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## LACAN, SUBJECTIVITY AND THE TASK OF MATHEMATICS EDUCATION RESEARCH

**ABSTRACT.** This paper addresses the issue of subjectivity in the context of mathematics education research. It introduces the psychoanalyst and theorist Jacques Lacan whose work on subjectivity combined Freud's psychoanalytic theory with processes of signification as developed in the work of Saussure and Peirce. The paper positions Lacan's subjectivity initially in relation to the work of Piaget and Vygotsky who have been widely cited within mathematics education research, but more extensively it is shown how Lacan's conception of subjectivity provides a development of Peircian semiotics that has been influential for some recent work in the area. Through this route Lacan's work enables a conception of subjectivity that combines yet transcends Piaget's psychology and Peirce's semiotics and in so doing provides a bridge from mathematics education research to contemporary theories of subjectivity more prevalent in the cultural sciences. It is argued that these broader conceptions of subjectivity enable mathematics education research to support more effective engagement by teachers, teacher educators, researchers and students in the wider social domain.

**KEY WORDS:** Lacan, Peirce, mathematics education research, subjectivity

### 1. MATHEMATICS EDUCATION, PSYCHOLOGY AND SEMIOTICS

Mathematics education as a research field might be understood as being a relatively new tradition emerging as an adjunct to the learning and teaching of mathematics in schools. Its initial inception as a social science, some forty years ago, was defined by a marriage of school mathematics with cognitive psychology (e.g. Skemp, 1971). The discipline was regulated by mathematicians who saw school mathematics as being centred on the operation of individual cognitions confronting mathematical phenomena. These mathematicians, however, were not especially versed in the wider social sciences of the day and the positivistic model they created aspired to the neutrality for which mathematics itself was then well known. Any concern relating to the social dimensions in which minds resided was marshalled through tight constraints. Students were required to respond appropriately within the frame their teachers set. So often here, research was

directed at harmonising the language spoken and shoring up final unknowns. This conception of the world was governed by a mechanics that had evolved within a very specific and rather limited reality frame. Alas, the marriage was not to last and it was formally annulled at the 2005 meeting of the *International Group on the Psychology of Mathematics Education*. An overwhelming vote deleted from the constitution of that group the need to consult psychologists in preference to other thinkers. This earlier mode of organisation which had been dependent on having a god's eye view of a cherished creation had proved to be just one of the available choices if research was to serve beyond existing hegemonies. For example, instances of more recent qualitative social scientific models, based on contemporary theory, resist such transitive orientations and place greater emphasis on the positionings, motivations, discursive formations and emotions of the researchers involved. Such models invite the researcher to come down to earth, look around from ground level and join in a bit, towards identifying, facilitating or living alternative modes of participation in variously conceived social worlds.

Yet despite such possibilities Piaget and Vygotsky, foundational figures in the formation of mathematics education research, still have considerable impact on how we understand the psychology of learning mathematics. Debate continues as to whether we should privilege the individual cognitive psychology of Piaget or more the socially oriented model of Vygotsky. That is, do we conceptualise the task of mathematics teaching to activate and transform the minds of children, which are assumed to be responsive to such external agitation, or do we suppose that individuals can only be understood as integral to more collective conceptions of who humans are and how they develop? Surely, such oppositions are irresolvable, though Vygotskian theory remains on the ascendance in fueling vibrant contemporary debate (e.g. the Sociocultural Theory in Education Conferences held in Manchester). Such debate, however, is arguably somewhat distanced from contemporary cultural theory as understood within a broader social scientific domain.

Meanwhile, a growing number of authors in mathematics education research have become interested in the semiotic theory of Peirce and draw on his theory in conceptualising signification within mathematical activity. This activity has led to recent Special Issues of *Educational Studies in Mathematics* (Saenz-Ludlow and Presmeg, 2006) and *Revista Latinoamericana de Investigación en Matemática Educativa* (Radford and D'Amore, 2007). Peirce, as a semiotician, however, was less interested in issues of psychology and his work predates key figures such as Piaget and Vygotsky, as well as contemporary discursive conceptions of subjectivity in which subject and object relate differently. As Radford (2006a, p. 47) points out, for Peirce:

The individual remains an abstract construct and his subjectivity takes shape in reaction to the non-ego. Man for Peirce is a natural entity carried out, as Nature itself, by the laws of evolution. Man is not a cultural historical product and neither is his knowledge of the world.

This conception of the individual places limits on the relevance of Peirce's semiotics to mathematics education research insofar as that area of work is about addressing diverse learning needs. The theory must be extended if it is to effectively support contemporary thought where conceptions of subjectivity have developed beyond the frameworks

acknowledged or predicted within this theory. Utilising Peirce's semiotics in its neat state, as it were, produces overly restrictive conceptions of students, teachers and of mathematics. Whilst Peirce's work does lend itself to extensions in which subjectivity assumes a more complex dimension, mathematics education research authors (e.g. Duval, 2006; Radford, 2006a; Ernest 2006; Steinbring, 2006; Otte 2006) have not pursued these avenues despite contemporary social theory and philosophy having done much work that follows and transcends Peirce's lead. Meanwhile, Presmeg (2006) utilises Lacan's semiotic apparatus derived from Saussure but without linking this apparatus to the theme of subjectivity for which it was designed.

Contemporary continental philosophy (e.g. Derrida, 1978; Foucault, 1997; Lacan, 2006) echoes the lack of intentionality and the processes of semiosis through which Peirce locates truth, yet such writers insist on a more thoroughly historical perspective. Derrida (2005, p. 127), for example, argues that even supposedly ideal objects have an historical dimension and this dimension implicates them in multiple discursive networks. In discussing Husserl he suggests:

objectivist naiveté is no mere accident. It is produced by the very process of the sciences and the production of ideal objects, which, as if by themselves, by their iterability and their necessary technical structure, cover over or consign to forgetting their historical and subjective origin.

That is, objective reality conceals its own history. For Derrida each word and by extension each text contains layers of meanings that have grown up through cultural and historical processes. A writer may not know it, but what he puts on paper has all kinds of other significance than the obvious and such content can be "deconstructed" by the expert. This historical evolution of objects closely echoes Lacan's (2002) Seminar Nine where all words and even the most basic of mathematical primitives (1, 0,  $A=A$ ) are entertained as historically evolving phenomena, or performatives (Austin, 1962), perhaps caught, or mistaken as stable, at specific moments of their becoming, at particular points in their histories, histories that cannot be severed from subjectivities similarly implicated in historical processes. That is, subjectivities are effects of organic discursive networks and mathematical objects like all symbolic objects are produced through their situation in such evolving networks. Through attention to wider discursive networks and how subjectivities are produced Derrida and Lacan each extend the scope of semiotic activity beyond the territory that Peirce's work explicitly covers. It is Lacan's system of thought however that provides the analytical filter for the paper that follows, which builds on my work in the area of teacher education (e.g. Brown and Jones, 2001; Brown and England, 2004, 2005; Brown, in press). Lacan's work echoes aspects of Derrida's work and other discursively oriented theory but unlike Derrida and other post-structuralist writers Lacan more explicitly supplements the symbolic with an attachment to the Real and to conceptions of identity.

I follow in the footsteps of Lacan, who combined a theory of mind (Freud), with theories of linguistics/semiotics (Saussure/Peirce). I seek to show how Lacanian theory transcends the supposed debate between Piaget and Vygotsky on how we might understand psychology, whilst supplementing Peirce's model of semiotics to provide a more sophisticated model of subjectivity. I commence with a brief discussion of how

Lacanian theories of subjectivity are positioned in relation to Piagetian and neo-Vygotskian psychology. I then provide a more detailed account of Lacan's conception of subjectivity in relation to some contemporary concerns in mathematics education. I follow this with a discussion of how Lacan is positioned in relation to Peirce and suggest that the latter writer has an undeveloped conception of human subjectivity that restricts the scope of his theory in tackling broader social concerns. For example, I argue that greater attention to policy domains rather than focusing primarily on developing apparatus for working with individual minds can broaden the conceptions of "student", "teacher" and "mathematics" that are more prevalent in mathematics education research.

## 2. LACAN PIAGET VYGOTSKY

Lacan's professional career spanned the middle decades of the twentieth century. He was influenced primarily by Sigmund Freud but also by Saussurian linguistics, and arguably Peircian semiotics. Saussure's (1995) influence is explicitly and extensively cited (e.g. Lacan, 2006, pp. 412-441). Saussure had famously argued that linguistic signs connect sound-images to concepts, instead of names to things, which underpinned a key shift in Lacan's work relating to how we might encapsulate humans and their minds. That is, we apply language to the concept of a human (rather than to an essentialised individual thing) where the concept can shift as a result of this application. Meanwhile, Peirce's semiotics, which integrated the notion of an *interpretant* impacting on the meaning of any signifying system, impacted on Lacan's work more obliquely (e.g. Lacan, 2002). Peirce's influence on Lacan has been identified by Lacan's son in law and intellectual custodian, Jacques-Alain Miller, who claimed in an introduction to Lacan's "*Ecrits*" that Lacan's understanding of subjectivity was inspired by Peirce's semiotic triad of sign, object and interpretant, and by his ideas of signifying production as an unlimited semiosis (Nordtug, 2004). Wiley (1994) however, insists that Lacan and Peirce represent different understandings of subjectivity. Since Lacan often defied academic conventions in referencing sources, the complexity of the territory resists an easy resolution to this question.

For Lacan (2002) the signifier does not mark a thing - it marks a point of pure difference in a discursive chain, and thus triggers a way of thinking. Through developing his psychoanalytic theory Lacan provided an important extension to Freud's understanding of the workings of the human mind. Lacan's theory combined linguistics and semiotics in producing a radical conception of subjectivity modelled on how clients presented (signified) themselves to an analyst. That is, if as a client I describe myself to an analyst I reveal a lot about how I understand myself but also how I (consciously and unconsciously) understand my social relationships as defined through my participation in discursive networks. Lacan's theory of the subject is centred on this attempt at self-definition, although the very notion of self is problematised or fragmented in his work. As Nordtug (2004) points out many authors write as though self and subjectivity are synonymous but in much contemporary theory subjects are understood as being effects of discursive activity rather than cognitive units (e.g. Foucault, 1997; Althusser, 1971). This seemingly curious move privileges humans being understood as being implicated in particular ways of talking about the world rather than as positively defined cognitive/

biological entities. Such perspectives have led to re-evaluations of the definition and tasks of the discipline of psychology itself (e.g. Parker, 2007). Lacan's work bypassed the respective psychologies of Piaget and Vygotsky, both of which are centred on more or less socially aware individuals, and reconceived Freud's psychoanalysis as narrative-based rather than scientifically based. In so doing he provided a powerful link to contemporary discursive conceptions of subjectivity. Contemporary take up of Lacan's work however has not so much been concerned with individual minds engaged in a psychoanalytic relation but rather such new work is directed more towards cultural studies and political theory (Žižek, 2006a; Laclau, 2005) and philosophy (Badiou, 2001; Butler, 1997, 2005). Others seeking to explore the ramifications of combining semiotics and subjectivity within the social sciences in a more accessible way include Hodge and Kress (1988), Fairclough (1995), Lemke (1995) and Gee (2005). This work is indicative of a refusal to treat individuals as analytic units outside of a social frame since any individual characteristic would be a function of the social frame supposed. I am proposing that mathematics education research has leant on overly restrictive analytical apparatus consequential to the discipline of psychology itself defining its own territory in an overly restrictive fashion around cognitive/biological entities (Parker, 2007). And this restriction to its apparatus has resulted in mathematics education research having a restricted vision of its own task. For example, by placing too much emphasis on researching the teacher's capacity to change the intellectual activity of the individual child, attention to the social assumptions being made in constructing "mathematics", "learner" and "teacher" is under-stressed. I concur with Radford (2006b, p. 23) who argues in his cultural theory of objectification that "the meanings circulating in the classroom cannot be confined to the interactive dimension that takes place in the class itself; rather they have to be conceptualized according to the context of the historical-cultural dimension".

I commence by offering a brief account of Lacan's attitude to Piaget, before attempting to join dots in calculating his view of Vygotsky. This brief passing reference to psychology however serves to emphasise that Lacan set the parameters of his theory rather differently and that his concerns transcend psychology as understood by most psychologists. Lacan certainly did not regard himself as a psychologist, in so far as psychology is about individual minds. And in particular Lacan privileged the notion of the subject produced through symbolic engagements over conceptions of individual cognitive entities. Through this route humans are seen more as players in social organisations and, in the context of mathematics education, teachers and students are primarily shaped by the social arrangements that prevail rather than by the specific conduct of teacher-student encounters. And as such this paper is directed more at understanding how those social organisations function rather than with how individual teachers' might adjust their classroom practice.

### *Piaget*

Lacan is scathing about his contemporary Piaget precisely because the latter assumed that a separation between individual and social is a useful analytic device in understanding learning. Piaget's assertion of an individual child passing through successive stages denies the full cultural dependency of the child's constitution asserted by Lacan. As it

would be hopeless to suppose that biological, physical and chemical aspects of the body could be held in by the same limits, any attempt to synthesise a supposed individual's activity in a multitude of discursive networks seems unlikely to succeed. Lacan castigated Piaget's emphasis on ego-centred analysis of learning instead interpreting children's actions against what he saw as the call of the Other. That is, Lacan believed that the child is responding to what the child perceives to be a demand to fit in.

The Piagetian error ... lies in the notion of what is called the *egocentric* discourse of the child, defined as the stage at which he lacks what this Alpine psychology calls reciprocity. Reciprocity is very far from the horizon of what we mean at that particular moment, and the notion of egocentric discourse is a misunderstanding. The child, in this discourse, which may be tape-recorded, does not speak for himself, as one says. No doubt, he does not address the other, if one uses here the theoretical distinction derived from the function of the I and the *you*. But there must be others – it is while all these little fellows are there, indulging all together, for example, in the little games of operations, as they are provided with in certain methods of so-called active education, it is there that they speak – they don't speak to a particular person, they just speak to nobody in particular. (Lacan, 1986, p. 208)

For Lacan the ego, the individual's understanding of who she is, is a response to the big Other, which directs and controls the acts of the ego. The big Other comprises the network of symbolic structures and discourses that I inhabit, try out for size, explore myself through, see my self reflected in, etc. Lacan calls this network the *Symbolic*, which will be discussed in the next section. Walkerdine (1988) showed mathematics educators how the concrete mathematical objects of Piaget's analysis were necessarily implicated in the child's conception of social relations. Whilst Piaget (e.g. 1965) centred his approach on a conception of individual cognition, Walkerdine contrarily posited both "student" and "mathematics" as being constructed in discourse. That is "student", "mathematics" and, for that matter, "teachers" are understood through specific constructions of the world. They are not things in themselves. For example, there are many ways in which we can pay attention to the presence of a student once she has arrived in a lesson described as "mathematics" by her teacher or school; her capacity to follow some prescribed mathematical steps, her capacity to relate mathematical apparatus to real life problems, her performance in certain forms of examination, her alignment with other pupils in terms of her physical presence in the classroom (clothing, behaviour, mode of engagement, etc), her residential or fee paying status (or even gender in some schools or countries) that may have some bearing on her admission to the room, her capacity to speak the local dialect, and so forth. Similarly, "mathematics" or "teachers" can be processed through a wide variety of social filters that undermine any supposed unity to those terms. (For example, Sammons, Day, Kington, Gu, Stobart and Smees, 2007, have carried out a major UK government funded study in to how differences in teachers' lives, such as personal pressures or career stage, impact variously on student performance.) My attention always goes beyond the mere objects in my immediate apprehension, shaping my talk and thus reflexively revealing my conception of the social

network and how I fit into it. The ego is in no way self-contained. That is, my sense of who I am is a result of my social engagements, where those social engagements are understood through a very broad spread of activity. My very sense of how I shape my own words, objects and gestures and how I interpret those of others is built through particular culturally dependent social experience. Elsewhere I discuss this in relation to the co-dependency of early language and mathematics (Brown, 1996, 2001).

Lacan (2006) claims that we all want to be looked at by a particular other in a particular way and that this is part of our constitution. What matters is who is looking at whom and how that makes up the parameters in to which actions are addressed. The cogito is not an entity in itself but a relational entity built through social interaction where the relations have many subtle or concealed features. The ego is shaped by guessing the answer to its own question (What is it you want from me?) addressed to the big Other (Žižek, 2006b, p. 8). All mathematical activity is predicated on being noticed and actions being shaped around that supposed noticing as part of social activity. The supposed objects of mathematical activity are implicated in and affected through such social processes. The human subject is produced as a result of this engagement, but a form of subjectivity profoundly connected to/understood through the network of discourses. For any mathematical gesture made by the student there is an attendant effect produced through this discursive embroilment, an effect that transforms the gesture and the objects contained/created therein.

### *Vygotsky*

Vygotsky (1986, pp. 12-57), meanwhile, shared some of Lacan's objections to Piaget, such as, how minds are social from the outset, on how children are differentiated from adults. Although it might be pointed out that Lacan was responding to a much older Piaget than was Vygotsky. Yet Vygotsky's concise work under the banner of psychology preceded Lacan's more intensive analysis over some fifty years of the human subject as an effect of social discourses. Vygotsky's (e.g. 1978, p. 36) encapsulation of the child posits an intentional being with essentialist characteristics:

the child, with the help of speech, creates a time field that is just as perceptible and real to him as the visual one. The speaking child has the ability to direct his attention in a dynamic way. He can view changes in his immediate situation from the point of view of past activities, and he can act in the present from the view point of the future

Vygotsky's work however has had a longer-term influence on a significant band of major thinkers motivated by a desire to create a more culturally oriented conception of psychology, where mind is "co-constructed and distributed" (Cole, 1996, p. 104), an agenda compatible with Lacan's. Yet despite the longevity of these enterprises there has been little communication between them, with a few exceptions (e.g. Bruss, 1976). Michael Cole (1996, p. 108), a student of Vygotsky's colleague Luria, argues that the "central thesis of the Russian cultural-historical school is that the structure and development of human psychological processes emerge through culturally mediated, historically developing, practical activity." The objects created in this structure reflect



and define the human's sense of self and her relation to the world. Key elements in this construction included: "mediation through artifacts" (p. 109) where the term "artifacts" encompasses Vygotsky's notion of tools, including linguistic tools; "historical development" in which already-created tools are arranged for rediscovery in each succeeding generation; and "practical activity" (p. 110) where it is assumed that psychological processes are grounded in humans' everyday activity. As an example, Radford (2006b, p. 7) provides an extended contemporary analysis of how this might be understood in a mathematics classroom. He analyses a classroom example in which a wooden ruler, a number line and mathematical signs on a piece of paper are all seen as artefacts, which "*mediate and materialise* thinking". See also Blanton, Westbrook, & Carter, 2005 and Goos, 2005. Meanwhile, artefacts such as works of art, scientific models, architectural designs, food recipes and other such cultural forms provide filters for understanding for successive generations as part of historical development. Further, my sense of the world is a function of what I do.

Lacan and Vygotsky would agree on much of this but differ in their understanding of how humans relate to this symbolic mediation. As we shall see shortly, Lacan claims that humans feed off the linguistic apparatus that surrounds them but at the same time they are alienated from this apparatus, it never quite fits their sense of reality, and sits ill with their sense of self. Vygotsky's (1986, pp. 174-208) psychological notion of *Zone of Proximal Development* attends to the localised case of children trying to learn from adults but Lacan's assertion of humans being alienated from language is built into their very constitution as subjects. Emerson (1983, p. 256) pinpoints this difference

For Vygotsky, the child's realization of his separateness from society is not a crisis; after all, his environment provides both the form and content of his personality. From the start, dialogue reinforces the child's grasp on reality, as evidenced by the predominantly social and extraverted nature of his earliest egocentric speech. For Lacan, on the contrary, dialogue seems to function as *the* alienating experience, the *stade du miroir* phase of a child's development.

As will be discussed in the next section Lacan's model of child development pivots on the notional point at which the child identifies with an image outside of herself (such as a mirror image) and says "That's me". And the opposition this creates between the "me" and the "I" results in a "permanent hunger" (ibid) to close this gap. As Emerson (ibid) continues: "The child is released from this alienating image only through discovering himself as subject, which occurs with language: but this language will inevitably come to him from the Other". That is, the only way out of the restrictive caricature of self is to accept the turbulence of participation in discursive activity, but any attempted identification with specific discourses or ideologies is tainted by the subject's desire to respond to the big Other. Meanwhile Bibby (forthcoming) argues that

The seductive imagery conjured by Vygotsky's metaphor of the "zone of proximal development" leaves hanging the nature of the zone and obscures the space it occupies, it allows us to ignore the difficulties and resistances which the learner will encounter and develop. Indeed, it demonises them –

any resistance must be wilful and destructive: why would anyone want to resist benevolence and kind intentions? In doing this, the metaphor encourages us to ignore any differences between the learner and the teacher and seems to suggest that the learner's differences will be unimportant and willingly subjugated to the teacher's benevolent intentions. Similarly, the metaphor locates the teacher in a place of idealised omnipotence – an impossible place from which to teach or relate, a place from which the teacher's own difficulties and resistances, perhaps difficulties with particular students, become intolerable and unspeakable.

Teachers and students variously act according perceived demands. Teachers may or may not identify with particular aspects of the curriculum. Children may or may not connect with the account of the world that the teacher seeks to present. For a teacher working according to a specific curriculum there may be forms with particular meanings that she feels she needs to communicate. Yet the child's apprehension of the form may be out of line with the teacher's intended meaning. I recall an incident in a mathematics lesson where a boy was moving matchsticks around a table like his fellows in a seemingly focused way, yet these movements bore no relation to the numerical intention as outlined by the teacher on the blackboard. The mathematics education research literature is full of examples of students not quite understanding the meaning that their teacher assigns to particular mathematical configurations. Psychologically these might be regarded as a localised problems resulting from the pedagogical definition of the task and the child's inexperience with making the required sort of intellectual connection. Educationally the learning situations might be seen as reproductive (Bourdieu and Passeron, 1977) in the sense that education does not have to be about children learning specific ideas from a teacher. Gallagher (1992) outlines a range of possibilities in this regard. In Lacan's model there is a cost attached to conceptions of psychology that process and understand the human through such objects insofar as the students fall short of the supposed correct meaning. The students get judged through an idealised account of what they should be as though a broader truth is captured in those local circumstances. Psychology as a discipline works in the name of the supposed normality of the status quo (Parker, 2007). The shaping through inherited or imposed artifacts, tools or words, Lacan would argue, can begin to misrepresent the human's sense of self and thus demand or suppose compliance with a false caricature. The human subject may be seen as being an effect of discursive activity. That is, definitions of the human subject derive from how the world is spoken about within particular ideologies. Yet Lacan insists that there is always a failure of fit between the psyche and the discursive depiction or tool kit. That is, there is a gap, a gap that prevents the subject having a completed sense of his or her self. And for Lacan this gap locates and activates desire, a desire brought about by a promise of perfection, but a desire that often mistakes its object. For example, the child misunderstands what would be achieved in getting the mathematics correct and this misunderstanding affects the nature of the child's motivation. We may well have fantasies of who we are and fantasies of the world that we occupy, fantasies emanating from different aspects of our fragmented selves but, for Lacan, there is always something beyond these fantasises and this supplement interferes with the operation of our fantasies.

### 3. THE LACANIAN SUBJECT

#### *The mirror phase*

Lacan offers a more thoroughly relational conception of the human subject where that relationality is built into the very constitution of the subject. Meanwhile, some contemporary work in psychology (e.g. Parker, 2007) has been more inclined than in the past to understand conceptions of the mind as being culturally specific. Individualistic conceptions of mind are perhaps more Western than Eastern and those conceptions are as much constructive as descriptive and relate to categories that continue to evolve. As a result, some alternative perspectives being advanced within contemporary social theory have unsettled more traditional psychological models, which often assumed a cognitive/biological unity as central to analysis. For Piaget this Cartesian unity (e.g. Descartes, 1642/1971, pp. 66-75) was quite evident:

Developmental psychology moreover represents an integral part of developmental embryology (which ends not at birth, but on arrival at that state of equilibrium which is the adult state), and the intervention of social factors does not detract from the validity of this assertion, because the organic development of the embryo is also in part a function of the environment (Piaget, 1972, pp. 17-18)

The diversity of cultural perspectives on notions of the mind is more readily accommodated in Lacan's framework since, as we shall see shortly, a human's understanding of herself is constructed in an image outside of herself rather than in some essentialist account based on a body or mind. Lacan's conception of subjectivity, like Vygotsky's, encompasses a dimension built through the subject's cultural situation. This is achieved through a radical adjustment to the Cartesian orientation supposed within cognitive psychology. Rather, Lacan's model derives from adding phenomenology and Hegelian conceptions of reflection (Hegel, 1807/1977) to Freudian psychoanalysis (1). Freud had earlier claimed that the human does not have a sense of self from the outset and that some new psychical action must take place to constitute the ego but he did not say what this psychical action was. Lacan saw the psychical action as being the child building an understanding of themselves by, as it were, seeing herself through her own mirror image. That is, the child conceives of herself as being reflected in a mirror, but this conception results in a transformation of that image to contain just those bits that the child supposes it to be. For Lacan the child in seeing "herself" in the mirror is identifying with an image outside of herself, characterising the image as being "me" whilst bringing to her own body itself a unity that she had not previously conceived. Here the notion of the mirror need not be taken too literally, it could be that the child recognises "herself" in another child. This marks the stage at which the child becomes able to understand herself as complete. But Lacan argues that this recognition is deluded, symptomatic of an order that Lacan calls the *Imaginary* to be elaborated shortly. The assertion of "that's me", that is, the assertion of the ego, comprises that which Lacan (quoted by Leader and Groves, 1995, p. 24) claims to be "an inauthentic agency functioning to conceal a disturbing lack

of unity”.

More generally Lacan sees the human subject as having a conception of self located in a fantasy of that self. Žižek (2000, p. ix) offers an example to illustrate this in which he suggested that the director Woody Allen, in the wake of his separation from Mia Farrow, appeared in a number of broadcasts to be like one of his own neurotic and insecure film characters. Žižek asked whether we could assume that Allen had put his own character in to the films. Žižek answered his own question in the negative, preferring to suggest that Allen was in fact copying a certain model that he had elaborated in his movies. He argued that real life was imitating symbolic patterns expressed at their purest in art. That is, human subjects do not have access to their true selves. They are decentred. Rather they play according to a fantasy of who they are or of who they think they should be. Elsewhere (Brown and McNamara, 2005), I provide countless examples of new teachers seeking to craft their actions according to the strictures of school and government requirements. See also Valli and Buese (2007). The image of who they should be is specified in great detail and, in due course, new teachers identify with such specifications, see themselves in those terms and, like their employers and regulators, begin to assess their own performance (find pleasure even) in those terms. See also Hanley (2007) and Nolan (2007). Ultimately, their practices are only noticed to the extent that they conform to the official image. As another example, many US mathematics teachers work according to a specific conception of the Reform agenda (e.g. Van Zoest & Bohl, 2002; Remillard & Bryans, 2004; Remillard, 2005), an agenda sometimes embraced by mathematics education researchers outside of the USA (e.g. Skott, 2001). They conform to an image of a “teacher” outside of themselves as it were, as a result of this image seeming to provide a version of life to which they can subscribe, identify with. Perhaps such identification with a movement (Laclau, 2005) can provide individual teachers with a sense of collective purpose. In another article (Brown, Hanley, Darby and Calder, 2007) I have argued that Reform functions as an ideology that can provide an effective point of reference for teachers and researching evaluating the social connectivity of their respective work. Teachers can aspire to evaluating their own practices in those terms. Researchers can judge their work according to how it supports the cause of Reform objectives. That is, the vocabulary of the ideology provides the apparatus or technology through which one is recognised, and through which one learns to recognise oneself (Žižek, 2006a, Brown, in press). Learning or teaching effectively in those terms only guarantees subscription to that ideology. It only guarantees successful mathematics learning teaching if you happen to subscribe to that ideology and the infrastructure that supports it.

As an example, in relation to students learning mathematics, I have provided elsewhere (Bradford and Brown, 2005) an account of some Ugandan students being asked to describe a variety of shapes in terms of their circularity. This was not a straightforward task for them as words for basic geometric shapes were not part of the students’ indigenous vocabulary. In their language words for objects such as square, triangle (*sikwera* and *turyango*) were only recently introduced and based on their Western equivalents. The students were caught between using their own indigenous language and the language of the Western oriented curriculum, taught by a Western teacher, which defined their mathematical lessons. Their own language was shaped around descriptions of everyday activity rather than around the classification of objects, which is more

common in English. For example, the closest approximation to the word circle was the word *oriziga* which, roughly translated, meant circular. As a result objects such as spiral, globe, oval were all *oriziga*. Words such as “circle” and “sphere” were *muzunga* (white) words and entailed labelling objects in a mode of abstraction less common in the students’ indigenous language. (Teacher: So if I give you an orange, a football, this small ball, and this stone, what shapes are they? How would you describe the shape in vernacular? Student: They are all a circular and shaped like the small ball.) In this classroom situation the students’ conceptions of mathematics were recognised, *with respect to the curriculum*, only to the extent that they could express themselves in a Western register of mathematical terms. A student’s mathematical self was only acknowledged to the extent that it was expressed through a Western filter. In this regard correctness in mathematics is culture dependent according to how mathematical phenomena are framed (Brown, 2001). More generally, the phenomenologist Husserl (see Derrida, 1989) sought to enquire how geometry came into being. He concluded that without the anchorage of words (that is, culturally specific constructs) it was quite difficult to conceptualise. Lacan (2002) has provided an extensive account of the evolution of numerical counting, although his efforts exceeded this reader’s patience.

The cross-cultural example, however, provides an excellent analogy in respect of students in more or less cross-cultural situations, around the world and in any country, insofar as there is a common requirement that students translate their experiential involvement in the world through unfamiliar linguistic or symbolic registers. And as in Žižek’s assessment of Woody Allen, they get accustomed (or not) to occupying a particular mode of being defined by a language outside of themselves. As Žižek (2001, p. 75) puts it in describing a similar example, “he does not immediately display his innermost stance; it is rather that, in a reflective attitude, he “plays himself”. Even Piaget (1972, pp. 20-23) questioned the possibility of a clear distinction between mathematical and empirical knowledge. And so long as empirical experience impacts on mathematical knowledge the cultural or inter-subjective dimension of human perception will be implicated even in the most abstract manifestations of mathematical knowing and the most generalised accounts of mathematical knowledge. Psychoanalytic theory emphasises relational conceptions of the human subject. In Lacan’s formulation teacher and student cannot be understood in isolation from each other. Rather like the relationship between analyst and analysand they are co-formative, each seeking something from the other. Their specific relationship is symptomatic but also generative of the culture in which they reside.

### *The Imaginary, the Symbolic and the Real*

Lacan’s notion of subject is based on three orders: *the Imaginary, the Symbolic and the Real* (cf. Brown and England, 2005). As seen above the Imaginary might be seen as self-identification, or rather, the creation of images of oneself. The notion of a young child looking into a mirror and seeing a whole self, an image of completeness, gives the child a sense of mastery. But this has some cost since the child is identifying with an image outside of himself. The crucial point here is that the individual, looking in on himself, sees an image (a fantasy) of himself, not the “real me” as it were. This identification however lays a foundation for a more symbolic engagement with the world. Bhabha

(1994, p. 77) pinpoints this: “The Imaginary is the transformation that takes place in the subject at the formative mirror phase, when it assumes a *discrete* image which allows it to postulate a series of equivalences, samenesses, identities, between the objects of the surrounding world”. The image of self, as characterised by a name, fixes an egocentric image of the world shaped around that image of self.

The Symbolic meanwhile relates in some respects to the notion of “interpellation” (Althusser, 1971, p. 174). Whilst the Imaginary might be seen as the individual looking in on a fantasy self, the Symbolic encapsulates this individual looking out to a fantasy world filtered through the ideological framings brought to it. These two fantasies continue to impact on each other yet the identification with each of these fantasies remains alienating as they each operate within a “previously formed language” (Althusser, 1971, p. 213). I can swim in the Symbolic but cannot grasp it.

The Real might be seen as the space in which the Imaginary and Symbolic are enacted. The fantasies built within the Imaginary and the Symbolic fail to capture, respectively, the signified self and the signified world. This brings into play a space for desire motivated by the supposed possibility of closing the gaps between the supposed Imaginary and Symbolic and the Real that hosts these dual fantasies. The Real, by definition resists symbolisation. The resources of language cannot mop up the whole of experience. Otte (2006, p. 16) gives a flavour of the Lacanian Real in the world of mathematics education where he suggests

It is impossible ... that everything means something. Not everything in the world is reasonable and intelligible. There exist pure feelings or brute facts that seem to escape any reasonable explanation. We therefore cannot describe or explain everything.

Lacan’s system of thought combines Imaginary, Symbolic and Real in a Borromean knot of mutual dependency where no element is privileged and each has a contingent status. Each order impacts on the other two orders.

At the Imaginary level we have signifiers in the social space of mathematical learning activity each shaped and characterised by its name: “student”, “teacher”, “circle”, “functional relation between  $x$  and  $y$ ”, “ $3 \times 4$ ”, “teacher accreditation criterion”. Each such “mathematical” object has a name and sense attached to that name (*Imaginary*) but that sense is different for each person, teacher, pupil, at different times, in different circumstances, within alternative curriculum documents, in different countries, etc. Any role such terms have in a symbolic network is filtered through the Imaginary perspective on them, even though that symbolic network is at least partly generative of the individual human subject. Each individual person has a different sense of how any object is positioned in relation to the discursive network. Such terms relating to perceived objects can be suggestive of character and function but sensual aspects can shield alternative or more generalistic aspects (cf. D’Amore, 2006).

At the Symbolic level these words are articulated in particular ways according to the multiple sets of cultural rules that prevail, such as a teacher giving a task to a student and expecting a specific style of response. Different discourses (e.g. Reform mathematics in the United States, cognitive psychology, constructivism) make use of different sets of words and use them differently. Žižek breaks down such symbolic operation to a number

of registers, such as grammatical rules followed blindly, cultural rules that allow partners to communicate, unconscious prohibitions that stand in the way of certain paths of action (e.g. not wanting to be seen as being too clever in class, not wanting to reveal sensitivities, keeping up proper appearances, etc). The Symbolic provides a yardstick against which I can measure myself and understand myself in relation to the social frame. That is, the self is not egocentric but defined in response to the call of Other. This dimension may obscure access to clear meanings yet such suppositions of clear or static meanings require reductive accounts of the life we are seeking to capture and serve through mathematical activity. In Lacan's account the meaning of words is constantly in flux refusing to settle for the purposes of unambiguous communication shaped around such clear or static meanings. The rules and conventions (the *Symbolic* order) that govern mathematical activity are context dependent insofar as in different mathematical domains (school, university, shopping, engineering, economics), different questions are asked, different things are emphasised, different assessment instruments are applied and different fashions prevail.

Yet the understanding of the social space as the enactment of these rules does not mop up everything. There are other factors governing mathematical activity: emotion, intelligence, mode of compliance /resistance of pupil, school context, affective dimensions of mathematics in particular learning sites, conceptions of learning relation; the quest to please the teacher; the satisfaction derived from particular relations with a teacher; the perverse pleasures achieved by those who paint themselves as mathematical illiterates, etc. Such is the domain of the Real. This domain cannot be ignored, and if such factors are ignored the efficacy of our research is compromised. The research would apply to "types" rather than the diversity of childhood. The subject is a product of discursive networks in which objectivity is refused a place except in the Real, that which by Lacan's definition refuses symbolisation.

A key argument of this paper is that mathematics education as a discipline often restricts its concerns too much with a) an assumed naturalness of names at the Imaginary level such that certain subjective dimensions are privileged over others, b) narrow conceptions of the Symbolic interaction (required performance of given mathematical procedures, tight specification of social roles), c) a neglect of the Real except as understood through external factors (e.g. affect, curriculum power relations, intelligence seen merely as better performance on a given register). This reductionism is captured in Lacan's definition of the signifier:

The signifier ... functions as a signifier only to reduce the subject in question to being no more than a signifier, to petrify the subject in the same movement in which it calls the subject to function, to speak, as subject (Lacan, 1986, p. 207).

In Lacanian terms, how might we define the big Other that mathematics education research writers are talking to? How do they conceptualise their audience? Through which strategies do authors seek to convince this audience? Such questions often remain understated in mathematics education research.

Lacan refuses the possibility of critical distance, or of an objective standpoint from which we can view the truth of the world. And for Lacan the only truth is the truth of

desire. By that he means the emotional flows activated by engagement with symbolic structures and the attempts to close the gaps between those structures and the lives they seek to capture. Mathematics and the structures that guide its conduct in schools are not neutral activities. They provoke diverse responses where emotion supplements any compliant action. For Lacan (2002), such desire never settles and is never satisfied. And as a consequence conceptions of mathematical objects, the people working with them and the social arrangements that host such conceptions and such people continue to evolve and shape themselves without the comfort of an imminent ideal outcome. Consequently, the triad of Imaginary, Symbolic and Real, or Lacan's more localised notion of a "signifier representing a subject for a signifier" (to be discussed shortly) resist convergence to supposed idealisms, whether those idealisms be geometric objects co-existing in a Euclidean framework, a standardised conception of a pupil learning mathematics in school governed by a robustly conceived curriculum, or a systematically conceived conception of mathematics operating in a harmoniously functioning society. Or more prosaically, Lacan's system of thought would resist idealisms such as "cognitive systems that ... give access to mathematical objects (Duval, 2006, p. 103) or "real mathematical activity (that provides) representations of mathematical entities" (Otte, 2006, p. 11). Such preferences are culture-dependent and time-dependent and may well be symptoms of blockages to certain alternative ways forward.

#### 4. THE SIGNIFIER REPRESENTS THE SUBJECT FOR ANOTHER SIGNIFIER

Lacan's construction of subjectivity builds on Peircian semiotics, and in particular Peirce's notion of the sign, which underpins several of the papers in the Special Issue on semiotics of *Educational Studies in Mathematics*. Peirce and Lacan are seemingly close on many core theoretical themes but my intention is to show how Lacan's work reaches more convincingly towards contemporary work in subjectivity than does Peirce. This is most apparent in Lacan's (2002/1961) notoriously difficult Seminar Nine on Identification referred to above. Yet we may see glimpses of this from a later seminar by Lacan (1986/1973) where he states in his characteristically slippery way, that

The whole ambiguity of the sign derives from the fact that it represents something for someone. This someone may be many things, it may be the entire universe, in as much as we have known for sometime that information circulates in it ... Any node in which signs are concentrated, in so far as they represent something, may be taken for a some-one. What must be stressed at the outset is that a signifier is that which represents a subject or another signifier.

The first and last sentences may be read as mapping closely into Peirce's famous definitions.

*A Sign, or Representamen, is a First which stands in such a genuine triadic relation to a Second, called its Object, as to be capable of determining a Third, called its Interpretant, to assume the same triadic relation to its*



Object in which stands itself to the same Object. The triadic relation is *genuine*, that is its three members are bound together by it in a way that does not consist in any complexus of dyadic relations. (Peirce, CP 2.274)

A sign, or *representamen*, is something which stands to somebody for something in some respect or capacity. It addresses somebody, that is, creates in the mind of that person an equivalent sign, or perhaps a more developed sign. That sign which it creates I call the *interpretant* of the first sign. The sign stands for something, its *object*. It stands for that object, not in all respects, but in reference to a sort of idea, which I have sometimes called the *ground* of the representamen. (Peirce, CP 2. 228)

Yet this apparent mapping is disturbed by certain details. The appearance of the word “ambiguity” hints at something less straightforward. This uncertainty relates to how Lacan’s “someone” maps on to Peirce’s term “interpretant”. Brown, Atkinson and England (2005, p. 73) argue that Lacan’s famous last sentence might be understood through an example of a chart at the end of a hospital bed. The signifier, a graph maybe, represents the subject, a patient in the bed, for another signifier, a doctor or nurse reading the graph with view to it impacting on a specific dimension of their subsequent actions. That is, we are not attending to patient or medic as holistic subjects but rather through the restricted registers of the patient with particular symptoms and a medic only interested in those symptoms. That is the sign relation only works or applies within a particular discursive register, or in a specific “ground” to use Peirce’s terminology. The ambiguity is located on how we understand the subjectivity or identities of such actors when filtered through such limited registers. The “someone” or “interpretant” are in a sense, in any instance, both discourse specific. They only register as entities in certain modes of discourse, or ground. And in the context of mathematics education we might wonder how this reduction functions when understood in the context of teachers, learners and mathematics. In particular, what reductions of teacher, learner and mathematics might result from semiotic analysis of mathematical activity? What do we hold still in seeking to understand how those words signify? And what cost does that freezing have? The convenience of holding the meaning of a word or symbol still for the purposes of communication privileges some interests over others.

For example, mathematics teachers might be understood and recognised by their employers only insofar as they fulfil the remit of a government policy directive. Stephens (2007 p. 32) reports on his involvement as an education authority manager in a Neighbourhood Renewal Strategy where his work is prescribed by a central government directive: “Overall the targets set in 2000 are aimed at ...ensuring that at least 25% of pupils in every school and 38% in every local education authority can achieve five or more GCSEs a grades A\*-C (British 16+ examination)”. Such targets are supplemented by policy apparatus specific to mathematics: For schools; National Curriculum, National Numeracy Strategy, Standardised Attainment Tests, Standardised training programme for teachers administering the Strategy, Government Inspections; For training colleges; National Curriculum for Initial Training, Numeracy Skills Tests for teachers, Government Inspections for training colleges. Brown and McNamara (2005) provide further discussion of this. Within such a frame children’s mathematical work may only be

appreciated to the extent that it fits within the teacher's immediate objectives as defined within such apparatus. As another example, in a New Zealand government study that I directed, Pacific Island teachers sometimes felt that they were only noticed within school contexts "insofar as they fitted the conventional image of a New Zealand teacher" (Brown, Devine, Leslie, Paiti, Sila'ila'i, Umaki, & Williams, 2007, p. 115).

The ambiguity for Lacan I believe is centred on how the "someone" is predicated in semiotic activity. What aspect of the whole person is activated (or brought into being) in a particular semiotic configuration? How are they created as subjects? Especially, since in poststructuralist readings notions such as "whole person" are deeply troublesome. Which discursive aspect responds (appears) and why? Yet Lacan's work on subjectivity provides a crucial albeit less travelled link that connects Peirce's semiotic insights to the philosophy of the later twentieth century, where the production and analysis of subjectivity have assumed centre stage in many important debates. It is this more extensive engagement with discursive networks and their production of subjectivity that fuels Lacan's concerns, and in turn Žižek's (2006a) account of these in a broader social arena. This connection is hinted at in Lacan's curious suggestion that the "someone" could be the "entire universe", made yet more obscure by the clause "in as much as we have known for sometime that information circulates in it". Contemporary understandings of subjectivity centred on human immersion in discursive and signifying activity provide a backdrop to Lacan's assertion that someone might provide access to the entire network of discursive activity. Everyone is implicated in the discursive construction of society and everyone draws on that construction. And thus: "Any node in which signs are concentrated, in so far as they represent something, may be taken for a some-one". Yet between the "entire universe" (which I take to mean the universe of the discursive domain as defined by participation in it) and the example I have offered of a medic with a specific brief there are many possibilities, each defined by their specific mode(s) of engagements with the discursively created world. It is important to maintain this range of possibilities in analysing mathematical phenomena and the teachers and learners working with these. If we were to suppose that research were in the business of providing formulas for action there would be a need to take great care in ensuring that the diverse entities of learner, teacher and mathematics are not reshaped or reduced for the purposes of fitting such formulas. Or perhaps rather we need to be attentive to how such reshaping and reductions, inevitable as they may be, transform our understandings of what we are trying to achieve with groups of people or with individuals.

## 5. CONCLUSION

The notion of subjectivity is crucially important to mathematics education research in that we can ill afford to be insensitive to the alternative needs of learners, their teachers and the communities with which they associate. The very definition of psychology as a field of study has over-emphasised "American individualist ideology" (Wertsch, quoted by Newman and Holzman, 1993, p. 31) resulting in a partisan and sometimes dysfunctional control technology. Within this frame of reference mathematics education research has had a past tendency to shape itself around the needs of pupils understood in a rather limited way. Mathematics is a function of the community that embraces it and evolves in

relation to the needs expressed and tasks performed. For this reason it is necessary to resist moves in which mathematical achievement in schools is increasingly read against a register of *commodified* procedures, in a “one size fits all” model, spanning diverse nations and communities, where individuals are required to fit in and act appropriately. This paper has sought to illustrate how theoretical apparatus commonly utilised within mathematics education research can fix our understandings of both teacher functionality and the dimensions of children’s mathematical learning into time or culture dependent configurations. I have provided examples of common psychological theories and accounts of signification, which produce overly reductive conceptions of the student and teacher within the fabric of mathematics education research output. Piaget supposes progression through a sequence of predetermined stages. Neo-Vygotskian theory psychological supposes unproblematised engagement with the tools of society. Peircian semiotics, as utilised in some mathematics education research, separates mathematical signification from subjectivity. Duval (2006) for example asserts that mathematical objects are only known through signs yet underplays the productive role of the situated individual who gets to know these signs. I am reminded of a frequently encountered dilemma faced by teachers working with children that might be encapsulated by the plaintive request: “Look at what I am showing you but it is what you see that is important”. Semiotic systems are culture dependent and subjectivity is entwined in each dimension of this dependency and what you see results from this entanglement. Lacan’s three orders the *Imaginary*, the *Symbolic* and the *Real* that make up his conception of the subject provide a pliable analytical framework for inspecting the wider ramifications of subjectivity in mathematics education research and beyond.

But the more important concern is that in our everyday activity in the name of mathematics education we are guided by terms that petrify the phenomena to which we give our attention. Phenomena can become to be understood only as a function of outmoded control technology. For example, pedagogical devices can begin to shield or replace the mathematical concepts they were designed to reveal (Brown, Eade and Wilson, 1999). Lacan’s conception of subjectivity, whilst complex, does provide a way of thinking differently in which “teachers”, “students”, “mathematics” and the frameworks that define them (curriculums, policy initiatives, research frames, learning theories, public expectations, employer demands) are conceptualised as mutually evolving entities resulting from the play of discursive activity. Yet for Lacan discursive activity is more than mere words and symbols. Rather the operation of discursive networks shapes us all, along with the very world in which we live and the objects contained therein. And in so doing this glues us into these multiple realities with varying degrees of comfort in positions that confer many and sometimes conflicting perspectives. We need to live with reductionism that results from attaching labels to life but we also need to learn how specific forms of reductionism serve particular ideological interests.

Mathematics education research has had a tendency to be targeted at teachers, teacher educators and researchers and this activity masks us from the limited impact that it has. Such research can only ever reach a small proportion of such individuals restricting any process of dissemination. Yet even the capacity such individuals have for impact on broader states of affairs in mathematical learning must be questioned. Politicians and government administrators can often have more influence on the shape of mathematical learning in school through dealing with populations rather than individuals, social

organisation through policy directives, rather than face to face encounters. Mathematics education research needs to be attentive to how such handling of populations impacts on broader conceptions of subjectivity and how we might impact on the factors that shape this subjectivity. And for this reason our engagement with theory requires apparatus that reaches out to what may at first seem more distant concerns.

#### NOTE

1. Žižek has extensively outlined Hegel's influence on Lacan. For instance, Žižek (2000) offers Hegel's example of a plant being akin to a human with intestines on the outside. Whilst a plant draws nourishment through its roots a human draws nourishment through symbolic networks and in a sense becomes understood through the filter of her participation/implication in these networks, which are external to her. In Hegel's philosophy objects are apprehended in relation to what the cognition brings to them, but the mind itself is then conceived of as being constituted out of these apprehensions. The act of cognition results in an aspect of the object being partitioned off according to how the human apprehends it. The "*in-itself*" of the object becomes the "*in-itself only for consciousness*" (Hegel, p. 55, Hegel's emphasis). That is, Hegel argues that the object "in being known, is altered for consciousness" (ibid). And this aspect in the object corresponds to an aspect of the human mind, "the pure *apprehension*" (ibid). That is, "the pure *apprehension*" mirrors the "*in-itself only for consciousness*" of the object. Thus in Hegel's formulation: "Consciousness simultaneously *distinguishes* itself from something, and at the same *relates* itself to it, or, as it is said, this something exists *for* consciousness: and the determinate aspect of this *relating*, or of the *being* of something for a consciousness, is *knowing* (Hegel, 1977, p. 52. Hegel's emphasis). Lacan's conception of the mirror phase (Lacan, 2006, 75-81) echoes Hegel's couple of the "*in-itself only for consciousness*" and "the pure *apprehension*" with regard to how a human develops an understanding of who she is. However, having taken this Hegelian step in constituting the human subject, the picture as regards how the human apprehends objects becomes rather more convoluted since Hegel's second object, "the pure apprehension", becomes a function of a fantasy self. That is, all objects apprehended are tainted according to the human's conception of who she is and, specifically, her conception of how she fits in to the social network. The composition of that social network defines the objects of mathematics and the correctness thereof.

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