Should Teachers Aim to Get Their Students to Believe Things? The Case of Evolution

Harvey Siegel

University of Miami

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Thanks Igor!

- I want to begin by thanking the Educational Research Institute for the opportunity to speak with you today, and Prof. Zagar for inviting me and organizing the event.
- This talk is based on collaborative work with geneticist/science educator Mike U. Smith (Mercer University College of Medicine) and
- Adam Laats, historian of education (SUNY Binghamton), from our book (U. Chicago Press, February 2016):

Adam Laats and
Harvey Siegel

TEACHING EVOLUTION in a CREATION NATION

Nutshell History of the Dispute in the U.S.

- Main point: The fortunes of the two sides have reversed over the course of the dispute.
- In early 1900s, advocates of evolution education had to fight to get evolution into the public school classroom.
- Now, advocates of creationism/intelligent design have to fight to get their views taught.
- Taking the long view, the historical tide is clearly flowing in the right direction.
- As it should, since on the scientific merits, the dispute should have been resolved long ago.

Why Is the Dispute Still Alive?

- Q: Given the clarity and strength of the scientific case, why is this battle still being fought?
- A: Because it's not fundamentally about the scientific merits of the opposing views, but rather
- opposing cultures: The evolution/creationism-ID dispute is not primarily about science, but is rather an episode in the long history, in U.S. education, of *cultural dissent*,
- and dissenters' correct contention that their children should not be subjected to hostile religious indoctrination in public schools.

History of U.S. Education's Failure to Respect Cultural Dissent

- There are many historical episodes of U.S. education's failure to respect dissenters. For example,
- Native American boarding school students were forced to cut their hair. School officials understood it as a matter of hygiene; for the students it meant much more. (D. W. Adams)
- Catholic students were forced to read anti-Catholic texts. For school officials, their Protestant values were simply universal American values. The Catholic students saw it differently. (C. Kaestle)

Religious/Cultural Dissent in the Schools

- Jewish students forced to sing Christmas carols, etc.
- More generally: A ham and cheese is just a sandwich. (Laats) But many students would object on religious grounds if they were forced to eat one.
- The same is true of evolution education for many public school students.
- Responsible parents rightly care deeply about what their children believe.
- If it seems to such parents that their children are forming and sustaining beliefs in school that the parents find objectionable, they will surely, and sensibly, object.

Evolution Education and Religious Dissent

- Of course, teaching evolution is not, in and of itself, religious indoctrination.
- After all, evolution is not a religion. (Overton decision; no followers, churches, rituals, moral commandments, beliefs about the supernatural)
- But it does have religious implications for the followers of some religions.
- For example, it's incompatible with the religious beliefs of young Earth creationists.
- Of course, those beliefs lack scientific merit.

Evolution Education and Religious Dissent (2)

- Nevertheless, public schools are obliged not to interfere with the religious beliefs of their students.
- Creationist complaints are justified when their children are required to believe things that conflict with their religious beliefs.
- Public school teachers shouldn’t push students toward or away from any particular religious belief.

What Should We Do?

- Q: How should we reconcile the apparent requirements that we
- (1) respect cultural dissenters,
- (2) respect the separation of church and state,
- (3) honor religious liberty, and
- (4) do justice to the science?
- A: Focus on *belief*: What should science teachers expect their students to believe?

Education and the Fostering of Belief

- What should we want students to learn, and believe about what they learn?
- Belief usually – but doesn't always – follow understanding:
- When we come to understand contemporary chemistry's accounts of valence and bonding, we ordinarily come to believe that atoms combine that way;
- when we learn that and understand why entropy increases in closed systems, we believe that such systems become more disordered over time;

Education and the Fostering of Belief (2)

- when we first grasp that ‘every action has an equal and opposite reaction,’ i.e., Newton’s third law, we generally believe it.
- So there is normally no need to distinguish belief from understanding in curricular contexts.
- That is: *understanding typically yields belief*, or, alternatively,
- *belief typically follows understanding*.

Understanding

- I won't try to give a complete account of 'understanding' here. But roughly, a student understands a scientific theory if she can:
- a) identify and define the central concepts of the theory (e.g., mutation, randomness, natural selection, ecological niche, etc.),
- b) provide rich, appropriate explanations of the relationships among them,
- c) explain how the theory applies in a variety of concrete situations,

Understanding (2)

- d) apply the theory to previously unencountered contexts and problems, and
- e) appreciate at least some of the reasons/evidence that justify the theory, i.e., render it *worthy of belief*.

Education and the Fostering of Belief (3)

- But belief doesn't always follow understanding:
- For example, when students learn Newton's first law – the law of inertia, which states that objects in a state of uniform motion continue in that state of motion until influenced by an external force – many of them understand it well enough to do well on their physics exams;
- but when they are tested in the psychology laboratory, they turn out not to believe it, and

Education and the Fostering of Belief (4)

- instead to believe that the world works as Aristotle thought, namely that objects “should go in the direction they are pushed.” (diSessa)
- So here – inertia – is a place where understanding and belief come apart.
- There are many educational contexts in which we don’t want or expect belief to follow understanding:
- Historically important scientific theories, e.g. Ptolemaic astronomy or Lamarckian inheritance;
- A class on World Religions, in which we want students to understand various religious traditions, but not to believe any of them; etc.

Education and the Fostering of Belief (5)

- Evolution is of course another such place: students can come to understand the theory, and the biochemical, ecological, paleontological, statistical and other evidence that supports it, without believing it.
- The reasons for/causes of this failure to believe it can vary but might involve a worldview that includes a deep distrust of science (and other things secular),
- a particular philosophical view about the relationship between science and religion, or

Education and the Fostering of Belief (6)

- a rejection of the epistemological presuppositions underwriting the claim that the reasons/evidence just mentioned actually constitute good reasons for belief.
- When the teaching of evolution results in student understanding of the theory but not belief that the theory is true, we needn’t and shouldn’t regard this as an educational failure.

Education and the Fostering of Belief (7)

- On the contrary, in the case in which students reject the theory as incompatible with their religious commitments, we should regard the achievement of student understanding of the theory, and the way in which its supporting evidence makes it the best *scientific* account of the relevant biological phenomena, as an educational success.

The Aims of Science Education

- What are we trying to accomplish in science classes?
- One of our aims, clearly enough, is to convey to students the *content* of our current theories. We want them to know what current scientific theory tells us about the nature of atoms, genes, molecules, space-time, etc.
- In addition, we want them to know something about *how that knowledge was arrived at*: how did scientists discover that, e.g., genes are composed of DNA and space is 'curved'? That is, we want students to understand how what scientists do – the method(s) they use – delivers such knowledge, and we want them to know something of the historical and ongoing struggle for scientific knowledge.

The Aims of Science Education (2)

- At least for some students, we also want them to develop the skills and abilities necessary for producing such knowledge themselves.
- We want them also to have a grasp of the *epistemic status* of our theories: how does evidence support (or fail to support) particular theories? Why are we entitled to think that some theories are better supported by the evidence than others?
- The key to all this is that students understand the nature and role of *reasons and evidence* in science:

The Aims of Science Education (3)

- Central to scientific inquiry is the *quest for reasons and evidence*, and the point of much scientific activity is to gather and evaluate it.
- The understanding of this quest is basic to science education.
- Science education envisioned as a ‘rhetoric of conclusions’ (Schwab) is for this reason deficient.

What about Knowledge?

- It is uncontroversial that science education aims at fostering student *knowledge* of particular curricular content: theories, methods, techniques, and such.
- Does it follow that science education aims at fostering *belief*?
- It looks as though the answer must be that it does, since belief is a necessary condition of knowledge:
- students cannot be said to know, e.g., that molecules are composed of atoms, if they don't believe it.

What about Knowledge? (2)

- But: in the case in which a student understands a theory (such as evolution) but does not believe it -- that is, believe that the theory is true -- what she understands about the theory is not identical with what she does not believe.
- For example, the student might understand, know and believe that
- *p*: *according to evolutionary theory*, speciation is a complex, lengthy process that typically takes place in contexts of geographical isolation

What about Knowledge? (3)

- but not believe that
- *q*: speciation is a complex, lengthy process that typically takes place in contexts of geographical isolation.
- This case is like the one mentioned earlier concerning Newton's first law, in which understanding does not routinely result in belief. In that case, the student who understands the first law believes that
- *r*: according to the first law, objects in a state of uniform motion continue in that state of motion until influenced by an external force

What about Knowledge? (4)

- but need not believe that
- *s*: objects in a state of uniform motion continue in that state of motion until influenced by an external force.
- The cases differ in that it is not usually prior religious belief that interferes with the scientific belief in the physics case, whereas that is much more common in the biology case.
- Nevertheless, in both, the primary aim should be for students to understand the relevant science.

What about Knowledge? (5)

- If understanding is achieved, belief will typically follow, barring some specific barrier,
- whether psychological, religious, or some other sort.
- Whether or not it follows, the science teacher has done her job well if her students acquire the relevant knowledge and understanding.

Relating All This to the The Broader Aims of Education

- When students master the relevant scientific content but do not believe it, how should teachers respond?
- Should they understand their task to be that of changing student beliefs?
- No: teachers ought *not* to strive to shape directly the content of student belief.
- Striving to do so is the mark of the *indoctrinator* rather than the educator.
- What students believe must in the end be *up to them*.

Evolution Education and The Broader Aims of Education

- The appropriate goal is for the student to recognize the scientific status of the theory in question,
- that is, to believe that the theory reflects the best available evidence and so affords the best current scientific account of the phenomena the theory addresses.
- Instruction must provide students with an understanding of the evidence related to the theory, but in the end the student must judge for herself the merits of the theory's claims.

Evolution Education and The Broader Aims of Education (2)

- Anything less amounts to a failure to treat students with *respect as persons*.
- The science teacher should be content simply to point out that, regardless of whatever else might be said in its favor, religious belief cannot be *scientifically* sanctioned.
- It is not part of the biology teacher's task to demonstrate that a religious belief is false.
- Neither is it the science teacher's task to judge the epistemic status of the students' religious beliefs.

Evolution Education and The Broader Aims of Education (3)

- So: Should teachers try to get their students to believe the theory of evolution?
- Yes and No:
- Students *should* be expected to learn about and understand evolutionary theory and the evidence that renders it the only serious scientific contender,
- But they *should not* be expected to believe it.
- Normally, they will: belief typically follows understanding.
- But when it doesn't, understanding should suffice.

Evolution Education and The Broader Aims of Education (4)

- I've now dragged you into consideration of the aims of education understood broadly, that is, beyond the confines of science,
- and have suggested some: autonomy, independent judgment, critical thinking,
- and the constraint that students must be treated with respect as persons,
- and that this requires leaving their belief up to them.
- These are large matters that must be left for another time. And so,

Time for Wine

Hvala!