Towards Social Justice: Re-theorising the "Social" In Constructivist Practice in Mathematics.

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Abstract:

The understandings reproduced here arose from three year's involvement in an action research project in pre-service teacher education in mathematics. I implemented pedagogical practices based on constructivist tenets of students' active and autonomous construction of meaning in a supportive, though challenging, environment. In this article I endeavour to make explicit some concerns I experienced within my practice when I failed to appreciate the full implications of the socio-cultural and political constitution of the students and knowledge within the discourse of constructivism. It became clear that all students are always actively involved in learning, some learning even within constructivist methods of teaching that they have no agency in this supposedly supportive context.

Introduction

Educational policy documents such as the *Discipline Review of Teacher Education in Mathematics and Science (1989, p.17)* support the notion of constructivist teaching practices in the tertiary sector so that pre-service teachers have access to new methods of teaching "by constructing their own knowledge through discovery, exploration and problem solving in relevant and supportive environments". I found the underlying assumptions, that *all* students will construct knowledge in this way, and that this knowledge will later be usefully employed in future teaching practice, problematic because of the failure to adequately theorise the context in which knowledge is constructed and will later be applied.

The intuitive appeal of the "supportive" environment where students are obviously actively involved in learning does not make clear the interested nature of the knowledges favoured there and the positioning of students within the pedagogical practices employed. Having completed two years of my research, I became concerned at the direct translation of an epistemological position, that learners actively construct knowledge, into a method of teaching which, as Lusted (1986, p.2) states, places "a cosmetic bandage on the hard body of classroom contact". For example, where mathematical knowledges from minority cultures were introduced into my program, they were presented for interest only and reinforced the view of minority students as "other" to the dominant discourse. As I hope to make clear from my research, constructivist pedagogical practices premised upon psychological assumptions of knowledge as a construct and the universal individual are discriminatory and perpetuate routines which "blame the victim" for educational failure. This does not augur well for social justice.

In pre-service teacher education this is particularly problematic because the majority of students who perceive themselves as growing enormously in confidence concerning their future ability to teach mathematics are disinclined to critique a practice which appears to serve them so well. For example, it has been my experience that Aboriginal and Torres Strait Islander students do not find constructivist approaches to teaching mathematics any more liberating than conventional approaches. The problem arose in my research that not only had

my practice failed to cater for the minority group students, but also that the majority who perceived themselves to be empowered through participation in constructivist practice saw no need to question the social, political and cultural assumptions under which mathematics is taught. Also ignored were the probable effects of socio-political and cultural assumptions operating in and framing the context in which they will later be expected to implement constructivist practice.

I realised after two years of the research that both conventional and constructivist approaches to the teaching and learning of mathematics are premised on the notion of an unproblematic environment outside, and separate from, the epistemic individual and the knowledge constructed. It is now my view that this misapprehension will ensure business-as-usual in mathematics teaching and learning into the immediate future, despite the improvements intended by constructivists. In the following sections of the article, I examine some instances within my own constructivist practice where such understandings proved discriminatory for many students.

Constructivist Practice

Piaget's epistemological position, that learners actively construct meaning, underpins the acceptance of constructivism into the area of mathematics education. His epistemology is founded on a biological metaphor of adaptation of an organism to its environment in order to survive. Similarly, the human intelligence, through processes of assimilation and accommodation, adapts to its environment in order to remain viable. This position is structuralist in positing the development of cognitive logico-mathematical structures through an individual's active involvement in the experiential world.

"Constructivist" practice then follows directly from this view of learning. Davis, Maher and Noddings (1990, p.3)

present the notion of mathematical activity in a supportive environment as "a common thread" uniting all constructivists in practice. Such practice broadly encompasses teaching situations where the teacher's role is to "provide the setting, pose the challenges, and offer the support that will encourage mathematical construction" (p.3). Thus cognitive development is accorded priority over "material interests, social practices or objective properties of the stimulus situation" (Sampson, 1981, p.731). In such practice, where the development of cognition is equated with learning, those who do not learn the set knowledges and demonstrate the stipulated outcomes are readily classified as somehow outside the "norm" and so marginalised with regard to the dominant discourse. This classification and labelling occurs as a result of the acceptance of the meta-theoretical assumptions of psychology informing constructivist practice with regard to the unproblematic nature of the individual and the knowledge constructed. That is, since all individuals experience the given authoritative knowledges similarly, they should all be equally capable of demonstrating evidence of having formed the necessary mathematical constructs. It is my contention that this paints an all too simplistic picture of knowledge and the individual; having explored the discriminatory playing out of such understandings in my teaching practice in the following paragraphs, I propose an alternate conception of the learner as *always* actively involved in learning and the knowledge as discursively constructed through involvement in social practices such as mathematics education.

The Individual in Constructivist Practice

The learner is an epistemic subject who "abstracts from experience logical schemes and discards the experiences themselves as empty shells" (Venn and Walkerdine, 1977, p.79). The learner is presumably the universal individual who interacts with the neutral environment to

produce knowledge. While this view of the learner is accepted, as not substantially influenced by the "environment" in other than a supportive way, it is convenient to apportion guilt and "blame the victim" for not learning. With reference to my practice, I examine how a Euro-centric view of "supportive" is not necessarily experienced as such by some students.

Several students, mostly Aboriginal or Torres Strait Islander, expressed concern that they were not coping at all with the content of the course. One student in particular spoke of feeling ill when concrete materials, such as geoboards and protractors, were to be used in geometrical exploration. My immediate response was to schedule extra tutorials for these students where the material could be covered more slowly and deliberately. A psychological understanding allowed me to view this problem in terms of student lack - vaguely aware of some language problems, and the difficulty of concepts. I wasn't sure of the exact nature of the problem though I did know who owned it - them!

A second instance of marginalisation has to do with attempts to give students more autonomy over the ways they could meet assessment requirements. An example of one such activity read: "Find several activities which could be used in the middle school to help develop the concept of area". Students who did not engage fully with activities such as these were labelled, by myself and other students, as lazy and unmotivated. But the problem could again lie in viewing all students as essentially the same, and in not recognising the immense power within any pedagogy of the "nurturing" teacher who is also gatekeeper of "correct" responses regarding the construction and demonstration of seemingly immutable knowledges. I will revisit these issues in the conclusion of the article where I more fully explore the always political and problematic positioning of students within discourses such as constructivism.

At the level of policy, too, the social, cultural and political constitution of the environments in which students will later teach is ignored, acting once again to discriminate unjustly against students. The belief predominates, as in the *Discipline Review (1989)*, that if the individual pre-service teacher can be changed then the teaching of mathematics in schools will change. Pre-service teachers are seen to be at fault generally because they are "very rusty on primary level mathematical skills" (p.149). Teacher educators similarly need to change to "overcome the students' anxieties by the way they teach" and simultaneously to "promote enthusiasm for mathematics" (p.19). But when one examines more closely the positioning of the pre-service teacher within the discourse of constructivism within the tertiary institutional context in which "skills", "enthusiasms" and "attitudes" are supposedly (re)constructed, one questions the notion of the direct transference of assessed skills and enthusiasms across contexts. It is, I believe, extraordinarily problematic to view knowledge, including attitudes and enthusiasms, psychologically as "constructs" which can be used and applied in diverse contexts. That is, it is often unjust to blame the student for the non-application of constructed knowledge - it may be necessary to look beyond psychological assumptions to the power relations in social practices in the environment generally.

The View of Knowledge in Constructivist Practice

Ernest von Glasersfeld (1988, p.83) has built upon Piaget's epistemological foundations in proclaiming two basic tenets of the constructivist epistemology. These are that:

a   Knowledge is not passively received either through the senses or by way of

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communication, but is actively built up by the cognising subject.

b   The function of cognition is adaptive and serves the subject's organisation of the experiential world, not the discovery of an objective ontological reality.

Thus, new knowledge is "actively constructed from pre-existing mental objects within the mind of the learner, possibly in response to stimuli or triggers in the experiential world, to satisfy the needs and wants of the learner her/himself" (Ernest, 1991, p.28). The significance of this for pedagogical practice is that the teacher is to provide for students an environment where the material to be learned is relevant, where there are triggers or challenges acting as a catalyst for new learnings and where the student is actively involved. But once again there are problems as the "environment" is not adequately theorised and presumed neutral: the view of knowledge we have here is that it can be commodified as a "construct" and easily applied in alternative contexts. It is also problematic that the view of knowledge is conservative in privileging subjective constructions which are inadequately theorised as to their discursive and interested articulation. That is, the authoritative knowledges taught and assessed in mathematics are socio-politically and culturally determined, benefiting some to the detriment of others.

The first cycle of my action research was based on the understanding that if the students knew the mathematics and had constructivist methods of teaching modelled for them they would later manage to teach mathematics this way. The Discipline Review (1989, p.30) supported this understanding and defined the necessary knowledge for pre-service teachers as "the ability to solve problems across a variety of situations, to apply mathematics to real world activities and to have the mathematical knowledge to

adapt to and respond quickly to change". Thus I adopted an enquiry or problem-solving approach to the teaching and learning of mathematics and the majority of students felt enormously empowered and enlightened by the experience of understanding many concepts for the first time.

By the time I had begun the second cycle of the research I had read and researched various educators stressing the "social" in the construction of mathematical knowledge (See, for example, Cobb, 1994). As well, I was influenced by critical social theorists such as Habermas (Grundy, 1987) and his notion of technical, practical and emancipatory knowledge-constitutive interests and communicative action. With students I began to reflect on the disempowering constraints of ideological ideas and values underlying the chosen knowledges in the curriculum. In an effort to redress some of the perceived problems and to cater for the various socio-cultural histories of students, I introduced the study of mathematics originating in diverse cultures and made space for students from minority groups to "speak" their perceived realities concerning the teaching and learning of mathematics.

But some students, and in particular the Aboriginal and Torres Strait Islander students, continued to find the study of mathematics threatening and more often than not failed to pass the course. One student found the constructivist, problem-centred pedagogical practices particularly difficult as these did not gel with culturally based understandings of the manner in which mathematics should be taught. An Aboriginal student spoke to a friend of the alienation experienced in tutorials where everyone else was engaged happily in learning, but where she could find no relevance at all in many of the set investigations. It seemed that the pedagogical practices I inaugurated in an attempt to make the study of mathematics more relevant to the minority students served only to

exacerbate the positioning of minority students as "other" to the dominant discourse. That is, the mathematical practices and understandings of minority groups and women were introduced as of interest only, not assessed, and so marginal to *the* powerful and authoritative mathematical knowledge. It became clear to me at this stage that although these students were finding it difficult to pass assessment requirements, they were indeed learning - learning again through involvement in mathematical social practices their seemingly obligatory marginalisation.

At this stage I realised that catering for the needs of pre-service teachers generally, and in particular those of the Aboriginal and Torres Strait Islanders, would always mean much more than getting *a* method of teaching "right". It also became clear that the psychological view of the individual and knowledge underlying constructivist practice was inadequate to theorise a responsible pedagogy as it merely further advantaged the already relatively advantaged. Rather it became necessary to see the "social" environment for learning as composed of relations of power, inciting forms of subjectivity through involvement in social (mathematical) practices constituting individuals and valorising authoritative mathematical knowledge. To allow the view of knowledge as a cognitive construction to prevail in education is to presume that the work of justice has been done, requiring no further action nor articulation.

Conclusion

In deconstructing constructivist pedagogy I am critiquing something "which is so useful to me that I (almost) cannot speak another way" (Spivak, in Lather, 1992, p.120). However, as long as the "social" context of the construction of knowledge is not problematised, discriminatory practice-as-usual will continue in pre-service teacher education. Students generally will continue to believe that there are few options other than to try to fit into the system. And, as in my practice, minority groups' failure within this system is seen as natural and unavoidable and remediation is presumed to occur through the more intense application of the same.

The psychological view of the learner and knowledge constructed frames contemporary practice so absolutely that it is difficult to think differently of the nature of learning and the learner. However, were one to view all knowledge and the learner as *discursively* constructed, opportunities for social justice might be better advanced. Thus constructivist practice, like previous transmission methods of teaching, would be regarded as a social practice comprised of relations of power. These power relations position students and teacher within the discourse through involvement in social (pedagogical) practices which valorise authoritative knowledges and ways of being within the discourse. The failure of many to succeed within the constructivist discourse, or to later reproduce practice as modelled within the institution, might then be theorised in terms of marginalisation or inferior positioning within an immutable discourse. That is, though many voices speak within "active" approaches to learning, it is still the authoritative voice (knowledge) of teacher and text which is valorised and authenticated.

Within my practice, then, rather than apportioning blame upon students for not learning or not behaving autonomously, one is able to contemplate the positioning of students within constructivist practice. One is able to confront social practices such as the use of worksheets and textbooks, and questioning, assessment and credentialling routines for positioning some students in discriminatory ways. And then, too, when students begin teaching and turn to the use of conventional teaching methods

rather than the constructivist alternative, it is again the positioning within powerful discourses such as teacher accountability, discipline and management which ultimately determine practice in the classroom context.

And so it becomes unnecessary to stress the *active* participation of students in learning. Students are always actively involved in learning because knowledge is constituted through involvement in discourses and one is ever involved, and positioned, in one discourse or another. The way forward is to interrupt the mathematical discourse, here constructivist practice, which positions so many students in ways which constitute them to "know" they have no agency in this material practice.

Since knowledge is discursively constructed, change needs to be articulated around action rather than belief systems. In teacher education, this obviates a joint exploration of the workings of local discursive practices in positioning students and teacher through unearthing instances of classism, racism, sexism, Euro-centrism and so on by interrogating the assumptions on which practice is based. Thus students are constituted differently through involvement in an alternative discourse - a discourse towards justice.

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