

Democracy in the Science Classroom

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There is one duty that is unique to India under Article 51A (h) that encourages the citizen to 'develop the scientific temper, humanism and the spirit of inquiry and reform'.

How does a teacher of science view democracy in her classroom? Does it play a role in defining the approach to classroom teaching and learning? In Dewey's words, 'If we were ever to be governed by intelligence and not by things and by words, science must have something to say about what we do, and not merely about how we may do it most easily and economically.'

What is it that Dewey means by 'what we do' in science? The life that we lead outside the classroom and its influence in shaping our perspective to aspects of life cannot be ignored. Owens, Sadler and Zeidler (2018), in a study, speak of the socio-scientific issues that need to be brought to the fore. A science classroom includes opportunities to seek out trustworthy information, develop positions concerning controversial issues, practice defending those positions using scientific evidence and respectfully evaluate alternative positions held by others.

Fostering a scientific temper

Practising science in a manner that leans on evidence helps prepare students for the responsibilities of democratic citizenship which, while strengthening their content knowledge, helps them see both the benefits and the limitations of scientific inquiry (Reiss, 2003), and gives them opportunities to practice robust argumentation and develop reflective judgement (Zeidler, 2014).

Traditional science education has focused mostly on dispensing established and secure knowledge while relegating controversial or ethical topics to the sidelines (Hodson, 2003). In doing so, it enables teachers to avoid conflict with students, parents and other stakeholders by removing controversial issues from the curriculum and keeping their own

ethical perspectives to themselves. Yet, these topics that teachers deem too controversial to teach are precisely the kinds of issues that are most relevant to students' lives and to the development of democratic citizenship (McGinnis & Simmons, 1999) Owens, Sadler and Zeidler (2018) emphasise creating strategies that would establish classroom communities that support thoughtful questioning and attempt to critique the ideas related to science concepts. This builds muscle in children to ask their peers difficult questions, challenge different interpretations of experimental results and understand that questioning and critiquing can lead to productive discourse and learning.

However, before providing opportunities to delve into socio-scientific issues, it would help a science teacher to look closely at how she could inculcate some basic democratic practices in the classroom, for example, the usage of common resources provided in the environment. This could be an important feature in science, especially during lab work – being aware that the space is common for all like a regular classroom, respecting the space and using apparatus with a sense of responsibility. We will now look at some narratives in a science classroom.

Lab work and democracy

Class VIII students come into the science lab. There is a sense of excitement as this is perhaps the first time that they would be performing experiments individually and all by themselves. They have been used to watching demonstrations by their teachers and participating tentatively whenever the teacher permitted. The lab is a familiar place for them but not in terms of a workspace. It is different from a classroom in that it provides freedom of movement, allows for a greater approachability towards the teacher and peers and above all, in a sense of 'doing science'. These class VIII students have been looking forward to this experience.

The teacher walks in and absorbs all the excitement that she sees in the twinkling eyes and bright smiles. Teacher: Welcome to the science lab! It is wonderful to see your happy faces and I look forward to our

year together. How would you describe what you see around you?

Student 1: Worktables, shelves, bottles, specimens...

Student 2: Varied materials for performing experiments arranged meticulously.

Student 3: Neat worktables!

Student 4: A setup and procedure sheet for our experiment.

Student 1: Lots of informative charts that we can use as reference!

Teacher: Wonderful! You will experience all the aspects of this work area in the coming weeks. Let's begin. You will find the procedure sheet of the experiment for today which is in line with what we discussed in the class yesterday. I will come around your tables and you can clarify your queries then.

The teacher provides clarifications across the class and supports the students wherever needed. She rounds them up for a brief discussion of the experiment and the home tasks to be completed.

Teacher: I think you all have worked through the experiment well and I look forward to responses on the home task. Just one thing – I would like you to look around at your worktables and tell me what you see now.

The students look around.

Teacher: Are they the way we gave them to you?

Students shake their heads to indicate 'no'.

Teacher: There is another set of students who will come in now. Can we present them with these untidy tables?

Students in chorus: No teacher

Student 2: Can we have something to clean the tables with?

Teacher: Sure. (hands over some dusters).

Students get into groups and tidy up the tables.

Teacher: Thank you very much for respecting this space, especially as it belongs to each student who steps in here.

The teacher here has established an important tenet of freedom with responsibility, respect for common space and the importance of cleaning up after one has used it.

What could be the importance of this in the everyday life of the child? It would help instil in children responsibility towards the use of public spaces and work towards their upkeep. This kind of approach is not restricted to the urban child whose exposure

to such places is more than that of a child in a non-urban space. For such a child, her/his home, school, market, places of worship, community centres provide opportunities for exhibiting these practices.

An eclipsed view

A student comes up to his class teacher (also his science teacher) and gives a letter of request. The letter is to seek permission of absence from school the next day as there is a solar eclipse and he must be at home as instructed by the elders. The teacher is not surprised as this is not the first time that she has come across such a request. She also understands the sentiments behind such requests, yet as a teacher of science wants to provide her students with a scientific perspective towards natural occurrences, such as eclipses. Her intention is not to critique long-held practices, rather to provide a rational perspective to them.

Teacher: Students do all of you know that tomorrow is a solar eclipse. You do remember the concept of an eclipse from an earlier class?

Students in unison: Yes!!

Teacher: So, tomorrow being a solar eclipse, what is going to happen?

Student 1: The sun will get eclipsed.

Student 2: By the moon... meaning the moon comes between the earth and the sun.

Student 3: We need to remain indoors. We cannot eat food or drink water.

Student 4: If we look at the sun, we will become blind.

Teacher: Okay. So, an eclipse is a phenomenon in which the shadow of the moon covers the sun. Why are you not allowed to eat food or drink water during an eclipse?

Student 1: The food turns into poison!

Teacher: Is that so? Do you have any evidence?

Students chorus: Evidence?

Teacher: Yes, as students of science anything you say needs to be supported by evidence. If you say that during an eclipse one can become blind, what is your basis for it? Presenting evidence to prove a hypothesis is very crucial in the learning of science. Our task for tomorrow is to gather as much information about the solar eclipse as we can and present it in the class. I will look forward to our discussion.

The teacher here has provided a platform for the children to look beyond their acquired beliefs and

question them.

In the two narratives, the teachers have gently and sensitively raised questions and attempted to create a certain level of awareness about issues and responsibilities. By doing so, an atmosphere is created for discussion of practices that might not have a strong scientific rationale. The essential part of such interactions is the need for continuous dialogue and making sure they are not isolated cases in a science classroom. The teacher and student will need to consistently question social beliefs that are

prevalent, explore the basis of their existence and work towards finding plausible explanations for them.

In conclusion, a science classroom where discourse is encouraged, questions are welcomed, seeking evidence is non-negotiable is a space that can be created by a teacher who instils in her students a sense of rational thinking and exposes them to democratic processes. These students could be expected to approach socio-scientific issues in an objective and fair manner.

References

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