

"Inside Every Child is a Scientist" M. Gelfand

th Fountaining Wisdom at the Source of the Blue Nile for 60 Years!



STEM Education in Ethiopia: The case of Bahir Dar

University Hospital → University School

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Bahir Dar University STEM Center





Content of Presentation

- Bahir Dar University in Brief
- STEM in Africa Ethiopia Bahir Dar
- STEM Developments in Bahir Dar
- Future STEM directions at Bahir Dar and Ethiopia





"Inside Every Child is a Scientist" M. Gelfand





Her Excellency Prof. Sarah Anyang, the African Union Commissioner for Human Resources, and Science and Technology and her team visited Bahir Dar STEM Center, Nov 2017





STEM Education in Ethiopia

• Ethiopia – aspires to be a lower Middle Income country by 2025

(STEM Education – as corner stone for the industrialization plan)

- STEM Education— 70:30 Policy (70% of HEIs students in STEM)
- STEM Centers at Ethiopian HEIs MoE/MoSHE
- 2030 Ethiopian Education Roadmap Development





STEM Education in Ethiopia

- BDU is trying to invest in STEM Education at the lowest class room level:
 - Grades 1-4 Special hands-on-trainings for STEM School teachers
 - Grades >5 Special hands-on-trainings for STEM School teachers and Students
- BDU is integrating the HEI students and School students through STEM group works by engaging both groups in Entrepreneurial trainings with the support of US Embassy and JICA – SolveIT Project – STEM for Business innovations!
- BDU-STEM Center is running STEM Education Assessment research (The Practice of STEM Education in Ethiopia)
- This research work is going to be repeated at HEIs level once the status of STEM centers is known from this research result.







• The Foka STEM Center, 2012, our first of many with four engineering laboratories:

- » Electrical (both analog and digital)
- » Mechanical
- » Optical

<u>Bahir D</u>ar

» Computer (both traditional IT and microcontroller)





Vision

• <u>To provide a challenging learning environment</u> in STEM education, which maximizes individual potential and ensures students are well-equipped to meet the challenges in the world around them.

<u>Mission</u>

• To provide competent students with high learning experience, through rigorous and relevant content, that mainly focuses on hands on activity in STEM laboratories, to be productive and successful citizens by developing a strong work ethic and the higher-level critical thinking skills needed to solve problems in the real world.

Objectives

- To increase student interest in STEM areas.
- To increase student achievement among all students in order to prepare graduates to be civically and college and/or career ready.
- To produce critical thinkers, innovators and problem-solvers.
- To connect classroom lessons to real-world problems.
- To increase the number of teachers prepared and delivering integrated STEM education.
- To foster cross-sector partnerships that provide informal learning opportunities







STEM Center Activities at Bahir Dar

- Outreach Program since 2011 every summer for 45 days for ~500 Students
- STEM Projects STEM Project training and coaching
- STEM Short term trainings (School students and teachers)
- Camp programs (Math, Girls, STEM) Once a year for 7 15 days
- Science Shared Campus program full STEM course provision for the whole year at the STEM Center
- STEM Fair Programs Twice a year at the STEM center and once a year at country level
- STEM Gardening Practical and Demonstrative garden practices
- STEM Visiting (Institutions and Individuals) teaching different stakeholders through visiting the center
- Bahir Dar City UNESCO Registered Learning Cities Member (STEM Focused Life-Long-Learning Program)

"Inside every child is a scientist"





Outreach Program For Talented Students Project (Nov. 2011 – Sept. 2014)

- Outreach Program for Talented Students was a two year project financed by:
 - Mr. Mark Gelfand and Bahir Dar University
 - The objective was to maximize the number of STEM students with a motto:

"Inside every child is a scientist"

Inauguration of The BDU STEM Outreach Program in July 2012

National Conference on Present and Future Direction of Science, Technology, Engineering and Mathematics (STEM) Education in Future

STEM





Outreach Program For Talented Students

- Science (Physics, Chemistry, Biology)
- Mathematics
- ICT
- Electronics
- Technical Drawing
- English
 - Projects can be done in any field of stud
- Projects can be done in any field of study
- Extracurricular Activities and Educational Trips are also included in the program.

The Summer Training Program Structure Students were grouped as:

- ➢ Group 1 (Grades 7 and 8),
- **Group 2** (Grades 9 and 10), and
- Group 3 (Grades 11 and 12)





Outreach Program For Talented Students

- The training is conducted through team teaching mode:
 - one school teacher,
 - one university instructor, and
 - one laboratory technical assistant helped 25 students in a laboratory room and
 - it was:
 - hands on practical laboratory experiment followed by
 - students' presentation,
 - report writing and
 - project works.





Students in Science Lab

STEM Center Launching - 2014



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STEM INCUBATION CENTER





Bahir Dar STEM Incubation Center Objectives:

- Project advising and incubating school students' project work and creativity
- Organizing and supporting of <u>school clubs</u>
- Provision of <u>laboratory based hands-on education for</u> <u>talented school students</u>, through:
 - an after-school short term training,
 - summer training and
 - camp programs.
- Developing and disseminating <u>teaching and learning</u> <u>resources</u> like:
 - audio and video files,
 - reference books,
 - laboratory manuals,
 - learning/teaching softwares and
 - standardized exam items;





Bahir Dar STEM Incubation Center Objectives

- Providing <u>library, internet and laboratory services</u> to students and teachers in elementary, secondary and preparatory schools.
- Provision of <u>short term hands-on training on teaching</u> <u>science</u>, and <u>mathematics through playing/fun.</u>
- Developing museum <u>outdoor and indoor exhibits</u> and helping the community as a whole to learn through visits and playing.
- Familiarizing the role of <u>gardening (Vertical) practice for</u> <u>education</u> to nearby schools and community.





Bahir Dar STEM Center has the following facilities

- <u>12 Laboratory Rooms</u> (Physics, Optics, Space Science, Chemistry, Biology, Biochemistry, Electronics, Mathematics, ICT (Two Rooms),
- Workshop, and Project Room,
- Meeting Hall/Library,
- Staff room, and
- outdoor biological gardens.







Students in Lab works







Math and STEM Camp Programs

- BDU is offering annual <u>Math and Girls STEM Camp</u> programs since 2013 for students from grade 7 to 12
- The aim of the Camp is to make it a <u>real fun and pressure-</u> <u>free place.</u>
- The camp stays for one/two weeks.
- It is a training program that includes:
 - Science and environment
 - computer programming,
 - computer graphics and animation,
 - physical exercises,
 - socialize and leadership development, etc.





Math and STEM Camp Programs

- It allows students to experience science and math as never before- through:
 - games,
 - projects,
 - experiments, and
 - other fun activities.
- The camps also highlight <u>the role that math and science</u> <u>plays in everyday life</u>.
- In the last:
 - five Math Camp (64+98+84+90+85 = 421 boys and girls) and
 - four STEM Girls Camp (56+65+70+75 = 266 girls) programs,
 - 687 students,
 - 24 school teachers and
 - **73** university instructors attended the programs.





Math Camp Participants

















Sample Camp Events

MIL







...Participants



Volunteers from different universities, partially







BDU STEM Center Started the 4th STEM-Girls Camp Program

The Bahir Dar University STEM Center started its 4th STEM-Girls camp program which is running from February 3 to 10, 2019. The training was officially appended by Dr Zaudu Engine the Wise Dresident for





BDU STEM Girls Camp Program





Science Shared Campus Program (2015 - ...)

- The special science shared campus training program aims to conduct hands-on laboratory based training in <u>STEM related</u> <u>school disciplines:</u>
 - Physics,
 - Chemistry,
 - Biology,
 - Mathematics,
 - ICT for secondary and preparatory school students
 - Technical Drawing
 - English language, project work and life skills training are also included in the program (Grades 9 – 12).
 - In addition, a short term training programs on robotics, earth science, space science, genetics and human anatomy are also given on Saturday and Sunday programs.







• The 1st Batch Who Completed STEM SSC Program in 2018 ²⁹





Gardening for Education Program

- Botanical Gardening is a common practice in BDU STEM Center.
- Students are working in groups in preparing:
 - vegetable beds,
 - compost,
 - soil mix,
 - · vertical gardening installation, and
 - watering the garden.
- The garden includes:
 - medicinal herbs
 - vegetables and other edible plants,
 - fruits and indigenous plants collection,
 - maze/puzzle garden and also
- It is used for recreation and outdoor learning site.

Vertical Gardening with drip Irrigation



Ornamental Trees



Medicinal and indigenous Plants Garden

Gardening Practice in STEM Center

Vegetables

Garden







Gardening Practice visits by STEM community







Project Works and short term training program

- Students are working on group projects, ranging from grades 5 to 12, private and governmental schools in Bahir Dar City.
- Every year, a total of 50+ project ideas, both simple and advanced, are submitted and started working in groups of two to four students.
- 10 of them are completed and awarded every year
- Short term training programs on Computer programming (C++, Python, VB, HTML with CSS, Java, Scratch and Alice animations), Robotics (Lego EV3, Artificial Intelligence), Engineering softwares (Arduino, circuit maker, Catia designing), Earth Science, Space Science, Genetics, Human Anatomy are also provided to students.



Project Works - STEM











Project work presentation at different Events







2018 National Fair Winners





Trainings in the Labs

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TUDY

Bahir Dar University "We can-do spirit" Strategy





3D Printing Exercise of School Students

Face shield

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mechanical ventilato 2











Collaborations

- Mr. Mark Gelfand and Family Charitable Trust (Funding the Outreach Program and STEM CENTER)
- STEM Synergy
- STEM Power
- MoE and MoSHE (Recognition and Multiple Support for the center)
- Amhara Educational Bureau (Selection of students and covering transport costs of students in the summer outreach program).
- Bahir Dar City Education Office (Selection of students and arranging platforms with schools).
- BDU colleges (Assigning of teaching staff and teaching materials)
- BDU management (Assigning of resources needed for the success of the center)





Bahir Dar STEM Center Future Plan

- Revisiting of the STEM curriculum there is a team from Israel working on additional STEM courses on Water, Agriculture, Geology and Science Arts where the Emerging technologies like Biotechnology and Materials Sciences can be addressed at the School level.
- Establishment of Science and Technology Museum,
- Providing Mobile STEM Laboratory for schools in rural areas.
- > TV program in STEM for school students and community.
- Summer and Semester break STEM Camping Programs
- Technology Garden
- Strengthening of the existing ones:
 - School Science and Technology clubs;
 - Organizing STEM fairs;
 - Project Competitions;
 - Digital Library;
 - Gardening;
 - Science lab for lower school grades (1-6).





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BDU STEM Center Future Plan

Science and Technology Museum Design







Success Stories of the Center:

- STEM Students self confidence established
- Impact on their academic performance of kids
- Environmental awareness against science (application of STEM in the Real World)
- Team work
- Innovation skills
- Strong "I can do/be spirit"
- International experiences/links created 46





Challenges of the Center:

- Future destination of STEM students lack of appropriate HEIs for STEM Center Graduates
- Ownership of the program Universities and Federal Ministries (MoE, MoSHE, MInT)?
 - Resources
 - Administration
 - Eligibility
- Stakeholders PPP, Marketing of Student innovations???





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Is your organisation active in science engagement? Join us. benefits



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328 members

202 SCIENCE CENTRES/MUSEUMS, 17 NATURAL HISTORY MUSEUMS, 28 RESEARCH BODIES, **31 PRIVATE COMPANIES, 7 FESTIVALS, 6 PROFESSIONAL NETWORKS**, AND 37 OTHER ORGANISATIONS members section

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Bahir Dar STEM













AUDA-NEPAD STEM Education Project Members

Major types of STEM initiatives



- STEM centers
- Science museum
- Science cafe
- Virtual computer labs
- University STEM outreaches
- Mobile STEM lab
- STEM TV and radio
- National science fair
- Science shared campus
- STEM Camp programs (Girls Camp)

AUDA-NEPAD STEM Education Team- 5 Countries:

Ethiopia Gana Nigeria Malawi Gabon



Ethiopian AUDA-NEPAD STEM Education Team:

Dr Solomom Mr Berhanu Dr Tesfaye Dr Aster Mr Alemayehu





United Nations Educational, Scientific and Cultural Organization

From
the People
of Japan





Ethiopian Team members

No	Name	Organization	Position
1	Dr Tesfaye Shiferaw	Bahr Dar University	Research and Community Services VP
2	Dr Mengesha Ayene	Wollo University	Academic Affairs VP
3	Dr Tsigie Ketema	Jimma University	Research and Community Services VP
4	Dr Techlemichael Tesfay	Axum University	Research and Community Services VP



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Conclusion - I'm a STEMinist!

Where are Science Centers in Africa ??? Let us Establish African STEM center forum! Let us Establish Ethiopian STEM center forum! Let us Establish BDU-AU STEM center Partnership!





What is Next???

Let us Establish Strong STEM center Partnership



Thank You!