

Science Center of Ethiopian Academy of Sciences

Its current status and future prospect



May 2024

1. Introduction

The Ethiopian Academy of Sciences (EAS), which was founded in 2010 by a group of distinguished scholars, is dedicated to contribute to the nation's development by instilling a culture of science and innovation among citizens so that they become knowledgeable, strive for change, achieve attitudinal change and enjoy better and civilized life style. As an institution dedicated to foster scientific culture, knowledge, and innovation for societal development in Ethiopia, EAS has taken the initiative to establish a Science Center (SC) in Ethiopia, which has been serving as a hub to enhance public understanding of science and technology in the country. To realize the mission and vision of the Academy, the SC of EAS has been implementing different programs in its various units.

Typically, a science center is an educational facility that uses effective methods to enhance knowledge in Science, Technology, Mathematics and Engineering (STEM) among the general public. It is also a venue that provides an experiment based learning ambiance to inculcate a spirit of inquiry, foster creative talent and generate scientific interest in communities. In doing so science center stimulates curiosity, develops inquiring minds and exposes children and adults to positive new experiences. It helps people to cope with the rapidly changing technological environment, and empower them by improving their life skills. It also enriches the school curriculum and train science multipliers such as teachers, teacher-trainers, researchers and parents.

By establishing a Science Center, the first of its kind in the country, EAS has been realizing its aspiration of instilling a culture of science and innovation among our nations. Such commitment of the Academy plays a crucial role in equipping our societies with the tools of scientific and technological knowledge, which in its turn plays a significant role in ensuring the realization of sustainable development in Ethiopia. Since it has set out to establish a model science center, EAS has been fortunate enough to garner the support of governmental and non-governmental organizations, and its fellows. The major support granted to the Science Center of EAS (SCEAS) includes the 40 Million Birr award provided by the Ministry of Finance and Economics following the request from EAS by submitting detailed proposal which depicts facilities which have to be acquired by EAS in order to establish a model Science Center along with the required budgets. The other significant supports offered by nongovernmental organizations include the provisions of electronic devices and instruments which are dedicated for the establishment and the ongoing trainings of informal STEM education center, 10 kW Solar Power System, Biomechanics Laboratory, Children's Science Center and Fabrication Laboratory – from STEMpower Inc., PHÄNOMENTA Science Center of

Germany and Universcience of France. Being invigorated by these supports, the Science Center of EAS has been able to establish different centers to meet its objectives and aspirations.

2. Main tasks of SCEAS

In allegiance with becoming a model science center in the country, the SCEAS accomplishes its tasks into three main categories:

2.1. Popularization of science and technology

By displaying interactive scientific exhibits in distinctive galleries, the SCEAS popularizes science and technology for the general public by making complex ideas in science and technology simple to visitors coming to the Science Center so that ideas which were puzzling become clear and the public become aware and bring attitudinal change, become knowledgeable and enjoys civilized and better life styles. The galleries (centers) in which the SCEAS displays interactive exhibits includes Physics Unit, Children's Science Center, Geology and Paleoanthropology Unit and Engineering and Industry Unit.

The other platform that the SCEAS plans to implement is hosting Science Communication Events which can be made use of as means to popularize science and enhance public engagement in science and technology. Beyond clarifying complex ideas in science and technology, and creating awareness of the benefits that the public harness from science and technology, science communication events play crucial roles in enhancing public engagement so that individuals and communities contribute their share by putting efforts to the advancement of science and technology to the benefit of Nations, say to tackle global challenges like climate change, Artificial Intelligence, Genetic Modifications, Vaccines, etc. The Science Communication Events that SCEAS envisages to host includes Science Festival, Science Lecture, Science Shows and Intellectual Debate.

2.2. Inspiring the younger generation in Innovation and Critical Thinking

The SCEAS has established an informal STEM education center where high school students drawn from various schools across Addis Ababa are trained in Electronics and Computer Science in hands-on bent approach. The STEM education center is organized into Electronics and Computers Science Laboratories which are equipped with electronic devises and instruments, including 30 computers configured in server-client connection. Typically, students of grad 10 to 12 are trained theoretically and practically in our STEM

education center by integrating the four discipline (Science, Technology, Engineering and Math) into one so that the students be equipped with the four important soft skills known as the "4C" – Critical Thinking, Creativity, Collaboration and Communication, which are key elements in inspiring students to become innovative, critical thinker and self-confident. Beyond the aforementioned objectives, the SCEAS uses the trainings being given in its STEM Center as a platform to inspire the younger generation to consider studying in STEM in their tertiary education programs, and also to have a preference in STEM in their future career. Such commitments of the SCEAS play a significant role in transforming the STEM education platform for innovation purposes, and in speeding up our Nation's economic competitiveness.

2.3. Reinforcing and broadening the STEM task force

The SCEAS has established units like Biomechanics Laboratory, state of the art 10 kW Solar Power System, and Fabrication Laboratory (FabLab) to establish strategic partnership with governmental and non-governmental institutions in professional development with the objective of filling the gap in acquisition of knowledge and skills by professionals so that they can cope with the rapidly changing science and technology in their specific fields of study by providing appropriate and timely trainings. In connection with such responsibilities, the SCEAS plans to take the initiative in the establishment of center of excellence and high tech training center in collaboration with stakeholders, which can play strategic importance in ensuring development and economic growth in the country.

3. Units of the SCEAS and their activities

To execute its main tasks appropriately, the Science Center of EAS has established the following units:

3.1. Informal STEM education center

The STEM education center of SCEAS was established in collaboration with STEMPower Inc. and it was launched officially on the 8th of July 2019. The center has two rooms dedicated to Electronics and Computer Science Laboratories. In the Electronics Laboratory, high school students are trained in fundamental concepts of electronics theoretically and practically – an hour and half theoretical training and two and half hours practical training daily – three days in a week during the summer seasons when

the students are relieved from their regular classes. The electronics laboratory is equipped with electronic devices and instruments which are used to construct electronic circuit and measure electrical parameters during the students' practical session. The Computer Science Laboratory is equipped with 30 desktop computers and one server computer; all the 30 desktop computers don't have their own processor, rather they are connected to the server computer in client-server configuration so that each computer can access resources like software and internet connection from the server computer. Similarly, students in the computer laboratory are trained theoretically and practically mainly in programming which helps them to program microcontrollers (embedded systems) while the students are given the opportunity to develop their own prototypes. Each laboratory has the maximum capacity of accommodating 30 students during the respective training sessions. The electronic components, instruments and the computers are donated by STEMpower Inc.

At the end of the training sessions in electronics and computer science, as explained above, for two consecutive months, the high school students are given the opportunity to develop their own project prototypes by forming teams of two and three students within about one month's duration. Three or more outstanding prototypes are selected to participate, representing EAS, upon the nationally held Science and Engineering fair and competition in commemoration of World Science Day, which is held annually. Since its establishment in 2019, the STEM center of SCEAS could run four consecutive programs successfully, except the 2020 interruption due to COVID pandemic, and won First rank three times and Third rank once; and the STEM Center won Third rank in 2023 among STEM Centers found across the country, upon the aforementioned competition. Also, students who developed outstanding prototypes won Second rank twice and Third rank once upon competitions hosted by Intellectual Property Authority (IPA) in commemoration of World Intellectual Property Day in 2022 and 2023 consecutively. The following are pictures of some activities of the STEM Center.



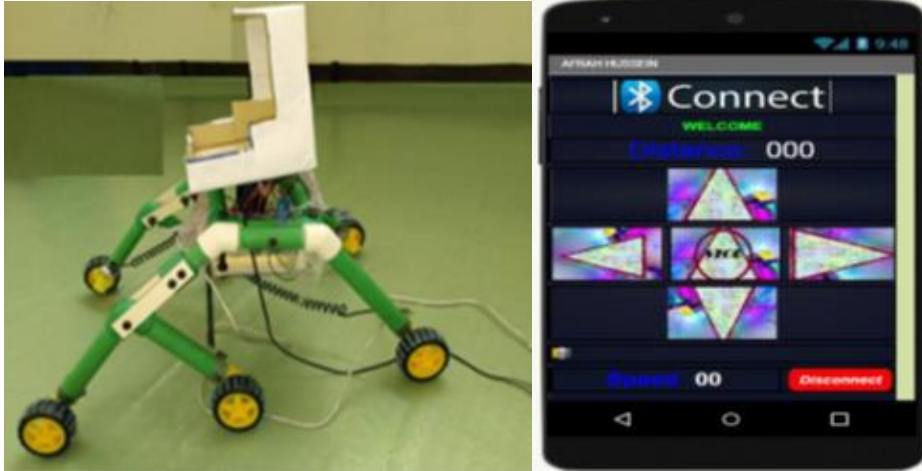
Figure 1: The launching ceremony of the STEM Center



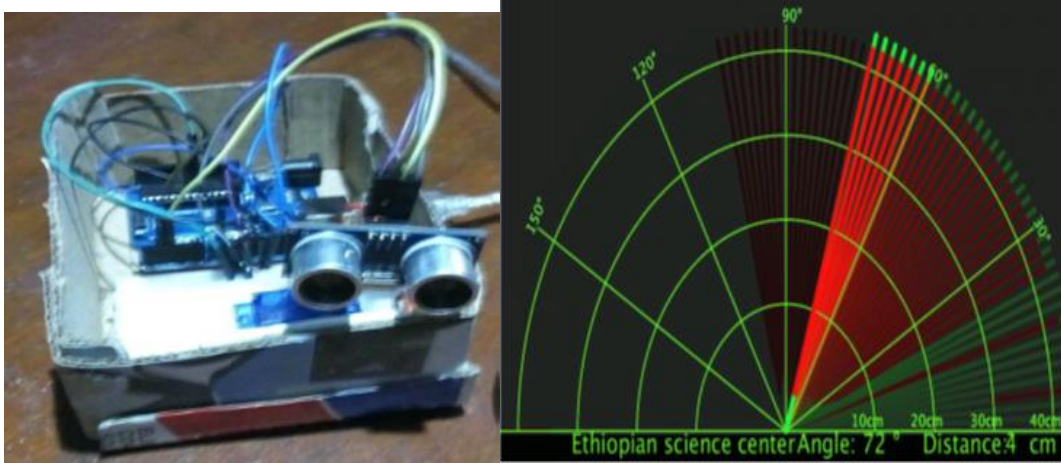
Figure 2: Students taking theoretical training



Figure 3: Students on practical session



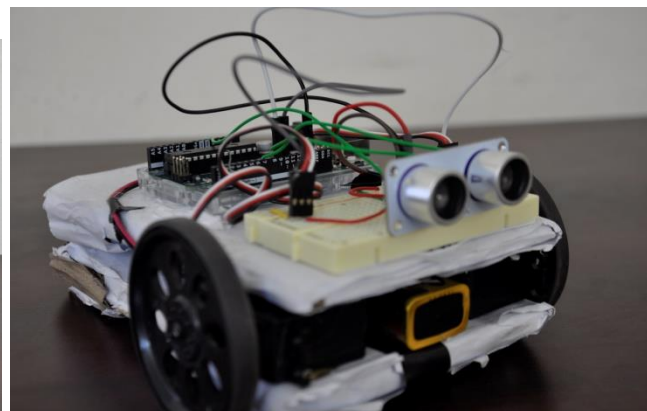
Stairs Climbing Wheel chair



Arduino Radar



SPLG Smart Car



Line following and obstacle avoiding robot

Figure 4: Project Prototypes developed by students trained in the STEM center



Figure 5: Winners of the 2021 National Science and Engineering Fair and Competition



Figure 6: Winners of IPA Competition in 2023

3.2. Physics Unit

Physics Unit of SCEAS is a center where different interactive exhibits which demonstrate various theories and principles of physics have been displayed. In this center, visitors of diverse background, in terms age, education, profession, etc., are guided by a curator to get explanations about theories of physics using different exhibits in hand-on approach. Visitors can try to operate the exhibits by themselves and will have good understanding of the theories and principles of physics, and they entertain by doing so. Most of the exhibits found in the physics are locally made by an exhibit builder. The physics unit is not officially launched. However, schools and other communities can visit the unit by submitting application for permit to visit; guests of the Academy also visit the unit.



Figure 7: Some exhibits of the Physics Unit



Figure 7: Guests of the Academy visiting the Physics unit

3.3. Children's Science Center

The Children's Science Center is a center where various scientific exhibits, especially that of physics, are displayed so that children of aged 4 to 10 along with their parents come to the center as visitors and get inspired from the explanation given by a curator. The children are also given opportunities to operate the exhibits by themselves and get inspired and love science. Such a platform has immense contribution in fostering culture of science and innovation among communities in the future, igniting discussion among children, parents and teachers on scientific issues, and students start to claim for hands-on experimental facilities to be fulfilled at school and home. The center has been established in collaboration with Goethe Institute in Addis Ababa and PHÄNOMENTA Science Center from Germany. All the exhibits have been donated by PHÄNOMENTA Science Center. Also, schools and other communities can visit the center by submitting application to the Academy.



Figure 8: Some Exhibits of the Children's Science Center

3.4. Geology and Paleoanthropology Unit

Geology and Paleoanthropology Unit is a place where visitors are educated about geological processes, human evolution and major geological and archeological research findings and explorations in Ethiopia through interactive displays. Through engaging exhibits, the Unit will offer a deeper and more practical understanding of Ethiopian geological and paleoanthropological features that is beyond facts and figures. The exhibits found in the unit includes representative rocks and minerals samples from all over Ethiopia with scientific significance using a geological time scale, and casts of prehistoric human fossils like Lucy and Ardi discovered in Ethiopia which help to educate visitors about human evolution and paleoanthropological discoveries in Ethiopia, and pictures which demonstrate the geological evolution of location where the

country is found. The unit is not yet also officially launched as there are remaining facilities to be introduced.



Figure 9: Some exhibits of the Geology and Paleoanthropology Unit

3.5. Industry and Engineering Unit

In this unit different industrial and engineering hands-on exhibits are displayed to educate visitors some concepts of engineering designs and industrial processes. By doing so, visitors will get knowledge on how some technological artifacts are built and operate; and what some industrial processes look like. The exhibits found in Industry and Engineering unit include a miniature of cement processing plant and a model of the Grand Ethiopian Renaissance Dam (GERD). Other interactive exhibits are planned to be introduced.



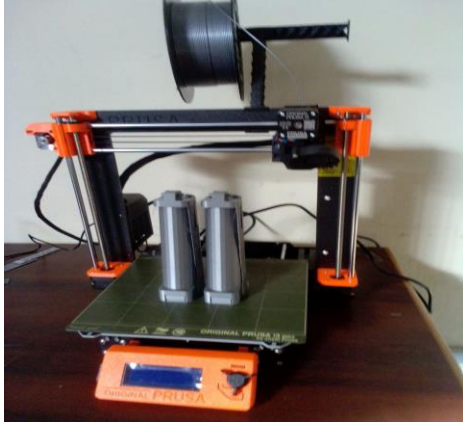
Figure 10: Miniature of Cement processing plant

3.6. Fabrication Laboratory (FabLab)

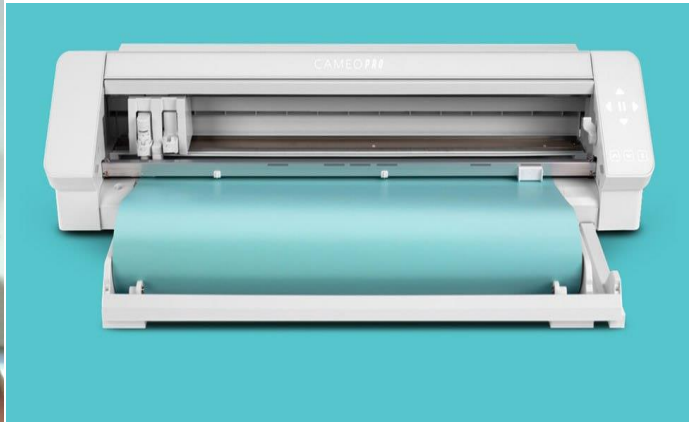
The FabLab is a laboratory where students, entrepreneurs and researchers get the opportunity to have a maker space to practice on equipment that may normally be difficult to get access to; for innovators and entrepreneurs to build prototype and real products, and test their products on a very small scale without the need for large investments in technology. It is an open high-tech workshops where individuals have the opportunity to develop and produce custom-made things which are not accessible by conventional industrial scale technologies. It is possible to manufacture items like bottle opener, mug, eyeglass frame, etc. just in the laboratory using FabLab instrument like 3D printer. It offers the possibility of digital fabrication and rapid prototyping for projects in the fields of science, engineering, education, etc.

Even though there is no dedicated room for the FabLab, some of the FabLab instruments, 3D printer and Vinyl Cutter, have been installed and being operated in the Computer Center as there is extra space there. The plan is either to build a separate room or share space with Engineering and Industrial Unit. The FabLab has three instruments donated by Universceince of France: 3D printer for high precision small scale 3D printing; Vinyl Cutter for making crafts, such as signs, markers, adverts, designs to be fastened on textile products, labels, etc.; and Lather Cutter and Engraver for design and fabrication purposes. Furthermore, EAS won a grant for

the purchase of Computer Numerical Control (CNC) machine from InterAcademy Partnership (IAP), though the money has not been released yet. Recently, we only use the 3D printer for STEM center students to manufacture parts of prototypes.



3D Printer



Vinyl Cutter



Laser Cutter and Engraver

Figure 11: The FabLab equipment of SCEAS

3.7. Aquarium

The aquarium is the center where different species of fish from diverse regions of Ethiopia are displayed to visitors. The aquarium is used to create awareness about the vast fish resources that our country really has; and also visitors entertain watching the movements and behaviors of the different species of fish. Recently, there are only few species of fish; and the Academy is planning to collect additional species of fish from different regions of Ethiopian.



Figure 12: A species of fish of the Aquarium

3.8. A 10 kW Solar Power System

The 10 kW solar power system has been installed in EAS premises for the purposes of hands-on training and generating alternative power for the Academy electric power consumption. The solar power system is of all-inclusive solar power generation equipment which serves the purposes of training different communities, especially students and young entrepreneurs, and setting up an alternative power source. Now, the solar power system is generating half of the electric power consumption of the Academy. And EAS is planning to provide training to students and professionals from power generation sectors on solar power technology in hands-on bent approach. The solar power system was established in collaboration with STEMpower Inc. All the equipment have been donated by STEMpower Inc.





Figure 13: The all-inclusive 10 Kw Solar Power System

3.9. Biomechanics Laboratories

The biomechanics laboratory is the center where training about the motion and its causes of living things, especially human beings, is provided to various communities particularly to students, professionals from sporting, health and physical education sectors. The laboratory is used to analyze key information on most effective and safest movement patterns and relevant exercises to improve human movement and health using various state of the art instruments. Following the analysis using biomechanics instruments, it is possible to determine whether an individual is physically fit, healthy or has physical impairment so that further measures will be considered. The laboratory has been established in collaboration with STEMpower Inc. The SCEAS is planning to offer hands-on training in collaboration with stakeholders.



Figure 14: Some facilities of the Biomechanics Laboratory

3.10. Virtual Reality Center

In the Virtual Reality Center both virtual reality and augmented reality technologies are presented to visitors so that they can learn different wonders of science and technology like human anatomy and physiology, astronomy, aerospace engineering, AI, etc. In the case of VR, we use VR glasses to show visitors which are not real but fascinating and immersive like in the case of watching scenes in space. Whereas, in the case of augmented reality, visitors learn different phenomena in science and technology by manipulating dedicated software from computers by accessing the software resources from a dedicated server. And also visitors watch animation video from computers to learn different phenomena in medicine, agriculture, biology, engineering, etc. Recently, some facilities like laptop computers, interactive digital signage, Digital camera and server have been purchased. However, as a dedicated room has never been allocated to serve as the VR Center it is not accessible to visitors.

4. Future plans of the SCEAS

The following are plans to be accomplished by the SCEAS in the near future and in the long-run:

1. By next year the Science Center of EAS plans to launch its units officially and open to visitors of diverse background; and also will start to offer trainings on solar power technology, biomechanics, etc. in collaboration with stakeholders.
2. The SCEAS plans to expand its services by establishing large galleries which can accommodate state of the art interactive exhibits which demonstrate basic concepts in physics, chemistry, biology, engineering, math, etc.
3. The SCEAS plans to establish laboratories where researches in chemistry, biology, health, environment, etc. can be executed, and also students can also get hands-on trainings in the laboratories.
4. The SCAEAS will accomplish the activities mentioned above in No. 2 and No. 3 in line with the Academy's plan to build a multistory building in its premises once the land use plan is designed and endorsed.
5. The Science Center has also a plan of establishing an all-inclusive planetarium which is devoted to popular education and entertainment in astronomy and related fields, especially space science. The planetarium is also used to provide live lecture on astronomical phenomena to students.

6. The Science Center of EAS will start hosting a Science Festival annually, upon which many of standard practices of a science center like scientific and technological exhibition, science lectures, scientific workshops, live scientific experiments, etc. are presented to the general public in a large space like the National Science Museum or Millennium Hall. The festival is planned to access knowledge in science and technology to hundreds of thousands of visitors with in few days at the same place. The festival needs the participation of many stakeholders and huge investment which can be acquired through collaboration.
7. There is also a plan to take the initiatives of establishing similar facilities of the SCAEAS in other regions of the country in collaboration with governmental and non-governmental organizations.