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5 inspirations

for School Leaders on STEM Education

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Science: Inspiring Curiosity

How can school leadership encourage innovative and inspiring science teaching while also ensuring the inclusion and equal treatment of under-represented groups such as girls, black girls, and special-needs students?

How can school leaders inspire and engage students, teachers, families, and the local community? To support the discussion of these questions, the British Council and FLACSO Brasil – Faculdade Latino-Americana de Ciências Sociais –listened to school leaders, teachers and students speaking about their experiences and inspiring moments in their schools.

This publication draws on this work to bring together five experiences that can be repeated in other schools. These practical suggestions show how science classes can be made more interesting for young people in today's world, when they are able to access information and entertainment quickly and easily and find the appeal of the videos and memes of social media and instant messaging irresistible.

These experiences had overwhelmingly good results, challenging the daily classroom routine and using the reality of the students themselves to show how science – and the curiosity it inspires – is closely linked to their lives. In the following pages you will find short case studies of these ideas and suggestions for how to use them in your school.

Initiative 1

Active Leadership

The professional challenge is huge. It is not enough to face the known difficulties of the Brazilian educational system, made worse by the pandemic, and to deal with the bureaucracy involved in administering a school in Brazil. In order to improve student learning, especially when it comes to the sciences, school leaders need to reinvent themselves and use the skills that have only recently been more emphasised, such as project and people management.

“I have been trying to develop my skills as a mediator, keeping a dialogue open, team harmony and to keep listening”, says Wellington Pereira da Silva, Head Teacher at a municipal school in Angra dos Reis in the state of Rio de Janeiro. A lot of diplomacy is needed for the teachers, students, their families, and the community in general understand the role of the school and take its educational aims on board. The leadership needs to be able to make connections between the different actors. As well as this, the leader needs to act as the intermediary between all the bodies and organisations responsible for educational policies and programmes, striving to get the support and opportunities needed for the school and its staff.

A school leader who is engaged with the teaching of science to the students for which they are responsible has another difficulty to overcome: the inclusion of under-represented groups such as girls (black girls in particular) and special needs students. According to Pamela Santos Galetti, Coordinator of a state school in Guarapari in the state of Espirito Santo, role models are important examples in these cases. She explains the importance of celebrating professional scientists, especially during the pandemic, when a number of Brazilian women scientists have become highly visible.

“It’s time to show girls that there are women making a name for themselves in the real world, and that they could do the same”

Pamela Santos.

THE COMPETENCIES OF A HEAD TEACHER

NATIONAL SHARED COMPETENCIES

Approved by the National Education Council, these establish the core competencies and profile required of a head teacher. Some of these competencies can be applied to encouraging science learning.

1 School organisation and leadership

2 Educational and learning excellence

5 Designing the educational concept

6 Managing people and efficiency

9 Empathy and diversity

10 Encouraging teacher autonomy

3

Ensure that the National Curriculum is applied, along with the set of essential and indispensable learnings

4

Give value to staff, training and supporting them in collaboration with the educational network or system, focusing on developing general and specific teaching competencies

8

Integrate the school into other contexts (family, community), including social programmes and institutions that can help the school achieve its educational objectives

7

Seek innovative and creative solutions to the operation of the school, emphasising collective working strategies

*The National Shared Competencies include 10 general and 17 specific competencies.

THE COMPETENCIES OF A SCHOOL LEADER

FOUR DIMENSIONS

PEDAGOGICAL COMPETENCIES

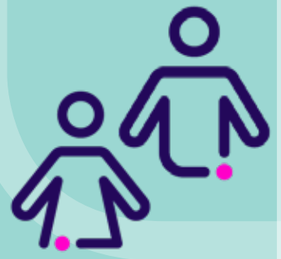
- **Commitment to learning and teaching**
- **Leadership of pedagogical planning**
- **Support to those responsible for teaching and learning**
- **Coordination of the curriculum, learning approaches and assessment**
- **Active promotion of an atmosphere which encourages educational development**

Initiative 2
Interdisciplinarity and Science Citizenship

A school leadership and management team which wants to see better science learning results for its students can take advantage of an approach that has produced good results in schools throughout Brazil, in step with the new concepts being applied to secondary education: breaking down the boundaries between the disciplines, emphasising projects which bring together different areas of knowledge, and interdisciplinary activity.
Leadership has a key role in bringing together teachers, encouraging dialogue and, whenever possible, using the pedagogical planning process as the starting point. Camilla Souza Alo, a winner of the Shell Science Education Prize in 2019 and currently working in the education leadership team at the Education Secretariate in the city of Niterói, Rio de Janeiro, says that learning is improved when the students' experiments are related to problems that they themselves face, or their families or community.

Luíz Felipe Lins, a mathematics teacher in the city of Rio de Janeiro and winner of the Nota 10 Educator Prize in 2020, says that he worked with a science teacher on an interdisciplinary project about herbal medicine, in the Pau da Fome nature reserve near the school. The project involved a group of students who were struggling at school, who were failing to pass the year. The project had some of the characteristics of Citizen Science, matching the needs of the local community, and helped him to introduce statistics to his students. "Knowledge, skills, and competencies all need to be connected", he says.

"Science is also a way to teach mathematics and Portuguese, helping these young people learn. When they understand that we are not a collection of little boxes, that we are a single, unified whole, we can show the importance of science in school".
Camilla Alo



What is Citizen Science?
It is a broad concept involving partnerships between scientists and those who are interested in science which can encourage
1. Public engagement during the different stages of the scientific process
2. Science and technology education
3. Joint preparation and implementation of public social and environmental policies

Initiative 3

Invest in In-Service Teacher Training Programmes

The pandemic led to us questioning many aspects of our lives and, naturally, education, in particular the teaching of science, has not escaped a process of profound reflection on the methodology used and its effectiveness. The world watched as science reacted in a way never before seen, attacking the virus by developing vaccines in record time. It will probably be some time before this is featured in the textbooks. It is just one example of the time it takes between current events and their appearance in mainstream educational material.

One approach to overcoming this mismatch between the speed with which knowledge evolves and it being included in textbooks is to invest in the in-service training of teachers. “Teachers remain very traditional in their approach, relying exclusively on the textbook. We need to invest in in-service training to encourage a different view of the teaching of science”, believes Wellington Pereira da Silva, Head Teacher at a school in Angra dos Reis in the state of Rio de Janeiro, who also works in the city’s education secretariat. Camilla Souza Alo, a biology teacher working in education management agrees. “When they see a lecture and discover something new, the teacher thinks: ‘Wow, that’s changed, I need to use it in my classroom’.”

Leaders who aim to set an example and want to see their students and teachers develop also need to keep themselves up to date by becoming involved in science promotion projects and programmes. They are responsible for setting targets, encouraging their teachers, and establishing the conditions they need to seek new experiences and knowledge, building momentum and excitement about the teaching of science.

Initiative 4
Beyond the Classroom

Students who are actively involved in new experiences, preferably focused on aspects of their own lives and which reflect the reality of their families and communities. This is the aim of an approach which normally brings good and long-lasting learning results, according to leaders and teachers who have already applied it, extending their activities beyond the classroom. “It’s not a school trip, it’s living in the real world. Field work is essential to the teaching of science”, says biology teacher and educational manager Camilla de Souza Alo. School leadership can encourage this type of initiative, encouraging teachers and their students, while ensuring a safe environment for these activities.

“Project working involves challenges for the students, connecting knowledge of different subjects, skills and competencies. It is an excellent opportunity to build learning, especially in mathematics”, says maths teacher Luiz Felipe Lins.

Daniela Graziane Oliveira da Silva, Head Teacher at a school in the city of São Paulo, explains that it can be enough just to take the class to the playground, anywhere on the school grounds where there is a tree. anywhere on the school grounds where there is a tree. “I don’t believe in this idea that we can’t do experiments because we don’t have a lab. Science doesn’t need to have a physical laboratory to get the children excited about experiments”.

Science fairs are a good conclusion to students’ work outside the classroom. Lucas Ayub, from the city of São Paulo, believes that they give students a chance to be creative and to do a practical project which has the added advantage of being able to show the result of their work. However, according to Camilla, a science fair organised at short notice is not very effective. “By working throughout the year on their projects, the students can present their work with authority, and be much more effective.”

The project Girls in Science was supported financially by CNPq, the Brazilian research agency. The girls investigated women in science and showed the results in their school, and also visited science research facilities such as Fiocruz. They participated in robotics workshops on Saturdays, passing on what they had learned to their male student colleagues, who were really interested in the subject.
The initiative came from Luiz Felipe Lins, who teaches in the Francis Hime school in Rio de Janeiro and who won the Educator Nota 10 Prize in 2020. He is also a winner of the Shell Science Education Prize, with a 100% online project for his students during the pandemic, when he brought together geometry and building.

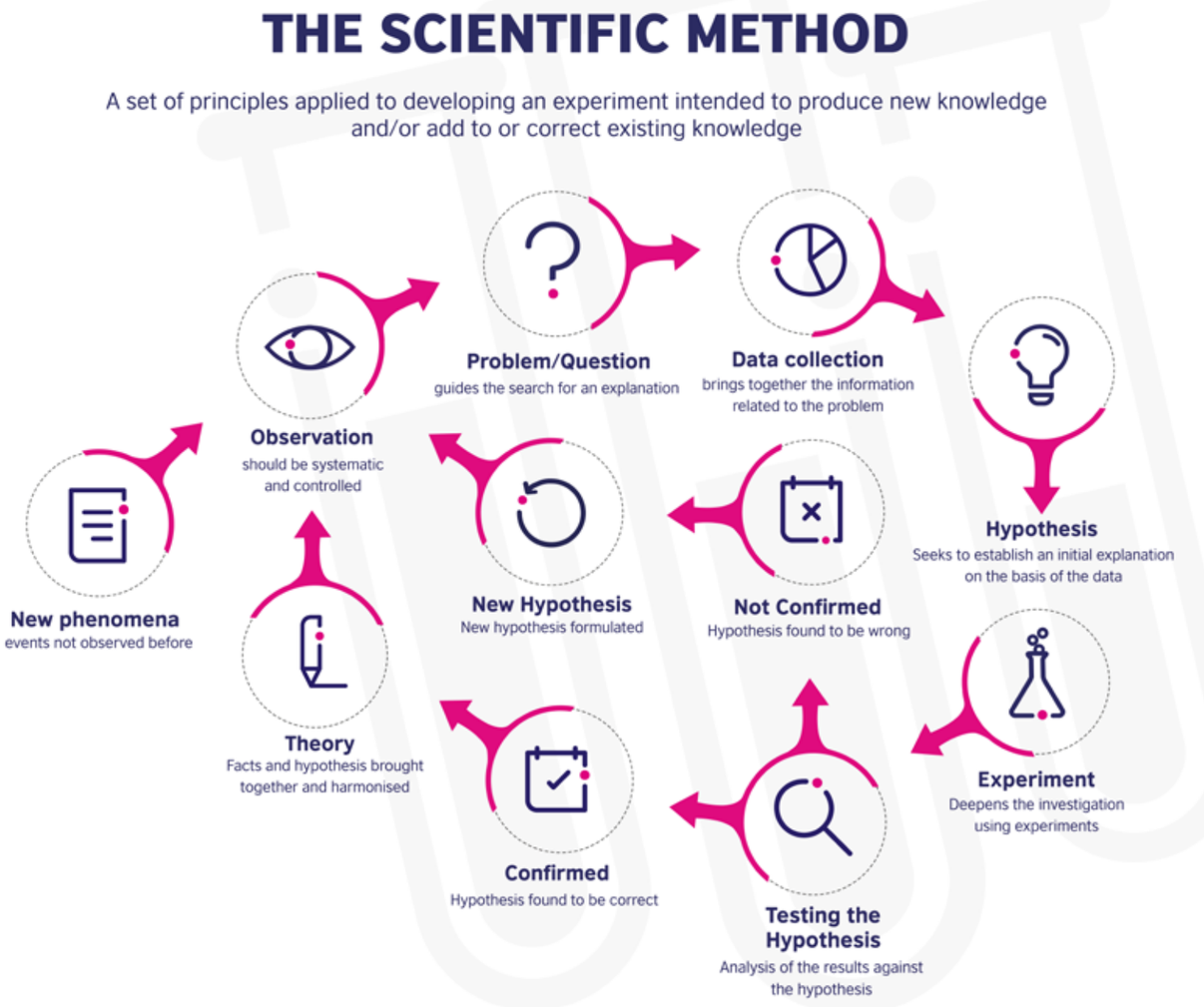
Initiative 5
Communication Reaches Out

It is very common for students not to understand what it is to be a scientist, and the situation is not very different in their families and communities. It is normal for them to think of a stereotype – a white man in a lab coat with unkempt hair and a distracted look, something like Einstein. There is an issue with communicating the reality.

"A scientist can be of any race, age or sex. It is important to show young people, black people, and women in science, as science is universal", emphasises veterinary surgeon Gabriela Leal, winner of the Famlab Prize in Brazil.

Communication can have an absolutely key role in helping the school leadership team achieve good results – and not just in science education. The internet, social media, and messaging apps – which were often the only contact between schools and their students during the pandemic, rapidly introduced and used out of sheer necessity, – can cut the distance between students and with teachers, speed up communication and, in particular, engage with the entire school ecosystem. Technology has really widened the communications possibilities available to us.

The parents, for example, may struggle to follow a traditional school meeting, with their long explanations, as they are often not used to these situations, but a photograph of their child at a science fair on a social media site is much more accessible. It can give an immediate and important stimulus to their understanding of the importance of science education and how children and young people are learning. Using digital tools, communication can help school leaders place science at the centre of learning.



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