Choosing kids with talents in science at the Planetarium Science Center at the Bibliotheca Alexandrina

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Abstract

Activities directed at kids from 6 to 16 years old are the main feature of the Planetarium Science Center at the Bibliotheca Alexandrina. Many of these activities are focused on choosing kids with talents in science. The experiences at the center prove that Egyptian kids are very smart and just need a chance to discover their inner talents. Activities such as science fairs, robotics and programming competitions, specialized workshops, and observational camps are organized regularly throughout the year, and the eyes of the originators are focused on the kids to discover those whose capabilities warrant more focused programs.

Nurturing Talents at the Planetarium Science Center

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Introduction

The Bibliotheca Alexandrina (BA) is a not-for-profit organization dedicated to the production and dissemination of knowledge, and to being a place of dialogue, learning, and understanding between cultures and peoples. In 2002, the BA established the Planetarium Science Center (PSC), a hands-on complex designed to stimulate imagination and innovation primarily through hands-on science and technology activities. Statistics for 2009 show that the library had more than 1.4 million visitors that year, 120,000 of which visited the PSC.

The mission of the PSC is to promote science and technology among students and the public at large and to show the relevance of science and technology to everyday life. To fulfill its mission, the PSC organizes various activities in line with the latest international themes.
Moreover, the PSC aims to design and implement programs that build up the scientific background of Egyptian students.

The PSC

The following are the three sections of the PSC:

1. The planetarium theater comprises a state-of-the-arts projection system. The planetarium theater is considered one of Alexandria's "edutainment" highlights. In spite of the important role of planetariums in disseminating knowledge among all societal sectors, the number of planetariums in the Arab region does not exceed ten. The planetarium theater and its projection system were completely renovated in September 2009. The newly installed projection system includes a production unit that will enable BA planetarium specialists—trained in the United States—to produce their own shows. This enhancement is a breakthrough in planetarium show production, which has always been dominated by few developed countries. The PSC already started producing planetarium shows in 2008. The first show produced was "Sky of Alexandria"; it is the first to be produced entirely in the Middle East.
2. The History of Science Museum comprises replicas of original masterpieces of major scientific contributions in Egypt. The museum covers the historical highlights of science in Egypt during the Pharaonic and Hellenistic eras, as well as during the golden age of the Arab Islamic world. The BA plans to add a fourth section covering the modern era and will completely renovate the museum to be more interactive.

3. The ALEXploratorium is a hands-on science facility dedicated to making science accessible and interesting to the public through innovative and interactive activities that explain scientific facts and demonstrate their presence in everything we see, hear, or touch in our daily life. The ALEXploratorium is the core of PSC activities and is highly equipped with experiments, interactive exhibitions, and workshop areas.
The ALEXploratorium completed its most recent renovation on March 2010, increasing the total area of the facility from 558 m^2 to 785 m^2. The area contains about 58 in-house exhibits.

Annual Events

The PSC organizes a number of national and international events to open the public's, including decision makers', eyes to the importance of making science accessible to all people through informal education.

Science Festivity (SF)

SF is an annual science festival designed to further the public's understanding of science and technology in an entertaining manner. The main objective is to engage the community in science-related events that are part of our culture.
Since 2006, the PSC has organized SF every April, under a specific overarching theme tackling the most pressing national and international scientific issues, the success of SF is based on the collaboration of the public, private, and educational sectors .
The science village is the focal point of the festivity. The village comprises booths where experiments are conducted. The village is open to the public for two days at the library plaza (an open area), and for one day at a public garden. The event is also hosted during the month of April at other venues all over Alexandria, such as schools, cultural centers, and public gardens, and by other governorates.

World Environment Day (WED)

WED was launched by the United Nations in 1972 to stimulate awareness about the environment, garner political attention, and increase public action. This international event takes place every year on 5 June, and every year a number of cities are selected as hosts. People from all over the world travel to host cities, join in on the activities, and collectively celebrate our environment. The festivities, however, are not limited to the host country alone: Celebrations are held simultaneously all over the world.
The PSC has organized WED every June since 2007 to disseminate knowledge about the individual's role in preserving the environment through changing our attitudes and habits. The core of the day's activities takes place at the environmentally friendly awareness village at the library plaza. In addition to engaging in games and contests, participants enjoy interactive activities, exhibitions, presentations, and technologies that are environmental friendly.
Starting in 2011, the PSC will celebrate the Arab Environment Day, which will be held each November and will comprise the same activities as WED.

Eratosthenes Festivity

An annual event since 2003, Eratosthenes Festivity honors that outstanding scientist, as well as the third director of the ancient Library of Alexandria. During the event, preparatory and secondary school students conduct Eratosthenes' experiment to measure the earth's circumference, using the same method used by Eratosthenes 2,000 years ago.
On 21 June, the day of the summer solstice, when the sun is almost perpendicular on Aswan city in Upper (southern) Egypt, 21st-century school students conduct Eratosthenes' experiment at the BA plaza and in Aswan. Other activities take place to encourage children to think about and solve mathematical problems. A videoconference is organized with other venues in the world to give the students the opportunity to share their results with international groups of students.

Science Competitions at the PSC

Every year, the PSC organizes many types of science competitions, targeting different fields of science and various age groups.
The following science competitions are organized under the overarching theme of Nurturing Talents:

1. INTEL BASEF
2. FIRST LEGO League
3. Science Olympiad
4. Graduation Projects Support

1. INTEL BASEF

The PSC, in collaboration with INTEL Co., organizes the annual Intel Bibliotheca Alexandrina Science and Engineering Fair (Intel BASEF) at the BA Conference Center. This event prepares students ages 14–18 from all over Egypt to participate in, compete in, and win the international competition. The first three winning projects in Intel BASEF go on to represent Egypt in the Intel International Science and Engineering Fair (Intel ISEF) organized every year in a different venue in the United States.
Intel ISEF, considered the world's largest international precollege science competition, provides an annual forum for more than 1,500 high school students from

over 50 countries to share ideas and showcase cutting-edge science projects. Participating students also compete for millions of dollars in scholarships, tuition grants, scientific equipment, and scientific trips.
Intel BASEF welcomes students who are capable of creative thinking and have innovative ideas in any field of science or engineering. They are asked to research a topic of their choice to which their project will be related. The students can choose from a variety of 13 scientific themes. After choosing the theme, participating students are asked to prepare a research paper, a data handbook, a prototype (optional), a display, an abstract, and a presentation that is not on paper (optional). The Grand Award evaluation is judged on a 100-point scale, with points assigned to creative abilities, scientific thinking, engineering goals, thoroughness, skills, and clarity.

Getting Started

How could a student participate at the INTEL BASEF competition? He or she should follow these steps:

- *Pick a topic.* This is perhaps the most difficult part. Getting an idea of what the student wants to study or learn about is challenging. Ideas may come from any area of interest. A hobby might lead to a good topic.
- *Research the topic.* Go to a library or surf the Internet to learn more about the chosen topic. Keep a sharp eye out for unexplained or unexpected results.
- *Organize.* Organize data related to the topic, and focus on a particular idea.
- *Make a timetable,* Develop a timeline to manage time efficiently. The timeline should allocate time for research, experimentation, and data collection, as well as time to write the paper and prepare the display board.
- *Plan the experiment.* Give careful thought to experimental design, which should explain how the experiments are to be done and exactly what will be involved. The experimental design should also include a list of materials. Once finished with the experimental design (called the “procedure”), all students are required to fill out the appropriate forms for applying for the competition.
- *Consult adults.* Students are required to discuss their research plans with an adult and obtain the adult’s signature of approval.
- *Conduct the experiment.* As he or she carries out the experiment, the student takes detailed notes on each and every step, measurement, and observation in a data hand book which is distributed to the participants for free. *Analyze results.* Results may be analyzed through appropriate graphs or patterns and should be compared with the “standard” data taken originally before doing the experiment. The comparison will confirm or disconfirm the hypothesis that has been posed at the beginning of the experiment. Also, defining errors and defects in the experiment will be helpful in planning later experiments.

Community Involvement

During the BASEF, the following members of the community may be involved in one way or another:

- Parents
- Volunteers
- Judges and reviewing committees
- Sponsors
- Mentors

Teachers’ Role

Teachers play a very important role during the various stages of the ISEF competition. It all starts in the classroom, where teachers help students develop their research and innovative talents, and their teamwork and presentation skills.
During the competition, teachers may mentor their students as the projects progress, and they may lead the students in the right direction.

Science Clubs Initiative (SCI)

SCI is a long-term informal science education program that runs over three academic years. The program was launched in 2007 to introduce inquiry-based hands-on science education on school premises. SCI offers hands-on facilities and programs in selected public primary and preparatory schools to encourage students to pursue careers in science and technology and to foster their understanding and appreciation of science .
SCI-allocated areas in schools are considered satellites of PSC workshops. The PSC provides SCI schools with the necessary equipment, computers, and materials to conduct simple scientific experiments .
Above all, the PSC offers SCI teachers training to equip them with the necessary teaching skills and resources that enable them to conduct workshops without being confined to the school curriculum. Training is conducted by experienced PSC facilitators, as well as by international facilitators, through PSC collaborations. Trained teachers are in turn required to train other teachers in the same school, to ensure the sustainable growth of the initiative. SCI schools are directly linked to the PSC for continual follow-up. Each school science club acts as a hub, transforming the initiative to other neighboring schools in the school district and securing the sustainability and expansion of the initiative in Alexandria and other governorates.

2. FIRST LEGO League

FIRST LEGO League (FLL) was initiated in the United States by FIRST (“For Inspiration and Recognition of Science and Technology”) and Lego company in 1998 (www.usfirst.org). FLL has grown nationally and internationally to nearly 130,000 children in 2010 from 1,600 children in 1998. FLL includes participants from the Americas, Europe, Asia and the Pacific, and Africa. The PSC of the BA has launched this annual event in 2006 to foster children’s creativity on the national level (FLL in Egypt) and expose them to the marvels of science and technology on the international level (FLL World Festival in thje United States and Open Asian Competition in Japan).
The national FLL tournament gives the message to the wider public that technological innovation starts at the early age of 9–16 and with very simple equipment. Twenty-first-century scientists and researchers will rely mainly on their scientific thinking and presentation skills and on the values of science and teamwork. The FLL embeds all these skills and others through solving the annual challenge, thereby producing the think tanks that are the cornerstone of Egypt’s science society.

Strategy and Development Plan

FLL is an international program for children ages 9–14 in the United States and Canada and 9–16 elsewhere. FLL combines a hands-on, interactive robotics program and a research presentation with a sportslike atmosphere. Teams consist of up to 10 members and focus on building team spirit, solving problems, encouraging creativity, and thinking analytically, in addition to advancing science, to solve the FLL challenge.

Every September, FLL teams around the world are provided with the annual challenge, based on a set of real-world problems facing scientists today. The challenge has two parts: a robot game and a project. In the robot game, teams design, build, program, and test autonomous robots that must perform a series of tasks, or missions. In the project, teams conduct research and create a technological or engineering solution to an aspect of the challenge and present that solution.
When children build and experiment, they live the entire process of creating ideas, solving problems, and overcoming obstacles. The FLL international program meets children where they are and helps them shape a positive perception of science and technology. We believe that children's natural curiosity and creativity are critical qualities to envisioning possibilities and developing innovative solutions to challenging technology problems and opportunities. We therefore strive to strengthen children's innate motivation to learn in new ways.
Expected Impact

Through the FLL event, the PSC aims to convert the community's behavioral difficulties with science to appreciation for the subject. Moreover, the event is designed to change the public's perception of scientists as almost akin to aliens. The FLL event aims to eliminate youths' reluctance to learning science, in the hope that it will lead to the creation of a critical mass of researchers and innovators in new generations. If so, then the Egyptian market will gradually transform from an importer and consumer, to an exporter and producer, of science and technology.
Output from the initiative is measured quantitatively by monitoring the number of students and teachers participating in the FLL national and international tournaments. Student and teacher participation in the tournaments is is in turn monitored by monitoring the number of children joining the schools and institutions' RoboLabs activities and the number of teachers and instructors trained by the PSC. Qualitative progress is measured through questionnaires distributed to the FLL teams, participants, and partners. Schools and institutions are increasingly introducing RoboLabs so that their students can qualify to join the FLL tournaments, but economic constraints are hindering the PSC in its attempt to meet the demand for students.

3. Science Olympiad

The Science Olympiad is a competition targeting students 10–13 years of age that aims to stimulate enthusiasm and interest in different fields of science. It is an excellent opportunity for applying basics of science and mathematics, as well as social studies and language, to solve the competition's required challenges. Through hands-on activities, research, and observation, students demonstrate their creativity, as well as their problem-solving and teamwork skills.
Teams participating in the competition consist of five students and a teacher. The competition is divided into a number of rounds in which every game between two teams competes to accomplish a task and get points for each task. The team that collects the highest number of points wins first place.
The first- second- and third-place winners win free places in different observational camps in the deserts of Egypt. These educational camps encourage students to observe and research different sciences, such as geology, astronomy, botany, and history, in an interesting and exhilarating way.

4. Graduation Projects Support Program

The Alexploratorium Project Support (APS) Program was initiated by the PSC to encourage young engineers to implement their ideas in feasible applications. The

program is designed to help undergraduate students in schools of engineering to advance and upgrade their graduation projects by offering them both technical and financial support. Because of financial constraints, the PSC selects the best three projects from the proposals that have been submitted. The selections are made by the APS committee that evaluates project proposals according to established criteria.

APS milestones

- Teams have to send their projects' Preliminary Proposal Abstract, as well as team members' curricula vitae to the APS committee.
- Projects are evaluated according to the following criteria:
  1. Presentation of the project, done by the team members
  2. Analysis of the estimated budget
  3. Timeline of the project
  4. The added value of the project
  5. Demonstration of teamwork skills through the allocation of tasks and responsibilities.
  6. Project description and flow chart

The projects selected receive nominal financial support, in addition to generous technical support. Moreover, it is anticipated that the projects will be introduced to industry and business upon their completion.

Conclusion

The PSC is considered one of the leading Egyptian informal education organizations. It has implemented multiple projects in the field of education, thus supporting education reform initiatives in Egypt. More information about the activities of the PSC is available at www.bibalex.org/psc

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