The First Bahir Dar University Maths Camp 1st -14th July 2013

A Report to Bahir Dar University

By Berie Getie and Abebe Regassa

In 2012, during the second Maseno University Maths Camp, a delegate from Bahir Dar University by the name Abebe Regassa, attended the Camp. Upon returning to his country, he shared the ideas about maths camps with his colleagues in the Mathematics Department at Bahir Dar University. They brought the thoughts and sought for the university support in having annual Maths Camps as part of their outreach program, and this led to the first Bahir Dar University Maths Camp, which took place between the 1st and the 14th of July 2013.

Bahir Dar University Maths Camp was held under the theme "Learning Mathematics through fun". A total of 65 students from grades 7 to 12 and from 13 different schools participated (Teyma, Tsehay Gibat, Sertse Dingil, Tana Haik, Ghion, Shimbit, Dilchibo, Meskerem 16, Yekatit 23, Kukual Meda, Dona Berber, Fasilo and Bahir Dar Zuria), accompanied by eight teachers. The Camp was organized by 10 lecturers from Bahir Dar University together with seven international volunteers, bringing the total number of participants to 90.

The two weeks were split into the preparation week which ran from the 1st to the 6th and the actual camp week from the 7th to the 14th. It was during the preparation week that ideas about the content for the Camp sessions were discussed, the logistics were ironed out, and the materials for the sessions were prepared. The Bahir Dar University Maths Camp had many interesting sessions, which included among others: functions modulo with strings, Gapminder, shift cipher, modulo arithmetic, animations using Geogebra, card tricks, Ethiopian numbers, and programming among others. These sessions were alternated with sports activities that make use of mathematical concepts, including among others "Wizards, Giants and Fairies", "Untie the Knot", "Balloon Relay Race", "Three-legged Race" and "Dodge Ball". In addition, every day the students were challenged to solve daily puzzles and asked to write journals on their experience about the Camp.

The Camp activities included a very interesting excursion to the Blue Nile falls and the sources of the Blue Nile, a most renowned natural site in Ethiopia, which gave the chance to discuss about the development of hydroelectric power in the country, and its relation to the country's development. The "house competition" made the Camp more exciting as students were divided in four groups (each group named by a famous mathematician: Fermat, Gauss, Pascal and Pythagoras) and each group had to try and win as many tokens as they could during the Camp activities. Different houses had different colors for their t-shirt; Green for Gauss, Red for Pascal, Yellow for Pythagoras and blue for Fermat. The winning house was to be the first to reach the top of the Blue Nile poster, where the house cup was placed. At the end of the Camp, the Pascal team was pronounced the winner, and all teams were praised during the Closing Ceremony at the presence of the President of Bahir Dar University.

The commitment and enthusiasm of Bahir Dar University lecturers' was remarkable, and the students' enjoyment was their highest reward. One of the students wrote in his journal:

"There is one thing about the maths camp the system that they use is really amazing. I wish if they could consult the education minister so that each and every Ethiopian learned like that. The more we are learned like that the more successful we are."

"As far as the maths camp is mainly targeted with improving students' thinking and problem solving capacity besides having fun with mathematics!"

"Maths camp was awesome. We learned things we kind of knew but never quite got it."

"I am grateful of our team & our communication. But I am more grateful for this maths camp, which helped me look maths in different fun way."

"Day after the day maths camp program becomes more interesting. I love it too!"

There were seven international volunteers: David and Victoria from the Department of Mathematics in Maseno University and Giovanna currently working at Maseno University in the School of Development and Strategic Studies, Tom a Mathematician from the US visiting Maseno University's Mathematics Department, Matt and Natalie from the US, and Elizabeth from Canada.

Pascal Group when they are celebrating their success with BDU Higher Officials

Fermat Group when they are celebrating their success with BDU Higher Officials

Pythagoras Group when they are celebrating their success with BDU Higher Officials

Gauss Group when they are celebrating their success with BDU Higher Officials

BDU Instructors, Guest Instructors and Students who participated in the BDU Math Camp

A detailed report about the Preparation Week

Day 1 & 2: Tuesday, 02/07/2013 and Wednesday, 03/07/2013

The main activities were to table the logistics for the camp preparation and the following were the two key areas to discuss.

1. The camp themes and sub themes
    - Themes, content and sessions
    - Cards for games: some are there; need to purchase more?
    - Half-day trip: this will be a camp activity; when/where
    - DVDs to distribute to students: one DVD should be enough
    - Publication: organisers should regularly keep record and write daily about how the camp has been prepared (methodology used, process leading into decisions, content of the activities, etc,), and about the experience during the camp
    - House cup: provide a cup; purchase stickers to stick on the bottle taps, which will be used as tokens
    - Badges: how do we make the name badges interesting? This could be a camp activity
2. Accommodation and activity rooms
    - Accommodation: organisers, teachers and students staying in the houses?
    - Visits to activity rooms-meeting rooms and computer labs
    - Visits to accommodations (4 houses)

THEMES AND SUB THEMES

The following are the themes to be covered during the camp. Each theme has a content and and for each each content a session(s). Each session will be at most 45 minutes.

1. **History of numbers-**the content to be covered under is theme includes: Ethiopian numbers, fractions, irrationality of the square root of two, bases of modulo, shift cipher and prime numbers encryption. There will be six sessions under this theme-one for each content.
2. **Scientific research**- the content under this theme includes: investigating own data, using own data (gapminder), data in research, modelling 1, modelling 2, importance of mathematics. Again there are six sessions-one for each content, under this theme.
3. **Geometry**-the content here includes: introduction to Geogebra(animations), properties of including angles and lengths, construction of pi and the arc length concept, dimensions, 3 D figures, spherical geometry., Each of these content constitutes a session and there are six sessions under this theme.
4. **Rules in mathematics**-the content here includes: Relations and functions, program syntax, pascal triangle 1, pascal triangle 2, graphs with Geogebra, program algorithm. Again there are six sessions here, one for each content.
5. **Card tricks**-the content is not yet decided upon.

Other themes/activities will include: **puzzles, fun sport, card games, history of mathematicians** and **time travel**. The following has been agreed concerning these themes.

1. For **puzzles**, some sessions will end with a puzzle for the students and also there will be a daily puzzle for the students to solve and there will be tokens for solving the puzzles correctly.
2. There will be sessions for **fun and spor**t which shall be agreed upon before the week closes.
3. There will be sessions for **card games** especially in the evenings.
4. The **mathematicians** whose history shall be studied were chosen based on the various themes being covered in the camp. They include: Gauss, Fermat, Pascal and Pythagoras. There will be four houses of competition in this camp and each shall bear the name of one of the identified mathematicians.
5. There will be a **time travel** to the Blue Nile falls. This apart from being an excursion activity, it will help relate history to mathematics since the data for the activities around the place shall be used in the modelling sessions.

ACCOMMODATION AND ACTIVITY ROOMS

The accommodation and activity rooms were visited yesterday and it was apparent that the university has enough facilities to host the camp. Everything is set in place ready for the event.

At the moment the organises are trying to get their content ready and more meetings shall be held between today and tomorrow to set up the timetable and any other thing that might contribute to the success of this camp.

Day 3 & 4: Thursday, 04/07/2013 and Friday, 05/07/2013

This has been the preparation week and on Thursday all the volunteers continued with their preparations for the various contents assigned to them. The international volunteers, led by David Stern held meetings here and there with the university volunteers to discuss the contents they are working on just to be sure things are moving in the right direction and as per the themes of the camp.

One of the major challenges expected is that of language barrier. The commonly spoken language here is Amharic and even lessons are delivered in the same tongue. There are high chances that the university volunteers will play a bigger part in leading the sessions, though the international volunteers will be available to offer any help that might be required.

One international volunteer called Tom Denton arrived on this day and it was great to have him around as he would help a lot with card tricks- a theme whose content had not yet been decided.

On Friday, one of the key activities was to fix the content for card tricks with the help of Tom Denton. This is what was agreed to be the content for the theme of card tricks:

1. Introduction to card tricks
2. Elimination shuffle
3. Elimination shuffle
4. Riffle shuffle
5. Riffle shuffle
6. Towards research

There will be six sessions on this theme just as it is with the other themes-(I mentioned them in the first mail send to you on updates).

Another major event for Friday was a joint meeting in the morning to discuss further the content and set up the timetable for the camp week as well as get things ready for arrival and the first day of the camp.

Content discussion

Further discussions on the content went on. The university volunteers were asked to present their sessions as they would present to the students so that others could give comments for improvement. It seemed like a lot was needed to be done on the contents and so there were intensified meetings in the afternoon to iron out issues on the content. However, by the end of the day, sessions for day 1 of the camp were ready.

Timetable

The schedule for the week was made bearing in mind the following constraints:

- Irrationality of square root of 2 should come after Arc length, construction of pi
- Introduction to geogebra should come before using graphs in geogebra
- Modelling should come after the trip, using data before the trip (using data provided from researchers on the Blue Nile)

Arrival Day and day 1 of the camp (i.e. Monday)

Registration on arrival-three volunteers will be waiting at the first gate (Abebe, Yismaw, Berie) a banner is to be erected to announcing the camp. A bus to collect them the registration desk. Let them come in smaller stream to ease the registration process. Have the same venue for the games all through the camp period. Registration will be online (Mulat, Abdu, Giovanna). Elizabeth and Endalew will help with packs. The events will follow in this manner: From the gate to registration to accommodation to card game activities.

Accommodation –Issues of accommodation and activity rooms, food and drinks, T-shirts are already sorted out.

Activities on arrival. Students will do card games after settling with registration and accommodation. The thing is that we need to create a good first impression about the camp, (David, Tom, Getch, Berie, Vic) will be in charge of these activities.

They will be issued with packs containing a pen, badges, t-shirts, playing cards, note book, crib sheet, DVD. The t-shirts are of four different colors each identifying a house. There will be four houses in this camp named after four mathematicians: Gauss, Fermat, Pythagoras and Pascal.

By the end of day, most of the sessions for Sunday and Monday were ready while there is still an amount of work going on to prepare for the rest of the week’s sessions.

Day 5 Saturday 06-07-2013

On Saturday, one of us went to church while the rest went to the university in the afternoon to make further preparations. The university held its graduation on this day and so the town was extremely busy in the morning hours and there was less commotion in the afternoon.

The following are the activities that took place on Saturday:

- Practicing card game tricks
- Setting up the packs
- Further discussions on the content for Monday sessions and getting ready.

It was decided that the Monday sessions will be rehearsed on Sunday morning and so the volunteers concerned were asked to prepare. Rehearsing provides an opportunity for improvement.

Day 6 Sunday 06-07-2013

Everybody was getting geared up with the various roles they were to play upon the entrance of students and teachers. We were all very excited and enthusiastic about the day's events. We all had joint lunch at the university canteen (to save on the time in going to and from the hotel where we were booked) and by exactly 1.30pm everybody was strategically waiting at the various points to execute the different roles assigned them on the arrival of students and teachers.

Such roles included:

1. Arranging the hall for activities to keep students busy while registration is ongoing-these activities included, the game of 21, guess my number, connect four, guess my fraction, dots and boxes. The volunteers practiced among themselves the games they were to engage the students with. ***Find attached a puzzles book and crib sheet attached also for details on these games and more.***
2. Receiving and escorting students from the main gate to the registration venue.
3. Getting the registration desk ready: registration was to be done online and there was a survey form to be filled by the students and teachers with the aid of the volunteers. The name tags were arranged alphabetically so it would be easy to find for each student.

By 2pm students accompanied by their teachers began arriving and as registration was going on for some students, others went on with the activities. Full registration included the following steps in the given order:

1. Filling up the online survey form
2. Getting the pack-which contains: a note book, a pen, puzzles book and crib sheet and a card games pack.
3. Getting the name tag
4. Signing the attendance sheet

5. Getting a t-shirt: given as per the house assigned-green was for Gauss, yellow for Pythagoras, red for Pascal.
6. Accommodation

After sorting out accommodation, students returned to the hall for further activities till 6.00pm when we had a break for dinner. All participants returned to the hall at 7.00pm for card game (specifically the game of 8's) until 8.30 pm when people went to bed.

Faces could not hide the fact the camp started very well and that a good initial impression about the camp had been created.

Generally, we feel the day was a great success and we look forward to more success in this camp.

Time	Day 1 Sunday	Day 2 Monday	Day 3 Tuesday	Day 4 Wednesday	Day 5 Thursday	Day 6 Friday	Day 7 Saturday	Day 8 Sunday
1:00-2:00		Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast
2:00-2:30		Opening	Assembly	Assembly & Journal entries	Assembly & Journal entries	Assembly & Journal entries	Assembly & Journal entries	Assembly & Journal entries
2:00-4:00 2 sessions, 1 hour each			Puzzles Code breaking	Eliminations (card tricks) Shift cipher Furnctions, relationships	Data in research Modelling 1	Riffle (card tricks) Pascal's triangle	Prime trapdoor func Spherical geometry Toward research	
4:00-4:30		Tea break	Tea break	Tea break	Tea break	Tea break	Tea break	Participants departing at 4
4:30-6:00 2 sessions, 45 min each		puzzles Intro to geogebra Intro to geogebra puzzles	Irrationality of sq.root of 2 Intro to tricks Intro to tricks Irrationality of sq.root of 2	Shift cipher Furnctions, relationships Eliminations (card tricks)	Modelling 2 Data in research	Pascal's triangle Riffle (card tricks)	Toward research Prime trapdoor func Spherical geometry	
6:00-7:30		Lunch	Lunch	Lunch	Lunch	Lunch	Lunch	
7:30-9:00 2 sessions, 1 hour each	Participants arriving at 8 Survey (1)	Ethio numbers Syntax Syntax Ethio numbers	Own data Properties geogebra Properties geogebra Own data	Arc length Gapminder Gapminder Arc length	TRIP to Blue Nile falls	Graphs in geogebra 3d figures 3d figures Graphs in geogebra	Closing– Joy of Stats? Survey BDU staff	
9:00-9:30	Drinks break	Drinks break	Drinks break	Drinks break		Drinks break	Drinks break	
9:30-11:00 2 sessions, 45 min each	Games: set, connect 4, 21, nims, dots & boxes	Modular aritm Sports sports Modular aritm.	Dimensions Sports Sports Dimensions	Complex numbers Sports Sports Complex numbers		Hash functions Sports Sports Hash functions	Closing– Joy of Stats? Survey (3)	
11:00-11:30	Assembly	Assembly	Assembly	Assembly	Assembly	Assembly		
11:30-1:00	Dinner	Dinner	Dinner	Dinner	Dinner	Dinner	Dinner	
1:00-3:00	Card Games	Card Games	Card Games Survey (2)	Card Games	Card Games	Card Games	Card Games	

Math Camp Time Table