

ATWEH

MATHEMATICS EDUCATION AND DEMOCRATIC PARTICIPATION BETWEEN THE CRITICAL AND THE ETHICAL: A SOCIALLY RESPONSE-ABLE APPROACH

In the mathematics education literature, the relationship of mathematics education and democratic participation has been discussed by different authors writing from various perspectives. Here, I have in mind writers who have addressed the issue directly or indirectly through their discussion of, for example, politics of mathematics education (e.g. Mellin-Olsen, 1987), critical mathematics (e.g. Frankenstein, 1983; Skovsmose, 1994), social justice (Gutstein, 2006), ethnomathematics (e.g. D'Ambrosio, 1985; Powell & Frankenstein, 1997), and equity (e.g. Burton, 2003; Secada, 1989). In this chapter I adopt an ethical perspective that, I will argue, complements these approaches by providing tools to deal with three inherent complexities encountered in linking mathematics education and democratic participation, namely: the uncertainty in the relationship, the question of power, and the elusive nature of democratic participation in globalised pluralistic times. These complexities are discussed in the first section of the chapter, followed by a discussion of an ethical approach to mathematics education based on the theorisation of ethics by the French philosopher Emmanuel Levinas. The chapter concludes by outlining an approach to mathematics education that brings the focus on democratic participation to the forefront of decisions on curriculum and pedagogy.

COMPLEXITIES IN THE RELATIONSHIP BETWEEN MATHEMATICS EDUCATION AND DEMOCRATIC PARTICIPATION

The first complexity in the relationship between mathematics education and democratic participation to be discussed here is identified by Skovsmose and Valero (2001). The authors point out that for some writers in mathematics education there appears to be an assumption of *intrinsic resonance* between mathematics and democratic participation – in the sense that more mathematical knowledge directly leads to more democratic participation. At the same time, other authors focus on an *intrinsic dissonance* between mathematics and democratic participation by pointing out that mathematics achievement can act as a “critical filter” or “badge of eligibility” that stands in the way of democratic participation by certain groups that are traditionally excluded from participation and success in mathematics education. In rejecting both positions, the authors call for a *critical*

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stance where the claims about the relationship between mathematics and democratic participation themselves should always be questioned and our practices should always be examined. In particular, Skovsmose and Valero note the increasing focus of many curriculum reform documents, in many countries, on the principle that mathematics achievement can, and should, promote citizenship and democratic ideals of society as a primary aim of mathematics education. However, they warn that:

it is important to realise that such aims are without much descriptive value. Even if they guide mathematics curricula, the actual mathematics education may not necessarily support the development of democratic values. Nor have such aims much prescriptive force, since what in fact prescribes the practices of mathematics education is that whole range of external factors considered as a justification for the thesis of dissonance. (p. 44)

In a later work, Skovsmose (2005), based on the writings of D'Ambrosio (1994), notes the critical role of mathematics in society that is, on one hand, intrinsically related to significant advances in knowledge and technology and on the other to most devastating instruments of war and destruction. Skovsmose calls this the "paradox of reason" and asserts that even though there is nothing intrinsically in mathematics that determines its effects, it is in the midst of – and cannot escape from – this paradox. Here I might add the dual effects of mathematics for "empowerment" and "exclusion" as further manifestations of this paradox. Skovsmose goes on to make two points that are essential for the discussion here. Firstly, the "wonders" and "horrors" regarding the social effects of mathematical knowledge are often *unpredictable* and *uncertain*; moreover, to add complexity, "we might be lacking any reasonable standards for judging [between them]". (p. 101)

Secondly, he rejects critical rationality as a means of providing the foundation for the necessary critique to deal with the socio-political effects of mathematics – since rationality itself has led to this paradox in the first place. Using the concepts of existential freedom and responsibilities of Sartre, Skovsmose argues that in the face of uncertainty, responsibility is expressed as concerns, and shared and discussed with others, thus forming a "critique without foundation" – in other words a critique that is not based on "logical, philosophical, political nor ethical" grounds (p. 131). In several places in the book Skovsmose presents responsibility as a way to deal with uncertainty; yet stops short of following it to the heart of the discourse on ethics – thus, using Habermas's (1998) terms, he points to the road taken here.

The second complexity in relating mathematics education and democratic participation relates to the necessary politicisation of mathematics education that this relationship implies. The concern here is not that mathematics is objective, value-free and, hence beyond politics. As Mellin-Olsen (1987) argues, mathematics education is political through and through. Among other reasons, it is political because it supports the ideology of objectivity (Bishop, 1998); it is associated with practices of legitimisation of social stratification (Apple, 1992);

and with patterns of colonisation (Powell & Frankenstein, 1997). However, political considerations necessarily raise the question of power. I concur with Ernest (2002) that mathematics can lead to empowerment for active citizenship. Only the cynic can disagree with the often-made claim that certain ability to understand and use mathematics is not only useful but also necessary to make many informed decisions about day-to-day affairs. Following this argument one can safely say the more ability to deal with mathematical situations somebody has the more access they have to social power. However, social power is not unproblematic. As Simmons (1999, p. 97) points out, that power “unbounded may lead to tyranny, absolute power of the strongest”. Thus, increasing the capability to deal with mathematical situations might enhance civic participation of an individual, but it may also lead to increasing personal gain at the expense of the public good and, at worst, to domination of others and reduction of their opportunity for meaningful participation. Hence, relating mathematics education to democratic participation for the public good requires other considerations in order to keep democratic participation under check. Traditional views of mathematics as a system of knowledge and truths, and of mathematics education as a set of statements about desired content and means of its development, fail to provide such mechanisms. Such a role necessarily involves social values and ethical judgements.

The third complexity – rather set of complexities – in linking mathematics education with democratic participation relates to traditional understandings of democratic participation in a globalised pluralistic and new-times society (Giddens, 1990). It appears to me that an essentialist understanding of the construct of democratic participation, and of democracy itself, is becoming increasingly untenable. It remains, using a term discussed by Gallie (1956), an “essentially contested” construct that has a variety of uses in different contexts. Skovsmose (2005) relates his experience in travelling in post-Apartheid South Africa where the salient understanding of the concept of democracy was the right to vote in elections, a feature taken for granted in many Western countries. Perhaps some of the meanings and characteristics of democracy identified by Wikipedia illustrate this diversity.

1. Democracy is a political government carried out either directly by the people (direct democracy) or by means of elected representatives of the people (representative democracy).
2. Democracy includes: equality and freedom ... These principles are reflected in all citizens being equal before the law and having equal access to power.
3. “Majority rule” is often described as a characteristic feature of democracy... An essential process in representative democracies is competitive elections that are fair both substantively and procedurally. Furthermore, freedom of political expression, freedom of speech, and freedom of the press are essential so that citizens are informed and able to vote in their personal interests.

The article goes on to list 12 different forms of the term “both in theory and practice ... [that are] not exclusive of one another: many specify details of aspects

that are independent of one another and can co-exist in a single system”. (Democracy, Wikipedia, undated).

Here, I note some observations about these articulations that are representative of wide understandings of the construct. To start with, they all seem to be based on the ideology of individualism and nationalism. In other words, they refer to democratic participation by independent but equal citizens in a particular nation-state. This understanding does not take into account our increasing awareness that nation-states are composed of a variety of minority groups that resist identification with the identity and values of the majority. Many have standards of social organisation that are not based on individualistic identities but rather as members of family and social groups (Brubaker & Cooper, 2000).

I am thinking here of the Australian Aboriginal people and their struggle to have group ownership of land and to have their traditional law exist in parallel with the European law of the majority. I also have in mind many migrant communities who value family affiliations and traditions as well as their individual choices. To add to the complexity, members of these minorities do not necessarily have a single identity that allows them to speak with a single voice. In an increasingly globalised world, identities are not unitary and fixed; rather they are fluid and multiple (Butler, 1990). Hence, regarding individual identities *without* a consideration of their social identities is untenable for democratic participation. Similarly, it is futile to treat them as *only* members of a group since social groups consist of individuals with varying histories, needs, and interests.

Further observations about the traditional understandings of democracy and democratic participation relate to their implied ontological and epistemological foundation on natural rights and freedoms. In particular, the rights and freedoms enshrined in the United Nations Declaration of Human Rights are widely used as bases for both social organisations policy and their contestations by dissident groups in many liberal regimes around the world. However, Heller (1992) raises questions about the ontological character of these rights and their theoretical nature. She notes that they are not descriptions of reality – hence they are “fictions” (p. 351). Similar understanding is presented by Lakoff and Johnson (1980) where they interpret abstract constructs as metaphors. In his recent and controversial book *Whose freedom? The battle over America’s most important idea* (Lakoff, 2006), he outlines how the debate on freedom between liberals and conservatives in the USA can be constructed as based on distinct family metaphors where the conservatives’ view of freedom is based on the “strict father” metaphor while the liberal discourse seems to be based on the “nurturing parent” model.

Similarly, K. Roth (2007) investigated the foundation of democratic participation on epistemological grounds and found it problematic. Knowledge of the other may lead to acceptance inclusion, but, by the same token, it may lead to indoctrination and oppression. Roth claims that such knowledge may be necessary but not sufficient. As the writings of Popkewitz (2004) show, disciplinary knowledge acts as inscription of the child and controls her/his way of thinking and behaviour. In that article, Popkewitz goes on to critique the discourse of democratic participation itself as means of disciplining social

participation as a compliance to social functions and structures. Undoubtedly he has in mind here the conservative understanding of the construct referred to by Lakoff. Hence, with the lack of solid ontological and epistemological bases, the rights and freedoms that are assumed to be behind democratic participation are a set of political and ethical principles to guide social organisation and actions. As I will elaborate below, rather than seeking ontological and epistemological foundations of democracy, Levinas posits ethics as the foundation of being and knowledge and as a basis for politics. Here, I don't take democratic participation as based on the humanist construction that "we are all born free". Rather, I understand freedom as being based on ethics, which in turn is based on responsibility towards the other. In other words, we are free because of our responsibility to the other, not the other way around.

The last observation about the above articulations relates to the deconstruction of the term "democracy" by Derrida (1997). Democratic participation is intrinsically based on agency of each citizen being and acting within a collective. But it is also based on balancing this participation by single citizens with the participation of others in the collective. This balancing inevitably leads to consideration of the agent's voice as a single voice among others – in other words, not as an individual but as a number. To quote Derrida: "there is no democracy without respect for irreducible singularity, or alterity, but there is no democracy without the 'community of friends', without the calculations of majorities, without identifiable, stabilizable, representable subjects, all equal" (p. 22). Hence, there is no democracy that empowers citizens to participate without limiting such participation. However, this does not imply that democracy is an empty construct. Derrida goes on to talk about "democracy-to-come", not as a new form of democracy, but as an affirmation of it as an essential ideal – albeit it cannot be reached.

All these observations that problematise the understanding of the term "democratic participation" imply complexities that need to be considered in establishing the relationship of mathematics and democratic participation. Similarly to the "paradox of reason" discussed by Skovsmose, they call for critique that, if it will not determine action, will, at least, allow for reflection on action.

ETHICS AND CRITIQUE

In the quotation above, Skovsmose calls for a "critique without a foundation". He also acknowledges that putting the concerns stemming from a sense of responsibility in the public arena avoids the accusation of "relativism" (p. 132) often raised against some postmodern perspectives. Here, I interpret this stance as an avoidance of privileging a unique foundation for the critique rather than a call for no foundation at all – since every concern, and the reaction to it from others, has some basis, whether rational, legal, political, ethical or otherwise. Accepting the limitation of each of these perspectives to provide an exhaustive foundation for critique of mathematics education, they can be used as a basis for a "reaction" to a critical situation.

In particular, social justice has often been used as an argument to provide critique of mathematics education. However, social justice itself, as a foundation of critique, raises its own problems. As Young (1990) reminds us, the principles of social justice are not theorems, or laws, rather they are claims that one group makes of others, and hence, the notion of social justice itself is contested (Gallie, 1956; Rizvi, 1998). Further, Simmons (1999), quoting Kant, claims that social justice to one group may imply social injustice to another group outside our immediate concern. A contested social justice depends on discourse and language, and hence it is inherently “violent” in the sense discussed by Derrida (in Critchley, 1992). Political considerations in general, and social justice in particular, are under threat of reducing the individual to merely being a member of a species. By saying social justice is violent, I do not understand it here as being evil to be overcome. Rather it is inherently open to the possibility of violence and, hence, needs to be kept under questioning and in need of another foundation to deal with its conflicting claims. As I will argue below, the political, while not reducible to ethics, requires ethics as a foundation of its decisions (Simmons, 1999).

In another context (Atweh & Brady, 2009), I argued that the discussion of *ethics* is raised in mathematics education literature very infrequently, and that this silence is paralleled by the avoidance of discussion of ethical questions in most traditions of Western philosophy. With the rise of scientific rationality, ethics is often associated with questions of morality, dogma, codes of behaviour, and legal imperatives and is often seen as belonging to the domain of metaphysics rather than philosophy proper. Cohen (2005) explains this avoidance of ethical discussion in philosophy as a fear of moralising, preaching, and questions of values in philosophical discourses that are mainly focused on ontology rather than meaning. Similarly, in Western thinking, there is a movement away from essentialist thinking represented in the universality of ethical principles (Christie, 2005) and their foundation on rationality as established by philosophers such as Kant. As Levinas (1969, 1997) maintains, philosophy is mainly concerned with questions of being (ontology) and knowledge (epistemology). The discussions of being and knowledge are achieved by reducing the Other to the same (Critchley, 2002).

K. Roth (2007) notes that the relationship between ethics and knowledge is not new. Going back to the philosophical and ethical discourses of Socrates who established the primacy of the knowledge of the good over the knowledge of the truth, Cohen raises the question “has the philosopher abdicated responsibilities?” (p. 39). However, this avoidance of dealing with ethical discourse is slowly dissolving. As Critchley (2002) indicates, it was only in the 1980s that the word “ethics” came back into intellectual discourse after the “antihumanism of the 1970s” (p. 2). Further, the post-ontological philosophical writings of Levinas (1969, 1997) have been accredited by the re-introduction of ethics within philosophy by establishing ethics as the First Philosophy.

However, discourse of ethics is not unitary (Giroux, 1987). K. Roth (2007) identifies some alternative approaches to constructing ethical decisions. A utilitarian approach bases ethical decisions on consequences of action – in other words, an action or knowledge is neither good nor bad by itself; its ethical value

depends on what it leads to. A deontological approach identifies principles for ethical duties regardless of consequences. More recent feminist writers developed an ethics of care approach which focused on principles for emotions and virtues that are morally relevant. Discourse ethics establishes ethical claims on the same basis as claims of truth and fact – that is, on argumentation and the logic of communicative action; hence ethical norms can only be justified intersubjectively through the processes of argumentation between individuals in a dialectic manner. For Levinas, ethics is before any philosophy and is the basis of all philosophical exchanges. It precedes ontology, “which is a relation to otherness that is reducible to comprehension or understanding” (Critchley, 2002, p. 11). This relation to the Other that precedes understanding he calls “original relation”. Critchley points out that Levinas’s original contribution to ethics is that he does not see ethics as a pre-determined set of principles that can be used to make decisions about particular instances of behaviour. Rather it is an adjective that describes a relationship with the Other that precedes any understanding and explanation. Using a phenomenological approach, Levinas argues that to be human is to be in a relationship to the other, or more accurately, in a relationship *for the other*. This relation is even prior to mutual obligation or reciprocity. W. R. Roth (2007) argues that this original ethical relationship discussed by Levinas consists of an “unlimited, measureless responsibility toward each other that is in continuous excess over any formalization of responsibility in the law and stated ethical principles”.

In his later work, Levinas (1997), in response to Derrida’s claim that the encounter with the other is “violent” if it is based on language and discourse, introduced the distinction between *saying* and the *said* in the face-to-face encounters with the Other. Further he located the initial encounter with the Other as based on saying which precedes the ontological said. Simmons (1999, p. 88) explains “Prior to the speech act, the speaker must address the Other, and before the address is the approach of the other or proximity”. Importantly for our purposes here, Levinas places ethics in the *saying* and politics and social justice in the realm of the *said*. He argues that *peace* is in the *saying* and the *said* is necessarily open to the possibility of violence. Using this distinction, Levinas demonstrates how ethics and politics are necessarily independent; however, each needs the other. Ethics, which is the encounter with the Other, needs politics since the Other is not singular – there are many others. On the other hand, politics needs ethics since politics is always open to the possibility of excesses and needs to be kept in check.

Here I propose that a conception of ethics is necessarily implicated with any critique of the relationship between mathematics and democratic participation. Further, I propose that the inclusion of an ethical/responsibility perspective – in particular an understanding of ethics not as a set of specific codes of behaviours, but as basic inescapable responsibility to the other – in that critique assists in dealing with the uncertainties and complexities discussed above.

Giroux (1987) points to a paradox facing many radical educational theories that often posit “moral” indignation about social and political injustices and yet have “failed to develop a moral and ethical discourse upon which to ground its version

of society and schooling” (p. 9). He further adds that, without such discourse, it is not possible for critical education to “move from criticism to substantive vision” (p. 9). He calls for an ethical discourse that transcends both the essentialist constructions of ethics from the right – that may lead to standardisation of being and conduct – on the one hand, and constructions of certain “free-floating” forms of postmodernism – that may lead to pragmatism and relativism – on the other.

Arguably, every complexity identified above gives rise to situations where the choices need to be made and outcomes critiqued and where the outcomes are neither pre-determined nor simple. Nevertheless, choices still have to be made – one hopes responsibly. However, every critique consists of a judgement about “what is good”. Hence, it enters an ethical discourse. Skovsmose was right in noting that rationality is limited to providing the foundation of the needed critique or reflection on action. However, placing ethics prior to (in both temporal and precedence meanings) rationality (and philosophy, politics and law for that matter) allows rational thinking itself to be used as one among many bases for critique while it is itself kept under check by the sense of responsibility towards the other.

TOWARDS SOCIALLY RESPONSE-ABLE MATHEMATICS EDUCATION

In my introduction, I referred to different perspectives that support and enhance democratic participation by various segments of the population. Here, I do not make the assumption that these different perspectives are necessarily in accord with each other in their theoretical foundations or in their implications for practice in mathematics education. I do make the observation, though, that behind many of their concerns is the lack of distribution of power and access to mathematics and, in particular, making mathematics empowering to the less advantaged in society. Without a doubt, this is a worthwhile endeavour that should remain, with urgency I might add, at the forefront of our collective consideration in the field. What I propose in this section is that an ethical dimension to the above dissenting discourses to mainstream mathematics education would increase the possibility of achieving the role of mathematics education as a tool to increase democratic participation by the marginalised social groups – and also by the whole society. It also provides that any approach to mathematics education would be self-reflective and critical as to its assumptions and practices.

Here, I put forward a vision of mathematics education based on ethics and, in particular, on the concept of responsibility. Elsewhere (Atweh & Brady, 2009), I suggested that in current political discourse the demand for responsibility, or more often for its synonym “accountability”, is an increasing concern in educational policy and practice. However the term is used with a variety of meanings. Responsibility is often presented as a requirement or duty that restricts (as in, it is the teachers’ responsibility to cover the curriculum), as well as enables (as in, evaluating students’ learning is the teachers’ responsibility), or sometimes in the placement of blame (as in, who is responsible for the students’ lack of achievement?). As Christie (2005) suggests, when it comes to responsibility or ethics, it is possible to “work with and work against” (p. 240) the construct at the

same time. In other words, I adopt a critical stance on the concept, its usefulness, and its limitations. To distance the approach to responsibility proposed here from these legal and rationalistic understandings, I will suggest a slight change in the term “responsibility”. Puka (2005) suggests that a great contribution to ethics is the feminist distinction between responsibility and “response-ability” (for diverse feminist stances with respect to Levinas, see Chanter, 2001). Response-ability highlights the ability to respond to the demands of our own well-being – hence it focuses on agency – and the ability to respond to the demands of the other – hence doing that responsibly. This is similar to the observation that W. R. Roth (2007, p. 5) makes that:

... etymologically [responsibility] derives from a conjunction of the particles *re-*, doing again, *spondere*, to pledge, and *-ble*, a suffix meaning “to be able to.” Responsibility therefore denotes the ability to pledge again, a form of re-engagement with the Other who, in his or her utterances, pledges the production of sense. Each one, on his or her own and together, is responsible for the *praxis* of sense, which we expose and are exposed to in transacting with others.

In the following two sections, I briefly outline some implications of a Socially Response-able Mathematics Education (SRaME) as they relate the two of the three message systems of schooling: curriculum and pedagogy (Bernstein, 1971).

Implications of Social Response-ability for the Curriculum

The dominance in school mathematics of content needed for careers that are seen as mathematically based – mainly science and engineering – does not promote democratic participation and, perhaps, is a residue of times when few students finished high school and went to university. Notwithstanding the importance of jobs in science and engineering for social technological development, only a few students end up in such careers. The approach to mathematics taken here is that *all* students need considerable amount of mathematics for effective citizenship in the increasingly mathematised world of today – albeit different type of mathematics depending on their interests, capacities and career choices. Hence, a *utilitarian* approach to mathematics falls short of developing a response-able student. As Ernest (2002) argues, a critical approach to mathematics and citizenship is needed. This ethical response-ability discussion applied to mathematics education posits the primary aim of mathematics education as enabling the response-ability of students in their current and future lives as citizens. Here I will discuss two implications for the curriculum of mathematics that promotes democratic participation.

Firstly, an SRaME implies a shift of focus on what is central in mathematics education. Curriculum documents around the world often contain lists of outcomes or topics in mathematics that students are expected to cover in their progression from year to year of school. It is customary to present this content in strands along the lines of number, algebra, geometry, probability, and statistics. At times this content is articulated as concepts, skills, and procedures. Lastly, most new curriculum

documents focus on applications and problem solving as important aspects to be developed with students. Undoubtedly, such topics dominate the majority of classroom time and assessment instruments that teachers utilise. However, many curriculum documents also articulate aims or outcomes that cut across the different topics. For example, the Western Australian Curriculum Framework (Curriculum Council of Western Australia, 1998) identifies “working mathematically” as an important rationale for mathematics education. The document states that:

Every student needs to develop an awareness of the nature of mathematics, how it is created, used and communicated, for what purposes, and how it both influences and is influenced by the things we believe and the values we hold. (p. 179)

Further, it lists some specific outcomes that students need to demonstrate. In particular:

Appreciate that mathematics has its origins in many cultures, and its forms reflect specific social and historical contexts, and understand its significance in explaining and influencing aspects of our lives.

Show a disposition to use mathematics to assist with understanding new situations

Choose mathematical ideas and tools to fit the constraints in a practical situation, interpret and make sense of the results within the context and evaluate the appropriateness of the methods used.

For many teachers, however, these outcomes are problematic in the sense they don't define particular content nor do they easily lend themselves to particular ways of assessment. The Western Australian Curriculum Framework itself asserts that working mathematically is not an area that needs to be targeted in assessment directly. Hence, the tendency of many mathematics classroom practices is to pay lip service to this aspect of mathematics. Further, the focus on the set of what might be seen as “core mathematics” skills and understandings is further encouraged through the increasingly high stakes multiple-choice national numeracy tests that are conducted every two years in the country. Lastly, for most mathematics teachers, the curriculum is very crowded. Often working mathematically is seen to be desirable, but not an essential addition to the curriculum, and remains of secondary importance.

An SRaME approach that aims to increase democratic participation requires that a shift be made away from mere content and procedures into problem solving, modelling, and applications. Further, while it is usual to find applications in mathematics from science and the natural world of the student, applications from the student's social life often remain neglected. Social applications in mathematics are often seen as contrary to rigorous mathematics that is needed for higher studies and often dealt with in special less academic courses targeting students designated as less able. However, this binary might be counter-productive by denying the opportunity and the ability to develop their generalised abstractions of

mathematical concepts and procedures to the majority of students taking the so-called social or practical mathematics. Further, in spite of the rhetoric of curriculum documents, and the assurance by many teachers that the two streams deal with equally valuable mathematics – albeit for different needs – for many students a hierarchy of values exists between them, resulting in higher status for the formal academic mathematics.

However, not every focus on applications and modelling guarantees the development of a socially response-able curriculum. As Warnick and Stemhagen (2007) point out:

If acquiring a mathematical worldview means that students begin to see how the subject applies to the problems of everyday life, it does make sense to say that the mathematization of experience is an important goal of mathematics education. At the same time, though, we argue that students should also recognize the limits of the mathematical language game, and that mathematics education should play a part in fostering this recognition. We move toward this goal by exposing the relationship between a mathematical worldview and a technological worldview (p. 305).

Secondly, an SRaME approach implies a shift of sequencing in the development of mathematical knowledge and its application. The common practice in many mathematics classrooms is that students develop mathematical understandings and skills before they are able to apply them in problem solving. Hence mathematical knowledge is often presented as decontextualised and abstract. This approach often leads students into asking “Why are we studying this?” and to students switching off mathematics before real and interesting applications are encountered. Mathematics education that promotes democratic participation must aim at not only developing mathematical knowledge and skills, but also knowledge and skills about the real world of the students. The approach promoted here is for the use of real-world activities that promote students’ learning about their social world *while* they are learning mathematics and, at the same time, their learning about mathematics *while* they are engaging with real-world activities. Moreover, there has to be a balance between these two areas of learning. An SRaME teacher always needs to ask what mathematics, higher order mathematics in particular, is learnt by such activities and what significant learning about the social world is anticipated. In particular, they need to raise the question about the mathematics itself, its assumptions, power, and limitations as a result of these activities. These stances are consistent with the approaches promoted by critical mathematics, ethnomathematics, and social justice approaches. What an SRaME approach adds to this is the raising of issues of social responsibility with students as they engage in learning to read and write the world through mathematics (Gutstein, 2006).

Implications of Social Response-ability for Pedagogy

In this context I understand pedagogy in the sense discussed by Lingard (2005) who, using Bernstein (1971) elaboration, states that pedagogy goes beyond mere

teaching methods or instructional techniques to include teachers' interpersonal competencies for interacting with students as well as contextual considerations and questions of power relationships enacted in the classroom. Here, I consider three implications for a Socially Response-able Mathematics Education to pedagogy.

Firstly, an SRaME approach stipulates relationships between teachers and students in the classroom that are not common in traditional practices. Neyland (2004) demonstrates how in mathematics education the demand for accountability or responsibility, as portrayed in the worldwide push towards standards and testing, reflects a "scientific management" rationality that posits institutions and norms as the cause of ethical behaviour. Using Levinas's writings, he goes on to argue that such institutions externalise and mechanise ethical behaviour and thus "sometimes erode a primordial ethical relation between people" (p. 517). In this context, a focus on ethical responsibility shifts the focus of interactions between students and teachers from technical and system demand considerations to an encounter between two human beings, and while it is not totally free from *system* demands (Habermas, 1987), it allows for teachers' decision making based on the interest of the student. It implies a collaborative and mutually respectful classroom environment where the participants are constructed as co-learners, an environment to which Vygotsky and Freire aspired. In working towards SRaME, the teachers and students develop a new relationship of co-inquirers or co-learners in contrast to the traditional construction of expert and novice. In such real life activities, while the teacher is not the source of knowledge about what needs to be changed, the students need support in identifying these needs and in negotiating change. As Atweh and Bland (2005) point out, in their reflection on one such project, there needs to be a balance between the teachers abiding by their duty of care and minimizing the risk of student failure, and thus limiting students' agency, on one hand, and their willingness to take risks by maximising students input, on the other.

Secondly, an SRaME approach implies new understandings of what constitutes knowledge in mathematics classes. This understanding of the Socially Response-able pedagogy is in harmony with some of the tenets of constructivism (Von Glasersfeld, 1991), a position that constructs the learner as an active participant in the development of their own knowledge. Further, it posits the student and the teacher in a "reflexive" relationship developing contextualised knowledge wherein neither party can claim a monopoly of expertise. However, since such mathematical knowledge is to be used in social and political contexts, questions of values and ethical decisions about possible action must necessarily arise. This approach is perhaps more aligned with critical constructivism as discussed by Kincheloe (1995), who claims that:

Critical constructivists ... ask what are the forces which construct the consciousness, the ways of seeing of the actors who live in it. ... Critical constructivism concerns the attempt to move beyond the formal style of thinking which emerges from empiricism and rationalism, a form of

cognition that solves problems framed by the dominant paradigm, the conventional way of seeing. (p. 88)

Hence, SRaME activities should do more than attempt to achieve students' *engagement with the mathematics* learning by giving them real-world examples of the content. Students should also engage with the world situation being investigated. Through the SRaME activities, students engage in critical reflection about the assumptions behind the mathematics developed as well as the assumptions behind social practices being investigated. Lastly, through these activities a sense of an empowered agency is developed to reflect ethically on various possible lines of action and to actively listen to alternative points of views. Hence, the call here is for an interdisciplinary approach to mathematics education and the willingness to deal with controversial topics in which debate and difference of opinion and human interests are part of the equation rather than nuisance variables. This approach is in direct conflict with the view of mathematics as an abstract, decontextualised, and value-free system of knowledge.

Thirdly, an SRaME approach implies a socially just pedagogy that necessarily raises the question of inclusion of marginalised groups of students in the study of mathematics. Education is often discussed as the most effective solution to addressing disadvantage in society and between societies. After at least fifty years of development and reform in education, it is important to raise the question as to whether education has been able to address this challenge. Perhaps Basil Bernstein (1971) was correct in his conclusion that schools do not compensate for society. However, there is some good news. A wide-ranging review of the effects of educational interventions aiming to alleviate disadvantage show that increasing quality teaching does contribute to improving opportunities for marginalised groups of students (Hayes, Mills, Christie & Lingard, 2005). This research shows that quality education assists *all* students; however, as Christie (2005) comments, "it is for the most disadvantaged children that improvements in school quality will make the most difference in achievement" (p. 245). Further, out of all the school factors that affected students' achievement the most important was the teacher. Hence good teaching "can make a difference, but not *all* the difference" (Hayes et al., p. 178). The danger of exclusion is not in challenging disadvantaged and underachieving students to higher intellectual quality, but in "dumbing down" the curriculum for them – thus locking them into marginalization and disempowerment.

These conclusions, however, should not be taken to imply that a focus on quality automatically results in equity. The authors go on to discuss Productive Pedagogy as a framework for reflection on pedagogy to ensure it focuses on both quality and equity. The Productive Pedagogy framework consists of four main categories with each divided into several subsections:

- Intellectual quality
- Connectedness
- Supportive classroom environment
- Recognition of difference

An ethical response-ability places the primacy of ethical considerations in the teacher-student pedagogical encounter. There are two dangers in this encounter that might erode ethical response-ability for the student. First, to deal with the students as individuals with no regard for their gender, ethnicity, or socioeconomic background – factors that are demonstrably related to student achievement in mathematics – is to relate to an “abstract” student. Not only is this a recipe for failure – it is also dehumanizing and is unethical, as argued by Neyland (2004). Similarly, the other extreme of seeing a student *only* as being of a particular gender, ethnicity, or social status is equally counterproductive. Such stereotyping also limits the possibility of an authentic encounter with the real *Other*. An ethical encounter attempts to be open to any possibility that exposes itself and responds to the students’ needs and aspirations rather than in a stereotypical fashion. In supporting the students’ response-ability a teacher can provide the opportunity to develop the high intellectual quality to the maximum of the students’ needs and capacities. This is consistent with Vithal and Skovsmose’s (1997) argument that a focus on the background of the student can obscure and hinder a focus on the *foreground* that sees possibilities as to what the student can be rather than a focus on where they have come from.

CONCLUDING REMARKS

Increasingly, educational policy and curriculum discourse around the world are being constructed in terms of citizenship and democratic participation. For example, In Australia, the Ministerial Council on Education, Employment, Training, and Youth Affairs, consisting of all the state ministers of education along with the Federal government, issued the Melbourne Declaration (Australian Government, 2008) which forms the basis of the current attempts in the country to develop its first National Curriculum. The declaration identifies two goals of education:

Goal 1: Australian schooling promotes equity and excellence

Goal 2: All young Australians become

- successful learners
- confident and creative individuals
- active and informed citizens. (p. 7)

The identification of “active and informed citizens” as a main goal of education may be taken as a commitment for social transformation as discussed above. In this chapter I explore a type of mathematics education that is likely to contribute to the aim of “active and informed citizens”.

I began this chapter by problematising the relationship between mathematics education and democratic participation. Building on the observations by authors such as D’Ambrosio and Skovsmose, this relationship cannot be assumed and needs to be scrutinised with careful critique. The experience of several mathematics educators within movements such as ethnomathematics, critical

mathematics, and socially just mathematics education have provided valuable critiques of traditional mathematics education and demonstrated that mathematics teaching in formal education can contribute to both empowerment of individuals and groups of students as well as enhance social justice in many societies. The approach taken here complements these perspectives by presenting ethics as the basis for this critique.

I conclude this discussion by making the assertion that ethics is not an add-on to the concerns in mathematics education. It lies at the very foundation of every decision in the field. It is reflected in identifying the aims of mathematics education, in making decisions about practices of teaching, learning, and assessment. It raises questions of inclusion and exclusion. However, it is not deterministic in a sense that following simple rules or principles ensures ethical conduct. As Foucault (1983) famously warned us, “everything is dangerous”. But Foucault added “If everything is dangerous, then we always have something to do. So my position leads not to apathy but to hyper- and pessimistic- activism” (pp. 231–232). By the same token, an ethical approach to mathematics education calls for taking risks, albeit with a great sense of responsibility, and to be constantly vigilant about the outcomes of our actions. Ethics invites us, rather compels us, to a continuous and exhaustive sense of engagement with the welfare of the other.

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A SOCIALLY RESPONSE-ABLE APPROACH

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Bill Atweh
Science and Mathematics Education Centre
Curtin University of Technology, Western Australia

