

A PROJECT-CENTRED APPROACH TO BIOGRAPHIES OF SCIENTISTS

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Biographies of scientists can be an effective and engaging way to introduce students to the process of discovery. How do we use a project-centred approach to meet this aim? What skills do students develop in such an approach? What do they learn about science?

The National Curriculum Framework for School Education (NCF-SE) 2023 suggests that: "...examining the lives and works of scientists and the development of scientific knowledge is a way for students to engage with the nature and process of science and develop scientific values and dispositions".¹ It is for this reason that middle school science textbooks include biographies of scientists. An expected learning outcome for Grade VIII science is: "Children should discuss the stories of scientific discoveries and understand their importance".² But conversations with students and colleagues revealed that students are often asked to study these parts of the textbook by themselves. In some cases, teachers select details that are important from an examination point of view and write them down on the class board. Children are asked to copy these details in their notebooks and memorise them.

In the rural environment that I teach in, I have seen many instances where children take the initiative to work together as a group towards a common goal. Their goal could be as simple as planning a trip to a nearby place or playing a team sport. In each such instance, children come up with a plan to meet this goal, decide each person's role in the implementation of this plan, collect necessary information, and analyse it to make necessary decisions. These steps are part of the project-centred approach that the (NCF-SE) 2023 recommends for teaching school science: "This approach allows learning within the classroom to continue outside the classroom and extend over a period of time. For example, observing the changes in the moon over a month to understand the phases of the moon. In this process, connections to daily life are also made. The project-centred approach allows students to develop artefacts/products (charts, presentations, speeches)

that reflect and communicate their emerging understanding. It also allows the integration of concepts across different curricular areas".¹ Since rural children use a project-centred approach so naturally and effectively in their everyday world, I decided to use it to introduce my Grade VIII students to the biographies of scientists.

My classroom process

Step 1: The Grade VIII textbook (NCERT, 2024-2025) includes biographies of eight scientists: Louis Pasteur, Alexander Fleming, Edward Jenner, Robert Koch, Ian Wilmut, Otto von Guericke, William Nicholson, and Benjamin Franklin. None of these scientists are from India. According to the NCF-SE 2023, one of the curricular goals of science education at the middle stage is to ensure that each student: *"Understands and appreciates the contribution of India through history and the present times to the overall field of science, including the disciplines that constitute it"*.¹ With this aim in mind, I prepared a list of Indians who have made important contributions to science. This included people like Sushruta, Charaka, Kanada, Aryabhata, Bhaskaracharya, Varahamihira, Brahmagupta, Nagarjuna, Birbal Sahni, Har Gobind Khorana, Meghnad Saha, MS Swaminathan, Homi Jehangir Bhabha, Vikram Sarabhai, APJ Abdul Kalam, CV Raman, Srinivasa Ramanujan, Jagadish Chandra Bose, and Satyendra Nath Bose. Two of these people are featured in the Grade VI textbook (NCERT, 2024-2025).

Step 2: I stuck photos of these scientists on a piece of thick cardboard and displayed this in class. I gave my students 10 minutes to look at these photos and asked if they recognised any of them. The only scientist my students knew of (and slightly) was Abdul Kalam. Apart from his name, they knew that Kalam was a scientist and had been one of the presidents of India. I named each of the scientists on the display.

Step 3: With their consent, I named each student after one of the scientists

on my list. Their task was to investigate the scientist assigned to them. At the end of the two weeks, they were expected to submit a biography of this scientist. The biography could include details like: (a) What do we know about this scientist's life and the challenges they faced, (b) What were their contributions to science, and (c) What have we learnt from their work or how have these contributions benefited us. I encouraged them to search for this information in books, newspapers, magazines, and on the Internet.

Step 4: I observed that my students applied themselves to this task with seriousness. In the days that followed, I heard them discuss their projects with each other, their siblings from higher grades, and the other teachers in school. Some of the students came up to me to share what they had learnt so far or to ask where they could get some more information. At the end of two weeks, each student submitted a piece of writing about the scientist assigned to them (see Fig. 1).

Step 5: To bring the students together as a group, I invited each of them to

play the role of the scientist assigned to them and present what they had learnt about this scientist as a first-person account to the class. My students enjoyed this task. It allowed them to share their own work and hear about the scientists that their peers had researched.

Step 6: I wrapped up the project with a class discussion. I invited my students to share what they had learnt from their own work and that of their peers. This exercise gave them a chance to reflect upon and express their learning as a group.

Parting thoughts

Using a project-centred approach to introduce students to the lives and contributions of Indian scientists had many advantages. The individual tasks assigned to the students appealed to their inquisitive nature and interest in exploring new things by themselves. The process of writing biographies allowed them to develop skills like collecting information from different sources, analysing this information to understand it and reach valid

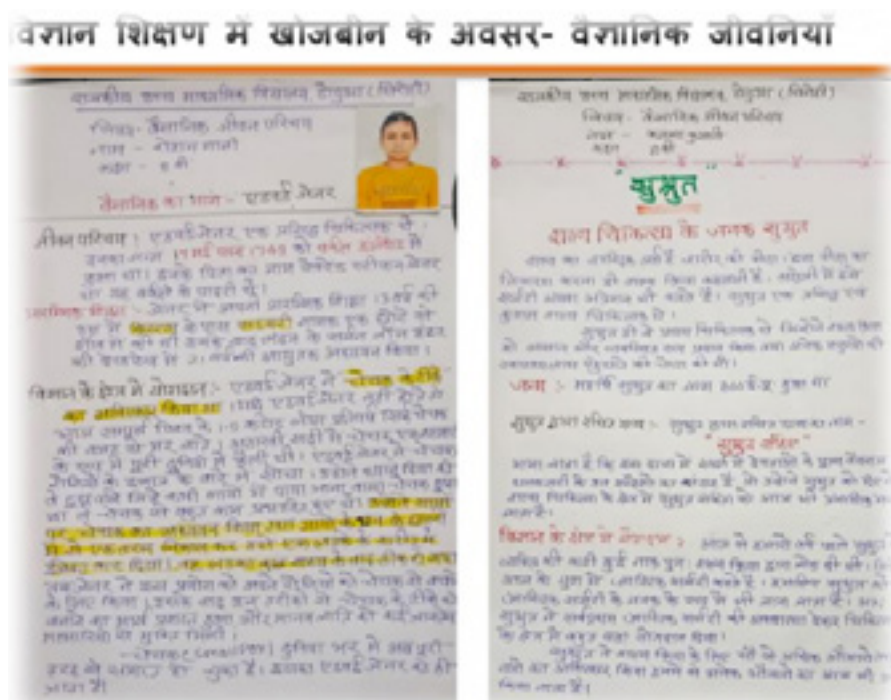


Fig. 1. Examples of student-authored biographies of scientists.

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The Science Educator at Work

ACTIVITY SHEET I : WHO ARE THESE SCIENTISTS?

What to do:

The wall below has photos of six Indian scientists. Take a few minutes to look at them. How many of them can you identify?



(a).....



(b).....



(c).....



(d).....



(e).....



(f).....

Here are some clues to help you:

- (a) Do you enjoy sucking on sugarcane stems? Did you know we imported sugarcane from other parts of the world till this scientist (1897–1984) developed varieties that were sweeter than native Indian varieties and better suited to grow in our country than imported varieties? She is sometimes called 'The first Indian woman botanist'. Chapter 2 ('Diversity in the Living World') of your Grade VI science textbook (NCERT, 2024–25) highlights her role in the Silent Valley Movement and in documenting Indian plant diversity.

- (b) Chapter 7 ('Temperature and its Measurement') of your Grade VI science textbook (NCERT, 2024-25) introduces this scientist (1918-2001) as the 'Weather Woman of India'. She invented many instruments to make precise measurements of weather phenomena like humidity, rainfall, air pressure, and wind speed. This reduced our need to import scientific instruments from other countries. She also used one of her instruments to measure the thickness of the ozone layer. You read about ozone in Chapter 5 ('Physical and Chemical Changes') of your Grade VII science textbook (NCERT, 2024-25). Her measurements have helped us understand the importance of this layer in protecting life on Earth.
- (c) In Chapter 8 ('A Treat for Mosquitoes') of your Grade V Environmental Science textbook (NCERT, 2024-2025), you read about how we can get malaria when we are bitten by a disease-causing mosquito. Chapter 2 ('Microorganisms: Friend and Foe') of your Grade VIII science textbook (NCERT, 2024-25) shares simple things you can do to prevent the spread of this disease. But what if you have malaria? This scientist (1917-2006) isolated many chemicals of medicinal value from plants native to India and used some of them to develop a drug to treat malaria.
- (d) Some couples find it difficult to have children naturally. In Chapter 6 ('Reproduction in Animals') of your Grade VIII science textbook (NCERT, 2024-25), you read of how in-vitro fertilisation can help such couples have test-tube babies. This scientist (1946-) was among the first to try this process in India. She was also one of the two people who led the medical team that delivered one of India's first test-tube babies: Harsha Chawda.
- (e) In Chapter 1 ('Crop Production and Management') of your Grade VIII science textbook (NCERT, 2024-25), you read of how important water is in growing food. Our farmers depend on the monsoons and groundwater for water. But we are using up groundwater very quickly and the monsoons can be late or not bring enough rainfall. This puts us at risk of droughts. Droughts can cause crops to fail and millions to die. This scientist (1956-) has developed seeds of wheat, rice, and mulberry that can grow in severe drought conditions.
- (f) You may have learned from your parents, teachers, and Chapter 3 ('Mindful Eating: A Path to a Healthy Body') of your Grade VI science textbook (NCERT, 2024-25) about the importance of a balanced diet and how inadequate nutrition can cause diseases. But many children and adults cannot afford nutritious food. This scientist (1911-1998) studied the nutritional value of a commonly available, sweet, and inexpensive drink, called *Neera*, prepared from the sap of coconut palms. She showed that adding this drink to the diets of undernourished adolescents and pregnant women could improve their health.

Sources for images:

- (a) Credits: The Modern Review, February 1938, Wikimedia Commons. URL: https://en.wikipedia.org/wiki/Janaki_Ammal#/media/File:E_K_Janaki_Ammal.jpg. License: CC0.
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conclusions, and communicating what they had learnt to their peers and teachers. The class presentations allowed my students to listen to and learn from their peers. These are important aspects of knowledge creation in science.

In the discussion that followed their presentations, the students shared how learning about the work of scientists like Sushruta, Louis Pasteur, Edward Jenner, Benjamin Franklin, and MS Swaminathan had shown them the usefulness of science in their real worlds. This observation extended

into a discussion on the many ways in which the contributions of scientists from India and other parts of the world have not only helped save lives but also improved the quality of our lives. The students also shared how this project had challenged two of their most common beliefs: (a) Scientists are rarely Indian, and (b) Scientists had special abilities that made them very different from other people (in my students' words, they were "*smarter*" or "*more intelligent*" than "*ordinary*" people).³ Through this project, my students learnt about some of the Indians who have

made important contributions to science (see **Activity Sheet: Who are these Scientists?**). As they documented these lives in science and role-played them in class, they began to identify with the scientists assigned to them. For some time after the completion of this project, my students would call each other by the names of the scientists they had researched instead of their real names. Most importantly, they now looked at the biographies in their textbooks with spontaneous interest and curiosity rather than as material to be mechanically memorised for examinations.

Key takeaways

- Biographies of scientists can be an effective and engaging way of introducing students to the process of science.
- A project-centred approach that invites students to document and share key aspects of the life and work of scientists with their peers can help them develop skills like collecting, analysing, and communicating scientific knowledge.
- Focusing on scientists from other parts of the world as well as India allows students to examine some of their own beliefs about where scientists come from and who can be a scientist.
- The opportunity to relate to the people behind scientific discoveries and see how these discoveries have improved our lives can help students develop an interest in science and scientists that extends beyond examinations.



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Notes:

1. Credits for the image used in the background of the article title: Constructing knowledge, Kathas_Fotos, Pixabay. URL: <https://pixabay.com/photos/jengawooden-blocks-game-strategy-6380189/>. License: CC0.
2. This article includes one detachable classroom resource: **Activity Sheet: Who are these Scientists?** The scientists in the sheet are: (a) Janaki Ammal, (b) Anna Mani, (c) Asima Chatterjee, (d) Indira Hinduja, (e) Paramjit Khurana, and (f) Kamala Sohonie. If you try this activity in your classroom, which scientists would you include and why? Write to tell us (at: iwonder@apu.edu.in).

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