

## Stories of hope

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### Abstract

This is a narrative account, reflected from the author's perspective, of three teachers' resistance to the formulation of metrication and fabrication arising from the influence of STEM in science education. It focuses on the ways transformative science teaching challenges this obstacle viewed through the lens of Critical Realism and how social justice is meshed into science pedagogy.

Keywords: pedagogy . transformative . STEM education

### Episodes of ambivalence

As I am sitting down to write this in the garden on an unusually warm summer's day, the children next door are having a game of being 'teachers and children'. The play acting goes like this:

'Now what are you doing Charlie?'

'A drawing Miss.'

'Well stop it. Please get on with your work and I'll see you at the end of the lesson.'

There are any number of scenarios like this with the teacher staunching any sense of wonder and play with the prospect of punishment. I know the school the children go to because my own children went there. The teachers I came across at the school were welcoming, imaginative and gentle with children. And I would guess not that much has changed. But what remains is an image of the Gradgridian teacher: grim, deathly and oppressive.

A year or so ago I happened across an obituary in *The Guardian* newspaper of a man called Ormond Uren. I was immediately struck by this because Mr. Uren (I had known his initial was 'O' but not what it stood for) was my French teacher when I was 12, back in the 1960s. Even many years later I recall him vividly. He was a tall impressive figure in early middle age with a nonchalant bearing, as if life held no anxieties for him. He had a red open-top sports car, and all my school friends thought he was incredibly wealthy, aristocratic and that he owned a villa in the south of France. What didn't occur to us is why anyone with a villa in the south of France should be earning his keep teaching in a school in Hackney, one

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of the least salubrious parts of London. But the reason why I had a distinct picture of him was because he was one of the best teachers I ever had. He only taught us for a year and then left the school but I learned far more with him than with all my later French teachers put together. He didn't allow us to speak anything other than French, and he was kind in a way that authoritative, confident and respected figures can be. I always looked forward to the sophisticated discussions that would emerge in French even at a young age. I had not seen nor heard from him until I came across his obituary.

So why was his obituary in a national newspaper? Sadly, fame isn't the privilege of all great teachers. If we had imagined that he lived some alternative glamorous life-style, his story was far more extraordinary than even we, as 12 year-olds, could have known. After an affair as a very young man with a Hungarian Countess, when he became a fluent Hungarian speaker, in addition to his proficiency in French and Spanish, he was designated to be parachuted behind German lines during WWII. But he was arrested just before the operation was due to take place, suspected of passing on information to a Soviet agent – a claim he vehemently denied until the end of his life, which was lively and rich. He then spent four years in prison. Because of his conviction as a 'communist' spy he was not allowed to follow an academic career for some time after his release but, as the obituary says – and here is the crushing verdict - his only option was “*unsatisfying* teaching posts” (Williams 2015) (See <https://www.theguardian.com/world/2015/jul/23/ormond-uren>).

I had a strong sense of betrayal, ironically in the context of spying, when I read this. People like Ormond Uren had convinced me of the good one could do by becoming a teacher. If one of the teachers I had admired found their vocation 'unsatisfying' then clearly I had understood myself and those around me rather differently than I had thought.

Perceptions of teaching, at least in the U.K., are complex, and deeply bound up with notions of social class, culture, social history, and academic snobbery. If Ormond Uren was unsatisfied ('unsatisfying' was the obituary writer's term, I don't know if it was his) then at least he had somehow achieved the pedagogic autonomy contemporary teachers in the U.K. can only dream about in the context of 'presentism' (Hargreaves 2010) and 'fabrication' (Ball 2013), a cynical compliance in pretending to achieve performative targets.

These scenarios and memories disturb me. I had chosen the vocation as a teacher and later as a teacher educator because I thought teaching could transform people's lives. But society and the media had a perception of teaching that lacked creativity or insight. Yes, I had seen one or two colleagues who were boring bullies. But many more took risks, significantly increased the aspirations of their students and were committed to a better world. Thirty years later I still recall the names and faces of the children I taught. Shaw's infamous - and ignorant - aphorism - "those who can do, those who can't teach" – reflects an ambivalence on the part of teachers, a defensiveness that teaching carries with it. But this is far from the whole story. In this semi-narrative I want to include stories of three science teachers, two of

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whom were part of a British Academy funded research project (Levinson and Martins 2012), we carried out with Brazilian colleagues. To some extent they reflect my own genesis and development as a science teacher, hence this is a kind of displaced narrative. Science is a subject which deepens this complexity and ambivalence because of its present-day associations with academic hierarchy, individualism (the scientist as genius), suspect notions of rigour and fairness, masculinism and instrumentalism in the egregious form of STEM education (Gough 2015).

Science practise has been unhelpfully associated with positivism – that it can be the measure of all things. However, as a young beginning science teacher I was moved, perhaps idealistically, by a science which had its origins in Marxist materialism through the works of scientists such as Lancelot Hogben and J.D. Bernal who saw in the role of scientific knowledge an emancipation for working people, destroying prejudices, obscurantism and myths. But my views changed pretty quickly after a few months in the classroom – for most pupils science was something to endure, and that was the start of a process of gradual marginalisation and resistance as a teacher.

That process put me in a difficult position. The colleagues with whom I felt closest politically had been drawn to post-modernism from which I also felt alienated: I am sceptical of its uneasy relativism, open to exploitation by authoritarians, climate change deniers and corporate expansionists, as much as by those struggling to break through the oppression of colonialist and masculinist science. On the other hand the reductionist view of science as descriptive and disengaged with social justice was equally alienating. If science was emancipatory it had both to encompass the possibilities of human agency (hence non-positivistic) but also that there were real structures and systems in the world which could be subject to processes of change and liberation through human possibilities. The Critical Realist philosophy of Roy Bhaskar (2002) which reflects this agency/structure dynamic forms the background to these narratives.

## Transformers

The idea for this research project arose from a conversation I had about five years ago that disturbed me. A young student science teacher, Emma, whom I had supervised, came to see me at the end of her training year wondering whether she had what it takes to teach in a London state school. Unassuming and introspective, Emma had come to do a pre-service course having opted out of her medical degree. Feeling that medicine as a career was not for her, she transferred to do a biology degree where she graduated with the highest mark of her year. (This was a prestigious university with hundreds of students following this particular course). Rather than follow a postgraduate research career she then went to work for two years as an assistant in a school for children with learning difficulties where she decided she

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definitely wanted to be a teacher. It was at that point of her life that I supervised her teaching practise. Of the hundreds of pre-service teachers I had supervised – and many were very impressive - she was one of the most remarkable. She said very little in sessions, listened attentively and then towards the end, very diffidently, raised pertinent questions which none of us had thought about but seemed so obvious when she asked them. In her teaching practise she would prepare meticulously which reflected a deep respect for the students as learners. Students surpassed themselves in her lessons, it looked to me that they felt empowered by her presence. She was one of the few teachers I have witnessed where, at a number of points, some students experienced transformative, almost existential, moments: those moments which had always seemed to me as the *raison d'être* for teaching. In one lesson with 13 year olds, in a school in a severely deprived area, she had prepared beautiful masks of a range of animals and plants, provided the students with pieces of string and asked them to use their masks to become an animal/plant and use the string to represent flows of energy in habitats. She gently encouraged them to articulate what was happening, how they would respond to competitors, what was meant by energy flows and why energy flowed in particular directions. Gradually the networks became more and more complex. At the end of the lesson a girl stood up and said: “Miss, I’d never thought about it this way. But does that mean we are *all* connected to each other”. It was spoken as if this was a revelation, that what was hidden beneath the surface of the natural environment had suddenly become evident and real.

This episode also revealed something which I have observed with a few science teachers, one or two of whom have been student teachers. They raise, if implicitly, interconnected ontological, epistemological, political and moral questions. The ontological question is: Nature appears to be organised. Why should that be? The epistemological question is: How do we know this? The political question: What are the power relationships which privilege certain kinds of knowledge? The moral question is: What does that *mean* for us as conscious beings? In the case I described above it became clear to the students that there were dependent relationships in living systems. This was not obvious but it became so. The epistemological and political questions were not explicitly addressed (although the nature of interdependence represented through strings and masks alluded to these, as well as the sensitivity expressed towards student explanations and inferences) but the ontological aspect of what was revealed certainly paved the way to addressing these questions. And the moral question became core: if we are connected what does that tell us about ourselves and our responsibilities towards Nature and towards the Other? *This relationship between describing Nature and the socio-political questions which emerge through reflection was an epiphany for me.* It seemed to both address why teaching was so valuable and why science teaching in particular was so much more than a short term instrumental role in supplying the workforce.

So when Emma approached me and expressed self-doubts about her ability as a teacher I was alarmed. But while she was unassuming she was also sufficiently self-aware to

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know she was a good teacher. What worried her, she said, was the way schools felt they had to ‘perform’, all that mattered were exam results and how they competed with other schools, how schools were increasingly marketed on ‘performance’, and teachers’ lack of autonomy. Even the way you taught was governed by imposed standards and although she had commanded enough respect from sympathetic staff to get around this as a pre-service teacher, that wasn’t an environment she wanted to work in. So this led me to wonder how teachers like Emma make out in the world of metrication and ‘fabrication’.

### Against the grain

Talking to friends in London and Brazil about teaching as an act of resistance we found some way forward in Marilyn Cochran Smith’s work (1991), *Teaching against the Grain* (the title expresses what we were looking at) and Roger Simon’s inspiring book on pedagogies of possibility (1992). These works are encapsulated in Gramsci’s account of lives that are accountable for what they have achieved – not in an individualist or instrumental sense – but for their contributions to events which constitute a struggle for justice and fairness (Mayo 2008).

What we wanted to know was how do teachers who retain Gramsci’s sense of the teacher’s vocation, who are respected by staff and students alike, and who have stayed as teachers manage, indeed thrive in the world of STEM, performativity, outcomes and entrepreneurship. Because survival isn’t good enough. So between us we identified three science teachers in London who fit the bill. All fulfilled the criteria: they had taught for at least ten years, they were well-known to us for opposing any educational move they saw as threatening equality and fairness, and they were respected by students and colleagues alike. They were competent in widely accepted modes of teaching even when challenging the purposes of these modes, and identify and contend with their own doubts (Cochran-Smith 1991).

In doing so we interviewed the teachers through a narrative approach. What emerged were stories which ranged a continuum from despair to hope, more particularly how institutional structures had mediated their sense of agency. Here I depict two teachers at different points in the continuum of despair-hope. One who eventually succumbed to the pressures of ‘performativity’, the other whose institution gave him the oxygen to thrive but where he met an unexpected obstacle, but perhaps predictable in hindsight..

Sally had recently left school teaching to work in teacher development. She radiated happiness as a teacher and the more challenging the class the more at home she seemed in the classroom. She had been head of the science department and a notable campaigner for a reformed science curriculum. What was interesting for me in the light of perceptions about teaching was that she had come to teaching from industry. After a few years as a graduate

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trainee in industry she became bored with predominantly menial tasks and changed to teaching

‘because of my enjoyment of the science, and the idea that science could be more fun, more motivating, more interesting, . . . that I really wanted to be the teacher.’

She recalled her mother had been a primary school teacher and she had loved accompanying her on school trips. Helping children develop an interest in nature, she reflected, was what drew her back to teaching. That she could make a difference.

There were three important ‘i’ aspects of Sally’s commitment as a science teacher: identity, inquiry and integration. She retained a deep excitement about the practise of science, drawing on trips she had experienced as a child, and science had become ‘part of <her> life’. Science, for Sally, was about being able to use inquiry as a means of transforming knowledge for human good. Context therefore was the hook for her: ‘it’s that thing about *living in the real world*, we don’t live in atomic theory.’ So, she recounted an incident that illustrated her commitment to inquiry-based science:

‘one bright lad came in and said . . . A sister had died from sickle cell . . . I’ve heard people in Nigeria tell me this tree has anti-sickle cell properties. I said, “oh that’s interesting, what can we do about that?” And that to me was what it turned from being kind of receivers of science to being their own little scientists . . . , really powerful . And then changing from people going “uhhhhh what’s the solution” to “I know exactly what I need and how I’m going to make it happen” .’

And in order for knowledge to be used in a way that was socially progressive it had to be integrated with other disciplines. : ‘I used to argue with the humanities departments that maybe they should do the same and combine the curriculum . . . to develop more a whole person . . .’

Developing a science curriculum at a national level while still a practising teacher was a great opportunity. But as the curriculum became established and then standardised under governmental reforms, the national emphasis on performativity came to affect her practise.

Sally is a collectivist and an activist. She recalled a strike when she was the Union secretary and the opposition to assessment systems.

‘ . . . tick boxes, objective testing awful. . . Is there a fair way of getting kids to be graded in a normative distribution? You’re always getting people at top and bottom. Unless you can say every child is allowed to achieve this. . . We did have a strike and on the strike day we had a meeting, in that meeting was the best ever educational discussion we have ever had. Teachers had such brilliant ideas

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how they could have run it. How do we take that forward? As an erstwhile activist you hope those teachers will go with it, you know they could have worked it out. Everyone was so inspired. Everybody came, not just activists. Everyone had discussions. But the action, what we knew we were trying to defend what we knew worked . . . We will be collective no matter what they do to us.’

Sally’s view of collectivism was a long term one. But the performativity driven by top-down corporate management drove her to close doors, operate as a separate unit. She saw a new headteacher as a union-smasher and found she had few political resources, as an organiser and head of department, to counter the new management.

‘As soon as you close the classroom door provided the kids come out having done their homework, actually even then perhaps you don’t have it written in their books but provided they come out, they’re motivated, they’re not misbehaving and they’re doing the tests and passing exams or whatever you can pretty much do what you want behind closed doors.’

So Sally left teaching and took up a post in teacher development. That she is still able to work with her ideas in a different way is important. But towards the end of the narrative there is a sense that she found it impossible to combat an ideology that countered her philosophy of teaching. For Sally dominant political structures confounded agency.

Don tells a very different story. Growing up in a working class district in the English Midlands he was apprenticed as an electrician but his science teachers convinced him to stay on at school to complete his education and go on to study science at university. He was the first in his family to go to university. On leaving university he took a number of part-time and temporary posts ranging from teaching primary school children to teaching electronics in adult education.

There are aspects of Don’s professional context which gave him possibilities not available to Sally. Don teaches at a college Centre for 16 to 19 year olds where the staff have the kind of autonomy rarely seen in other institutions in the state sector. There are various reasons for this, some of which I am familiar with having taught there about 20 years ago when I first met Don. The first is that since the Centre caters for students who are beyond the age of compulsory schooling it is not subject to the same tight regulations encountered by other schools. Second is the intellectual, professional and political commitment of many of the staff, an aspect which I found liberating during the 18 months I taught there. Often, over coffee between lessons, staff were discussing cosmology and the burdens of proof; Marxism and science; humanism and evolution. I found a number of my colleagues would have been considered rebels and misfits had they taught in other schools. And thirdly is a degree of consensus between management, staff and the student body about the educational role of the

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Centre.

As Don recounts:

‘There were all kinds of freedoms. There was the freedom to develop the kind of curriculum which suits the kids, and I think that was the culture of the place, that whole structure of team meetings what you were going to teach anybody and being involved in the staff meetings where clearly decisions were made to some degree. There seemed to be a structure . . . over which you had control and also responsibility. For the curriculum you felt responsibility as well . . . I don’t think at the time I understood that wasn’t what everybody did in every institution.’

Don’s interest in the history of science led him to read Galileo and the Homeric sagas. Combined with his interest in constructivism he started teaching physics using a storytelling structure based on the sagas, an approach which enabled him to illuminate the diverse theories which explained different natural phenomena.

‘I . . .formed the notion about lesson planning and long term planning based on the structures of poetry. The notion being that if you’re recounting an epic poem and you’re in the oral tradition you need some kind of structure in order to remember so it helps you remember things and helps you find out when you’ve forgotten something ‘

He found that initially his pedagogy met with some resistance from the students. Rather than management telling him that he had to meet performance targets, his students were concerned about examination performance. All very well being introduced to history and philosophy of physics but why were they studying content outside of the examination specifications? And, in any case, what *was* the right answer? Don understood the tensions and tried to meet their objections. His role, he explained to them, was to deepen their knowledge and understanding of physics. It was also to ensure they passed the examinations. But the pedagogic register for these two processes was not necessarily the same.

‘I mean one of the things is going to the kids and saying look this isn’t education, this is passing exams. . . . And you have that notion of a passport out is important to them but you have to be clear with them particularly if they are doing sciences or engineering subjects actually if they’re to be successful, understand something about what it is they’re doing, the pieces of paper at some stage won’t get them very far . . . The degree to which I’m disingenuous even around that that because actually I think fundamentally what I’ve always been interested in is understanding the world, and allowing people to understand the world in which they live, which is not just about a job but actually make sense of the world in which they find themselves . . . ‘

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Making ‘sense of the world’ is a deeply philosophical point, difficult to make explicit in the school science curriculum. Don also understands that there are inherent contradictions in opening up topics for discussion

‘. . . It is quite difficult with a number of kids, . . . where religion is important when you start to come across those deeply philosophical things about the nature of being, you can end up, and I have ended up in difficult situations. They can ask questions which you answer honestly which they don’t like the answer to, God, how old the Universe is, what you think about evolution, all those things are problematic. I’ve had discussions about the nature of prayer and things. Through a number of those discussions, understood to be handled quite carefully if you’re not to make the kids think you’re not another oppressor. You are in a position of power and if you don’t acknowledge your power position what appears to you to be honesty can actually rebound . . . I think certainly in the past few years I’ve been really clear with kids about talking to them about why it is I’m teaching them the way I’m teaching them and engaging them with that. I try not to burden them. I find that quite helpful.’

#### Concluding thoughts on a socially just science

I have told part of the stories of Emma, Sally and Don because through them I recognise my own hopes and contradictions. There are commonalities between them. Emma demonstrates to the young people she teaches that scientific knowledge can lead us to understand connectivity as a natural reality as well as the social *need* for connectivity. Although Sally’s pedagogy is different from Emma’s she also recognises the way in which knowledge can empower, for example, the need to lessen the pain of sickle cell anaemia. Her emphasis on integration and collectivity also reflects the importance of connectivity from a pedagogic perspective. Don helps his students see the multiplicity of ideas (often reflected through the tensions he feels as a teacher) – as opposed to a monologic epistemological hierarchy – which constitute what it is to know. How the teachers achieve their aims is mediated by the institutions in which they work, and these are moulded by broader political influences and norms. In Don’s case the institution is enabler whereas Emma’s and Sally’s agencies are partially stifled. But what these three practitioners share is the way in which science knowledge is geared to social justice where the ideas of ‘connectivity’ and ‘multiplicity/plurality’ shine through.

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