Confessions of a Science Teacher

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I would like to share my concern for the teaching and future of my subject, as also to suggest the basis of the way that I would proceed, should I get the opportunity to teach again.

I taught physics at the examination level at Brockwood Park School, England, for 18 years. By examination I mean the standardised national school leaving test, which in the UK is called the "A" level. Despite most students passing the exam, I finished teaching with a very strong feeling of dissatisfaction with my classes. It was true that I was getting a little stale with teaching the same content for so many years, but it was not this that was bothering me. Although I had a good relationship with the students in and out of class and I was basically happy with my contribution to the place, something was wrong in class. Partly it was the lack of engagement of the students with the subject and consequent lack of understanding, and partly my feeling that, even for those students who were engaged, I had failed to convey what relevance outside of passing the exam studying a subject like this might have. Apart from a small minority that went on to study the subject at college level I had the feeling that after the exam the students would very quickly forget what they had accumulated or even understood. Although they may have enjoyed the class to some extent they were basically turned off the subject, which would then be pretty much a closed book for them after they left school. Of course they don't need physics to go on to lead creative lives with integrity and, for most, the specialised knowledge they learn will be irrelevant in the world of earning a living and dealing with the issues of life.

I tried to rationalise the situation to myself by saying that in my class they were just accumulating the knowledge that they needed for the exam, but outside of class in other activities their education was more to do with the intentions of the school. I saw my classes as part of a pretext that allowed the students to be in the more meaningful environment of the school community and beautiful countryside. This worked to some extent, but ultimately seemed like a source of fragmentation and fuelled my dissatisfaction. When I left Brockwood I resolved not to teach physics again, unless I could get a better understanding as to how to teach it more meaningfully. I thought about teaching General Studies instead. In an article in an earlier journal Dorothy Simmons is quoted as saying "you teach what you know but educate what you are", and in this sense I was happier with the important "education" that involved my direct contact with the students.

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For young people in this country there is a general trend away from the study of physics, maths and chemistry (but not biology, interestingly). The students are voting with their feet. If by doing this they are saying that the subject, as it is taught in schools, is not relevant to their lives, is not attractive to study or inspiring them, then I understand and agree with them. This trend may not be the case in other countries but I feel it does point to a basic issue with these subjects. I have come to think that my subject needs a complete rethink, re-creative effort and reinvention as a discipline. Otherwise it may experience a terminal decline (a number of UK universities are closing their Mathematics and Science departments due to a lack of students).

To reinvent a discipline might sound daunting but the solution may well lie with what K described as "the true scientific mind" in his book "On Education", and on many other occasions when he talked in similar terms. To pursue this we need to look at the curriculum of the subject, which, as articulated in the exam syllabus, has the implication (sometimes called the hidden curriculum) that science IS its content; in particular physics is its formulae, laws and theories. This content in physics has not changed much in decades. However, science at its most meaningful is basically a creative human process and education that leaves this out takes the heart out of what the subject could be. This emphasis on content detracts from what I call the process values of the true scientific spirit that K valued as "an attitude to the world", such as clarity of perception, precision in observation, factual objectivity, an open questioning outlook, intellectual clarity and rational thinking.

The emphasis on content can also lead to a distorted and confusing implication that the content of scientific knowledge has a fixed and final relationship to what nature actually is, rather than being a limited representation that in some areas works extremely well. This in turn leads to a view of scientific knowledge as being a fixed and final body of knowledge that has been proved to be true because it works, and all a scientist does is to follow the procedures robot-like, preferably in a white coat, to get results.

Another aspect of the hidden curriculum is that knowledge has meaning without a context, so that formulae and laws can be presented in class in a meaningless vacuum. However, without a context knowledge becomes isolated statements with no meaning as a human endeavour. These statements are then understood superficially as just a bunch of words or equations. The only meaning being conveyed is that they need to be remembered for the exam; consequently many students will remain unaware that a science class could have more significance than this.

All this inhibits the creative flow of a young mind, and sooner or later it is registered by the student and, for the majority, deadens her mind to the subject. All teachers should be aware of the hidden curriculum of their subject, otherwise they may be, unwittingly, teaching often false and damaging implications such as these.

It is relatively easy to see all the above implications of the curriculum but to do something different with an exam class on a Monday morning (or Friday afternoon, even harder!) is another matter. I have sometimes wondered if it is even possible and how the schools would be now if it had been made clear from the beginning whether exams should be taken in K schools at all, especially in science subjects with their large knowledge content. Now that the schools are established it would be difficult to drop any exams; those responsible would see it as too risky. At Brockwood we did manage, however, to drop the tenth grade GCSE, a national exam taken at age16.

The issue around the compromise with K's intentions that exams demand is a problem that has to be addressed. So, how would I address it now? I would rewrite the syllabus in digestible quantities, in terms that the students can understand and work with, supply them with one of the many competent textbooks that treat the content of knowledge they need. I would only teach students who are willing to learn the content knowledge largely by themselves. Students will need support at first, particularly the weaker ones, and although they may resist, it is a study skill they should learn anyway. For students to 47 learn how to learn is by no means a new idea; in fact I think most teachers at K schools come to it fairly early on, as K often emphasised the importance of learning for its own sake (another process value). However, for me it would now have a new urgency, because if the students can do this, then I can teach the process values, the heart of the subject.

I would find ways for the process values to manifest in simple tasks, for example an accurate measurement of the period of a simple pendulum requires care and precision, the detailed characteristics of interference patterns can be observed with, or without, systematic objectivity.

I would also work on the issue of context, in terms of the process values, such as the historical background to the knowledge content, for example who were people like Newton and Einstein, what were their strength and faults as human beings, their successes, the failures and the mistakes they made that, by the way, do not diminish them as great scientists. Another important example would be the prejudice and difficulties faced by Copernicus and Galileo in proposing the Sun, and not the earth, to be the centre of the solar system, and part of this context would be the questions that Kepler and Newton had in their minds when they made their discoveries. Another fascinating area would be the insights out of which the knowledge emerged. Newton's gravitation law for example contains the insight of Galileo and Kepler that the order in nature can be expressed mathematically, a mystery that remains unexplained to this day. Topical ethical and environment issues such as using nuclear energy in response to global warming should also be included, as could the prejudice and lack of clarity that caused the Chernobyl and Challenger disasters.

Covering these topics in class would not make the teaching easier, neither would it mean less work for the teacher, but some such change is necessary to meet the concerns expressed above and for the teaching of science to be the creative, relevant and meaningful activity, for both teachers and students, that it should be.

Colin Foster was at Brockwood Park School for a number of years as a physics teacher and Academic Director. Apart from Krishnamurti, he has a strong interest in the work of David Bohm. He is at present living in London and running Krishnamurti video showings and dialogue groups.