

ECO Science Foundation (ECOSF)

INQUIRY BASED SCIENCE EDUCATION



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INQUIRY BASED SCIENCE EDUCATION

Why Science Education Matters?

Science education encourages children to develop an understanding of the world around them, and how to think critically about problems and solutions. Children in the 21st century are growing up in a world facing complex global issues. They will need to deal with the impacts of climate change, mass human migration to urban environments and health threats including chronic disease and emerging infectious diseases. Scientific literacy and critical thinking will help them to understand such issues and support their future efforts to address these enormous societal challenges. Providing an adequate science education to children enables them to learn how to reason logically, and it enables their growth as future active citizens.



IBSE

Inquiry-Based Science Education (IBSE) is a form of science education that - unlike the traditional model where the teacher provides facts and the students learn them, gives children the opportunity to explore “hands on”, to experiment, to ask questions and to develop responses based on reasoning. IBSE takes a more student-centered approach to teaching, and puts focus on questions and problem-solving.

Basic knowledge in science as well as up-to-date technical know-how and innovativeness are indispensable for countries aspiring to be part of ever growing global competition. Sufficient understanding of scientific principles and concepts is requisite for the needs at work place and in daily lives in order to fully gain the many benefits that science has to offer. Thus a good foundation in science among students serves as the basis for scientific literacy, promotes better understanding of the environment and the world as well as for the preparation of future scientists and technocrats but above all, for nurturing a rational and creative global citizens. Many developing countries are faced with basic issues in science education such as the shortage of qualified science teachers, lack of facilities, including laboratories and equipment and poor methods of delivery in teaching of this subject; which tend to be teacher centered and prescriptive; thus leaving little opportunity for children for investigation and discovery leading to disinterest in the subject.

How IBSE Is Different Than Conventional Science Education Approach?

Inquiry-based science education-IBSE is an approach to teaching and learning in general but especially the Science, Technology, Engineering and Mathematics (STEM) subjects at all levels particularly the schools. IBSE approach comes from an understanding of how learners/students learn the nature of science inquiry, and a focus on basic content to be learned. It is also based on the belief that it is important to ensure that

students truly understand what they are learning, and not simply learn to repeat content and information. Rather than a superficial learning process in which motivation is based on the satisfaction of being rewarded, **IBSE** goes deep and motivation comes from the satisfaction of having learned and understood something. **IBSE** is not about quantities of information memorized in the immediate, rather it is about ideas or concepts leading to understanding that grows deeper and deeper as students get older. Thus it is important to introduce **IBSE** to children in a manner that harnesses their innate curiosity, which is particularly strong when they are in primary-level schooling between the ages of about six and twelve.

Why Does IBSE Matter?

Education in 20th century focused on reading, writing and counting. In the 21st century we need to focus more on building reasoning skills early in life, and this is where inquiry-based science educational approaches can play an important role. Scientific literacy and critical thinking can contribute to sectors that bring economic advantages, such as technology and innovation, both in developing and developed regions of the world. Critical thinking skills can also help to prevent extremist ideological thinking of the kind that can lead to mass conflict.

IBSE Learning Cycle



Engage: Teachers create interest and generate curiosity in the topic of study; raise questions and elicit responses from students that will give you an idea of what they already know. This is also a good

opportunity for teachers to identify misconceptions in students' understanding. During this stage students ask questions

Explore: At this stage students should be given opportunities to work together without direct instruction from the teacher. Teachers act as a facilitator helping students to frame questions by asking questions and observing. This is the opportunity for students to test predictions and hypotheses and/or form new ones, try alternatives and discuss them with peers, record observations and ideas and suspend judgement.

Explain: Teachers encourage students to explain concepts in their own words, ask for evidence and clarification of their explanation, listen critically to one another's explanation and those of the teacher. Students should use observations and recordings in their explanations. At this stage you should provide definitions and explanations using students' previous experiences as a basis for this discussion.

Extend/Explore: Apply concepts and skills in new (but similar) situations and use formal labels and definitions.

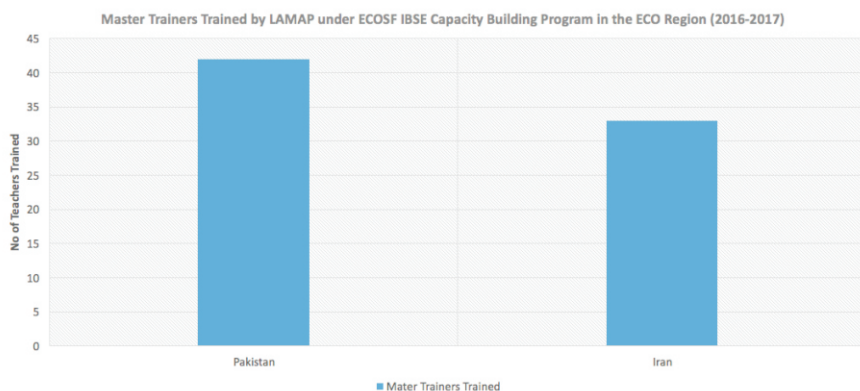
Evaluation: Evaluation takes place throughout the learning experience. Teachers observe students' knowledge and/or skills, application of new concepts and a change in thinking. Students assess their own learning. Ask open-ended questions and look for answers that use observation, evidence, and previously accepted explanations. Ask questions that would encourage future investigations.

How ECOSF Has Been Promoting IBSE In The Region?

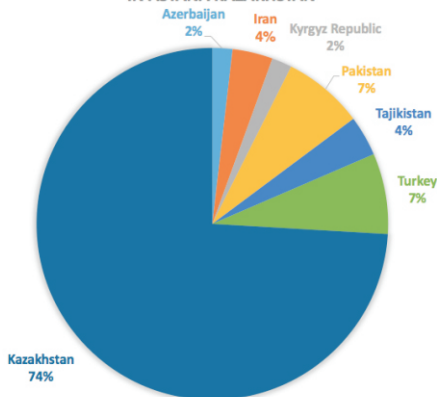
ECOSF has been promoting IBSE and developing capacity of science educators in the ECO region. The ECOSF launched its IBSE Capacity Building programme in 2015. The Foundation conducted its first ever IBSE Capacity Building Workshop for teachers and national programme leaders in Astana - Kazakhstan in June 2015, wherein 59



Kazakhs and 19 participants from other ECO countries participated. The programme was launched with collaboration and cooperation of national governments/organizations and international partners; viz., *La main a la pate* Foundation of France, the International Science, Technology and Innovation Center for South–South Cooperation under the auspices of UNESCO (ISTIC) Kuala Lumpur- Malaysia and the Inter-Academy Partnership (IAP) Science Education Programme (SEP)- a global network of over 130 National Academies of Sciences. Subsequently, the Foundation has conducted national full length Capacity Building Workshops (5 days) in Pakistan (Sept 2016) and Iran (Jan 2017). More IBSE Capacity Building workshops are being planned in other ECO member states organized as one of the flagship programmes of **ECOSF** in order to strengthen the science base for advance S&T research and higher education in the ECO region. The charts below presents the Master Trainers trained by LAMAP Foundation under the ECOSF IBSE Capacity Building programme in the ECO region.



PARTICIPATION FROM ECO REGION IN CAPACITY BUILDING WORKSHOP ON IBSE IN ASTANA KAZAKHSTAN



Our Collaborators to Promote IBSE in the Region.



FONDATION

La main à la pâte

POUR L'ÉDUCATION À LA SCIENCE



the interacademy partnership



ISTIC

INTERNATIONAL SCIENCE, TECHNOLOGY AND
INNOVATION CENTRE FOR SOUTH-SOUTH
COOPERATION UNDER THE AUSPICES OF UNESCO

IBSE Process

The specific learning processes that students engage in during IBSE or inquiry based learning include:

1. **Questioning**
2. **Hypothesizing & Language**
3. **Experimentation**
4. **Concluding & Communication**

Hypothesizing

Experimentation



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Questioning

& Language

Concluding & Communication





Hands on Activities





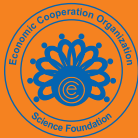


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ECOSF

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Organization Science Foundation**