Teaching of 'evolution' as a dogma versus science

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The recent decision by NCERT, Government of India, to move the topics on evolution from classes IX and X to the higher secondary level has garnered attention worldwide. Science educators must focus on this question of pedagogical sequencing. There is an even more important question that the entire international scientific community needs to engage with. Have we been teaching science as a dogma, or as a form of rational inquiry in harmony with the epistemology of scientific inquiry? This, in turn, calls for further questions: When do students gain intellectual maturity to understand rational justification? How do we empower them to critically evaluate the justification and decide for themselves what conclusions to accept and what to reject?

According to various newspaper reports, the National Council for Educational Research and Training (NCERT), Government of India (GoI) has moved chapters on evolution, periodic table and democracy from classes IX and X to XI and XII. This has resulted in a debate between scientific community and GoI. For instance, *Nature* published an article called 'India cuts periodic table and evolution from school textbooks – experts are baffled' by Dvani Lewis[1] and *Science* published an editorial called 'Not teaching evolution is an injustice' by L. S. Shashidhara and Amitabh Joshi[2].

In what follows, we will restrict our attention to the issue of evolution. Before we begin, however, we would like to highlight that NCERT is not proposing that the theory of evolution not be taught but moved to the higher secondary level.

Two questions arise.

(1) Is re-sequencing the topic from classes IX and X to XI and XII baffling or an act of injustice?

(2) The second question has two parts:

(a) If evolutionary theory is taught as the truth about the history of life on earth without presenting arguments in support of the theory, and without considering alternatives to the dominant view within the scientific community, does that not constitute subjecting the young minds to a form of indoctrination with a dogma?

(b) How should evolutionary theory be taught such that it is in harmony with the epistemology of scientific inquiry and the goals of education?

The first question is relatively less important and relevant only to India. The second question is relevant to science education across various countries.

The reasons given by NCERT for the revisions are:

(i) Overlapping with similar content included in other subject areas in the same class.
(ii) Similar content included in the lower or higher class in the same subject.
(iii) Difficulty level.
(iv) Content, which is easily accessible to students without much intervention from teachers and can be learned by children through self-learning or peer learning.
(v) Content which is irrelevant in the present context.

Assuming these reasons are true, we do not see how re-sequencing is baffling or an act of injustice.

The first two reasons involve designing the entire school curriculum from classes I to XII in a coherent and seamless manner. As for the third and fourth reasons, they are a matter of age-appropriateness of topics in a curriculum. Astute readers of high-impact journals like *Nature* and *Science* would agree that it is a bad idea to introduce calculus and quantum mechanics in class V. They would also agree that it is not a good idea to delay arithmetic calculations till class XII. Barring a few exceptions, such agreements are based on intuitions of age-appropriateness and logical sequencing.

Similar considerations would include questions like:

- Should geometry be taught as science at the primary level and as mathematics at the secondary level?
- For geometry at the secondary level, should the syllabus be restricted to Euclidean geometry, or should it include alternatives like spherical geometry, projective geometry, and discrete geometry?
- Should coordinate geometry be taught in classes IX or XI?

The community of science researchers may not be concerned with such questions on pedagogical sequencing. However, it is imperative that science educators think carefully about these questions and justify their decisions on inclusion and sequencing.

The fifth reason is probably the most important, as it concerns what content should be included and prioritized in the curriculum. For instance, both theories of evolution and theories of health, illness and healing are relevant to the intellectual lives of the learners, but the latter theories are also directly relevant to their practical lives after they graduate. Would it be justifiable to retain health, illness and healing in classes IX and X, and move evolution to classes XI and XII? If yes, would it be justifiable, for instance, to use the freed-up space to discuss competing theories of healing in mainstream and alternative medical systems?

Moving on to our second and more significant inquiry, we posit that educators, including curriculum designers and textbook writers, should refrain from persuading learners to adopt their beliefs. An axiomatic commitment that we consider all educators must adhere to can be stated as a Socratic oath: 'We will not tell learners what to believe and what to do, because such indoctrination would be ethically undesirable. Instead, we will try our best to expose them to multiple beliefs and practices, and the reasons for and against them; help them understand the various alternatives; and empower them to decide for themselves what to believe and what to do.'

If we go by this oath, we are obliged to provide rational justification (evidence and arguments) for at least some of the most

important statements presented as 'knowledge' in syllabi and textbooks, and empower learners to make an informed decision on what to believe and what to do. By and large, textbooks do not pay attention to evidence and arguments. (For a discussion of this problem, see Mohanan[3].)

Should we establish a Socratic oath in education, educators must consider at what point learners possess the intellectual maturity necessary to comprehend the arguments for and against evolutionary theory? Additionally, how can we equip learners with the skills to thoughtfully assess and determine which claims and reasons to accept or reject? These are significant inquiries requiring the attention of science researchers and educators committed to responsible teaching practices rather than engaging in surface-level or politically motivated discussions.

1. Lewis, D., *Nature*, 2023; doi:https://doi.org/10.1038/d41586-023-01770-y.
2. Shashidhara, L. S. and Joshi, A., *Science*, 2023, **380**, 1303.
3. Mohanan, K. P., https://www.thinq.education/post/knowledge-facts-and-truth-epistemology-and-education

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