THE USE OF NARRATIVE IN SUPPORTING THE TEACHING OF SOCIO-SCIENTIFIC ISSUES: A STUDY OF TEACHERS' REFLECTIONS

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Abstract

While narratives which integrate aspects of human consciousness can be a powerful instrument in teaching and learning about socio-scientific issues, the science curriculum offers unfruitful grounds for the development of narrative in school students. Learning science and learning about socio-scientific issues are epistemologically distinct activities. The way teachers across the curriculum use narratives suggests that an interdisciplinary approach might be more effective for teaching these issues, particularly where narrative plays a core role.

Key Words: Narratives; Socio-scientific issues; Pedagogy.

Resumo

Apesar das narrativas que integram aspectos da consciência humana poderem constituir um instrumento poderoso no ensino e na aprendizagem sobre questões sociocientíficas, o currículo de ciências oferece pontos de partida pouco frutíferos para o desenvolvimento de narrativas pelos alunos. Aprender ciência e aprender acerca de questões sociocientíficas são actividades epistemologicamente distintas. A forma como os professores de diferentes áreas do espectro curricular utilizam as narrativas sugere que uma abordagem interdisciplinar poderá ser mais eficaz para o ensino destas questões, particularmente onde a narrativa ocupa um papel central.

Palavras-chave: Narrativas; Questões sociocientíficas; Pedagogia.

Introduction

My aim in this article is to present an argument for the explicit development of narrative skills and content in teaching about controversial socio-scientific issues. Controversy implies disagreement where, in a democratic and open society, contending parties need to understand as objectively as possible the claims made by their adversaries (Dewhurst, 1992). People will need to understand the kinds of experiences that individuals have had which might explain why they hold the views they do. Narratives and stories are the best ways to convey such personal experiences. Bruner (1996), for example, contrasts and complements two modes of thought which seek to convince interlocutors, in other words to give validity to claims: one is the logico-scientific mode which deals in general causes and their establishment, and tests for empirical truth, and the other is the narrative mode which seeks to validate experience through verisimilitude, that is, stories of lifelikeness. Anecdotes, for example can provide the bridge between people's personal accounts – local knowledge in the form of evidence – and 'expert' science (Tytler et al., 2001). In presenting my argument I shall:

- Describe what I mean by narrative;
- Identify problems in deploying narrative in socio-scientific issues; and
- Exemplify and map the possibilities which emerged from a research study on the teaching of socio-scientific issues.

Towards a Description of Narrative

The word 'narrative' has its roots in the Sanskrit, *gnarus* (knowing or wisdom) and the Latin *narro* (relate or tell). In medieval times, *joculatores*, which forms the Latin root of the English 'joke' and the Spanish word 'toy', were popular street storytellers. Wisdom and frivolity are thus associated with the narrative story. Narrative not only conveys what is known from narrator to interlocutor but is expressly dialogic and performative – for narratives to be effective narrators have to 'speak' to their audience, to meet the needs of addressivity, constructing the narrative so that it has resonance for the interlocutors (Kubli, 2005).

At one level narratives organize experience and make it comprehensible through a

sequence of events. From the *Shorter Oxford English Dictionary* narratives are accounts 'of a series of events, facts, etc., given in order and with the establishing of connections between them' (OED). From this definition any connected series of events conforms to a narrative. Thus 'Molly dropped her doll and it smashed into pieces and then she cried' is a narrative story. In characterising personal narrativity, Fludernik (1996) foregrounds human consciousness, emphasizing 'the representation of experientiality' (p.28) as central to narrativity where the protagonist is goal-oriented, encountering obstacles on the way and reflecting on their experience as 'emotionally charged remembrance' (p.29). A three part schema of 'situation-event-reaction to the event' represents experientiality in which the narrator becomes morally self-evaluative (White, 1981) and accountable (MacIntyre, 1981). In the short story above the situation is that Molly is carrying her doll, the event is that the doll drops and shatters and Molly's reaction is to cry. This story is a basic example of the three part schema although the reaction to the event fails to meet the criteria of moral self-evaluation and accountability. My point is that the narrator is purposive and reflective when constructing the narrative in a structured series of events.

Problems and Narratives in Science

Everyone enjoys a good story. We identify with the characters, and wait breathless as the plot unfolds, exposing the weaknesses and redeeming strengths of the hero until the story reaches its climax. Besides literature, the social sciences and humanities incorporate narratives into their curricula (Bage, 1999; Connelly and Clandinin, 1990; Hawkey, 2004) because an important objective of studying these subjects is to account for human action. Despite a case being made for accounts of the human side of science in pedagogy (Barker, 2002; Rosen, 1987), literature in different genres (Galvão, 2006) such as science fiction (Reis & Galvão, in press), drama (Ødegaard, 2004) and games (Hipkins, 2004) narrative stories have rarely featured in the science curriculum. Where they have featured they have often recounted a series of events in which human interest is marginal or where the human is merely been a cipher to carry the action along.

Salters Advanced Chemistry is an academic course for post-16 students which differs from other post-16 courses in science in having a strong contextual element and 'Chemical Storylines which form the backbone of each unit' (Burton, et al., 1994) (p.1). A number of stories make up the first chapter, the *Elements of Life*, the first two being *An*

iron story and *Susan's story*. *An iron story* describes iron atoms carrying out 'a vital role' (p.4) as party of the red blood pigment haemoglobin, explaining how iron helps haemoglobin to function as an oxygen-carrier and why smoking prevents haemoglobin from carrying out its function effectively, concluding with an account of the test blood donors have to take to check for iron deficiency. While this account contains a human context – smoking is harmful, becoming a blood donor – there is very little correspondence to the characterization of narrative in terms of the three part schema. Iron atoms are ostensibly the protagonist: the situation is that they form part of haemoglobin, an event takes place in which their function becomes inhibited by carbon monoxide molecules becoming attached to haemoglobin but there is no moral evaluation of the event by the atoms or by humans. *Susan's story* looks more promising: there is a photograph of a young woman who works as an analyst. Susan gives an account of the analysis of a blood sample which is a series of technical procedures concluding that 'the results of my tests and those done by my colleagues are then sent back to the patient's doctor. I also have to send a reminder to the patient to go and see the doctor if they require any treatment as a result of having the tests carried out' (p.5).

In pointing out the lack of human consciousness, moral evaluation and reflection I do not want to dismiss the value of these 'stories'. They more than adequately serve the purpose of contextualizing the subject matter – in this case iron as an element – and give a sense of purpose to studying the topic of elements in chemistry. But the lack of personal narrative dynamics is down to the ontological distinctness of science (Donnelly, 2002), whose content comprises, for example, atoms, probabilistic effects, forces at a distance. Science works because of its instrumental and predictable nature (Donnelly, 2004); study of the material world cannot encompass that personal reflexivity so intimately associated with the humanities. While values, such as honesty, integrity and objectivity are intimately associated with doing science and with the role of science in society these values are contingent, and not intrinsic, to the study of science (Donnelly, 2004). Attempts at humanizing the sciences as demanded by a narrative structure incorporating human consciousness might be doomed because of epistemological incompatibility.

Norris et al (Norris *et al.,* 2005) researched the use of narrative as a learning device in a study of explanations intrinsic to science. They suggested that argumentation and exposition might be more productive genres than narrative for learning science because

they more closely reflect science's learning requirements. If narrative stories present problems in learning about those concepts intrinsic to science is there a more optimistic outlook for the use of narrative in teaching and learning about socio-scientific issues?

The Nuffield 2000 report which proposed reforms in science education in England, states:

> *"young people acquire a broad, general understanding of the important ideas and explanatory frameworks of science, and of the procedures of scientific inquiry, which have had a major impact on our material environment and on our culture in general, so that they can ... feel empowered to hold and express a personal point of view on issues with a scientific component which enter the arena of public debate, and perhaps to become actively involved in some of these* (…)*"* (Millar & Osborne, 1998)(p.2012).

The model of teaching socio-scientific issues which emerges from this statement is one where authoritative, established scientific knowledge informs personal points of view on 'issues with a scientific component'. Conceptualising that space where scientific knowledge diffuses into social and political interactions influences the possibilities for narrative. If science is sharply compartmentalised from, and dominant to, the arenas in which socio-scientific discourse occurs then the narrative dynamics which reflect human consciousness and moral reflection are likely to be inhibited. On the other hand, if layers between academic science and society are broken down, the relationship between science, technology and society becomes heterogeneous and diffuse. Science then has no particular cognitive authority and science policy is played out in public spaces in which science is contested and there are multiple and differentiated interactions between interested parties and scientists (Nowotny *et al*., 2001). In other words the possibilities for anecdotes, personal testimonies and narratives open up. Discourse in socio-scientific issues comes to reflect struggles for social justice and an understanding of power relations (Hodson, 1999).

> *"Narrative art has the power to make us see the lives of the different ... with involvement and sympathetic understanding, with anger at our society's refusal of*

visibility. We come to see how circumstances shape the lives of those who share with us some general goals and prospects." (Nussbaum, 1997)

In making this comparison between two different conceptions of science in society I should not be understood as implying that one model is superior to another. Schools are instruments of socialization and learning science is often a matter of learning the tools of a powerful, progressive and established knowledge, particularly for young people. What I am suggesting is that those skills which might be most effective for teaching the underpinning concepts of established science curricula are not at all suited for the pedagogy associated with socio-scientific issues. It is not surprising therefore that science teachers find it difficult to run discussions on socio-scientific issues (Bryce & Gray, 2004; Osborne *et al.,* 2002) whereas their counterparts in the humanities and social sciences have more confidence in discussing such issues (Levinson, 2001). If narrative can help to illuminate socio-scientific issues which involve controversy what might that look like in the school classroom?

The Research Study

To find out how teachers approach the teaching of controversial socio-scientific issues, 83 teachers were interviewed across a range of subject areas in 21 schools in England and Wales. Interviews drew on teachers' experiences in interpreting what teaching socio-scientific controversial issues meant to them in the context of their schools and classes (Gubrium & Holstein, 2002). The purpose was to map teachers' constructions of what it means to teach socio-scientific controversial issues. In each of the interviews teachers were asked:

- to exemplify any socio-scientific controversial issues they had taught to 14-19 year olds
- to describe the opportunities and impediments in teaching these issues;
- if there were any school policies known to them on the teaching of controversial issues;
- if there was interdepartmental collaboration in teaching these issues;
- if there was any professional development and resources they would benefit from;

- if there were any points they would like to clarify.

Themes were derived inductively through iterative coding and then operationalised by deriving empirical indicators from teachers' statements (Wengraf, 2001). Inter-coder reliability was based on making assumptions explicit in mapping themes through the empirical indicators to teachers' statements. Thus, the theme of the role of narrative in socio-scientific issues was based around indicators such as 'stories', 'narratives', 'personal experiences'. Sub-themes emerged under narrative such as 'literature', 'oral narratives (teachers)', 'oral narratives (students)', 'oral narratives (others)' and 'narrative strategies'.

This study looks at how teachers' construct meanings of narratives in the context of their own practice and then goes on to discuss the implications for using narrative accounts in controversial socio-scientific issues.

Teachers' Constructions of Narrative in Socio-Scientific Issues

Literature

Teachers used narratives in diverse ways: through a range of contexts, forms (written, oral, visual), agents (teachers themselves, students, visitors, parents) and purposes (promoting discussion, raising awareness, illustrating dilemmas, increasing understanding). Literature provided a fund of narratives but these were drawn upon almost exclusively by teachers of English who were adept at finding socio-scientific themes in a range of texts, often for the purpose of promoting discussion and discursive writing.

> Extract 1
> *"*(…) *there is a wonderful passage in there [Brave New World] that I very often use which is actually training the babies, the alphas, the betas, the gammas, some of them are trained to like books. The gamma babies are given an electric shock every time they touch a book"* (G/English/Head teacher)[1]

> Extract 2
> *"(…) nature/nurture would also be taught through* (…) *Alexander Pope's poetry, the idea of the formal garden and the ability to organise life and the garden as a symbol*

[1] (School identifier/subject taught/position in school, if any).

of organising life. So I am trying to link them to specific texts (…) *because we don't tend to teach issues, we tend to teach a novel or a play or some verse and from that the issues will arise* (…)." (E/English/Head of department)

Extract 3

"With the introductory work we do for Frankenstein (…) *I use a short story, which is called "thunderbolt" which she sets in the future and she talks about a few of these things. She perhaps doesn't name them, but the genetic engineering and cloning ideas are definitely there. And we talk about this short story in relation to "this is what we think's going to happen in the future" and 'Do you think this is going to happen? Do you think we're going to be able to clone people? Take this back 50 years. Do you think 50 years ago we would have thought we'd have this, this and this?' And I put it to them that it's frightening. I tend to use the idea 'Do you not find this scary, or is it thrilling or exciting?' So they begin to have an idea from that point of view: Does it worry them, does it concern them that we could clone something like Dolly the Sheep. We might next clone humans, is that good or bad? And we start talking about it."* (J/English/Head of department)

In the extract below the teacher discusses how poetry and a film around the theme of war – eventually a nuclear catastrophe - can provoke not only rich discussion but opinions which take the teacher by surprise; a point that narratives can unlock opinions which broaden the discussion more than expected. Awareness and anticipation of issues that can be generated has then to be part of the teacher's repertoire – something in which teachers of English might have particular sensitivity and expertise.

Extract 4

"We do a war poetry piece in year 10 where we compare 'The Charge of the Light Brigade' which is a very cruel war, written by Tennyson, (…) *with Wilfred Owen's 'Disabled' which is very anti-war and they come up with the most surprising things. We do a role-play, we do a radio interview with the man from Disabled, you know, 'would you do this now?'* (…) *and you listen to the media you'd assume that no young people would ever go off and fight for their country, but it is amazing how many of them – because I always assume because the man from Disabled is so badly damaged because of the first world war in that he's armless, legless, that I*

think 'Oh no I'd never do that' – and yet a lot of them think it'd be an honour for them to go and fight for their country. And that generates a lot of quite interesting debate. We also do – do you remember that Barry Hinds film 'Threads' about the outcome of nuclear war – we've been reading Children of the Destiny – just to get some creative writing, which is where a nuclear bomb is dropped just outside Bristol, and then we show them this film Threads, which shows you the implications of a bomb being dropped on a medium-sized city, which is Sheffield, which is interesting because that's where the Full Monty was filmed (…)*. Because the language would break down when those threads that join society are no longer there – they say 'Why do they talk like that?' – I say 'because they don't need to think grand thoughts any more, all that matters is survival' – so all the language revolves around 'eat' 'take' 'give' – you know, there are few adjectives and adverbs in the language 50 years after the bomb, yet 'Children of the Destiny' gives a very different, very positive view of what would happen 50 years after: we'd all be mutants, better people – as you do."* (S/English/Head of department)

One teacher discussed the purpose of literature in controversial issues as a way of enabling vicarious experiences. This is a particularly important point because it helps students come close to understanding the protagonists' world in what it means to be confronted with a dilemma without the possible trauma of undergoing a particular experience themselves. Literature becomes preparatory and an important illustrative resource in teaching socio-scientific issues.

Extract 5

"As far as I'm concerned, literature has a huge moral responsibility. I also think literature enables you to explore experiences that you wouldn't necessarily have. Not every child is going to come up against this first hand. You might say "well they're bound to in other ways, like genetic engineering" but things like dementia or depression they may at this stage anyway feel they're not going to experience it, but when they do come to experience it, they may realise they've vicariously experienced it through literature. Or if they're trying to comfort or help someone else. That's what I hope they get out of it and think about it." (I/English/Head of department)

Personal oral narratives (teachers)

Discussion of controversial issues often prompted teachers to give accounts of their own personal experiences in the form of Fludernik's three part schema. Some teachers were very forthcoming and felt that giving these accounts generated a sense of empathy among the students so that they saw the teachers were 'human'. These accounts were often very frank, arose spontaneously and discussed mainly with students above the age of sixteen who had the maturity to respond sensitively. But the teachers recognised that not all their colleagues would be equally comfortable in being so frank.

Extract 6

"(…) *one discussion I had some time ago, both my parents died relatively young in their sixties, and the decision I had to make as the only child was the decision about the life support and you know before it happened, what would I do in that situation but Dr G mentioned quality of life, and there wasn't a grey area with me at all, I just said to the doctors well it's your hands, there was no quality of life, a phrase that we use in this area is "there is no coming in for us", in other words they're not going to become any better and if both my parents had lived they would have been virtually vegetative, but it sounds dramatic, it happened over a period of ten years it happened on two occasions and it was the easiest decision I've ever had to make."*

I: *"Did you share that with the group, is that what you're saying?"*

G: *"Yes – I don't know why that came up it might not have had anything to do with geography. It maybe sometimes you know, something happens and something triggers something off and you want to share something that you think, the kids, can relate to making a decision. I can't remember the context of it but you know it didn't take lots and lots of soul searching. I knew, don't ask me why, but I knew that that was the only decision to make. My wife was nursing as well and you know I did share that with them. I think it's important if you've got situation from your own life that you can share with the pupils and make it easier and they also see that you are human as well you're not a teacher the other side of the table, things happen to you."* (C/geography)

Extract 7

(…) *my mother suffers with depression and it's very clear that there's a genetic basis to that and I feel that, and kids are always quite startled when we talk about that kind of thing in class. We do, but I think that's a very personal bend from my teaching, you know there could well be a genetic basis for it and no organic treatment's going to give help here and because it is a bit of a taboo still isn't it?"* (E/Science/head of department)

Extract 8

"(…) *And I talked quite openly to sixth form (post-16 students), not so much to the lower, to the young kids but to the sixth form* (…)*. We always get, 'well what do you think?' - prenatal screening – I had an amniocentesis, why, well if it was disabled I would terminate and I'm very, I've been in tears talking to the kids in the past, but I've been up front with them because from my point of view, there's no point for me, standing there and giving them a verbal description of things without them realising that these are factors that directly affect how you actually feel. And* (…) *I discuss with them, the counselling procedures I was given, what my husband was given, what we then did together so that they get a broader view of what a 'normal' couple, what a couple have had to go through to have two healthy kids. After what twenty years of medicine and technology and what have you and the kids respond very well to that honesty and some staff, within the biology department, aren't so happy talking about that, so I go in instead, but that's the way our department works, if you're confident on one bit, like miscarriage, abortion whatever, you say well do you want to do that, so we sort that.*

(…) *I actually, I said earlier on, I have sat and talked to kids and I have had tears streaming down my face as I've been talking – and they've said do you want to continue and well might as well get it over and done with. Now I've started. And it makes them aware that you are human and the issues aren't just directly affecting the person. Well it's like the smoking issue isn't it – well if I get lung cancer so what – but I watched my Dad die of lung cancer, do you want your kids to do that?"* (E/biology)

Extract 9

"I find that I can get children interested by dropping in a bit about me and, in fact, my assemblies very often start with me or my family or what we did at the weekend, or what I listened to on the radio coming in; very often a lot of lies and I shall never get into Heaven but, as soon as the children think it's you, then they are interested. they think they are going to learn a bit of dirt. But it depends on the personal and some people are very embarrassed about that." (G/English/Head of School)

These personal accounts from adults were not only restricted to the teachers interviewed. They recognised they could draw on narratives from other teachers and from adults other than teachers.

Extract 10

"And I know there's a member of staff here who's had in vitro fertlisation and has got twins out of it. Now with their willingness I mean there's an ideal opportunity. And we have people with diabetes and all sorts of things." (F/Science/Head of department)

Extract 11

"A friend of mine belongs to a family where the women all carried the muscular dystrophy gene, and when I am talking about abortion and the girls in particular are saying 'oh, I could never abort a baby whatever', I tell them about J and the way her brother's muscular dystrophy just dominated their lives. It drove the parents' apart, it dominated J's childhood. She had quite a miserable childhood because, for the first sixteen years of his life, all the attention was on A., and she felt neglected as part of the family and therefore her decision was with each pregnancy she was tested and she got rid of every male child, and in the end adopted a boy. Now, by telling them that, generally speaking, I can get them to think. They might still not agree with abortion but I am using experience, I am telling it with some emotion, I suppose, and I can get them thinking. I use it because it was a success." (G/English/Headteacher).

Extract 12

"Visitors coming in, David O is a friend of mine and he worked on the Iona community, running the community there for a while and he came into talk about the

people who came from the innards of Glasgow over to the Island to work […] *he's the hardest heroin addict etc etc alcoholics and he described in a very lively way the kind of reception they get and the various reactions, and the pupils love that because here is someone who's actually done the real work as opposed to us talking about the work that these people do."* (C/English/Headteacher)

These extracts also serve to show that such narratives move students emotionally and that they respect 'true life' experiences. Extract 10 demonstrates a model of the three part schema: J's situation in her family in having a disabled sibling, the event of feeling neglected and her moral response to that event. This resource of personal experience provides a very useful exemplar because it allows young people to find out what are the human dilemmas associated with having a hereditary condition, however as pointed out in extract 7 this depends on the relationship between teacher and students, the maturity of the students and the confidence of the teacher. While narratives from the teachers and other adults are detailed and moving, there is also the question of generating narratives from students.

Personal narratives from students

Examples of personal oral narratives from students were far fewer and less detailed. As with the teachers most of these were generated spontaneously. Although accounts of these are short – only a few words – they do imply deeper personal conflicts: the girl coping with the clinically depressed father, the boy whose father has cirrhosis of the liver and the less painful but life-revealing contexts around social differences – usually between students and teachers - over meat eating, for example the girl whose grandmother makes 'rabbit stew'. Narratives were not only spoken. The science teacher from school F gives some insight into drawings about students' views of suicide.

Extract 13

"I had a girl whose father was clinically depressed – she hadn't told a soul, she was coping, well she wasn't, but she was trying to that came out and it made life so much easier – for her, for her friends who didn't understand what was wrong with her." (E/Biology)

Extract 14

"'What's liver disease then?' so I told him all about it, 'why did you want to know?', 'well my Dad's got cirrhosis and he's dying'. Yes, ok – let's go through this carefully then." (E/biology)

Extract 15

"I can't imagine eating it. Although some of them would eat rabbit and tell you it's lovely. 'My gran[2] *makes rabbit stew, miss' – so some of them still hunt for the pots really round here."* (S/English/Head of department)

Extract 16

"we've got quite a lot of artists who do Psychology and some of the pictures and things that they drew and the mental images and things that they have are quite shocking, you know. They did one when they did depression and it was all about suicide and, you know, not something that we deliberately venture into." (F/Science/head of dept)

The extract below is a poignant depiction of the use of narrative by a student in a delicate and sensitive situation. How the student deals with the anorexia of her friend eloquently demonstrates the complexity of the teacher's point: the ability to depersonalise an intensely personal and problematic moment through a narrative account.

Extract 17

"Well, the beauty of English (…) *is that you can discuss something without personalising* (…) *so that, for example, I remember a few years ago I actually had a girl in my class who was anorexic, and her friend was very worried about her. She delivered a speech talking about beauty without and beauty within, and peoples' perceptions of themselves, and did it matter. In fact, it turned out at the end to be a plea to this girl from her friend, but it didn't come over like that if you didn't want it to."* (I/English/Head of department)

Even with these short extracts there is enough to suggest that student narratives can be drawn upon to illuminate issues. There is insufficient evidence to indicate how these

[2] grandmother

narratives were deployed into the structure of socio-scientific issues. This is an area which needs considerable development.

Narrative Strategies

Teachers used a range of strategies, whether deliberately or not, to promote narratives in the classroom.

Role play

Extract 18

"We have got some role play material we use for the 6th form, particularly with the question of genetic screening for example, with adults and embryos, the implications, would you want to know if you'd got Huntington's?" (I/Science)

Use of case studies

Extract 19

(…) *one of the most useful ploys that we tend to use are case studies, so whether we're talking about famine in various parts of the world, we usually hone in on a particular family or individual and say right this is the kind of life this person is leading, this is how he can be helped, we can give someone help and then when the help stops they're in just as bad a position whereas if we give them skills then we can go away and they are self sufficient, that kind of approach."* (C/English/Headteacher)

Video diary as case study

Extract 20

"We've adopted a girl in Kenya who we send money to . . . as part of World Vision and then we get post cards back telling us what's going and little thank you cards. But if we get little mini video diaries – those little clips are very useful because they can see the person and we can work on what's concrete they obviously can see for themselves and I think that's very useful." (C/English/Headteacher)

Conclusion

In these accounts of the use of narrative in teaching socio-scientific issues it is clear that many of the approaches used are not the common fare of most science lessons. Literature is used by teachers of English to enable students to experience dilemmas from a distance, to gain an insight into what individuals in a controversy have to say without being involved themselves. This helps students to have a critical and objective distance. Teachers use their own narratives to model controversy, many of which arise spontaneously in the classroom. Spaces for spontaneous narrative accounts from both students and teachers proliferate where the subject matter is discursive. Although this favours humanities and the social sciences there are still opportunities in science as extracts 7 and 8 demonstrate.

While narratives are used to illuminate socio-scientific dilemmas there are no accounts which demonstrate how substantive science concepts such as ‘mutations’, ‘hereditary’ or ‘nuclear fission’ are integrated into these narratives or the use of evidence which, in diverse forms, is crucial to rational discussion of these issues (Gott *et al*., 2006). In fact much of the research from a public understanding perspective indicates that the kinds of concepts learned in the secondary school science curriculum are inert in discussions about socio-scientific issues (Drake, 2006; Layton *et al*., 1993; Ryder, 2001; Thomas, 2000). The research would support the premise that learning about socio-scientific issues is epistemologically very different from learning about science bringing in tow distinct pedagogies. This would entail drawing upon an inter-disciplinary programme involving for example the appropriate use of literature and lessons whose structures offered greater opportunities for the use of personal narratives and relevant evidence which are core to teaching and learning about socio-scientific controversial issues.

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