

Teachers' Experiences of Learning Science: A Case of Autobiographical Reflection

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ABSTRACT This paper analyzes the experience of learning science in school of 34 teachers enrolled in a science methods course in the M.Ed. programme offered by the Aga Khan University, Pakistan. The participants were expected to write their reflections after recalling their experience of learning science in school. The findings reveal that the majority of teachers recalled negative experiences of learning science and that the teaching style of their teachers influenced the way they feel about science even to this day. It follows that if teachers are helped to recall their own experience of learning science in the classroom, it opens the doors to conscious reflection and realization of some of the methods of teaching that they use in their own classroom.

KEY WORDS: Science education, science teaching and learning, critical reflection.

Introduction

Science teachers' experience of learning science from their own science teachers is a powerful form of knowledge that acts as a template on which very often their own teaching is based (Cole, 1990, 1997). That is why it is often said that *teachers teach the way they were taught* (Cole & Knowles, 1998). This is even more true in Pakistan and other developing countries, where the professional teacher training is very theoretical, or as is often the case in private schools, not required at all (Davies & Iqbal, 1997; Farooq, 1993; Iqbal & Mahmood, 2000; Khalid, 1996). Hence, not having any practical experience of science teaching, teachers fall back on their own experience almost unconsciously, without even being aware of the source from which they are inspired. If teachers are helped to recall their own experience of learning science in the classroom, it opens the doors to conscious reflection and a better understanding of their own pedagogical practices (Bacchus, 1990; Halai, 2004). Teacher educators, like me, who are teaching at Aga Khan University, Hodson Institute for Educational Development, Pakistan (AKU-IED), are making efforts to encourage this kind of critical reflection.

AKU-IED was established in July 1993 as an integral part of The Aga Khan University, the first private University of Pakistan. "The IED's objectives, like those of the University, are to promote and disseminate knowledge, and provide instruction, education, research, demonstration and service." The more specific aim being to, "Become a leader in educational reform and improvement, especially in the developing world, with the aim of increasing the efficiency and effectiveness of schools, and other educational institutions" (IED, 1998, p. 1). IED's programmatic

activities include a PhD programme in Education, a 2-year Master of Education in Teacher Education and Educational Leadership and Management, in-service Certificate in Education Programme, and modular Diploma in different areas. The Institute has a partner relationship in teaching, postgraduate studies and research with the University of Toronto and Oxford University, UK. AKU-IED serves a region that encompasses eleven countries¹ and hence the student body not only has a diversity of students from the government and private institutions within Pakistan, but also reflects diversity in geographical regions to which they belong.

The M.Ed. programme in Teacher Education endeavors to prepare Master trainers who have a broad understanding of teaching of at least four subject areas² - science, mathematics, social studies and English (Jaworski, 1996). Hence, all the students that I had in my class were not science teachers and may not have a first degree in science. Of the 34 teachers in the M.Ed. class, only 14 had experience of teaching science though all of them had the experience of learning science at least until grade eight.

I decided to use the idea of a Science Autobiography (Koch, 1990) as part of my M.Ed. Science Methods teaching task³. I asked the students to respond to the questions included in the following passage:

We all have previous experiences of doing things. To understand your prior learning experiences in science, describe in narrative form your earliest memories of school science to the most recent. What made these experiences memorable (positive and negative)? If you cannot recall your earliest science experiences speculate on the possible reasons. This is an opportunity to examine your attitude toward science and explore how that attitude was influenced by your teachers. What implications do these experiences have for your teaching? Why would you want to do (or not want to do) certain things in your classroom?

All 34 students submitted the assigned task. Five of them were from Central Asia (Tajikistan and Kyrgyzstan), four were from East Africa (Tanzania and Uganda), and the rest from Pakistan. Eighteen of the participants were women. Thirty percent work in schools belonging to the government sector and the rest to the private sector. An initial analysis of data highlighted a number of issues discussed below.

Influence of Teaching Styles

The students specifically mentioned that the teaching style of the their teachers, whether traditional, or more progressive, using demonstrations and some practical work did influence the way they *feel* about science. Strategies, such as telling stories related to science and making diagrams, also tended to make them feel good about

1. AKU-IED serves eleven countries: Afghanistan, Bangladesh, India, Kenya, Kyrgyzstan, Pakistan, Syria, Tajikistan, Tanzania, Uganda and Uzbekistan.

2. It must be noted that at present the M.Ed. students are required to "specialize" in only two of the four subject areas.

3. I would like to acknowledge my colleague Ms Unaeza Alvi who taught this course with me. However, teaching and planning for this session was my undertaking and so was the subsequent decision to write about this experience.

science. More than two-thirds of the M.Ed. students, 23 out of 34 (68%), recalled a very rote method of learning science, where students were asked to memorize "answers" to prescribed questions. Emphasis was on theoretical knowledge rather than on conceptual understanding. One student clearly stated that, "Our science teacher was teaching 'tree' like a heavenly body. He was teaching about a tree, beneath a tree, but he never showed us the parts of a tree." The atmosphere was such that students felt disempowered to ask questions of the teacher or the text. This situation did not enhance learning and hence there was a tendency to lose interest in science. Data shows that the students particularly mentioned two results from such teaching: (a) negative feelings towards science, and (b) poor understanding of science. Among these 23 students, some expressed regret for not being able to recall any science content from their school days, as most of it was rote memorization that has now been wiped out from their minds.

From the remaining one-third of students, only a small number recalled that their teachers used more practical approaches for teaching science that allowed for experiments, demonstrations and discussions, and where students' questions would be entertained and answered. Another group of students explained that the requirement to have drawings in the science notebook, and the use of pictures in textbooks and by the teachers enhanced their interest in science. And because of these experiences, they felt more positively towards science. It is important to note that M.Ed. students from Central Asia dominated this small group of science teachers. Their experiences of learning science were not as poor as experienced by students from East Africa and Pakistan. It is my conjecture that despite the disbandment of the Soviet Union, the key structures put into place by the communist regime, such as basic education, still continue to function fairly adequately.

Practical Work in Science

It was clear from their recalled experiences that they could remember a lot of things from the practical work that had been done in schools.

One lesson, I can never forget in Physics, is the Vernier Calipers and Micrometre Screw Gauge. Each student was given one and we actually measured hair, threads, etc. I believe up to now, I can still use these instruments well, because the method has stuck in my mind.

Another student gave this example of a lesson still remembered:

My teacher was very strict so that nobody asked any questions in class. One girl stood up and read the whole lesson, and we marked the answers and learnt them by heart. When I was in class V, a group of teachers came for training to our school. I still remember the lesson that one teacher taught on solutions. She practically demonstrated "How do we make solutions?" What are the solvent and solute? She also demonstrated her answers by making a solution with sugar and water. She then went on to ask for more examples. I still remember with pride that I gave the answer.

Most of the students underwent a teaching process where memorization from the text was the focus of teaching, and hence every small practical activity was a thing to remember for the students. It was very poignant to read accounts of teachers where the presence of even one picture in a textbook was considered "pro-

gressive" and acted as an incentive to study science.

"Not Allowed to Take Science"

A number of autobiographical accounts have a strong element of regret for not being able to continue their learning of science beyond the very basic required in elementary classes. This was due to either having to "leave" science due to reasons beyond their control, or "not allowed to take" science due to low grades or other school policies. This particular group felt that if they had understood the content, their results would have been different. There was also a small group who voluntarily chose not to continue their studies in science.

There were 14 students in this cohort of 34 with enough understanding of science to be able to teach science. This indicated that, despite negative experiences, 40 % of them did choose to continue with science. This might not be due to their inherent experiences, but due to high status of science in all the five developing countries represented in the population. Science was seen as a subject that would open the doors for a more lucrative career. Hence, parents as well as students themselves are usually keen to continue studying of science until at least up to the secondary level.

Language as Barrier to Studying Science

As mentioned earlier, students are usually keen to take up the study of science. However, a number of those who do manage to study science at the secondary level, they choose not to take it up at the higher secondary level due to language barriers. Many students recalled that they had studied in educational systems, where science was taught in English at the Secondary or Higher Secondary level. Because they had completed elementary /secondary school with science taught in the vernacular, they could not continue with science at the college level, because they could not cope with it. Some tried to cope by learning by rote, but often the end result was moving away from science.

Perceived Obstacles to Science Learning

Some of the impediments that the M.Ed. students identified as contributing, in part, to their feelings towards learning science and science in general were limited resources. This partly ties in with the teaching style. One student mentioned that he did not have "good memories of learning science" in school. This was in part due to the fact that his school did not have enough resources in the form of trained teachers who could "teach in the proper way." Another student mentioned that his secondary school science experience was not very satisfactory, since the classes were overcrowded and students were always denied "the teachers' support."

A large number of students talked about the lack of laboratories in the schools to perform practical work in science. As at least one student mentioned, experiments "*piqued* his interest," and not having this resource eliminated a very important source of motivation for the students. The same student elaborated on his experience and wrote that whenever he asked the teachers about the experiments, they would beg off citing the lack of resources in school as an excuse. He further added that he "gave up on the idea of practical experiments" in school work after this experience. Two of the M.Ed. students identified the role of mathematics as an

obstacle in their science learning. They said that their weakness in mathematics was the reason why their performance in science suffered, and were later asked or forced to drop science.

Negative Feelings About Science

Many students showed deep emotion when they wrote about their memories about learning science in school.

The teacher used to give us fifteen to twenty minutes in the class to memorize specific definitions. My class fellows thought that I was against the science teacher, because all of them liked her very much as she had completed her syllabus and prepared students for the final examination...because of all these factors, I started hating this subject and if I write truly, I think I hate this subject because I don't have a clear understanding of the concepts. Maybe I am afraid of this subject because of the reasons mentioned. Whenever I see any science article or a book I just ignore it.

Another student wrote:

I remember that we used to have a test every fortnight, and tests used to be a nightmare for me, because no matter how much I tried to learn by heart the question or how many times I read the chapter, the result was always the same – fail and face the humiliation in front of the class. The end result would be more scolding from the teacher, and thus I decided to give up science learning.

Lack of understanding science evokes strong emotions among students that are still vivid even after a gap of years. One is left to wonder if a little change in teaching strategies used by science teachers would have reduced the negative feelings towards science.

Implications

This puts a lot of responsibility on the teachers of science, so that the future science teachers recall science as being taught with more progressive modes of teaching. Today our teachers can recall little else but “chalk and talk” modes of teaching (though this too has a place in teaching), and do not have role models to follow. Hence, despite the big gap in resources and effective teacher training that hampers efforts to improve science teaching in this region, there is great promise, potential and hope too. This is largely due to the very high motivation within students to study science as it has high status in society and is still seen as the door to good professional education, which can boost upward mobility.

Thinking and reflecting about their science learning made the M.Ed. students more conscious of their role in shaping the experiences of the students under their charge. As one of the students mentioned in class, when we were deeply engrossed in planning an activity for a science lesson, “I am now aware that 10 or 20 years later these children will be talking about my *classroom*.”

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