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## **TEACHING FOR DIFFERENCE IN VET: LEARNING AND WORKING TOGETHER IN MATHEMATICS**

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*In this paper I will address from theoretical and practical perspectives the issues associated with working in different communities of practice that constitute VET teaching arenas. Further, local sites of teaching and learning are uniquely constituted by the ontogeny of each of their participants embedded within more global socio-cultural forces which impact upon all vocational educational settings. I will draw upon personal experience of mathematics and statistics teaching, ranging from return-to-study access programmes to industry-based teaching to vocational diploma classes to discuss implications of difference for program design and delivery.*

### **Introduction**

One of the challenges facing adult and vocational education is to build a critically conscious society. In FitzSimons (1999/2000) I interrogate some of the many value-laden influences affecting the work of teachers in the Australian vocational education and training sector. I also argue that VET students are entitled to opportunities for personal development in mathematics — a mathematics education which respects them as people within the broader society and respects their ontogenetic development, both as workers and as more or less successful learners of mathematics. In this paper I will address from theoretical and practical perspectives the issues associated with working in different communities of practice that constitute VET teaching arenas. Further, local sites of teaching and learning, uniquely constituted by the ontogeny of each of their participants, are embedded within more global socio-cultural forces which impact upon all vocational educational settings. In this paper I will consider theoretical perspectives on teaching for difference and on mathematics as a cultural and social institution, reflecting on personal experience of teaching over two decades in the Australian VET sector.

### **What are the conditions of possibility for teaching for difference?**

Mohanty (1994) argues that pedagogical practices and their relation to scholarship should receive attention and acknowledges that sites of education are also political and cultural sites (e.g., Farrell 2000). She claims that pedagogies which focus on subjectivity “become more intelligible within an epistemological framework that begins by recognizing existing hegemonic histories” (p.148). This recognition applies not only to students but also supports teachers in their understandings of their own constitution in educational practices and institutions. However, she claims that challenging the dominant, normative discourses requires a broad-based transformation of the culture of the academy, including its relations with the state and other civil institutions — a prospect currently remote for the Australian VET sector. In addition she notes the need

to address seriously, even to theorise, the relations between knowledge and learning, and between student and teacher experience. As she observes: “teaching practices must also combat the pressures of professionalisation, normalisation, and standardization, the very pressures of expectations that implicitly aim to manage and discipline pedagogies so that teacher behaviors are predictable (and perhaps controllable) across the board” (p.153). With the infiltration of so-called ‘quality management’ discourses into the Australian VET sector these pressures are mounting.

Mohanty (1994) also notes that creating counter-hegemonic pedagogies involves a delicate balance between lived experience and textual and historical representations of that experience. Generalising from discourses related to racism to those of adult and vocational mathematics education I would add that, pragmatically, a balance must be found between the goals of the educator and those of the students. For example it is not always appropriate to impose one’s social and political agendas upon the very students for whom mathematics education represents a means of obtaining the cultural capital they lack for reasons outside of their own control and who have no intention of challenging its hegemony. Personal experience indicates that, surprising as it may seem to some, a three-hour mathematics class may represent an oasis of relative tranquillity and certainty in an otherwise chaotic, even brutal world. Even if it is ultimately to their own disadvantage, vocational students are generally resigned to the non-negotiability of their mathematics courses and have been known to object if they perceive a breaking of the didactical contract (Brousseau 1990) that they have come to know after so many years of traditional teaching. Pressures and expectations on teachers are not only exogenous to the classroom.

McLaren (1994, p.201) asks with respect to social justice whether teachers “have access to a language that allows them to sufficiently critique and transform existing social and cultural practices that are defended by liberals and conservatives as democratic?” Australian school mathematics teachers have a very limited lexicon when confronted with the topic of values, mathematical or social (Clarkson, Bishop, FitzSimons & Seah 2000), and it may be surmised that the case is similar for VET sector teachers — at least those who have had little to do with adult and community education. Arguing that subjectivities of both teachers and students are historically constituted discursive formations, McLaren suggests that teachers need to recognise the internal discourses that inform their rituals of practice as well as visions of the future. Although they are constructed as “functionaries within modern technologies of power” (p.212), this is not to say they cannot “foster and realize potentialities within the discursive and material conditions of their own communities” (p.212); they need to create what McLaren terms metacritical and relational perspectives, crossing borders into zones of cultural difference. It could be argued that workplaces represent zones of cultural difference for many mathematics teachers; this is not to ignore the importance of other sociocultural differences among the cohort of students in the Australian VET sector. However, under the current regime it appears that there is virtually no professional development specifically for vocational mathematics teachers, let alone that which might address any special needs groups or question the institution of mathematics itself, in order to begin to foster the metacritical and relational perspectives suggested by McLaren.

According to Giroux (1994), cultural politics of education needs to address representational practices that have discursive power to construct common sense and textual authority. Difference needs to be rethought and rewritten “in relation to wider

questions of membership, community, and social responsibility” (p.31). Here, rather than racial difference I refer to difference in ontogenetic mathematical development as a result of exposure to school systems of mathematics education, compounded by differences of gender, race, class, and so forth (e.g., FitzSimons 1994; Coben, O’Donoghue, & FitzSimons 2000); I also refer to difference resulting from infinite diversities of life and work experiences. Consonant with Bagnall’s (2000) exhortation to reclaim the construction of public image from the New Right, Giroux asserts that the Left needs to construct a new politics of difference, extending and deepening the possibilities of critical cultural work by reasserting the primacy of the pedagogical. In terms of contemporary rhetoric I interpret this as (re)gaining strategic control over the lifelong learning narrative.

In offering educators a critical *pedagogy of representation*, Giroux (1994) is calling for a critical pedagogy of public image formation both in the present as it creates, mobilises, and secures particular desires (e.g., lifelong learning) as well as enabling students to understand their own historical locations and social formations in relation to the ordering and structuring of dominant practices (e.g., the institution of mathematics) in order that they can produce and mobilise new forms of identity and agency. In terms of *representational pedagogies* Giroux suggests that beyond analysis of structuring principles, students learn to identify, challenge and rewrite such representations. Pertinent to mathematics education for adult and vocational students he advocates the discovery and recovery of hidden histories, “rewriting the relationship between identity and difference through the retelling of a historical past” (p.50). In terms of the new technologies of representation, Giroux asserts that educators need to help students understand their role in promotion in particular forms of cultural production, and to use them as part of a counter-narrative of emancipation, to make visible the unremarked categories of privilege — he was referring to whiteness as an ethnic category, but I refer to forms of cultural capital associated with mathematics education. In other words there should be an engagement with the social and political realities shaping the larger society, harnessing the technologies of power, while maintaining a self-critical attitude towards pedagogical practices employed. However, I believe that any attempt to introduce a critical pedagogy of mathematics into the Australian VET sector would encounter enormous resistance from vested interests in favour of the *status quo*, both institutionally and politically.

### **Mathematics as a Cultural and Social Institution**

Bishop (1994), discussing mathematical *enculturation*, notes that a principal assumption is that of cultural consonance; that is, learners are not expected to experience any conflict with a Westernised, mathematico-technological, society and its associated culture. He claims that this is “because of a general lack of understanding of mathematics as cultural knowledge, and a lack of awareness of any values underlying mathematical knowledge. For many people still, mathematics is culture-free and value-free knowledge” (pp.16-17). Yet, understanding mathematics as culturally-based knowledge, Bishop asserts that, in institutional settings at least, every learner experiences some degree of cultural conflict. In my experience, the cultural knowledges accumulated by workers in relation to mathematics are not only devalued by academically-oriented courses but may even be in conflict, in terms of methods at least. Two decades of mathematics teaching in the Australian VET sector indicates that curriculum and teaching have spanned a range of approaches identified by Bishop, from the traditional culture-blind view through assimilation of and accommodation to the

learner's culture (FitzSimons 1997), but have rarely moved into situations of genuine collaborative bi-cultural teaching between the academy and the workplace (or other community). Most claims that recent trends towards workplace-based learning are doing just this may be dismissed as spurious; Bagnall (2000) refutes claims made with respect to lifelong learning. By contrast, the work of *Workplace Learning Initiatives* (e.g., Sefton, Waterhouse, & Cooney 1995) provides examples of genuine collaboration.

According to Abraham and Bibby (1988), mathematics needs to be understood as a social institution, including developing an understanding of the human actions and commitments that give rise to major developments and an understanding of the role mathematics plays in structuring our experiences and judgements. They claim that 'everyday experiences' cannot be taken as the starting point (as in some ethnomathematical approaches) since they leave unasked the questions about the structuring role of context in its broadest sense. They propose a model for the role of *conscientisation*, emanating from the dual perspectives of the learner's own culture (here, the workplace or the community) and the social institution of mathematics. Developmental actions include separate, bifocal considerations of identification, engagement, critical reflection then judgement. Finally a synthesis leads to a consideration of how the ethnomathematics produced might have been affected by the techniques made available and the values adopted by the social institution of mathematics. Abraham and Bibby conclude with a warning concerning political ideologies:

We should not underestimate the extent to which particular political interests would attempt to undermine a curriculum which sought to critically debate the relationship between mathematics and society. Critical debate is threatening to those interest groups who wish mathematics education to *serve* their interests directly or indirectly. (p.9)

This is particularly pertinent to the Australian situation where, under competency-based education and training (CBT), workers' so-called 'naive' mathematical knowledges have been disqualified as inadequate to their task or insufficiently elaborated. Yet the revealing of these local knowledges (e.g., FitzSimons, 2000), shows how "official knowledges . . . work as instruments of 'normalisation', continually attempting to manoeuvre populations into 'correct' and 'functional' forms of thinking and acting" (McHoul & Grace 1993, p.17). Even the historical and social contents of the discipline of mathematics itself have been buried and disguised in a functionalist coherence under the hegemony of CBT. The questions arise: Is critical debate possible? Was it ever?

### **Pedagogies in practice**

In this section I will reflect on experiences of teaching over four distinct sites of practice. Adult and vocational mathematics education can take place in a variety of contexts, from timetabled classes inside TAFE institutes or workplace meeting rooms or community houses, for example, to more flexible drop-in centres or through distance education modes offered often at flexible locations and times. These encounters may be highly structured — usually, but not always, following a transmission paradigm — or they may be less structured and tend, sometimes at least, towards constructivist or situated learning paradigms. Vocational students of mathematics generally expect to encounter a transmission paradigm; they often have low self-esteem in this subject at least; and they have many competing interests or demands on their time. In my opinion,

working with difference means to expect it in each class and work positively with it, to value each student and to appreciate their varied backgrounds and foregrounds.

*The Adult, Community and Further Education (ACFE) sector; pre-CBT era*

These classes were able to accommodate the interests of individual learners through, for example, sharing goals, addressing cognitive and affective anxieties, valuing of multicultural differences (e.g., etymologies of various number names), seriously reflecting on personal mathematics learning histories, and attempting to overcome stereotyped images of mathematics education (e.g., through co-operative problem solving, investigation of news items, experiential learning relating in practical ways to domestic interests as well as the use of hands-on mathematical equipment). Teaching strategies were inclusive and mathematically extendable. Sometimes the activities followed a theme, such as the weather or demographic data collection; at other times the students wished to develop competence in particular mathematical skills and techniques. Participants were ultimately enabled to help close relatives (e.g., children, husbands) or young friends with mathematics. At this time there were few organisational constraints, except for meagre resources, and an excellent ambience for staff and students. (See FitzSimons 1994 for further details.)

In terms of my personal political awareness, the lack of cultural conflict with the educational bureaucracy of the day contributed to many implicit rather than explicit pedagogical assumptions. For example, there was little cause to reflect on the hegemonic role played by mathematics in my own history, although clearly it was important for the students who had not been served so well. The work on personal mathematics learning histories signified an attempt to recognise and counter this hegemony, to redefine students' identities ultimately through rewriting their own histories, but at a psychological level in order to help re-establish confidence and self-esteem. There was little attempt at broader social critique of the role played by mathematics, partly due to my awareness of the sensitivities of the class (as discussed above); there were no doubt more radical programmes in operation elsewhere. Critique of a seemingly benevolent adult education system, founded on humanitarian interests — as expressed in Faure et al. (1972) for example — even if under-funded and marginalised, did not occur to me at the time. Rather, there was a sense of excitement in employing innovative pedagogical strategies and in seeing second-chance students of different educational backgrounds, nationalities, and so forth flourish.

*The Adult, Community and Further Education sector; post-CBT era*

Adult education became harnessed as a tool of economic management, and at the same time was brought under bureaucratic control by means of a focus on outcomes of students, and providers alike. Constraints were felt by teachers in areas of curriculum, assessment and class sizes, for example; shifts in responsibility for costs to students restricted access for some. Levels of tension rose among students and teachers (e.g., Waterhouse 1995) as each group grappled with the new regime of accountability. This new era of standardisation gave cause for reflection on what had been lost. To avoid the hegemony of working to checklists meant working in the interstices (e.g., Clemans 1997). For example, a thematic approach was maintained through collecting and displaying temperature and daylight graphs (transcending supposed educational levels), and organising posters of creative student work, while still managing to cover each of the five listed topic strands and check off the competencies by the end of the course.

There was little time for considering personal histories and even less for critiquing either the mathematics or the changing education system. Pressures of accountability had earlier resulted in college managers banning course names such as *Maths is Fun!* Under this ethos it had become apparent that open criticism would not be tolerated. Teaching for difference had become a subversive activity.

*The Vocational Education and Training sector: industry-based learning*

TAFE teachers are constantly reminded that their system is ‘industry-driven’. Any administrative or curricular or pedagogical change is justified with the phrase: “this is what industry wants” to ensure compliance. Yet in meetings with representatives of the pharmaceutical manufacturing industry, for example, it was almost impossible to find any company that would adopt the nationally accredited curriculum, on the grounds that it did not meet their particular needs. In fact, personal experience of working in this industry teaching mathematics and basic computing revealed an unexpected degree of flexibility (see FitzSimons 2000). It was possible to link mathematics, statistics, and computing, with everyday life skills; to value the actual mathematical (and computing) activities of operators in each section of the plant over the jejune textual representations of the curriculum. It was possible to validate the workers’ day-to-day experiences through a Quality Assurance video regularly screened on Australia’s *Open Learning* channel, and simultaneously raise their academic self-esteem. As part of the computing course it was necessary to critique the social uses (positive and negative) to which computers are put. Workers were given further agency by company management requiring that their training was co-located on-site for relevance and at the university for their own personal development. Exercising a great deal of care on my part, it was possible for the workers to critique at least some work practices using the mathematical skills they learned. Clearly the work of Giroux (1994) suggests further development, but a small beginning had been made towards a critical pedagogy.

*The Vocational Education and Training sector: institute-based learning*

Teaching Laboratory Technology Diploma students offered fewer degrees of freedom, given that they may ultimately be employed across a range of scientific industries. It was necessary at all times to remain cognisant of official content — particularly under the constraints imposed by the institute’s ‘quality’ regime — but possible to work around this using a thematic approach. It is time-consuming but rewarding to devise activities so that individual differences among students may be accommodated through multiple modalities of teaching, including class discussions, small-group work, hands-on practical activities, computer applications, videos of industrial and community applications, and so forth. However, such pedagogical innovation is seldom rewarded under the current system of promotion; very clear messages are given that discipline-based teaching is considered a generic skill (FitzSimons in preparation). Rather, the message to teachers is to focus on administrative matters such as class rolls, course outlines, and results. What happens inside the classroom is of little concern provided that there are no complaints from students. Thus it is possible, but not encouraged, to pursue debates on critical issues such as the uses to which mathematics and statistics are put. However, from the students’ perspective all that seems to matter is the final assessment: *Competent* or *Not Yet Competent*, and this is generally restricted to facts and skills as listed in learning outcomes. There is little room in the limited course hours and overcrowded curricula for critical engagement, judgement and synthesising relations between the social institution of mathematics and the learners’ varied cultures.

## Conclusion

Although Giroux, McLaren and Mohanty were addressing the cultural politics of race, I believe that their work has application to teaching for difference, particularly to mathematics education in the Australian VET sector. However their writing is from a normative stance: what teachers could and should do. In Australia over the last two decades there have been many changes to the conditions of teaching and learning in the shift by governments towards neoliberal ideologies; these are reflected in trends such as corporatisation, privatisation, marketisation, and the commodification of education. As entry to the vocational teaching profession has become deregulated, teaching skills have been taken to be generic while at the same time the daily work of teachers has become increasingly constrained through the imposition of CBT and other accountability mechanisms enforced by their institutes. The result of practices such as these has been a standardisation of educational offerings. Concomitant with these changes has been the technologisation of equity (Butler 1998) as special needs groups have been categorised and, in a distributive model of equity, forced to compete with each other for limited funds. Thus, teaching for difference has become more problematic, especially when so many who belong to 'target groups' have been included in mainstream education.

Yet, in the Australian VET sector, within the constraints of curricula, time and location, it is possible for individual differences among learners to affect approaches to programme delivery; teachers continue to make value-laden decisions such as the level and style of classroom discussion, the choice of activities, and media chosen. It is possible to value contributions from students originating from their experience, apparently outside of mainstream curricula, but without exoticising them, to work across discourses (traditional/popular and academic) but not to valorise one or the other (Knijnik 1998) — although the power of the official curriculum is not to be underestimated. Prior to the inception of CBT, in the ACFE sector at least, it was possible to recognise and counter the hegemony of mathematics, to enable students to redefine their mathematical identities through rewriting their own histories. Now, for teachers attempting to counter political and cultural hegemonies it is more a question of working in the interstices.

Teaching for difference is a delicate balancing act, keeping in mind organisational constraints, pedagogical principles, individual goals and group norms. It is necessary at the outset of embarking on innovative teaching and learning activities to address the didactical contract. Adult students have long experience of being in classrooms, for good or for bad, and strong expectations, so it is necessary to work in partnership. However, even with this strategy, not all adult students wish to participate in this 'new world' of co-operation, problem solving, and critique; ultimately their wishes must be respected.

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