

Whose Interests Are Being Served in Cross-Cultural Science Teaching?

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I have chosen to address this question by writing a story, 'The Mission', that, I hope, will serve as a prompt for the reader to join in dialogue with others interested in the need for culture-sensitive science education. The writing of stories based in science education research is becoming recognised as a powerful way of stimulating critical discourse (Taylor, in press; Taylor & Geelan, 1998). Although The Mission combines fact and fiction, it is based on recent interpretive research on the teaching of science in Kantri, a South Pacific country (Giddings & Waldrip, 1993; Waldrip & Taylor, in press a, b), and on a call for a critical science education (Taylor & Cobern, 1998). There are two epistemic warrants for the story. For the character of Lapun, I have drawn on interviews of village elders to give the story authenticity and plausibility (*verisimilitude*; Adler & Adler, 1994). And to engage the reader in critical reflective thinking I have raised many questions and proposed no answers (*pedagogical thoughtfulness*; van Manen, 1990). Although I must admit to having fashioned some pointed clues.

The Mission Foreword

In the South Pacific, a chain of tiny islands make up the Melanesian nation state of Kantri. There are only a few high schools in Kantri, and these are located on the larger islands. Most of the teachers are Melanesian nationals, born and raised in the region, and a few are Western expatriots, on short-term government aid contracts. The official language of instruction is English. The following story focuses on Alex, an expatriot Australian science teacher in his first year at a residential high school known formerly as 'the missionary school'. The school serves the local Melanesian community, particularly village children from rural and remote islands for whom English is a second language. Most graduates of the school return to village life or seek employment in small towns; a select few obtain a government job or continue on to teacher training college or university located on the main island.

Alexander - The Great?

In his Grade 10 science classroom, Alex gazes at the class, waiting for them to finish copying homework instructions from the blackboard. The board is covered with his neat writing, the remnants of today's lesson. Alex has planned the homework as preparation for the next day's lab on Plant Nutrition. The class is to set up experimental plots to test the effect of various nutrient deficiencies on the growth of seedlings.

Alex is keen on 'applied science' and hopes that this hands-on 'agricultural' experiment will interest the students. In preparation, he has already germinated several pots of bean seeds that he bought in the gardening section of the supermarket when he and Sophie visited the (one and only) town on the island a few weeks ago, some 65 kilometres from the school. Going to town is a welcome cultural 'fix' that allows Alex and Sophie to buy various luxuries not available in the local community general store.

The 'nutrients' for the lab include magnesium sulphate, calcium carbonate, ammonium sulphate, potassium nitrate, and superphosphate, which Alex has found in the well-stocked science storeroom. This is a reliable teaching activity from back home, and Alex has learnt how to capitalise on common blunders that students make in setting up the experimental design. This time, however, one thing is causing him a little concern. The local soil is almost pure sand. Alex has never grown anything in sand; in fact, he's not much of a gardener, apart from mowing the lawn and raking leaves. Sophie had always taken care of their vege patch and fruit trees. In brief sortees around the island, he has noticed luxuriant village gardens full of exotic plants. And the school gardener, an old village man, seems to have a very green thumb; the school vege garden is flourishing and dozens of tropical shrubs and trees, many bearing fruit, have created an oasis of the school grounds. So, strangely enough, sand must be ok for growing plants.

The end-of-term government-mandated exams are not far off and Alex is determined to ensure that the syllabus has been covered in time for plenty of revision. He is very familiar with the content of the syllabus which was imported from New Zealand some 15 years ago. Waiting for the class to finish taking down the homework instructions, he gazes out of the window, catching sight of several chickens scratching in the mulch covering the garden beds. "It seems rather strange to be teaching science in this timeless place; or mathematics for that matter". "But I guess these kids need the opportunity for a better future, and a few, the brightest, will go on to careers in teaching and the public service". He had heard that many of these students carried the economic hopes of their village families; success at school meant a well-paid job and the prospect for the whole family of an improved standard of living. "Well, if this class is any standard", thought Alex regretfully, "there's going to be lots of disappointed families".

Turning his thoughts to the syllabus, he recognised how, regardless of where one was teaching, science itself remained a constant; except of course, for the way it is taught. Perhaps that's why he sought this posting; he was feeling a little stale after 4 years of high school science teaching in rural Australia. He knew the syllabus content inside out and he had achieved an enviable record in preparing senior students for the university entrance exam in Biology.

Probably the most stimulating event since he had started teaching was a one-day workshop on 'constructivism', a little over a year ago. Yes, there had been some theoretical waffle that had gone right over his head. Something about scientific knowledge being a fallible human construct didn't have much significance for him. And science not being a privileged way of knowing about the natural world kind of annoyed him. But what really appealed was the long list of student misconceptions discovered by science education researchers. And he had been really keen to trial some of the 'cognitive conflict' teaching strategies for detecting and remedying them.

Back at school in his junior science classes, he had experimented successfully with various questioning techniques aimed at probing students' understanding and inducing conceptual change. And he had come to see the value of small-group collaborative learning for promoting scientific inquiry, especially in the lab. After some early resistance, students had warmed to this new way of teaching. Yes, his teaching had certainly improved, especially if you looked at the exam results, once he had adjusted the questions to include an emphasis on conceptual understanding. Alex had become a committed constructivist! In fact, he had expressed his enthusiasm for acting as an ambassador for constructivism when he applied for this Australian-government funded overseas aid position. And the moment he arrived at the school he could see how much the moribund science department was in need of a constructivist approach to teaching.

But the going had been a struggle. Alex had soon found that Melanesian students maintained a strong resistance to anything other than chalk-and-talk teaching. It had taken weeks to establish the beginnings of the sort of informal teacher-student relationship that he preferred. Finally, the class had stopped standing to attention when he entered the room. But, even now, most of the students continued to call him 'Sir', and many studiously avoided eye-contact with him during class. He was constantly bemused when these same shy students greeted him enthusiastically from the other side of the street when walking to the general store. The few girls in the class were even more beguiling; they either were struck dumb or giggled inanely whenever he called on them to answer one of his probing questions. His first attempt at organising small groups was very disheartening. The girls refused to work with the boys; emotional resistance from both sexes was almost palpable. Once in groups, a disarming anaesthesia seemed to set in. To get anything happening Alex had to visit each group in turn and issue a set of procedural instructions. They seemed to respond best to the authority of the teacher; and were at their worst when offered opportunities for peer leadership. But Alex refused to be daunted. Although his teaching role was much more centralised than he liked, he continued to work on making inroads into students' resistance.

One of his colleagues, David, a national born and raised in Kantri, had counselled him to stick with a teacher-centred approach. On any day, when walking past other classrooms, Alex would witness the ultra conservatism of the teaching at this school. Silent classes seemingly paying strict attention to the teacher and copying notes from the blackboard. This regurgitative tradition seemed to fly blindly in the face of the school's history of mediocre national examination results. Alex soon found that other expatriot teachers who had been in Kantri for longer than he quite blithely attributed these results to the 'well-recognised fact' that Melanesian students generally lacked academic ability and self-motivation. He wasn't too sure that he agreed with this standpoint, but it wouldn't do much good for his social life if he disagreed. He was sensitive to his status as 'the new boy on the block'.

Sophistry?

"Not a constructivist in sight!", Alex complained one night to Sophie about a month after they had arrived. Sophie was usually very supportive of Alex, especially his aspirations to improve his teaching. But she was finding it increasingly difficult to muster the necessary enthusiasm. The social pressure of the expatriot community, especially the ladies social club that she attended twice a week, was increasingly weighing her down. The unwritten rules and regulations for 'expat' behavior (set down in invisible tablets of stone?) were policed in various none-too-subtle ways. Newcomers found that they were expected to adopt them as a charter for their tenure on the island. Only a brave or foolish few refused to play the game. Resist as she might, Sophie was unwilling to pay the price of public derision (excommunication, perhaps) for her cherished principles of independence and freedom of thought. Yes, she was used to the intellectual conservatism (and sometimes outright racial bigotry) of small town life back home, but this expat community made rural Australia seem like an exercise in social liberalism.

Having a genuine interest in other cultures, it didn't take long for Sophie to realise that the thing that really bugged her was the almost obsessive-compulsive concern of the expatriot community for reproducing its own Western cultural mores while, at the same time, directing a studied indifference toward the local Melanesian culture. There seemed to be an invisible wall between the two cultures, with little respectful exchange occurring. Sophie longed to learn about the Melanesian culture and she kept an eye open for opportunities. But this was not like Bali where traditional ceremonies are openly advertised and allcomers welcome. And even when she met the nationals with whom Alex worked, she encountered a reluctance to allow the conversation to move towards matters of Melanesian culture.

As Alex bemoaned the cultural norms of the school, Sophie thought how they seemed to mimic those of her conservative childhood when authority figures were to be obeyed unquestioningly. She was suddenly struck by the perverse idea that, in their roles as teachers implementing science curricula imported from a Western country, the nationals, themselves, might be deeply complicit in reproducing amongst the local children an indifference (or shame, perhaps) toward their natal culture. Although of village origin, was not this 'educated' elite acting (unwittingly perhaps) as agents of Western cultural imperialism? During their own schooling, had not they abandoned their own natal culture and made a one-way border crossing into Western ideas, values, and lifestyles? And, now as science teachers, were they not shepherding their own students along the same path, one whose destination (economic good fortune, it would seem) could be reached by only a very few given the limited resources of this country? What of the fate of the many students who returned to village life? How well prepared (educated? trained?) were they to adopt, once again, the values and practices of village life? And of what relevance to them would school science be with its Western concepts and ways of knowing?

At the same time, Alex's innovative teaching values based on his beloved constructivism seemed also to have a hollow ring. From what he had told her, his values did not seem to mesh well with the culture of the school. But wasn't it just a matter of different means for achieving the same end? Yes, Alex valued a very different teaching style, but didn't he share the school's primary goal of displacing students' natal culture with a Western scientific culture that was, for most students, of dubious everyday usefulness and perhaps of considerable cultural harm? Unless Alex's constructivism sensitised him to the students' cultural values then the best his teaching could achieve would be an indifference to Melanesian culture; at worst it might serve to delegitimise students' natal culture. "Perhaps", thought Sophie, "we expatriots have more in common with the nationals than I had realised. Perhaps we are both serving as insensitive agents of Western cultural imperialism? But, if that is the case, then where does one find authentic local cultural values as a standard against which to assess our actions? In the villages, perhaps?"

The only certainty that remained for Sophie after 3 months of living in Kantri was the terrible feeling that her own place in the world at large had become deeply problematic.

Authenticity?

In the school grounds Lapun pauses from his gardening. He has spent the morning topping up the mulch that covers the vegetable beds and circles the fruit trees. The chickens follow in his wake, excitedly scratching in search of tasty insects amongst the composted mix of seaweed, leaf litter, coconut husk, vegetable scraps and animal waste. This is Lapun's special mixture, one of the recipes he inherited from his father, at one time the chief gardner of the village.

Now an elder himself, Lapun has responsibility for nominating crop planting and harvesting times, and advising on places for creating new gardens and methods of maintaining old ones. He needs to have his wits about him, to keep an eye out for seasonal changes in the weather, for signs of plant diseases and pests, and to advise on crop rotation strategies and composting recipes. Now that his family has grown up he is able to find time for working his magic in the school garden, providing good, fresh food for the village children living there.

Peering upwards, he can tell that the tarcutta nuts are almost ready for harvesting, a favourite delicacy and a target for the children's throwing skills. "Hmm, time to remind the young kids not to try and knock them down." Lapun will remind the villagers that it is again time to tell the children the traditional story that knocking down the tarcutta nuts would cause the strong winds to start blowing; winds that could wreak death and destruction all over the island.

In the village, the young children will obey unquestioningly; they respect their elders. But times have changed and the older children are less likely to do so. They are lazy and don't want to garden or fish. He blames the school, as much as anything else, especially the high school. The children live here away from their families and learn white man's ways. "They lose respect for their own ways; they seem ashamed", is a common complaint of the villagers. He can understand the need for some of the village children to receive a white man's education. They can get good jobs and send money to the village. But who can teach the others the traditional skills needed to make a good living in the village? Certainly not the school teachers. They left their villages to go to school, and they never returned.

He recalled how he had gone to school and learned how to grow plants the white man's way. 'Agriculture', they called it. "We already knew how to garden, but they ignored our ways. They taught us to garden in the same place, but we knew we had to change the place where we gardened. When we go to a new place we cut everything down and build the new garden". His old friend Karsoon feels the same. They agree, the old ways are better.

But here in the school garden, by himself, Lapun has mixed feelings about what is better. Life is not as simple as he and Karsoon make out. The outside world is not going away; indeed, it is changing things in the village. Most houses now have electric lights and television. Laki's sons are using petrol engines on their fishing boats. Motorbikes are increasing. Western medicine is given out at the pharmacy. Fertilisers from the general store are being used for gardening. Plastic is used for so many things. At the last village meeting they discussed the problem of rubbish disposal; a lot of this new stuff does not rot; you can't put it in your compost heap. How to get a balance between the old ways and the new ways? Lapun glances across at the nearby science classroom. He can see the children busy copying notes from the blackboard and young Mr Alex gazing out of the window. "Shouldn't the school be helping them to find an answer?", he asks himself.

Reading the story

How might we make use of this story to think critically and creatively about the key issue of culture-sensitive science teaching? One way is to analyse critically the assumptions of the major protagonists. We could work out, from various theoretical standpoints, what might be 'wrong' with Alex's naïve (Eurocentric, paternalistic, masculinist, etc.) ideals about teaching science and reforming the culture of the school. We could elaborate a sympathetic understanding of Sophie as she struggles with her own cultural identity while trying to understand critically the historical barriers to realising a cultural sensitivity within the broader community. Or we could be critical of her sophistry, her tendency to over-theorise in the absence of a connected practice which might ground her critical idealism in the imperatives of pragmatic action.

Another (creative) way is to continue (re)writing the story. It is early days for Sophie and Alex. How might they move beyond their current struggles? What might happen if Sophie is given the opportunity to connect with the local culture as a participant in, say, a community development program? Perhaps the program is run by nationals who, themselves, are divided over how to account for local (competing) cultural values. And what might happen if Alex develops a working relationship with Lapun? How might his science teaching develop as he draws on the practical knowledge of the village elder? Is there room in Alex's science class for traditional stories as a legitimate way of knowing about the natural environment? Might Alex's teaching situate students' scientific inquiries in local cultural contexts? And what of the nature of science? Might the hallowed standard of scientific objectivity be cradled by the community's values for practical problem-solving?

I hope that this paper stimulates some vibrant discussion in this unique internet-based community of learning with its focus on culture studies in science education.

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