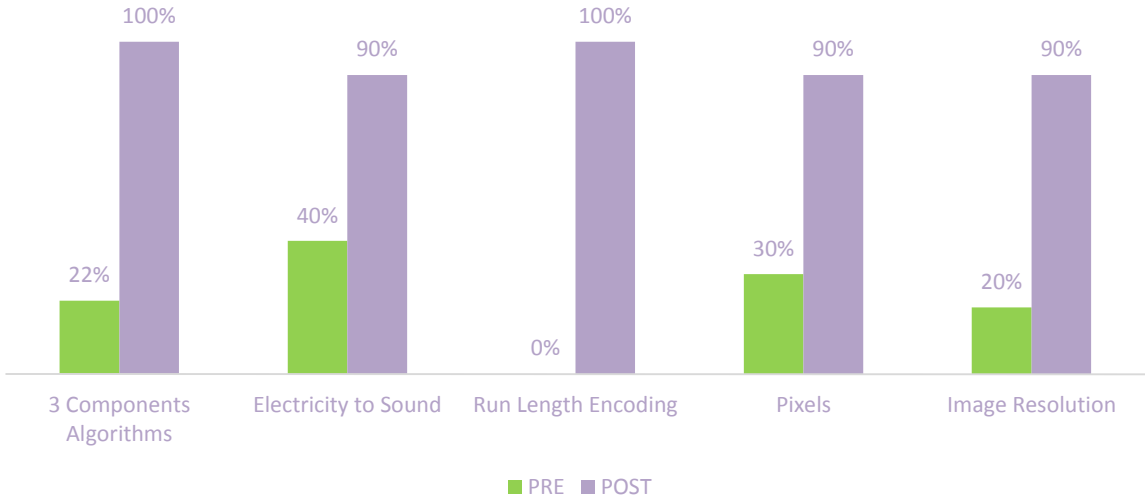
Chart 11. Teacher Learning Outcomes – Mid Levels of Pre & High Levels of Post Mastery



Teacher knowledge or mastery before the camp was low, with less than 70% of teachers with correct responses, in 16 subject areas or 53% of topics, including all Scratch activities, integrated circuits, algorithms, pixels, parallel execution, parallel algorithms, and gates.

The subject areas with the lowest levels of pre-camp mastery included run length encoding (0), Scratch sprite moves (10%), Scratch motion menus (20%), image resolution (20%), and the 3 components of algorithms (22%). See Charts 11-13 for subject areas with low levels of pre-camp mastery.

Chart 12. Teacher Learning Outcomes – Low Levels of Pre & High Levels of Post Mastery



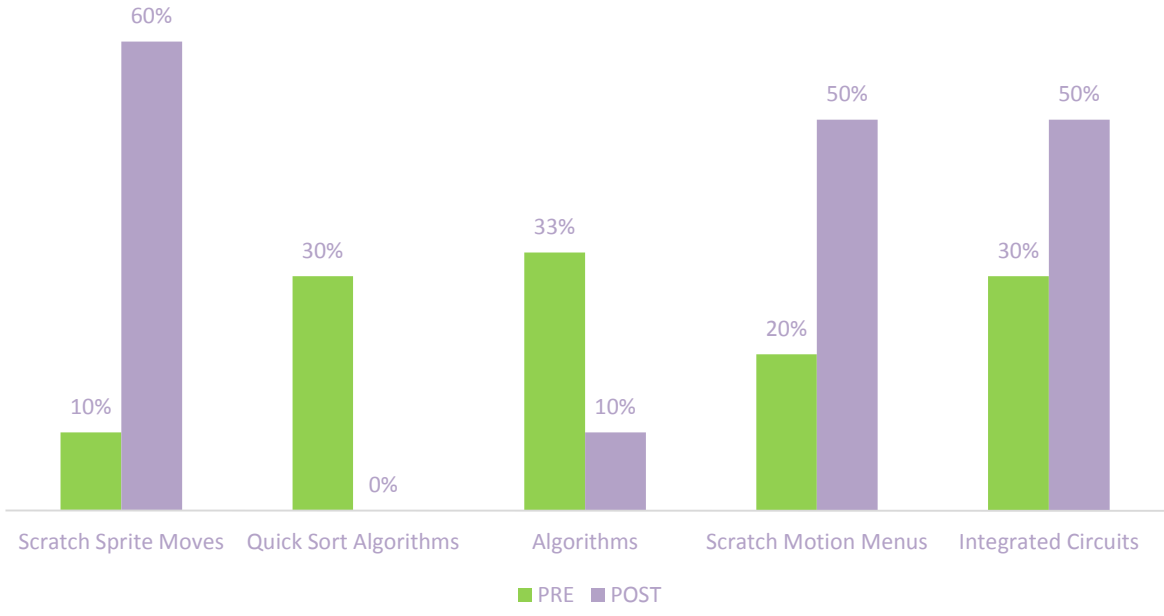
Other subject areas like Scratch, AND gates, and integrated circuits had low numbers of teachers with pre-camp knowledge, increased understanding with some teachers, but failed to achieve subject mastery with all teachers by the end of camp (Chart 13). These lesson areas might be reviewed for clarity. Teaching methods and teaching time might also be adjusted to increase comprehension.

Prior to the evaluation of Camp TechKobwa lessons, there was little understanding of teacher levels of experience or expertise in these subject areas. It may now be possible to create, modify, or enhance curriculum to meet the needs of the teachers so that they are fully equipped to both learn and teach ICT concepts.

Areas that might be reviewed for improvement before the next camp include: all Scratch subjects, quick sort algorithms, AND gates, algorithms, and integrated circuits.

Teachers did not achieve high levels of learning in 6 subject areas by the end of the camp (20%). Three of these subjects may not have been taught as planned, may not have been translated correctly, or may have been incorrectly scored on the rubric because teachers who answered questions correctly before the camp exceeded the number who answered correctly after the camp on quick sort algorithms and algorithms. An item that assessed learning on Scratch instructions had zero correct responses both pre and post-camp and was not included in the chart.

Chart 13. Teacher Learning Outcomes – Most Challenging Outcomes Pre & Post



Teacher Comments

Teachers had two opportunities to provide open-ended comments on the Attitudes and Experiences survey administered on the last night of the camp. The first question asked about changes they plan to make in their teaching as a result of Camp TechKobwa.

Five teachers shared plans to create ICT clubs at their schools. These same teachers also shared plans to teach algorithms and practice binary using TechKobwa methods, allow students to practice, use materials from the camp, and teach the 3 parts to a presentation.

Three teachers shared plans to use team work, encourage girls in ICT, and encourage creativity and self-confidence.

The second question asked teachers how they would share what they learned at Camp TechKobwa. Five teachers said that they would create ICT clubs in their schools. Two additional teachers mentioned Glow, BE (http://files.peacecorps.gov/library/M0100.pdf), and media clubs. Two teachers shared plans to inform other teachers. One teacher communicated plans to use social media to share information. Another mentioned plans to help students create email accounts.

Student Results

Students completed a total of 15 evaluation instruments at Camp TechKobwa. These included 12 pre-post assessments of student learning over 6 days as well as pre-post ICT attitude surveys and a camp survey.

There was a lot of discussion and planning before the camp to accommodate language challenges, address limited experience with surveys and survey response options, find ways to make the surveys culturally sensitive, and minimize the burden of being evaluated.

Students were extremely gracious about participating in the evaluation of Camp TechKobwa. They completed all pre-tests on their first day at camp and student learning outcome (SLO) post-tests after dinner each day. On the final night of the camp, students completed the SLO for the day as well as the ICT attitude post-test and the camp survey.

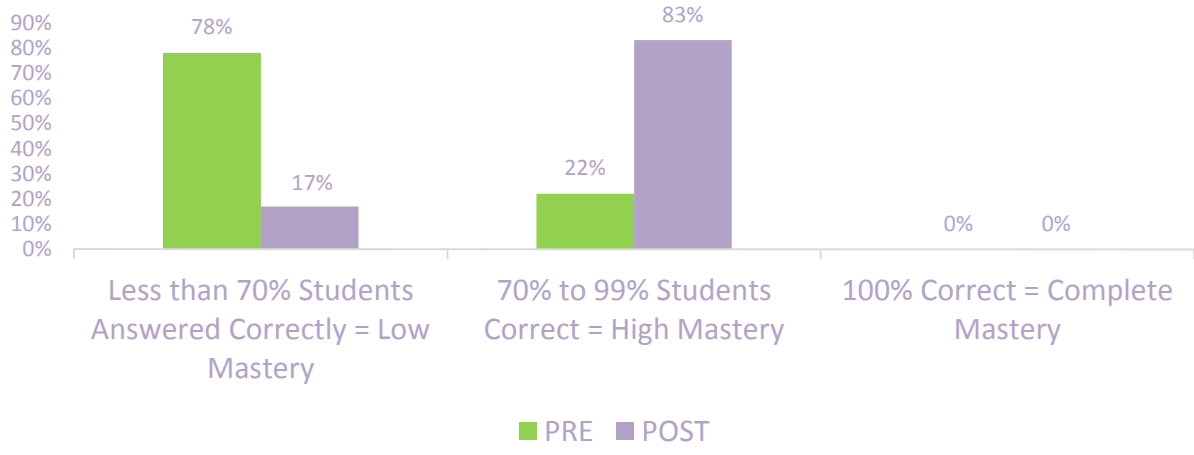
One night, after dinner, the evaluator yelled, "Yeah! It's survey time!" to get the attention of students in the noisy dining hall. To her surprise, they cheered! This experience uniquely captures the positive attitudes of the students about all of Camp TechKobwa, even the evaluation.

Student Learning Outcomes

Thirty-six student learning outcomes were measured in pre and post-tests over 6 days. Student mastery of 29 out of 36 SLOs (81%) increased significantly (* = p<.05) over the course of one week of instruction at Camp TechKobwa. Student mastery was low on most subjects before camp and high on most subjects after camp. Complete mastery (100% students correct) was not achieved on any subjects.

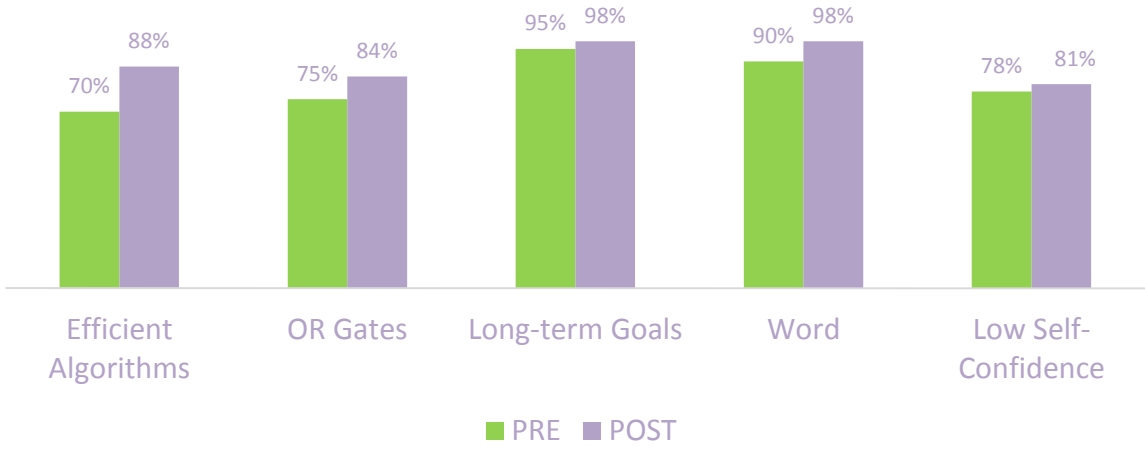
Student learning outcomes are presented in the following charts to show the percent of students who answered these questions correctly *before* the camp and the percent of students who answered correctly *after* relevant lessons.

Chart 14. Student Learning Outcomes – Levels of Mastery



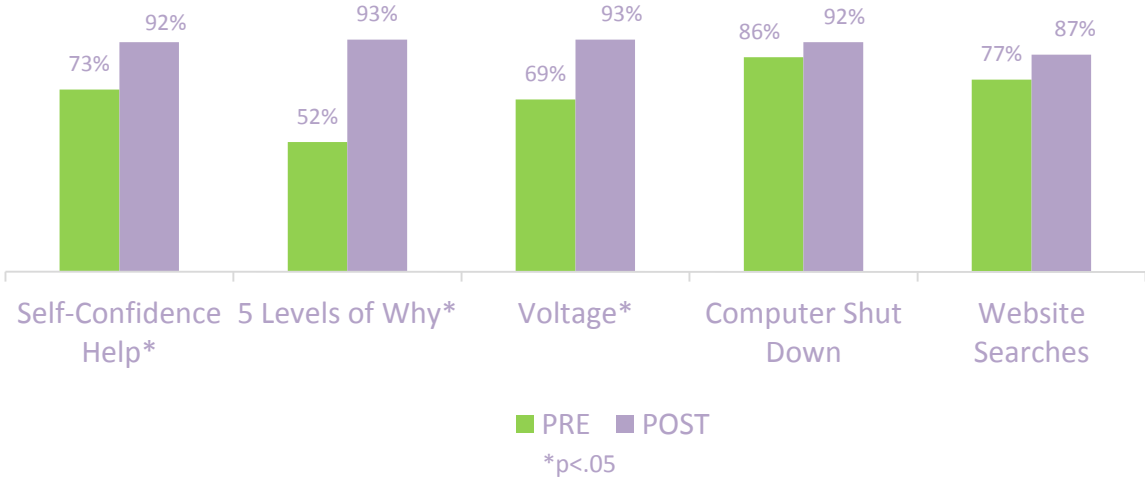
This data visualization approach provides 3 important pieces of information: 1) Which areas of ICT, personal skills, and professional skills training had students mastered or been exposed to before the camp, whose lessons might be eliminated, shortened, or just reviewed in future camps, 2) Which areas of instruction were effective at significantly increasing student knowledge for a majority of students, and 3) Which lessons would benefit from having more time spent in class, the use of different methods, or better examples because few students had mastered the subjects before or after the camp.

Chart 15. Student Learning Outcomes – High Levels of Mastery Pre & Post



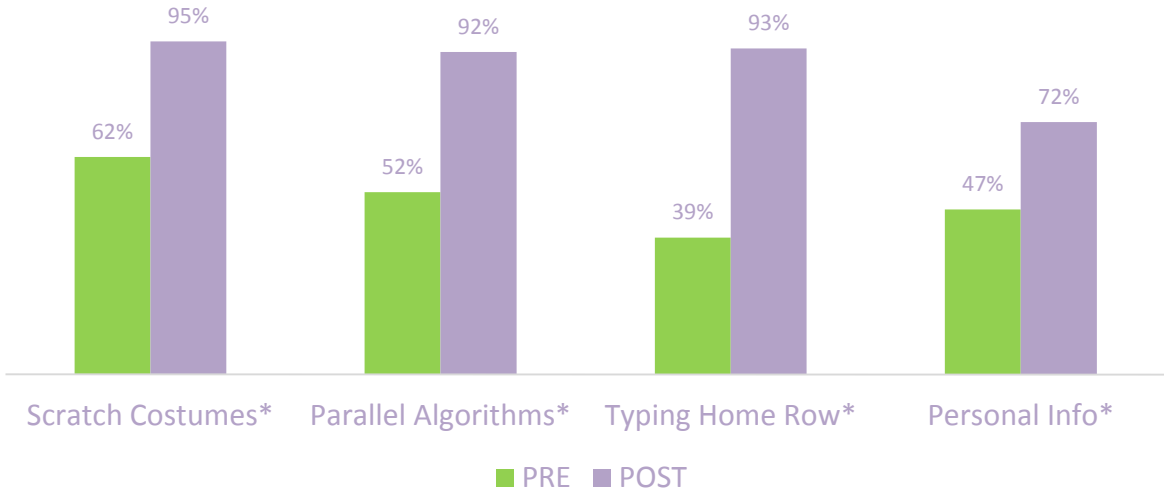
Seventy percent or more of students came to Camp TechKobwa with mastery of 8 subject areas, including efficient algorithms, OR gates, long-term goals, Word software, low self-confidence, getting help to improve self-confidence, shutting down a computer appropriately, and conducting website searches. More than 70% of students answered these items correctly before instruction.

Chart 16. Student Learning Outcomes – Fairly High Levels of Mastery Pre & Post



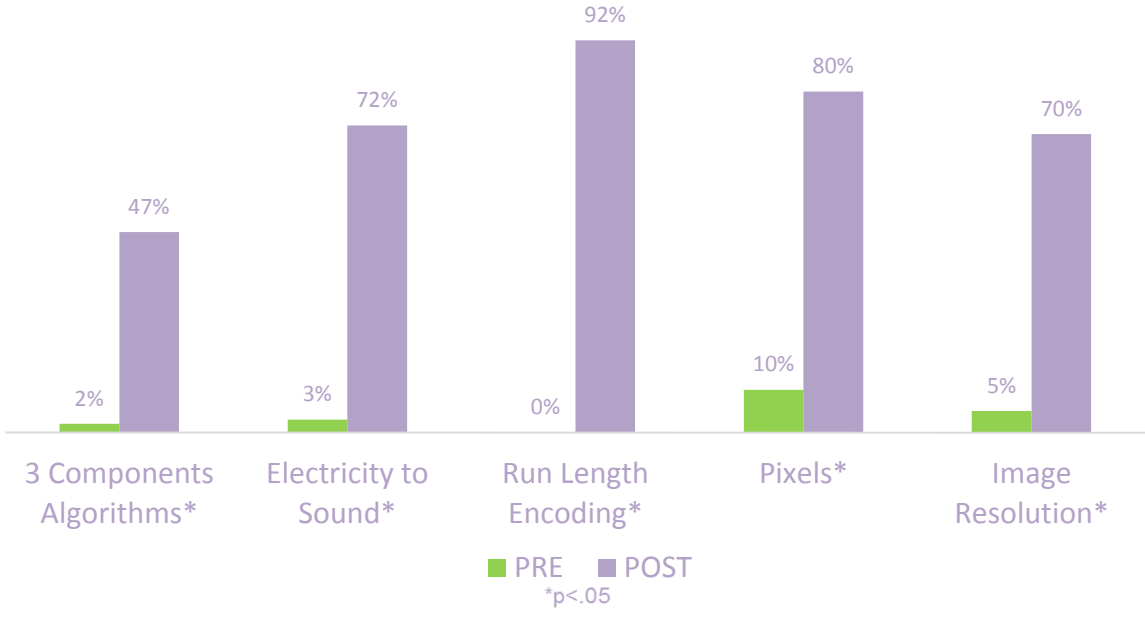
When students come to camp with fairly high levels of knowledge in particular areas, significant gains are not possible. These areas might even be perceived as boring by students and should be considered for reduced coverage in class.

Chart 17. Student Learning Outcomes – High Levels of Post Mastery



These areas also had high levels of correct responses on the post-tests. Other knowledge areas fell into the "low" range of correct responses, with fewer than 70% of students showing mastery of the subjects before the camp. These subject areas are excellent ones for camp expansion, especially if high levels of correct responses are not achieved on post-tests.

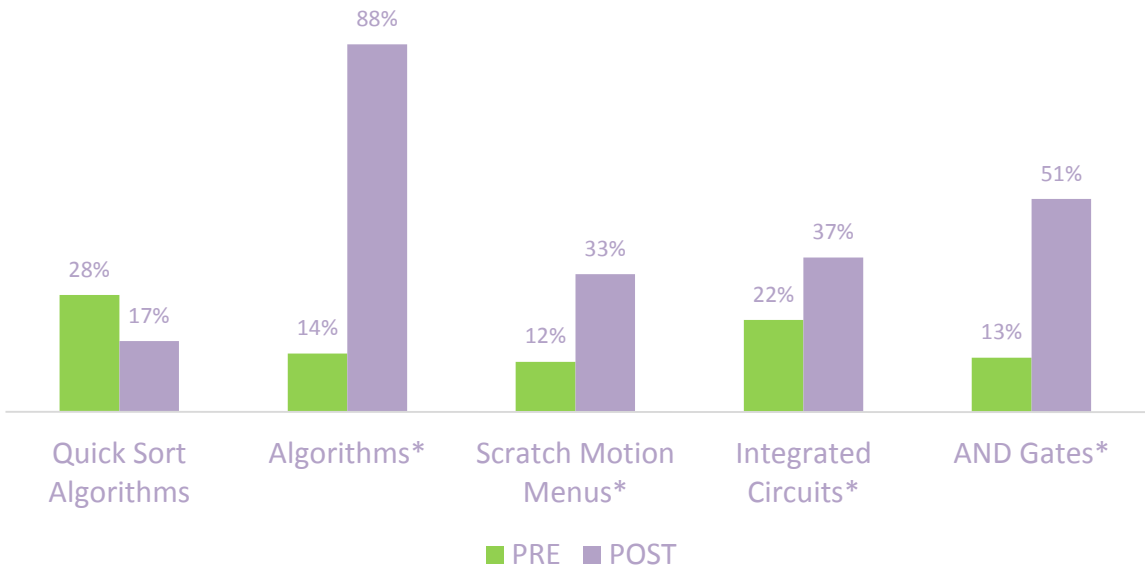
Chart 18. Student Learning Outcomes – Very Low Levels of Pre Mastery



For example, parallel algorithms, typing from the home row, what constitutes personal information on the Internet, and Scratch costumes all had fewer than 70% of students with correct answers on the pre-test. On the post-test, however, more than 70% of students had mastered these knowledge areas, showing that camp instructional content and methods are probably adequate.

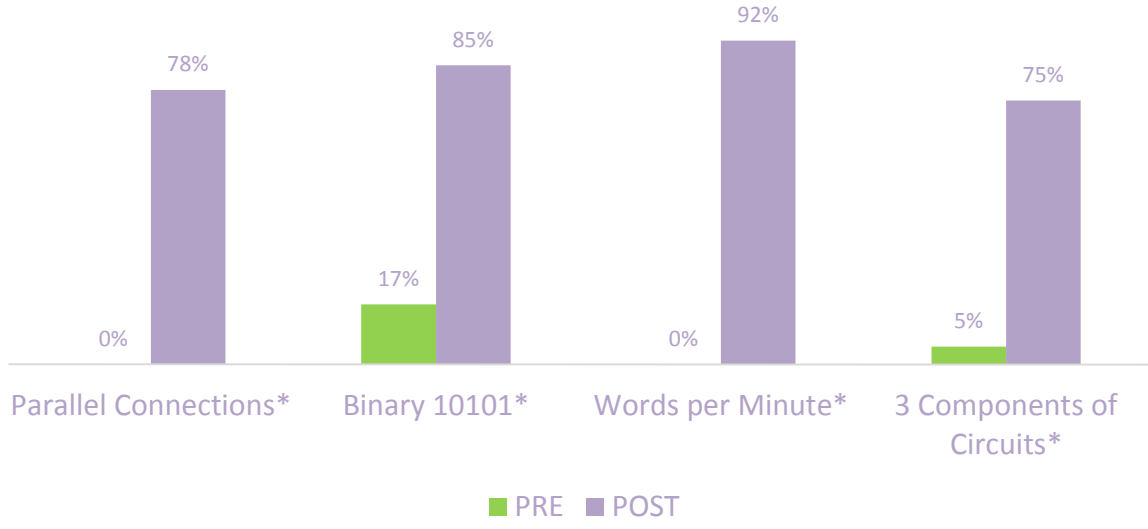
In the case of 3 components of algorithms, integrated circuits, and AND gates, student knowledge levels were low on the pre-test, increased significantly on the post-test, but high levels with 70% or more of students correct were not achieved. These areas might benefit from additional instruction, different methods of instruction, or other adjustments to make sure that students are mastering the information by the end of camp.

Chart 19. Student Learning Outcomes – Low Levels of Pre Mastery



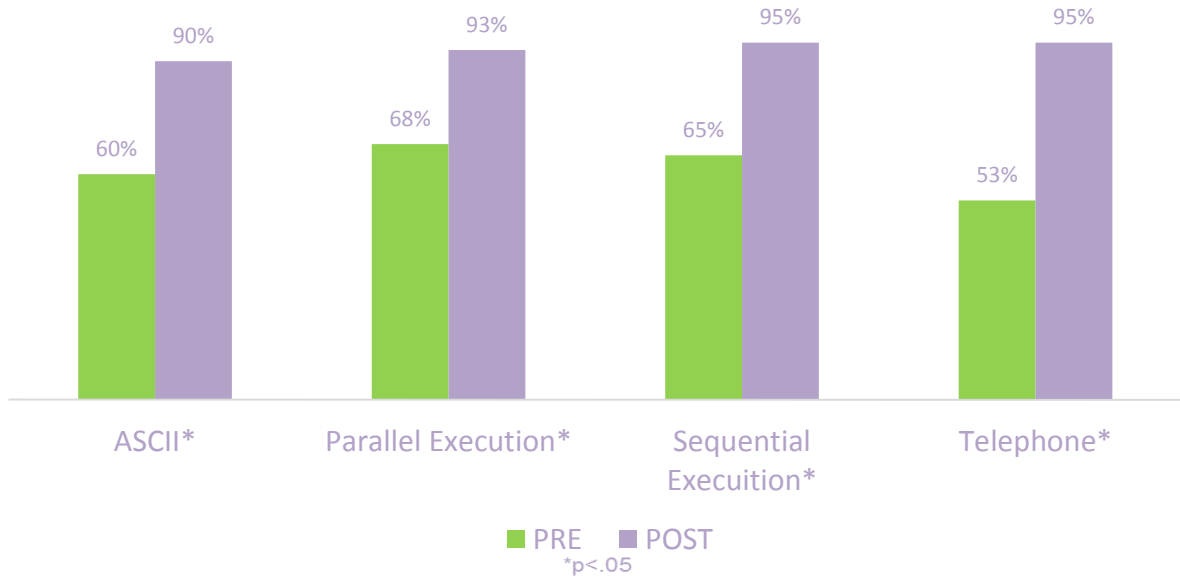
Students came into Camp TechKobwa with very limited knowledge of algorithms, binary, parallel connections, and the components of circuits, but achieved high levels of mastery by the end of the camp. In fact, mastery of 28/36 subject areas was low before Camp TechKobwa. Mastery of 30/36 subject areas was high after Camp TechKobwa.

Chart 20. Student Learning Outcomes – Low Levels of Pre & High Levels of Post Mastery



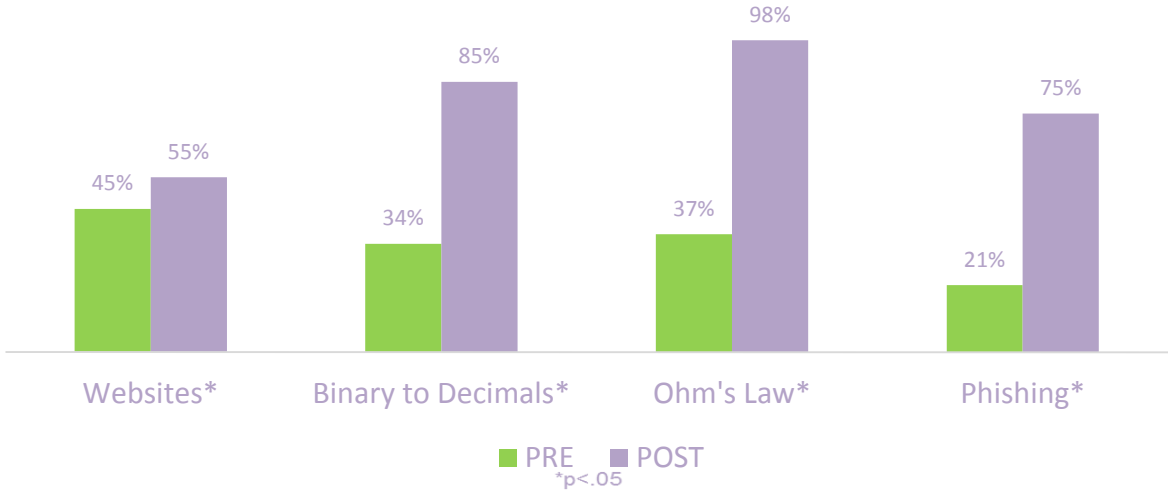
A moderate number of students had mastery of ASCII, sequential and parallel execution, and telephones before the camp, but most had achieved mastery by the end of the camp. Request the Appendices for the Final Evaluation Report to see all survey items.

Chart 21. Student Learning Outcomes – Fairly High Levels of Pre & High Levels of Post Mastery



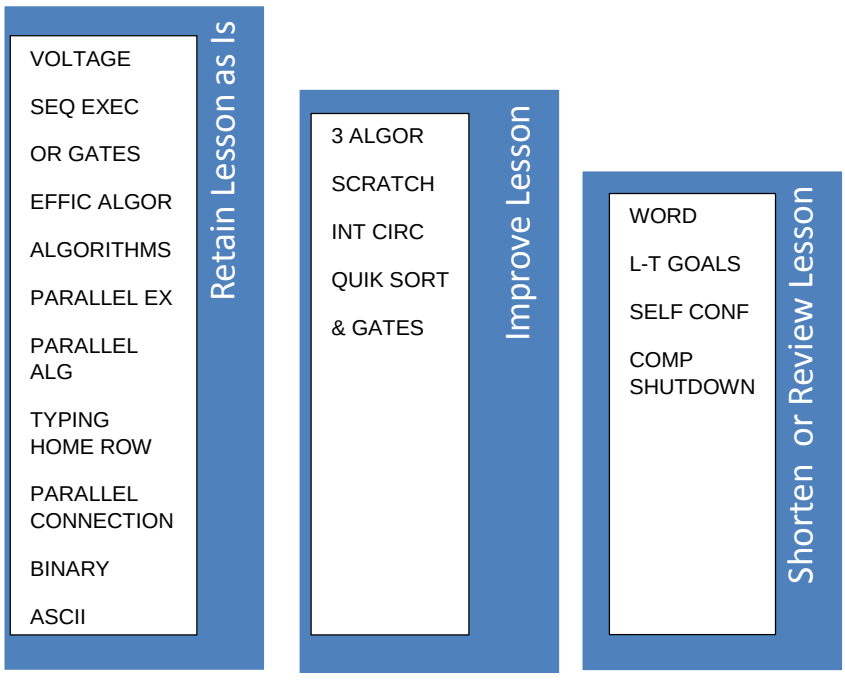
When teachers and schools are selected for future TechKobwa participation, it might be effective to conduct a focus group or administer a survey prior to the camp to assess the areas of instruction from which students might most benefit.

Chart 22. Student Learning Outcomes – Low Levels of Pre & High Levels of Post Mastery



Students came into Camp TechKobwa with mastery of approximately 22% of instructional subjects. To provide the most challenging and beneficial instruction, sort lessons according to levels of mastery to determine which ones are needed, which ones are effective "as is;" which lessons might be improved or expanded to increase the number of students who achieve mastery during camp; and which lessons might be shortened or reviewed because mastery is generally already very high and the time could be better spent on other subjects.

Chart 23. Student Learning Outcomes – Retain, Improve or Change the Lessons



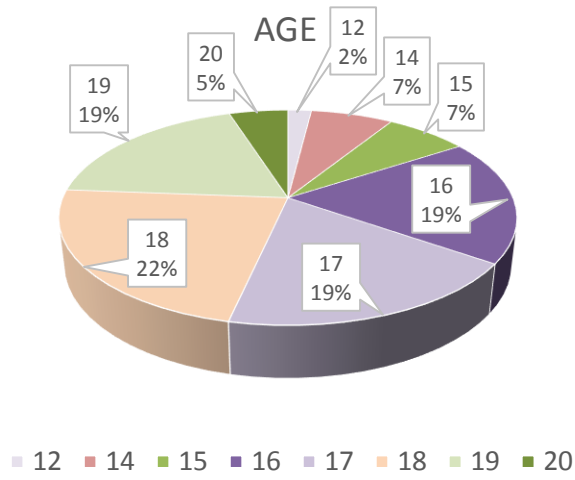
Student Attitudes

Students completed attitude and experience surveys before and after Camp TechKobwa. They were asked to share age, computer use, and cell phone use. They were also asked to rate their level of experience with ICT before and after camp.

In addition, students completed 14 questions about their feelings about ICT and six questions about their feelings about Camp TechKobwa. Many of these items were adapted from surveys developed and validated for computing camps at the Institute for Computing Education at Georgia Tech.

All Camp TechKobwa students were female. Sixty total girls participated in the camp. Ages ranged from 12 to 20. Mean age was 17 years.

Chart 24. Student Age

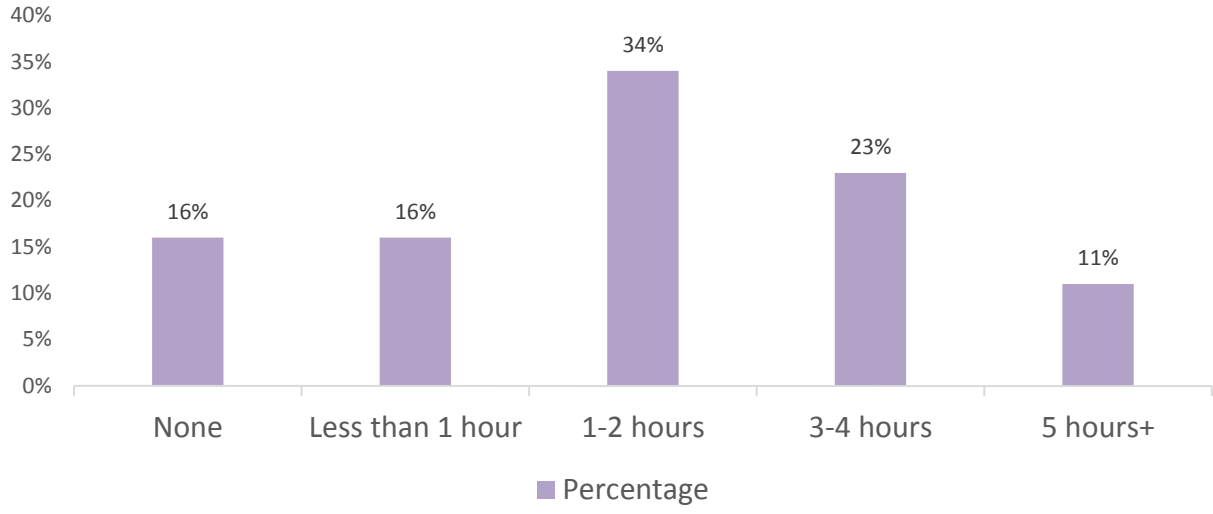


Students were asked about their computer use in an average week to get a sense of their experience, level of comfort, and access to ICT in daily life. Student use of computers ranged from "none" (16%) to "5 hours or more" (11%). Mean use of computers in an average week was between 1 and 2 hours.

Eighty percent of teachers reported 3 or more hours use of computers each week. Mean use of computers by teachers was 3-4 hours each week.

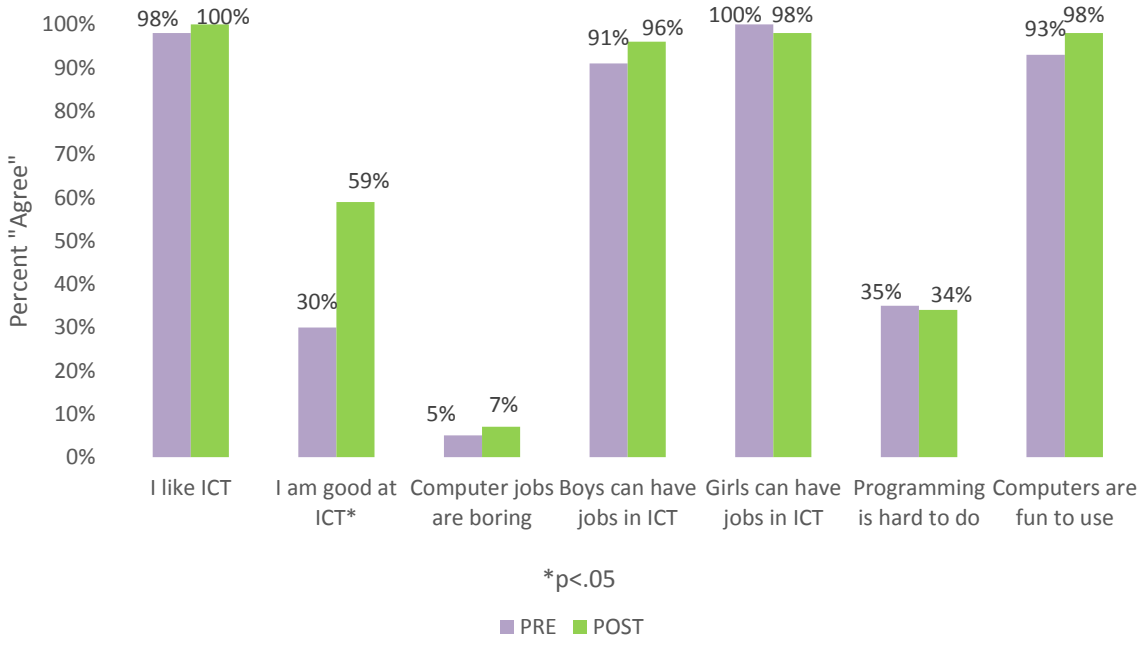
Cell phone use among students was evaluated by frequency, rather than total hours, like the teachers. The greatest frequency that students could respond was "about 1 time each day," but another response option unfortunately contradicted this one with, "more than 1 time each week," making the results questionable. Cell phone use ranged from "never" (21%) to "more than 1 time each week" (67%). Five percent of students said that they use cell phones "about 1 time each week," and 7% percent reported cell phone use of "about 1 time each day."

Chart 25. Student Computer Use – In an Average Week



Students were asked, "How do you feel about Information and Communication Technology?" Fourteen items addressed constructs such as attitudes about computers and ICT, ICT as a male domain, motivation for ICT, confidence in ICT, and utility of ICT.

Chart 26. Student Attitudes – How do you feel about ICT?

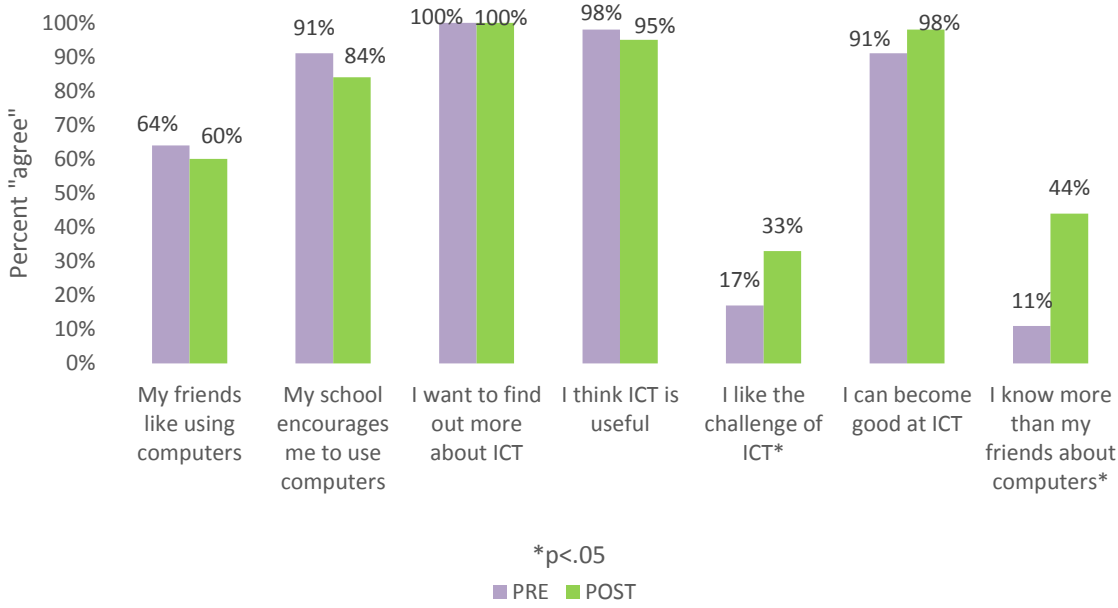


Students expressed great interest in finding out more about ICT, both before and after Camp TechKobwa, with ratings of agreement by 100% of respondents. Student feelings about liking ICT were also highly rated both before and after the camp. Computers were perceived as fun to use by 93% or more of students both before and after the camp.

Three ICT attitude ratings of agreement were fairly low before and after the camp. These included, "my friends like using computers," "programming is hard to do," and "computer jobs are boring." After attending Camp TechKobwa, students did not think their friends would be any more interested in ICT than they did before the camp. Computer jobs were not perceived as boring either before or after the camp. Programming was perceived as "hard" by just 35% before the camp and 34% after the camp.

Several variables had lower ratings of agreement after the camp than before the camp. These included, "my school encourages me to use computers," with a 7% drop in agreement after the camp.

Chart 27. Student Attitudes Pre/Post – How do you feel about ICT?

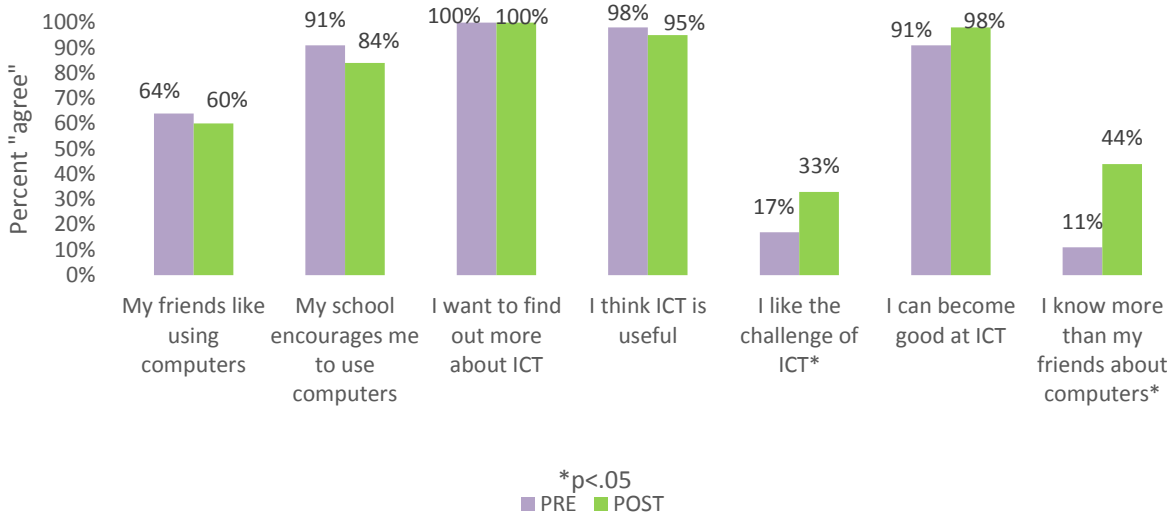


Attitudes with the greatest increase in agreement from pre to post-camp included, "I am good at ICT," "I like the challenge of ICT," and "I know more than my friends about ICT."

Ratings of agreement, that "I am good at ICT," increased 29 percentage points. This increase was significant ($p<.05$). "I like the challenge of ICT" increased by 16 points. This increase was significant ($p<.05$). "I know more than my friends about ICT" increased by 33 points. This increase was also significant ($p<.05$).

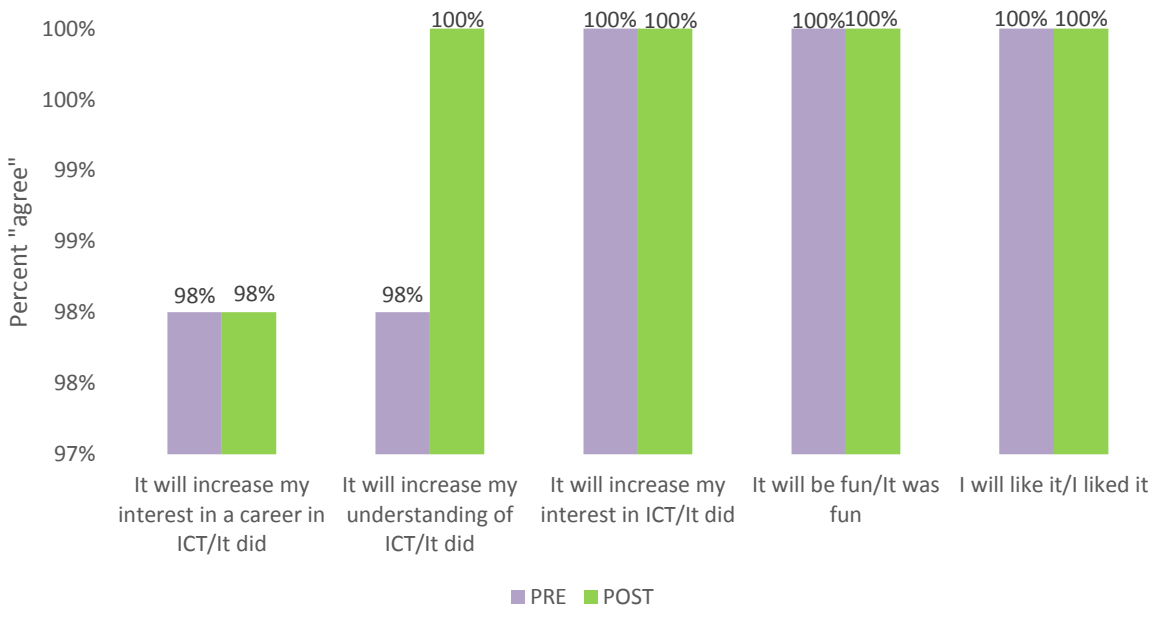
Although low, these attitude ratings were the only ones that changed significantly from pre to post-camp. They demonstrate the impact of Camp TechKobwa as well as the potential. Confidence increased significantly. Importantly, students acknowledged that ICT is not easy and that they like the challenge.

Chart 28. Student Attitudes Pre/Post - How do you feel about ICT?



To assess student motivation and interest, students were asked, "How do you feel about attending Camp TechKobwa?" Five items addressed their agreement with statements about camp, pre and post-camp. Students were very enthusiastic about participation in Camp TechKobwa. They thought it would be fun, expected to like it, and agreed that it would increase their interest in ICT in general, as well as interest in a career in ICT. In addition, students thought the camp would increase their understanding of ICT. Ratings of agreement on these statements were high both before and after the camp.

Chart 29. Student Attitudes Pre/Post - How do you feel about Camp TechKobwa?

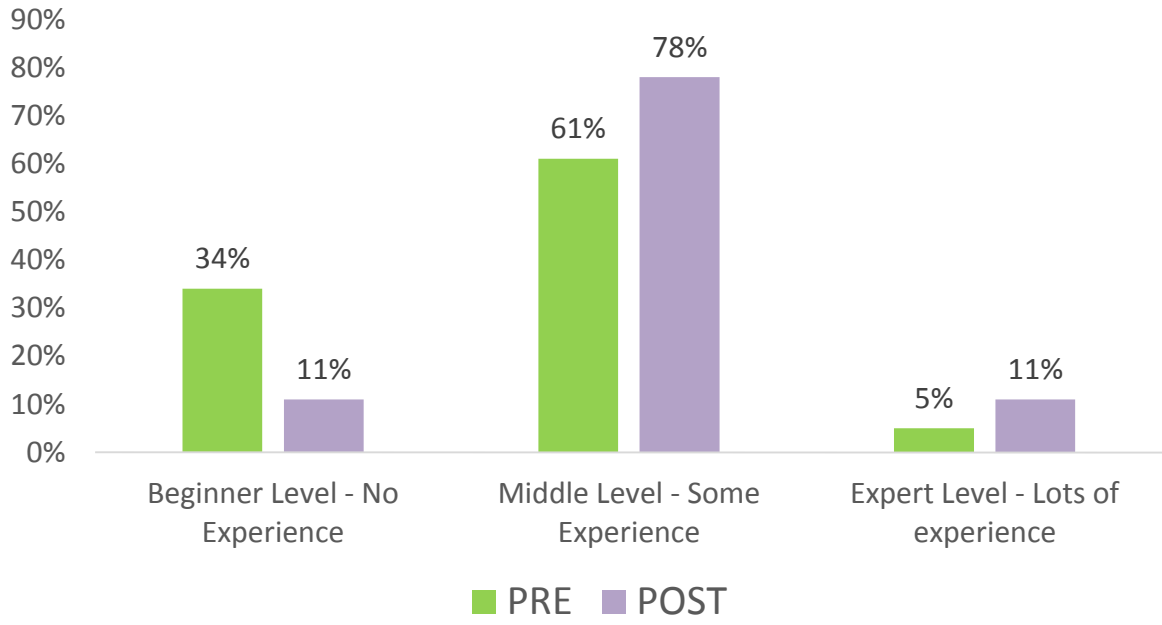


Finally, students were asked how experienced they believed themselves to be with Information and Communication Technology before the camp and after the camp.

About a third of students rated themselves as "beginners" before Camp TechKobwa. After the camp, just 11% of students still felt like beginners. More than three-quarters of the students rated themselves as "middle level" with regard to ICT experience after the camp, a 17 percentage point increase or 28% increase in perceptions of experience.

It's interesting that 5% of students considered themselves to be "expert level" before the camp, but this increased to just 11% after the camp. This modest increase might be another positive outcome of the camp. Students learned enough about ICT at the camp to have a realistic understanding of how much more they have to learn.

Chart 30. Student Attitudes Pre/Post - Rate Your Level of Experience



Camp TechKobwa

All Camp TechKobwa participants, facilitators, organizers, and volunteers were invited to complete a Camp Survey on the last night of the camp. Eighty-five individuals completed Camp Surveys. Although no names were requested, some individuals wrote their names on the surveys. Identifying information was removed from all surveys during data entry.

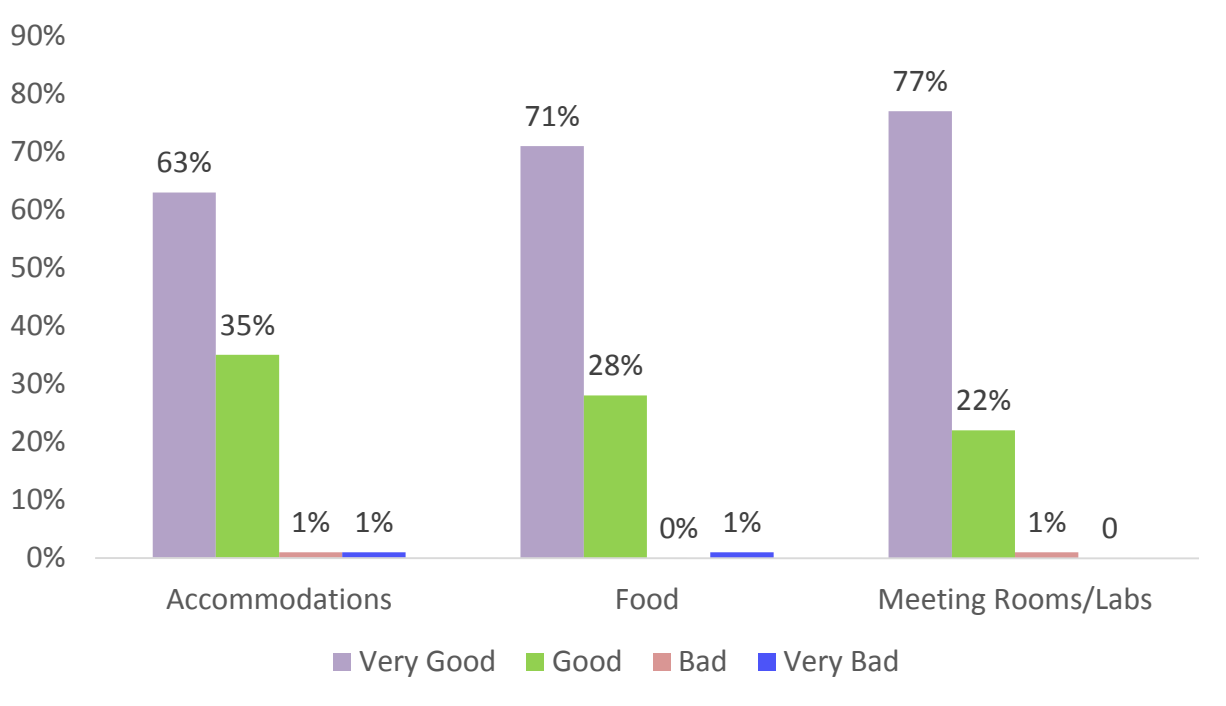
Participants described their roles as Students (58%), Peace Corps, MSU, or IBM Staff (23%), Volunteers (10%), Teachers (8%), and Other (1%). The category of Peace Corps, MSU and IBM Staff was chosen by 19 individuals, more than the number that actually represented these entities at the camp. Additional categories such as "camp facilitator" or "camp

assistant" might have given respondents categories that provided a better fit for the roles they played in making TechKobwa a success.

Respondents were asked to use a "very bad" to "very good" rating scale to share feelings about the accommodations, food, and meeting rooms/labs of Camp TechKobwa.

Meeting rooms/labs at IPRC West received the most "very good" ratings at 77%. Meeting rooms/labs also garnered the highest mean ratings at 3.76 on a 4-point scale, compared to 3.69 for food and 3.59 for accommodations. Ratings for IPRC West were high across categories.

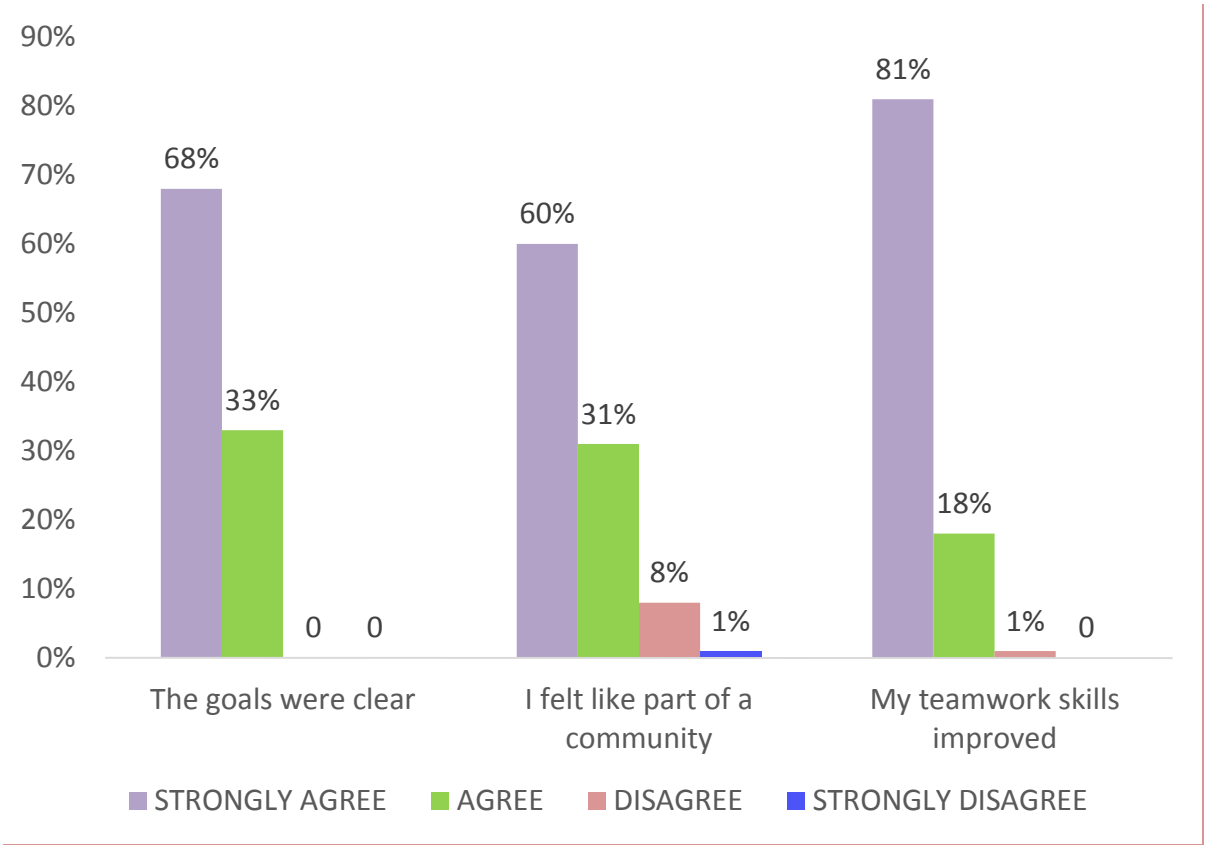
Chart 31. Feelings about Camp (n=84)



Respondents were also asked to rate their feelings from "strongly disagree" to "strongly agree" for 3 camp goals (Chart 32). They were asked if their teamwork skills improved, if they felt like part of a community, and if camp goals were clear.

Ratings were high across categories, with agreement ranging from 91% to 100%. There was some disagreement on feelings of community, with 9% reporting that they did not feel like part of a community. Anytime you conduct a camp with large numbers of students, it is possible to have a few students who feel lost and need additional connection and supports, especially if it is their first time away from home. Creation of "families" and mixing of students from many schools within each family probably contributed to high ratings of community. Student use of phones to connect with families at certain times of day might also help with feelings of home sickness. Another solution might be to create a Camp Counselor type of position for students to reach out with concerns for connection to resources and people who can assist.

Chart 32. Feelings about Camp Goals (n=84)



Camp participants were also asked to rate whether 18 different TechKobwa lessons were useful to them. The ratings were made on a 3-point scale from "do not agree" to "agree a little" to "agree." Respondents were also provided with an "I did not participate/NA" option. This chart shows the percentage of respondents who "agree" that lessons were useful.

Participants had high levels of ratings of agreement that all lessons were useful, with just two exceptions. Two speed fan & fuse (79%) and flying saucer (73%) were perceived as much less useful than other lessons.

Overall, Camp TechKobwa was rated "good" (11%) or "very good" (89%) by all camp participants. To understand these exceptional ratings, consider the participant list of things they liked about Camp TechKobwa.

Chart 33. These Camp TechKobwa Lessons Were Useful to Me - % Agree

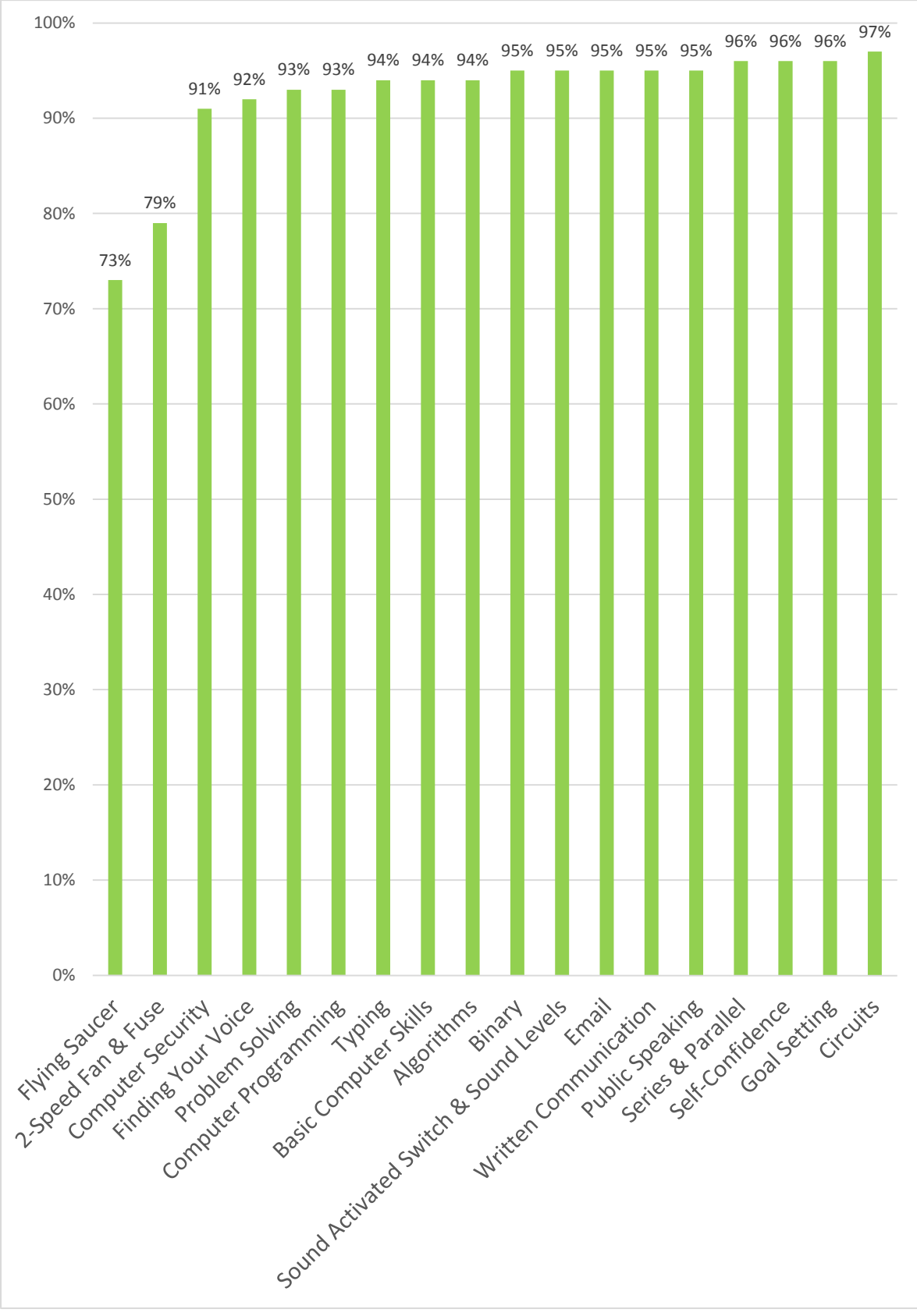
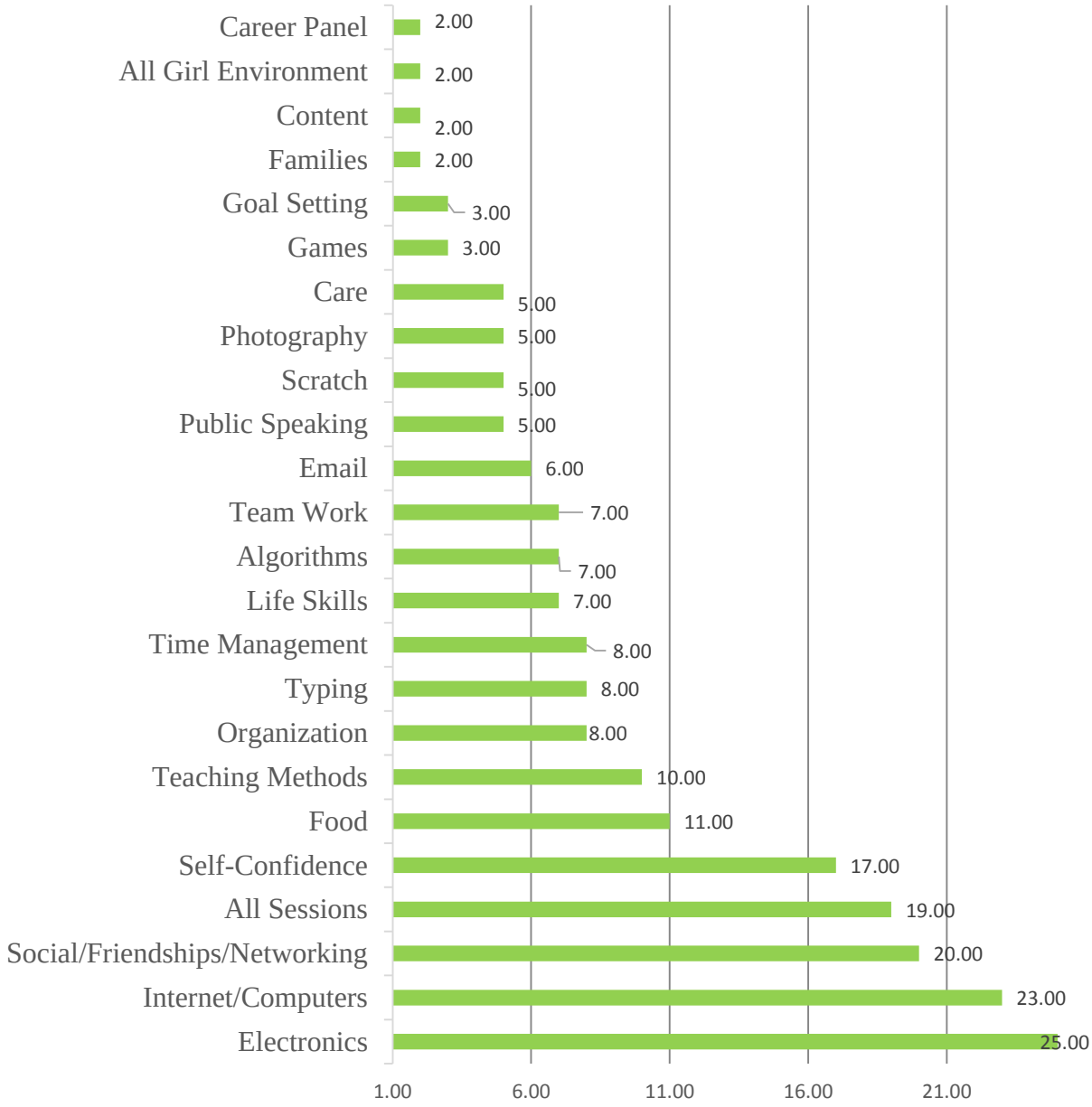


Chart 34. Name 3 things you liked about Camp TechKobwa



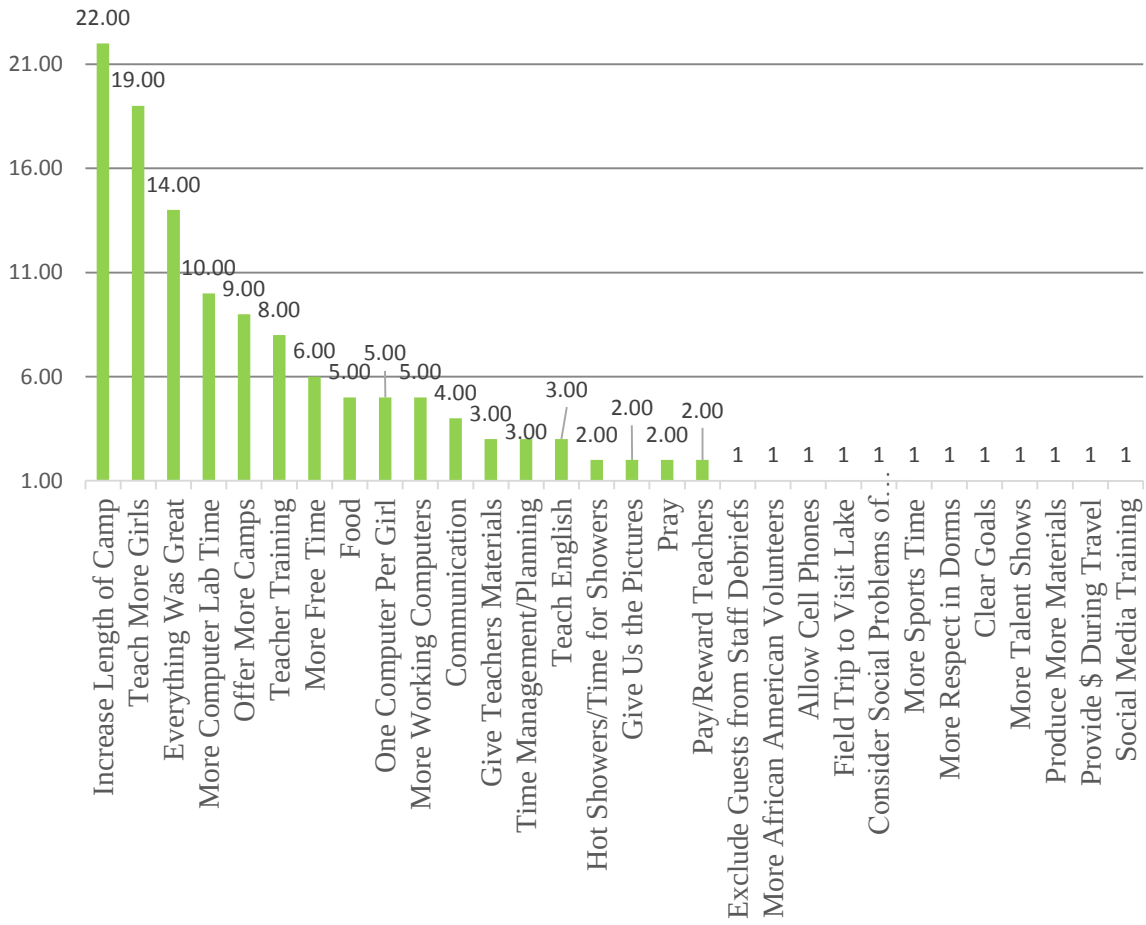
Participants were also asked to name 3 things they would change to improve Camp TechKobwa (Chart 35). Despite overwhelmingly positive ratings, participants had a lot of ideas for improvement.

The top 3 improvements suggested by participants involve more Camp TechKobwa – more time, more girls, more camps. Participants would improve the camp by increasing the length of the camp from 1 week to 2 or even 4 weeks. More girls from more schools should be trained at each camp. More camps should be offered all over the country.

Teachers would like more training, a break between their training and the teaching of students, and to be paid or compensated for their efforts. Teachers would also like to take all materials back to their schools, including digital cameras, Snap Circuits kits, and other tools. A great suggestion was to include training on the use of social media so that teachers (and students) could continue to support each other after camp.

Participants also requested more working computers. One suggested double checking the camp site for computers that work and troubleshooting these before students arrive. Five individuals proposed 1 computer per girl as the perfect ratio for ICT training.

Chart 35. Name 3 things you would change to improve Camp TechKobwa



Time was mentioned in several contexts – time management, free time, time for computer labs, time for showers, and time to recharge and keep teaching and facilitation skills sharp. Participants wanted more time with computers, more time for research, more down time to wash clothes and check on family members, and more time for showers. One suggestion was to allow teachers and facilitators to take rotating breaks so that the girls were always supervised, but each volunteer would have some personal time over 15 hours.

Comments about food included offering different drinks, such as milk, water, and Fanta, providing more food at breakfast, and offering greater variety in food choices at all meals.

Discussion

Teachers came into Camp TechKobwa with mastery of about half of the subjects covered. They left with mastery in more than 80% of subjects. Their interest in ICT is high, but none of them had more than 5 years' total ICT teaching experience. Access to computers must also be challenging at 20% of participating schools because these teachers reported less than 1 hour of computer use each week.

Teachers agreed that their teaching knowledge and skills had been improved in all 24 areas rated. They learned the camp material, taught the material, and then took their newfound knowledge, materials, and enthusiasm back to their own schools. This model provided intensive, applied training in a fun, engaging, and culturally sensitive context for continued application beyond the life and experience of the camp. Teachers should be interviewed or surveyed within 6 months of TechKobwa to assess the mid-term impact of camp on them, their schools, and their students. They should also be tracked long-term and encouraged to stay connected to the camp and the community that was created. One of the teachers suggested social media as a way to stay connected. This approach would also facilitate continued access to former participants for evaluation.

Teachers had a wide range of ICT experiences prior to Camp TechKobwa, but the camp helped all of them achieve key goals: strengthened knowledge of ICT through teaching, increased knowledge of the field of ICT, improved ICT skills, and for 90% of teachers, the knowledge and confidence to teach ICT in clubs and courses.

One teacher pointed out that girls in the families benefitted greatly from having native English speaking family members. Comfort and skills in listening and speaking increased throughout the week. English instruction was suggested by another teacher as a new subject to consider for subsequent camps.

Students came into Camp TechKobwa with great enthusiasm about ICT and a wide range of weekly computer use/access. Nearly a third reported less than 1 hour of computer use each week. Another third reported 1-2 hours of weekly use.

Student mastery of subjects covered in the camp was low (22%) before the camp, but high (83%) after the camp. They improved significantly in 29 of 36 subject areas. Confidence also increased as a result of Camp TechKobwa. Student ratings of the statement, "I am good at ICT" increased significantly ($p<.05$) from pre to post-camp.

Camp TechKobwa was highly rated overall by all camp participants, teachers, students, volunteers, facilitators, etc. The utility of all lessons was also high. Circuits, goal setting, self-confidence work, series & parallel, public speaking, written communication, email, and sound activated switches and sound levels received the highest ratings of utility. Flying saucers and 2-speed fans and fuses were perceived as having the least utility of subjects rated.

Electronics, Internet/computers, and social aspects of the camp were given the most "likes" in write-in comments. Suggested improvements for the camp ran the gamut, but a majority of suggestions focused on increasing the length of the camp, increasing the number of girls who attend each camp, and increasing the number and location of camps throughout the year to increase reach.

This report fails to capture the magical quality of Camp TechKobwa, how it nurtured and inspired, or the impact it achieved. Its true impact will be measured over time, as teachers and students carry the ICT knowledge, interest, self-confidence, personal, and professional skills, and connections they have nurtured into their communities and into the future.

APPENDIX A

Evaluation Challenges, Lessons Learned & Recommendations

Evaluation Challenges

Teacher surveys were developed for administration in the English language initially because skills were believed to be high. Surveys were translated at the camp into Kinyarwanda, however, upon request by teachers. Volunteers from Creation Hill helped with the translations. After translations were completed, respondents had their choice of surveys in either English or Kinyarwanda language. Most chose Kinyarwanda.

Instruments were scored each night, after instruction concluded, using a rubric with correct choice options. Unfortunately, 14 of 34 teacher survey items (41%) featured open-ended or write-in responses, which made scoring more challenging. Most respondents who completed surveys translated into Kinyarwanda also wrote their responses in Kinyarwanda.

The translation of the survey items from English to Kinyarwanda language on pre and post-test surveys increased opportunities for error, as did translations from Kinyarwanda back to English on responses written into text boxes.

All survey responses were entered into Survey Gizmo survey databases that were created before the camp, using a kiosk data entry tool to generate instant reports. Because of challenges with power and Internet Wi-Fi access, this method was abandoned during the camp and replaced with SPSS survey databases created on-site.

Many of the students traveled from significant distances, rode more than one bus, and possibly a motorcycle (moto) before walking with luggage approximately half a mile to the IPRC West campus. It was not an ideal time to administer evaluation pre-tests, but time had not been built into the camp schedule for daily pre-tests. Future camps might consider administering pre-tests after breakfast.

Another unknown variable was the amount of time students would require to complete assessments. As students became evaluation savvy over the course of the camp, completion time for the surveys was reduced. One exception to this finding of increased survey speed was in the Draw a Scientist Test (DAST). A majority of students were very uncomfortable with this task and spent a large amount of time completing it. When students turned in these drawings, many expressed disappointments with their efforts. This particular assessment, very common in STEM camp evaluations in the US, may not have been appropriate or culturally sensitive in this context in Rwanda. Drawing may not be taught, practiced, or encouraged much. The assessment was adapted for this context, with the intent of measuring change in depictions from male to female scientist, but may have had the unintended effect of making students feel badly about artistic expression.

Lessons Learned

- All surveys should be finalized prior to camp start
- All surveys should be administered in English with a Master Survey translated into Kinyarwanda made available to respondents for reference and assistance
- Surveys should include multiple choice options rather than open-ended response options to minimize errors of translation or interpretation
- Survey responses that must be open-ended should be requested to be written in English language to minimize errors and reduce workload
- Use names to link pre and post-test surveys rather than creating unique codes with, for example, the first 3 letters of your Rwandan name, the name of your school, etc.; replace names with numbers after data entry and pre-post survey linkage; the team struggled with the unique codes involving family members and letters from family names because of the genocide
- Teachers were asked to create a unique identifying code to link pre and post-survey responses, and also to increase confidentiality; this method was very challenging for teachers, so it was abandoned and replaced with first and last name for students
- Don’t trust respondents to remember a random number for survey linkage; researchers planned to white-out names on hard copy surveys, leaving only the number after linking pre and post-surveys; unfortunately, more than half of students remembered the numbers incorrectly by the end of the camp, causing surveys sorted by number at the camp and then entered into SPSS databases at the camp, to be incorrectly linked; all student surveys had to be re-entered with accurate numbers after the camp
- Take all final surveys and copies to the camp; access to paper, a printer, ink cartridges, power, and/or printing services at the camp was challenging, time consuming, and also expensive
- Participate and engage in the camp for improved understanding of evaluation results

Evaluation Observations & Recommendations

1. Schedule time daily for pre-tests
2. Provide teachers and students with more personal down time – at least 1 hour per day – for laundry, communicating with family, etc.
3. Allow students to keep cell phones; with use restricted to after class hours
4. Take a photo printer and printer paper if photography lessons continue so that girls can take home a memory
5. The evaluation was enhanced by the participation of the evaluator as a family member, even though participation in daily activities was often limited
6. Record student email addresses for longitudinal tracking, communication, networking, and mentoring potential
7. Invite participants to stay connected, using technology, such as a Facebook page for the growing TechKobwa family; post scholarship opportunities, share photos, mentoring, camps, training, evaluation requests, etc.
8. Ask the girls and teachers to reflect on the impact of the camp after 3-6 months, during their long break
9. Consider offering a camp during the long break for high schools in Rwanda – mid November through mid-January; consider invitations to exceptional former participants to attend as mentors and volunteers
10. Pilot evaluation best practices and make adaptations as needed based on lessons learned, rather than limiting evaluation utility, methods, and survey response options in anticipation of problems that may not exist

APPENDIX B

Camp TechKobwa Evaluation Plan

Camp TechKobwa Evaluation Plan

Evaluation Tasks	Outcomes	Data Gathered by Survey/Instrument
Evaluate Impact of Camp TechKobwa Experience on Student Participants	• Change in Attitudes about ICT • Increased Confidence in ICT • Increased Knowledge of ICT • Increased Perception of Expertise in ICT • Increased Interest in ICT • Increased Interest in ICT Careers	Student Pre-Post Attitude Survey
Evaluate Impact of Camp TechKobwa Experience on Teachers	• Improved Leadership/Teamwork Skills • Impact of Teaching on Learning • Impact of Teaching on Intent to Disseminate ICT • Increased Confidence	Teacher PostCamp Survey
Evaluate Camp TechKobwa Lessons (11)	• Improved Content • Increased Learning of Identified Objectives • Formative assessment	Daily Lesson Evaluations Of Student and Teacher Learning Outcomes
Evaluate Overall Camp TechKobwa Experience for All Participants	• Achievement of Camp Goals • Creation of ICT Community • Improved Teamwork Skills • Utility of Lessons • Impact of Lessons on Knowledge & Skills • Satisfaction • Formative program feedback	Post-Camp Survey for Students, Teachers & Staff
Process Evaluation	• Improved functionality and utility of materials and methods • Improved communication and collaboration of team • Integrate results of each Camp element/activity/group evaluation into recommendations	Observation Notes

Survey Name	Respondent	Dates
Teacher Survey	Teachers	August 7, 2015
Pre-Camp Survey for Girls	Students	August 8, 2015
Post-Camp (or RPT) Survey for Girls	Students	August 14, 2015
Lesson/Module Evaluations Electronics Circuits (Day 1) Sound-Activated Switch & Sound Levels (2) Series & Parallel (Day 3) Logic (Day 4) Flying Saucer (Day 5) Two Speed Fan & Fuse (Extra) Life Skills Goal Setting (Day X) Written Communication (Day X) Public Speaking (Day X) Finding Your Voice (Day X) How a Computer Represents Information (X)	Students Teachers Instructors	Administer Pre-Tests Prior to Camp Start Administer Post-Tests After Lessons Each Day
TechKobwa Camp Evaluation	Everyone	August 14, 2015
Process Evaluation – Observation	Everyone	On-going

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