Nurturing Children's Curiosity in Science

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Curiosity is the spark that ignites a child's desire to explore, learn, and understand the world around them. In the realm of science, nurturing this curiosity from a young age can pave the way for a lifelong love of learning and critical thinking. As parents, educators, and mentors, it is our responsibility to cultivate and support a child's natural inclination to question, discover, and experiment.

Understanding curiosity in science

Curiosity is a fundamental human trait that drives exploration and inquiry. In the context of science, curiosity fuels the desire to understand the underlying principles of the natural world. Children exhibit a unique form of curiosity - a natural wonder and eagerness to ask 'why' and 'how' about the phenomena they encounter. Nurturing this curiosity can help them develop critical thinking skills, problem-solving abilities, and a deeper understanding of scientific concepts.

In a dynamic and engaging science classroom, it is easy to gauge children's interest in science through hands-on activities rather than relying solely on theoretical explanations.

Application-based instructions also encourage students to apply at home what they have learned in school. This article explores the importance of nurturing children's curiosity in science and provides practical strategies to encourage their scientific exploration.

Creating an enabling environment

Provide access to resources: Surround children with age-appropriate books, videos, documentaries, and interactive tools that introduce them to various scientific topics and not only broaden their knowledge but also encourage questions and discussions.

To implement this, we introduced a library class once a week in the science period to create interest in books other than textbooks. Before the class, we, along with the children, planned the activities for language development as well as content knowledge.

The first activity was individual reading of science books and sharing the review of the portion they had read, either in their own words or by reading a portion from the book. In our second activity, the teacher formed groups and provided one book to each group for reading. The children read it in groups and shared their learning and experiences related to the books with each other, which provided a platform for peer learning and making presentations in groups.

Figures 1, 2, 3: Students read, observe temperature and the expansion of liquids, respectively.

Support hands-on exploration: Engage children in hands-on experiments and activities that allow them to observe, hypothesise, and test their ideas. Simple experiments using household items can ignite their curiosity and make science tangible. For example, in class VII, we asked children to bring different types of flowers from their surroundings and make indicators to test the substances to be acidic or basic. The children were very excited to see the colours of different flower strips change. This piqued their interest in this phenomenon.

Similarly, in class VI, while studying the properties of matter, we gave students materials from their surroundings, like paper, salt, polythene, magnets, iron nails, chalk dust, sugar, oil, milk, copper wire, battery, bulb, incense stick, water etc to test the property of solubility, transparency, magnetism, conductivity, and diffusion. By doing simple experiments, they understood these concepts more clearly.

Encourage questions: Foster an environment where questions are celebrated. Take the time to answer their questions, and if you do not know the answer, explore together to find out. This demonstrates to them that curiosity is a lifelong pursuit. This also forms a classroom culture that allows students to speak freely since there is an inclusive atmosphere. All questions and answers are treated with respect, and children feel a sense of belonging that allows them to participate actively.

The teacher also employs different types of questions, which cater to different levels of students, ensuring that everyone feels included and there are also some challenging questions. When children ask questions, the teacher also asks them some probing questions to encourage them to think critically and arrive at the answers themselves and to develop their problem-solving skills. The willingness to ask questions/doubts in students is enhanced, as they clarify their understanding and curiosities with their peers and the teacher.

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Inculcate argumentation: Practising science requires one to be able to reason out arguments and put those to test. When this idea of reasoning and testing is brought into the classroom, students get a flavour of science as a field that requires creativity and inquiry.

Figure 4: A student observing onion cells through a microscope.

When entering upper primary, students come with several questions and conceptions about the world around them. However, their reasoning may be inhibited by their level of knowledge - it is not fair to expect class VI students to know that the Sun gives off energy by nuclear fusion; argumentation must be level-appropriate.

In class VI, some students had the conception that the Sun was a biotic component of the ecosystem. Since to understand the term biotic and abiotic, students should have learnt the characteristics of living organisms (movement, respiration, sensitivity, growth, reproduction, excretion, and nutrition), which they had, it was possible to use these terms to reason out whether the Sun is living or non-living. In doing so, many other conceptions and beliefs that the students held about the Sun were also revisited. For example, students thought that the Sun could reproduce because in their cultural/religious beliefs, *Surya* (the sun god) has children. Hence, it also became important for the teacher to define reproduction in a specific (scientific) manner. ‘Does the Sun produce offspring like itself?’ The students said no, as they understood that the Sun does not produce other suns.

This also avoids the pitting of their cultural beliefs against science.

Embracing mistakes and failure

In the pursuit of scientific understanding, mistakes and failures are valuable learning opportunities. Encourage children to view setbacks as a chance to refine their hypotheses and approach problems from different angles. By fostering a growth mindset, children learn that science is not always about being right but about the process of discovery.

For example, in a science classroom, when activities and experiments were demonstrated, the entire process was shown, which allowed the students to pick up on some nuances that may have otherwise gone unnoticed. For example, when we were trying to see electricity conductance in distilled water compared to tap water, there was some conductance seen in the case of distilled water, which is not supposed to be the case. However, the teacher performed the experiment again using multiple methods, which demonstrated to the students the importance of resilience and determination.

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It is also very important to ensure that we, as teachers, do the experiment at least once before class so that we know whether the experiment will be successful, and we do not waste time during class to figure things out. However, even after this, some discrepancies may be observed, and the teacher, instead of overseeing these, must repeat the procedure with greater diligence so that the students also understand that the result may take time, and they may need to repeat the process more than once.

Connecting science to everyday life

Real-world relevance: Help children see the practical application of scientific concepts in their daily lives. Whether it is explaining the physics behind a bicycle or the biology of cooking, connecting science to their world makes it more engaging and relatable.

Figure 5: Students engaged in science experiments.

For example, in class VII, the lesson 'Acids, Bases and Salts' was being taught. For most of the discussions on the topic, real-life applications were shared with the students. Doing this regularly helps them to start thinking in that direction. When neutralisation was being discussed, one student gave us the example of when a bee stings (they have already learnt that it contains formic acid), they usually apply some *Nirma* powder (a detergent and basic substance) on the bee stung area. She linked something she saw often at home to what she was learning. This a very important skill to develop in students.

Outdoor exploration: Nature is a treasure trove of scientific wonders. Spend time outdoors observing plants, animals, weather patterns, and natural phenomena. Encourage students to ask questions about what they see and experience.

While taking class VI for a nature walk, we planned to observe the different patterns in leaves and flowers. This helped them correlate their understanding of the

connection between leaves and roots. By observing the flowers, students were able to relate their classroom understanding of dividing the flowers into male and female. This helped them build on their understanding.

Role models and mentors

Introduce children to scientists, inventors, and explorers who have shaped our understanding of the world. Reading about the lives and achievements of role models can inspire children and show them that their curiosity can lead to meaningful contributions.

Students should always be shown such examples so that they also feel motivated to try above and beyond what they think their capabilities hold. When Chandrayan was launched, students in the school were given a small talk on the whole process and why it is so important. The whole live launch was watched together, and they could see all the Indian scientists gathered, celebrating their achievements.

For the class VIII library period, we watched videos on Graham Bell and Thomas Alva Edison and the journey of their lives. This helped them to know how through different processes, inventions took place. It also shows them how common problems around them have simple solutions. This has helped them to think of different ideas for the 'Inspire Award' competition.

Celebrating curiosity

Acknowledge and celebrate a child's curiosity-driven achievements. Whether it is a successful experiment, a new question, or a concept they have grasped, positive reinforcement sustains their interest in science.

A good question by a student or an attempt at trying something new should always be appreciated by the teacher. This motivates students, makes them feel seen and builds their courage to think differently. For example, when the conductance of electricity through water was shown in class, a student, by himself, tried to experiment the same with the materials around him. Even though the experiment failed the first time, the teacher's constant encouragement motivated him to try again, and he was able to replicate the experiment with available resources.

While learning about cells and tissues, students were shown onion cells. They were shown how the slides were set up. A group of students found a discarded slide with an onion peel on it and immediately tried to recreate the experiment the way that the teacher had shown it to them. They were curious as to why it was not working, and this led to many new questions.

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