

## Imperial Knowledge: Science, Education and Equity

Kathryn Scantlebury, Elizabeth McKinley and Joce Jesson.

This paper was written as a contribution to a law and society symposium in the United States.

### Introduction

Imperialism is the practice, theory and attitudes of a dominating metropolitan center ruling a distant territory

(Said, 1994: 9).

Empire is a formal or informal relationship in which one state controls the effective political sovereignty of another political society. It can be achieved by force, by political collaboration, by economic, social or cultural dependence. Imperialism is the process or policy of establishing or maintaining an empire

(Doyle, 1986: 45).

Unlike the other contributors to the symposium, we are not lawyers. Nor are we Americans. Kate is an Australian currently living in the USA, Elizabeth and Joce live in Aotearoa<sup>1</sup> New Zealand. Our cultural backgrounds and identities are also diverse, Elizabeth is Maori<sup>2</sup>, Joce is Pakeha<sup>3</sup> and Kate is White Australian. The connecting thread is our commitment to feminism, and with that political agenda our activism through research, teaching and advocacy for equity in education, specifically - science education.

In Aotearoa New Zealand, Australia and the United States, there is a call for equity and excellence in science education. The equity focus is 'typically' to increase the

---

<sup>1</sup> Maori name for New Zealand.

<sup>2</sup> Indigenous peoples of Aotearoa New Zealand.

<sup>3</sup> Name given to non-Maori New Zealanders of mainly European descent.

---

numbers of people from under-represented groups (such as Aborigine, First Nations, African Americans, etc) into science<sup>4</sup> and to improve their achievement, retention and success compared to their White peers. Historically, the research addressing this issue is framed in terms of trying to help 'outsiders' into science. Researchers seek 'reasons', usually in the form of factors and/or attitudes originating in, and confined to, the excluded groups and individuals, to explain why particular groups are not in science beyond compulsory schooling. This research suggests that few underrepresented groups are in science for a variety of determinable factors and relatively fixable reasons. It is a research approach that raises several issues. For example, how are ideas of equity constructed in science education? Might we be able to re-conceptualise those ideas so groups of people are not viewed as deficient, or their identities, including race, class, and gender, are not 'additive' to each other? And how might we move society towards a commitment to implementing 'real' change?

An example from the USA provides an illustrative example. Over the past decade in the United States, the National Science Foundation (NSF) provided multi-year, multi-million dollar grants to 24 states and the Commonwealth of Puerto Rico to improve the teaching and learning of mathematics and science. Although the NSF solicitation for the statewide systemic initiatives emphasized equity and quality science education for all students, few of the statewide initiatives focused on urban education (Corcoran, Shields & Zucker, 1998). Yet, the need for reform is greatest in large urban districts which collectively educate 25% of school age students, 35% of poor students, and just under half of all minority children (Pew Charitable Trust, 1998). Even with policy makers' best intentions to promote change, why did the initiatives that addressed issues of equity not find their way into those very schools that educate large numbers of poor, minority students? Furthermore, how do such events reflect an imperial past and contribute to the production of ongoing imperial relations? These events, and the questions that emerge from them, support a growing worry in science education that the slogan 'science for all' is rhetoric and little is being done to make it a reality in the USA or other western countries (Jones, 2000, Krugley-Smolka, 1995).

---

<sup>4</sup> Science in this context refers to science and science education.

We argue that science education remains inequitable because science and education are imperialistic entities. As well we draw attention to America's positioning as a global colonising force. In the next section, we will show how science education has worked to exclude 'Others'<sup>5</sup> from its discipline through 'what counts as knowledge'. The following section argues that science education is fundamental to the connection between the individual and/or group and a global economy, and that the links between culture, western science knowledge and globalisation have led to education policies being dominated by American philosophies. We then show how the current attempts to engage 'under-represented groups' in science education is not only inadequate but contributes to ongoing imperial relations. Finally we turn to research investigating 'forms of address' (Ellsworth, 1997) in classrooms in an attempt to give a more complex understanding of difference and pedagogy.

### **Edward Said's *Orientalism* and Science Education**

From a postcolonial<sup>6</sup> perspective, science education can be read as a technology of colonialist subjection in two intrinsically inter-woven ways. Firstly, it reproduces the objectivity and rationality of science as normative through claims to 'universality' of the values embodied in science itself. And secondly, it represents the colonised to themselves as inherently inferior beings.

Edward Said's (1978) *Orientalism* is a fundamental text in a critique of the structures of colonialism, such as education or the disciplines of academia. Said deconstructed a wide range of texts in order to question the various assumptions held by 'the West' about other societies and peoples that are maintained through institutional structures and accepted on individual, academic, and political levels. He argued that the 'Orient' is constructed by and in relation to Western identity. Further, he suggests that the

---

<sup>5</sup> 'Others' are people that the dominant group compares itself with, and draws their identity from

<sup>6</sup> Postcolonial is used in this article because it implies a discursive formation of identity and representation – a condition of being postcolonial. At the same time, it embodies a strategy. Post-colonial (with a hyphen) is the time period after a colony gained independence – a legal decolonisation – and implies some formal break. However for all colonies of an Empire this link usually continues in one or both forms. One form is the imperial artifact. For example England's Privy Council still holds a role as Aotearoa's highest court. The second form is the cultural and political domination left behind, often in the practices, minds and institutions of the former colony.

'Orient' and its subjects serve as a mirror image of what is inferior and alien or the 'Other' for the West.

Said focused on individual artifacts of culture, such as language, literature, history and society. He defined these artifacts as great products of the creative or interpretive imagination. Then simultaneously he showed them to be part of the relationship between culture and empire that shapes the social experience of those who are part of the imperial culture. Extrapolating this idea, it has been argued that the development and maintenance of all cultures that have a colonial history requires the existence of another and competing 'alter ego', that is, an 'Other'.

Education, including science education, is often used as a vehicle (both consciously and unconsciously) to educate the wider population of, and about, the 'Other'. A survey of policy text will show that there are several ways in which curriculum documents, including textbooks and classroom resources, can represent a 'politics of culture' (Apple, 1996). Curriculum policy is never a neutral assemblage of knowledge. The choice of knowledge taught in schools is not just about what to teach and what is worth learning because schools are the mechanism that society inculcates its values, standards, and expectations. For example, let us consider the question 'what counts as science in science education? In the United States, the National Science Education Standards of the National Research Council, ((NSES), NRC, 1996) are used by science educators as a guiding blueprint for what science is of most importance for children to learn<sup>7</sup>. However, Rodriguez has criticised the NSES because of its 'discourse of invisibility' regarding ethnic, gender and socioeconomic issues (Rodriguez, 1997). NSES is described as ethnocentric because ethnic groups, such as, African-American, Asian Americans, Latina/Latinos, and/or First Native Americans have been combined together under the phrase 'minority'. This practice ignores the fact that there are different equity and identity issues for these groups.

In Aotearoa New Zealand, the national science curricula portray the dominant Pakeha groups' knowledge and excludes most Maori knowledge as this is regarded as something which exists outside science and science education. The only knowledge in the science curricula that is recognisably Maori is that which is defined by 'Western'

---

science, usually in the form of context for the 'real' science to be taught. For example, hangi (a way of cooking in the ground using heated stones and water) is admitted to science education as a context because it can be used to teach about forms of energy, particularly heat conduction. Such curricula constitute what knowledge is worthwhile to be taught and learned in school.

In Aotearoa New Zealand, the recognised knowledge is deeply embedded in the colonial frame of the British Empire. It actively works against knowledge from a Maori worldview, or even the development of an authentic pakeha view. An example, 'ecological imperialism' (Crosby, 1986) introduced and planted fauna from Britain, such as ivy, sweet peas, weeping willows and primroses around schools in order to carry out the science syllabus. Sycamore seeds were specially imported to provide winged seed specimens to 'draw from nature' (Jesson, 1991). What counts as knowledge, the ways in which it is organized, who is empowered to teach it, and what counts as an appropriate display of having learned it, are all part of the ways that dominance and subordination are reproduced in society (Apple, 1996).

At the same time, school knowledge acts as a source of identity because it is 'representing the best that is known and thought in a culture'. In this way, the knowledge 'taught' can interrupt the subjectivity of the colonial 'Other' through syllabus content, the exclusion or absence of knowledge, by internalising explanations from incomplete knowledge, and through the interpersonal interactions between student and teacher. When science knowledge from home is not recognised in the classroom students quickly learn that these places represent two different forms of identity, particularly if there are cultural differences between the two places. Going to the coast to gather seafood, or gathering 'weeds' from a garden or creek bed, to feed a large family is different from gathering seafood to observe and draw. These are lessons students learn from their science classes and fieldtrips. They learn that knowledge from school is not about their experiences and who they are. For the students to achieve they must absorb 'the lesson of the master'. As a result, and if they

---

<sup>7</sup> As curricular decisions are a local not national responsibility, there is no consensus across the USA's 16,000 school districts as to just what actual science education should be taught.

have learned their lessons well, this internalization enables the colonised to speak as if they were the imperial speaker rather than the subjectified colonial.

Feyerabend (1991) has raised concerns about the cultural nature of science itself and in particular the connection between culture and western knowledge. This has become material in the science that is constructed as anthropology.

And so a story is told that no indigenous person is likely to understand though it is a story not only about them, but about the way in which an initially ignorant stranger experienced their life. Using abstract categories we might say that the anthropologist transforms impressions into knowledge.... we at once realise how culture-dependent this so-called 'knowledge' really is (Feyerabend, 1991: 143).

The construction of science as imperial knowledge thus becomes the process of science education.

### **Education and the Global Economy.**

Currently education across the board is subject to various sorts of questioning. Calls for equity and achievement seek to reform mathematics and science education for all children. The focus however is either on the children or the schooling structures. Science education is a specific interest to us as it forms a particular role in the creation of a culture for a New World order, portrayed as the global economy. The National Science Foundation's (NSF) education mission statement illustrates this point.

The NSF's cohesive and comprehensive set of education and human resources activities addresses every level of education, including early career development. Stimulating quality science, mathematics, engineering, and technology (SMET) education is vitally important to ensuring a diverse, scientific and technical workforce, as well as a citizenry capable of mastering the scientific and technological concepts and skills needed by workplace,

social, and home environments that are characterized by increasing technological sophistication (NSF, 2000).

Science as curriculum, that is, science education, thus promises riches and access to power, both for individuals and for countries. Mathematics, technology and science education are linked together as an un-considered holy trinity of success. Yet neither the culture of the global economy, nor the science which is constituted in it, is able to be examined as containing culture. At the same time, as the words of the NRC statement show, science education is not about equity it is about global competition.

In addition, concerns regarding economic competitiveness stress the central importance of science and mathematics education that will allow us to keep pace with our global competitors (NRC, 1996: 1).

Science is there in Said's words 'as the marker'. Science marks the culture of the economic competitiveness of the internet, of technology, of the entrepreneur, of capitalism's values. It produces a rational objective system that is above dispute. Science holds out this promise of riches and the better life for all in the global economy.

Americans agree that our students urgently need better science education. But what should they be expected to know and be able to do? Can the same expectations be applied across our diverse society? (NRC, 1996: 4).

Statements like this seek a goal of reaching a standard scientific literacy for all citizens. Yet when these ideas are unpacked what we seem to have is what Marx called the law of Moses and 'the profits' clothed in the cultural accoutrements of America. There will be winners in the economy because there are losers. Science education links the ideal competitive aims with those of the World Trade Organisation (WTO). The opening up of China through the WTO is about creating a global economy through creating more markets in which to sell products. Everything in this

economic system has a value that is related to a price. The culture that is being developed is thus a culture of the market commodity. The division between science and culture is therefore rendered invisible because the culture of global success is through science.

Education strategies for equity have, at the first level, focused on a changed pedagogy. The informal, home-based understanding of the natural world and of numbers is transformed through the formal contexts of the classroom. Through programs like the NSF, schools are now being urged to help students to make connections between their informal learning and the classroom. Programs are being developed which emphasise experiential learning, drawing on the communities in which children live in order to help them go beyond textbooks and develop real understanding. We are somewhat in support of these aims. Yet at the same time the social divisions, which segment these communities, are ignored, as is the purpose of the science education. Is it sufficient to see education as simply the benign and neutral transmission of these various selections from the culture to form part of the curriculum?

The discussion of the positive and negative consequences of both the process itself as well as the content of education is what is being critiqued. From a postcolonialist perspective we focused on the imperialist creation of a culture and will continue to raise questions as to what we are doing.

### **Science Education, Culture and Equity**

Recent debates in the field of science and culture concern the way that science education should respond to cultural diversity, especially the presence in science classrooms of non-Western, Indigenous and minority group learners. While some authors (Good, 1995, Loving, 1995) have argued that since science is universal the concept of 'multicultural science' is problematic, other authors believe that indigenous and minority groups have their own knowledges which can contribute to scientific understandings and, hence, science education (Christie, 1991, Ogawa, 1997).

In the literature about culture, science and science education, a number of avenues are currently being investigated over the participation and achievement of marginalized groups in science and science education. In particular, these papers tend to address issues of either knowledge or pedagogy. However, we find that both these avenues have tended to incorporate the idea of 'managing' the 'Other' in the classroom through learning about the 'Other's' 'cultural knowledge and ways'. We argue that this is not satisfactory in trying to address the historical and social power relations that exist between social groups in classrooms.

A body of literature questioning 'knowledge' in school science curricula and 'what counts as knowledge' is starting to emerge in science education. It has the potential to question school science and science education. Indigenous populations, such as Maori in Aotearoa New Zealand and the Yupiaq in Alaska, or Aboriginal people in Australia, see the school curricula as a potential means of revitalizing their language and/or for reproducing their cultural knowledge. At the same time, such changes start to question the cultural knowledge that already exists as the content of school curricula.

The literature surrounding 'culturally relevant pedagogy' has been influential on science education. Building upon the assumption that teachers possess specific understanding about pedagogical issues, Ladson-Billings (1994) has suggested that successful teachers of African-American students shared specific and unique

characteristics. These teachers provided a culturally relevant pedagogy for their students.

Culturally relevant pedagogy involves students in knowledge construction. Also, it requires that teachers have high expectations and academic standards for their students, and engage them in a critique of society's racist, sexist, and elitist social structure. For African-American students culturally relevant science pedagogy includes students' constructing knowledge about science and its culture, as well as developing the skills they need to succeed in this field of study. Culturally relevant science pedagogy thus acknowledges that scientific discourse, the enacted school science curriculum, and confidence in their ability to construct scientific knowledge, may not be part of students' culture. Culturally relevant science teaching places value on the learner's experiential, as well as theoretical knowledge. In this pedagogical approach, teachers assist students in transcending the culture borders between their personal lives and school science.

Sherene Razack (1998) sends a note of caution about any view of relations between dominant and subordinate groups that is unmarked by histories of oppression. She argues that without history and social context, problems of communication come to be seen as 'technical glitches'. They are only seen as misunderstandings that arise because the parties are culturally, racially, physically, mentally, or sexually different. Moreover, without an understanding of how responses to subordinate groups are socially organized to sustain existing power arrangements, we cannot hope either to communicate across social hierarchies or work to eliminate them. The implication is that teachers from the dominant group can learn how to 'manage' 'Others' in the classroom according to some 'cultural' rules. This technical approach, i.e. dealing with 'Others' through a variety of pedagogical 'tricks', is becoming prevalent in education. For example, cooperative learning, girl-friendly science, and the use of myths and legends are used for introductions to the 'real' science. The pedagogical tricks infers that one just needs to 'learn the culture' to intervene 'appropriately' and accommodate culturally different or gender-specific styles of learning. It is thus implicit in the creation of the imperial 'Other'.

What makes the 'managed' approach completely inadequate is its emphasis on cultural diversity often descends to a superficial reading of differences. The pedagogical approach can reinforce an epistemological cornerstone of imperialism, that the colonised possess a series of knowable characteristics and can be studied, known, and managed accordingly. It also has the danger of limiting student experiences or inferring negative characteristics about ability. In contrast it is important to note that culturally relevant pedagogy does emphasise the cultural context of teaching and learning.

### **Final Thoughts**

Some recent postcolonial literature focuses on the understanding of the relationships and interactions between different groups. Cross-cultural interactions is an area traditionally ignored in the research regarding 'under-represented' groups in science education. Christine Sleeter (1993) argues that the adoption of 'cross-cultural' strategies does little to ensure that white teachers in the USA will view their Black and Asian students as capable of the same level of achievement and range of desires as their white students. Alison Jones (1999) suggests that the call for 'cross-cultural' dialogue in Aotearoa New Zealand is a reassurance at a 'postcolonial' juncture when Pakeha [Western] cultural dominance is not so taken-for-granted: a reassurance that the dominant group [White/Pakeha] are part of a scene of redemption, not the unfashionable colonizer or oppressor in the textbooks. She continues....

Through being good, open, loveable partners in the liberal social economy we seek liberation, through hearing you, through your dialogue with us. Touched by your attention, we are included with you, and therefore cleaned from the taint of colonization and power that excludes (Jones, 1999: 314).

Furthermore, she argues that in an entanglement of benevolence, desire, and colonization, liberal and radical dominant groups [White/Pakeha] have to engage in learning of their (and our) own histories and social privileges in relation to ethnic 'Others' which will require embracing positively an acceptance of ignorance of the

‘Other’. What such work has begun to show us all is that we must come to a better understanding of how our classrooms operate and at the same time be able to ‘view it from its own shadows’ (Ellsworth, 1997: 194).

We end with a series of questions. Can we as educators be comfortable with straying into an alien but uncannily familiar shadow cast by ourselves about teaching and learning? Can we as educators afford not to subject ourselves to such cognitive disjunctures? Things have been happening behind the teachers' back for far too long. Can we bring ourselves to face them without turning our back to the (en)light(enment)? Ellsworth suggests that in order to 'turn our back' we must reach out into other disciplines of knowledge and practice what is 'foreign'. This will ‘breach the circle of education in the name of becoming educated about what the field of education itself prevents us from thinking and seeing’ (Ellsworth, 1997: 195). The problem is not about finding things out and incorporating them into our understanding of teaching to make it more correct. It is about tracing the limits of our knowing and breaching them from within. It is in effect about subjecting science education to a scientific analysis.

Comments welcome

j.jesson@ace.ac.nz

## References

- Apple, M.** (1996). *Cultural Politics and Education*. New York: Teachers College Press.
- Christie, M.** (1991). Aboriginal science for the ecologically sustainable future. *Australian Science Teachers' Journal* 37 26-31.
- Code, L.** (1990). *What Can She Know? Feminist Theory and the Construction of Knowledge*. Ithaca, NY: Cornell University Press.
- Corcoran, T. B., Shields, P. M., & Zucker, A.** (1998). *The SSIs and professional development for teachers*. Menlo Park, CA: SRI International.
- Crosby, A. W.** (1986). *Ecological imperialism: the biological expansion of Europe 900-1900*. Cambridge: Cambridge University Press.
- Doyle, M.** (1986). *Empires*. Ithaca: Cornell University Press.
- Ellsworth, E.** (1997). *Teaching Positions*. New York: Teachers College Press.
- Feyerabend, P. K.** (1991). *Three Dialogues on Knowledge*. Oxford: Basil Blackwell.
- Good, R.** (1995). "Comments on multicultural science education." *Science Education* 79 (3,): 335-336.
- Irvine, J. J. & York, D. E.** (1995). Learning styles and culturally diverse students: a literature review. In James A. Banks & Cherry A. McGhee (eds) *Handbook of research on multicultural education*. New York: Macmillan Publishing, 484-497.

- 
- Jesson, J.** (1991). New Zealand Science Curriculum and the British Connection, in: B. Bell. (Ed) *SAME Papers*, Auckland: Heinemann.
- Jones, A.** (1999). "The Limits of Cross-Cultural Dialogue: Pedagogy, Desire, and Absolution in the Classroom." *Educational Theory* 29 (Summer): 299-316.
- Jones, L** (2000). *Science education for all? Examining Connections/Disconnection Between Theory and Classroom Practice and Finally Moving this idea from Rhetoric toward Reality*. Symposium presented at the National Association of Research in Science Teaching, New Orleans, LA.
- Krugley-Smolksa, E.** (1995). "Cultural influences in science education." *International Journal of Science Education* 17 (1): 45-58.
- Ladson-Billings, G.** (1994). *The dreamkeepers. Successful teachers of African American children*. San Francisco. Jossey-Bass.
- Loving, C.** (1995). "Comment on 'Multiculturalism, universalism, and science education'." *Science Education* 79 (3,): 341-348.
- National Research Council (NRC).** (1996). *National Science Education Standards*. Washington, DC: National Academy Press.
- National Science Foundation (NSF).** (2000). <http://www.nsf.gov/> 2000.
- Ogawa, M.** (Ed.) (1997). *Effects of Traditional Cosmology on Science Education*. Faculty of Education, Ibaraki University, Japan.
- Pew Charitable Trust.** Quality Counts. The Urban Challenge. Public Education in 50 states. *Education Week*. Washington, DC. 1998.
- Razack, S. H.** (1998). *Looking White People in the Eye*. Toronto: University of Toronto Press.
- Rodriguez, A. J.** (1997). "The dangerous discourse of invisibility: A critique of the National Research Council's National Science Education Standards." *Journal of Research in Science Teaching* 34: 19-37.
- Said, E. W.** (1978). *Orientalism*. New York: Knopf.
- Said, E. W.** (1994). *Culture and Imperialism*. New York: Vintage Books.
- Sleeter, C.** (1993). How white teachers construct race. In McCarthy, Cameron & Crichlow, Warren. eds. *Race, Identity and Representation in Education*. New York: Routledge, 157-171.