DISCOURSE TOWARDS BALANCED RATIONALITY IN
THE HIGH SCHOOL MATHEMATICS CLASSROOM:
IDEAS FROM HABERMAS' CRITICAL THEORY

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ABSTRACT

This paper aims to contribute to research in mathematics education which is exploring, from
social constructivist perspectives, the prospects of reconstructing the microworld of the
traditional classroom learning environment. A Habermasian perspective is adopted on the need
to make visible and subject to critical scrutiny the hidden frames of reference which constitute
the dominant instrumental ideology of traditional mathematics teaching. Three powerful and
congruent frames of reference are discussed: the technical curriculum interest, Platonism, and
formalism. The paper argues that a balanced rationality is required which emancipates students
from these intellectually disempowering frames of reference. Pedagogical strategies are
suggested for establishing a critical discourse in the mathematics classroom which both reveals
and subjects to critical scrutiny the constraining nature of these traditionally hidden frames of
reference.

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[M]athematics does appear to be the product of human, fallible minds rather than the everlasting substance of a world independent of man. It is not a structure of steel resting on the bedrock of objective reality but gossamer floating with other speculations in the partially explored regions of the human mind. (Kline, 1953, pp. 481, 499)

INTRODUCTION

This paper aims to contribute to the evolving research program in mathematics education which is exploring the prospects of constructivist-related theories of learning for the restructuring of the culture of the traditional mathematics classroom. The theoretical framework of this research program is based on three principles of constructivism.

The first principle of constructivism states that: 'Knowledge is not passively received either through the senses or by way of communication, but is actively built up by the cognising subject' (von Glasersfeld, 1990, p. 83). Arguably, this is the most well-known aspect of constructivism, and often is interpreted in the Ausubelian form that the learner's new understandings are dependent on prior knowledge and experiences.

The second principle addresses the ontological issue of reality: 'The function of cognition is adaptive, in the biological sense of the term, tending towards fit or viability; cognition serves the subject's organization of the experiential world, not the discovery of an objective ontological reality' (von Glasersfeld, 1990, p. 23). This principle is associated with Piaget's genetic epistemology, and highlights the subjective and dynamic nature of cognition: the learner is a self-regulated and autonomous thinker who has no access to objective reality, but whose knowledge results from reflective abstractions of experience.

The third principle derives from the sociology of knowledge, and acknowledges that reality is constructed intersubjectively, that is, it is socially negotiated between significant others who are able to share meanings and social perspectives of a common lifeworld (Berger & Luckmann, 1966). This principle acknowledges the sociocultural and socioemotional contexts of learning, highlights the central role of language in learning, and identifies the learner as an interactive co-constructor of knowledge.

Recently, constructivist-related research in mathematics education has begun to address the third principle of constructivism. In particular, the covert social structure
of the mathematics classroom has been identified as a major constraint to the
development of students' mathematical knowledge (Bauersfeld, 1988; Cobb, Wood,
Yackel, & McNeal, 1991). As a result, collaborative research with teachers of school
mathematics has begun to focus on a renegotiation of social norms in attempts to
restructure the traditional teacher-centred culture of the classroom. The aim is to assist
the teacher to create a classroom learning environment in which the negotiation of
mathematical meanings is a central activity. Typically, children work collaboratively
in small-groups on experientially-based problems, and engage with the teacher and
other students in whole-class discussions. The classroom discourse comprises
students' explanations and justifications of their personal and collaborative ideas, and
involves the class as a community of learners who seek to co-construct personally
viable meanings in relation to the range of perspectives generated by other students
(Cobb, Yackel & Wood, 1992; Cobb, Wood & Yackel, 1990; Tobin, 1991; Wheatley,
1990).

However, the reconstruction by reform-minded teachers of the social reality of the
traditional mathematics classroom is likely to be problematic, especially in schools
which implement externally mandated curriculum and assessment policies. Recent
research suggests that the social reality of the traditional mathematics classroom is
underpinned by a powerful ideology which is resilient to radical epistemological
reform (Taylor, in press, 1991). This paper adopts a Habermasian perspective and
critically examines the nature of this conservative ideology. The paper suggests ways
in which reform-minded teachers might act strategically to establish a more balanced
rationality in accordance with a social constructivist perspective on learning
mathematics. The type of pedagogical reform which is envisioned in this paper is one
which involves both the teacher and students in an ongoing collaborative endeavour
which aims to make visible the hidden frames of reference which constrain their
mutual intellectual development.

A HABERMASIAN PERSPECTIVE ON CLASSROOM CULTURE

Jurgen Habermas (1929 – ), a leading thinker in contemporary critical theory, has had
a major influence on the social sciences in his German homeland, and his influence is
being felt increasingly in the English-speaking world (Agger, 1991; Young, 1989;
that are taken up in this paper. Firstly, he postulated that certain fundamental human
cognitive interests — technical, practical, emancipatory — are crucial to the way in which
human knowledge is constituted. Secondly, there is the idea of the *ideal speech situation* as an environment for empowerment and an opportunity for truth, justice and freedom – ideals which constitute the cornerstones of his societal model of the *good life*.

Habermas' more recent work, which is described in his magnus opus, *A Theory of Communicative Action* (1984, 1987), has given up the strong transcendental claims about the knowledge-constitutive interests, and the idea of the ideal speech situation has broadened and matured to that of a persuasive theory of language and action in which the central idea is *communicative discourse*. Habermas refers to his recent work as a platform for research in the social sciences which is fallible and open to change, rather than a static philosophy of consciousness (White, 1988, p. 14). Although this paper makes use of the ideas of knowledge-constitutive interests and the ideal speech situation, these ideas are considered in the spirit of Habermas' notion of communicative discourse.

**Knowledge-Constuitive Interests**

Grundy's (1987) critical analysis of teachers' curriculum reform attempts adopts, as an interpretive framework, Habermas' (1972) theory of human knowledge-constitutive interests, and reveals the predominance of the *technical cognitive interest* in determining the nature of modern school curricula and classroom practice.

*The Technical Curriculum Interest*

The technical cognitive interest arises from a fundamental need of the human species to survive and reproduce itself, and is manifested in attempts to control and manage the environment. This interest underpins the empirical-analytic sciences which are concerned with discovering natural laws, and formulating *instrumental* means of action designed to attain predetermined and quantifiable ends, not only in relation to technological development, but also in social spheres of action such as education. The technical interest is a fundamental interest in control.

According to Grundy (1987), the technically informed curriculum, which comprises predetermined content, or learning objectives, is designed to be implemented in learning environments in which students' behaviour and learning are strongly controlled by the teacher. Students have little power to determine their own learning objectives and, together with the teacher, are caught up in a seemingly inexorable
process of attaining predetermined learning outcomes of a product oriented curriculum. The technical interest not only prefigures the form of the curriculum process, and objectifies students, but promotes also an objectivist form of knowledge.

In the resulting classroom culture, knowledge is viewed as 'sets of rules and procedures or unquestionable truths. Knowledge is regarded as a commodity, a means to an end' (Grundy, 1987, p. 34). This instrumentalist view of knowledge leads to externally controlled agricultural-botanical and industrial models of curriculum evaluation (Lawton, 1980) which are designed to measure the learning product.

Not only do these technical forms of evaluation break the intimate nexus between learning and assessment, but they define teachers' classroom practice in terms of the quantitative products of their actions, and promote a mechanistic, skills-based view of teaching, which leaves little room for moral judgements or critical analysis. Because the 'power both to determine and to judge what teachers and learners must do is vested elsewhere' (Grundy, 1987, p. 38), the technically informed curriculum removes the control of the teaching-learning process from teachers and students, and teachers become de-skilled pedagogically.

The Practical Curriculum Interest

Grundy's (1987) practical curriculum interest conceives of knowledge and curriculum as a process of social interaction aimed at generating understanding, or sense-making, and gives rise to a conception of curriculum-as-practice. At the centre of a curriculum informed by practical curriculum interests is a concern with the intersubjective process of interpretation, personal judgement, and reflective deliberation, rather than with the objective products of learning.

This curriculum is concerned with human interactions in which teacher and students are regarded as subjects engaged in sense-making activities. The teacher is interested in developing the judgement-making skills of his/her students, as part of an overall goal of personal development and improvement. The curriculum content is justified in terms of moral criteria associated with the good of students, and is selected on the basis of facilitating interpretation and meaning-making, rather than rote learning of pre-specified skills. The teacher is an interpreter of curriculum documents, rather than a technical implementer, and is an active participant in curriculum decision-making.
However, Grundy (1987) argues that the attainment of practical curriculum interests constitutes a limited pedagogical reform goal which is likely to be frustrated by the predominance of teachers’ extant technical curriculum interests. Furthermore, the full realisation of practical curriculum interests is a necessary, but insufficient, condition for the development of teachers and students as autonomous intellectuals who are free from the unduly constraining influence of the hegemonic ideologies which underpin modern school curricula and which distort classroom communication. 

*The Emancipatory Curriculum Interest*

The emancipatory curriculum interest aims to transcend the dialectical relationship between technical and practical curriculum interests. Grundy (1987), after Habermas (1970), identifies ideology as a set of ideas of a powerful group in a culture which dominate the perceptions and actions of the majority of less powerful members of the culture. Ideology has political overtones to the extent that the interests and ideas of one group have power to determine the thinking of other members of the group. Of particular interest is the means by which the ideology of the dominant group colonises the minds of the majority. Grundy adopts Gramsci’s (1971) concept of hegemony to describe the dominance or imposition of the ideology of a powerful group, and its unquestioned acceptance by less powerful members.

At the centre of a curriculum informed by an emancipatory interest is a counter-hegemonic concern for liberating teachers and students from the disempowering constraints of the ideology, or dominant ideas and values, that underpins the curriculum and defines the social norms of the classroom.

However, the hegemonic nature of ideology makes this a very difficult task. Ideology constitutes teachers’ and students’ subjectivities, and serves as an invisible interpretive framework for making (restricted) sense of the teaching-learning process, and of the prospects of changing the natural order of the classroom. Ideology is subtly but effectively propagated in the hidden curriculum of rituals which socialise teachers and students into the dominant order of schooling (McLaren, 1986). To the extent that the prevailing ideology remains unrecognised, teachers and students will be unable to discern its socially constructed nature and will remain disempowered and unwitting agents of its propagation.

According to Grundy (1987), emancipation requires the development of a critical consciousness which (1) recognises the culturally constructed nature of the education
enterprise, and (2) fuels debate about the fundamental assumptions and taken-for-granted interests that underpin the culture of teaching and learning, and that give rise to social inequalities and inequities. In practice, teachers and students share the locus of control of their mutually constructed and intersubjective knowledge, and struggle collaboratively to make sense of both the perceived world and the ideology that constrains their perceptions and actions. Thus, emancipation commences with enlightenment about the nature of ideological distortion, and continues with political action aimed at reforming the social structures that constrain the emancipatory interests of teachers and students.

To what extent is it possible for a pedagogical reform process to liberate teachers and students from the pedagogically distorting influence of a pervasive ideology that promotes a culture of schooling based on technical curriculum interests? Grundy acknowledges that emancipation might not be an immediately attainable pedagogical reform goal, and that the development of a critical consciousness amongst teachers and students is the most feasible goal in the shorter-term. The process of liberating students and teachers from the false consciousness which distorts the constitutive communications of the teaching-learning process is a collaborative enterprise between teacher and students.

In critical pedagogical practice — a form of action research operating in an emancipatory mode — teachers and students not only engage actively in processes of reflective deliberation, personal judgement-making, and interpretation, in accordance with practical curriculum interests, but also they bring a critical focus to bear on their social interactions and social contexts of learning. With recourse to critical social theories teachers and students participate in ideology critique for the purpose of identifying 'the constraints imposed upon their practices by social structures and interactions which are informed by interests in domination and control' (Grundy, 1987, p. 146). In these new roles, teachers and students move strategically towards sharing authority and control in relation to the social construction of their own subjective and intersubjective knowledge.

**The Ideal Speech Situation and Discourse**

For Habermas, human cognitive interests constitute forms of human knowledge, and arise out of the actions of speech. It is this form of human communication which defines humanness itself, and separates human beings from their evolutionary
forebears. Habermas argues that although it is realized rarely, everyday speech is oriented towards achieving the ideal of a genuine consensus through discourse:

The rationality proper to the communicative practice of everyday life points to the practice of argumentation as a court of appeal that makes it possible to continue communicative action with other means when disagreement can no longer be headed off by everyday routines and yet is not to be settled by the direct or strategic use of force (Habermas, 1984, pp. 17, 18).

However, the attainment of genuine consensus amongst participants in a discourse requires that an ideal speech situation be created. The ideal speech situation is marked by the following conditions:

1. There are no constraints (such as lack of time) upon discussion. Therefore, any participant has full opportunity to question the truth of another's argument in arriving at a consensus;
2. All participants having unimpaired self-representation. That is, they are willing to disclose their true intentions and motives, and they give each other equal opportunity to express themselves;
3. All participants are free of coercion (such as bullying), and possess equal right to command others. They are willing to accept responsibility for their own actions, and may expect the same of others.

In the ideal speech situation, therefore, there is full reciprocity which is characterised by lack of coercion and distortion. To an extent, these conditions parallel the ideas of truth, freedom and justice which are cornerstones of Habermas's notions of the good life. Attainment of the ideal speech situation requires, therefore, that participants be emancipated from the distorting effects on their own self-consciousness of externally imposed constraints (Dews, 1986, p. 18).

Although technical efficiency (which is associated with the technical cognitive interest) is regarded as a necessary component of contemporary social reality, Habermas argues that it has been extended inappropriately and ubiquitously into most areas of life and culture. Partly in response to this, and because Habermas believes that people should become empowered to be free of domination, he argues that the ideal speech situation provides an environment for the emancipatory interest to flourish.
DISCOURSE TOWARDS A BALANCED RATIONALITY IN THE MATHEMATICS CLASSROOM

The well-established ideology which governs the culture of the traditional mathematics classroom is constituted by largely invisible frames of reference which harbour technical curriculum priority interests and outmoded rationalist conceptions of mathematics and mathematical cognition. The resultant undemocratic culture promotes an impoverished conception of teaching and learning, and stifles the development of intellectual autonomy. The cultural reconstruction of the traditional mathematics classroom is a pressing goal.

However, cultures are not reconstructed overnight, especially the microculture of the classroom which is buttressed by the macrocultures of the institution and of the larger society whose interests it serves. Nevertheless, the microculture of the classroom can serve as a site in which flourish emancipatory interests that fuel intellectual development. A critical discourse which is based on Habermas' notion of the ideal speech situation is required to make visible and subject to critical scrutiny the invisible frames of reference which constitute the traditional culture of the classroom.

Revealing the Technical Curriculum Interest

In many mathematics classrooms, the teaching and learning activities are framed by a highly prescribed curriculum and a summative assessment policy which promote a pedagogical priority interest in expediency rather than in intellectual development. One of the major constraints to achieving a balanced rationality is the teacher's perception of the need to ensure that students cover the common content of the syllabus. The teacher's main classroom role becomes that of teacher as controller, and students are required to act as passive and compliant consumers. Although the teacher assumes the locus of control of classroom activities (e.g., design of instructional activities, management of classroom discourse, validation of students' knowledge) the teacher remains an agent of an external locus of control which resides with the curriculum policy makers. In these types of traditional curriculum systems both the teacher and students are disempowered; the taken-as-natural curriculum frame of reference constrains the teacher and students to act in accordance with a predetermined and impoverished pattern of physical and cognitive activities.
Attaining a balanced rationality in the mathematics classroom requires the teacher to establish a critical discourse which reveals the culturally constructed nature of the curriculum and assessment policy, and identifies the policy makers and their technically-oriented assumptions about the nature and purpose of schooling, in general, and of school mathematics, in particular. For example, it might be the case that an externally-mandated assessment practice is based on assumptions about the desirability of normatively distributed scores and ranking of students. The constraints of this form of assessment (e.g., individual development subjugated to common content coverage in a fixed time frame, limited opportunities for high achievement, divorce of learning from assessment, control of learning vested in external authorities) should be revealed as a politically inspired frame of reference.

A balanced rationality might be promoted by student participation in the design of a nested curriculum policy, that is, a policy which both complements and subverts the predominant technically-oriented curriculum policy. For example, in addition to the externally-mandated assessment system, a classroom-based assessment system that serves better the daily interests and needs of both the teacher and students could be designed by the class. From a constructivist perspective on learning, the collaborative process of classroom policy formulation would result in a critical discourse on: the nature and purposes of assessment and its relationship with learning; design criteria for assessing conceptual development (cf. algorithmic ability); the role of the individual student in determining the viability of his/her newly constructed knowledge, and the collaborative role of the classroom community in constituting a consensual domain (cf. teacher/textbook validation).

The type of classroom discourse which both critically appraises the predominant technical curriculum frame of reference and engages students in a process of designing a nested curriculum policy can make a significant contribution to the attainment of a balanced rationality in the mathematics classroom. Not only does this type of discourse provide opportunities to make visible a major frame of reference which otherwise would continue to disempower both teachers and students, but also it stimulates the development of a more democratic classroom culture which is conducive to the development of intellectual autonomy.
Revealing the Myths of Certainty and Pure Reason

The culture of the traditional mathematics classroom is shaped also by powerful myths of the realist nature of mathematics and the rationalist nature of mathematical thinking. These myths continue to be propagated by an ideology which determines that the teacher is the primary source of students' mathematical knowledge, and that the formal rules of deductive symbolic logic constitute mathematical thinking (Taylor, in press, 1991). Attaining a balanced rationality in the mathematics classroom requires the teacher to establish a critical discourse which reveals these invisible frames of reference and identifies their constraining influence on the mathematical activities of the teacher and students.

Platonism

One of the most commonly accepted characteristics of mathematics, namely, its certainty, objectivity and truthfulness, is attributable to the 2000+ year-old Platonic myth which elevated mathematics to the status of a philosophy that could reveal absolute truths about the universe of pure forms (number, geometrical shapes) to those who could purge their minds of bodily sensations and indulge in the act of pure reason. This myth underpinned the (later to be known as Euclidean) geometry which purported to be an exact description of physical space, and enabled science to 'reveal' the apparently natural laws of the Newtonian clockwork universe, especially the (fictitious) force of gravity (Davis & Hersch, 1981; Hersch, 1986; Kline, 1953; Rorty, 1982).

The invention of non-Euclidean geometries in the late nineteenth century, however, resulted in the realisation that mathematical theories of physical space, or mathematical spaces, are subjective constructions, rather than objective descriptions, which derive from experience and which constitute theoretical frames of reference for the scientific examination of physical space (Kline, 1953). In particular, it was realised that the axioms which underpin the geometrical theorems (e.g., the concepts of a straight line as a stretched string on a flat surface, or a great circle on a spherical surface, or a ray of light in interplanetary space) are subjective constructs that are embedded in human experience and embodied in cultural conventions.

Nevertheless, the Platonic myth constitutes a major invisible frame of reference which continues to be embodied in modern school mathematics, especially in the
pedagogical practice of presenting mathematics as an objectified body of predetermined facts (e.g., properties of geometrical shapes, number system laws) which is historically and culturally unbounded. This myth promotes an image of the separateness of mathematics and mathematical cognition, and underpins pedagogical assumptions that disembodied mathematical facts are knowable by the disciplined individual cognitive exercise of reason.

Attaining a balanced rationality in the mathematics classroom requires that the teacher establishes a critical discourse aimed at revealing the Platonist myth that underpins intuitive and popular understandings of mathematics. This type of discourse might focus on: the issue of the apparent truth of mathematics, especially the perception that geometrical properties inhere in geometrical forms; the concept of theoretical frames of reference, especially their role in governing our perceptions of the natural world and in making cultural conventions appear to be natural; the derivation of frames of reference from bodily experiences, and the empirical nature of mathematics; and the intimate relationship between the fields of science and mathematics, particularly their complementarity in constructing (mythical) models of the natural world.

The teacher might engage students in this type of discourse during, for example, their study of the prescribed curriculum topics of two- and three-dimensional (Euclidean) geometry which focus on the properties and constructions of regular polygons and regular polyhedra. Students should be provided with opportunities to become aware of non-Euclidean geometries (e.g., Reimann, Lobatchevsky, Bolyai), and of the historical significance of these frames of reference in replacing the scientific myth of the Newtonian clockwork universe with Einstein's relativistic conception of the universe (e.g., the observer-dependent laws of space and time). The realisation that the axioms and theorems of Euclidean geometry were formulated on the basis of human experience of a seemingly flat earth provides a compelling case for the culturally and empirically constructed nature of mathematical frames of reference. Similar realisations about the number system can be facilitated from both historical and ethnomathematical perspectives.

**Formalism**

The apparent certainty of mathematics and the rationalist nature of its genesis has been sustained by a more recently established myth, namely, that of formalism. The aim of the formalist program was to re-establish the certainty of mathematics that had
been lost by the discovery of non-Euclidean geometries. Formalism abandoned the
notion of mathematics as comprising accurate descriptions of reality and, in essence,
viewed mathematics as the science of rigorous proof. From a formalist perspective,
mathematics is the application of formal mathematical logic for the purpose of
deducing content-free theorems which await non-mathematical or scientific
interpretation in relation to the world of human experiences (Ernest, 1991; Lakoff,

However, the formalist view of mathematics has lost credibility amongst
mathematicians and philosophers of mathematics, especially since Godel's
Incompleteness Theorem (Hersch, 1986, Goodman, 1986). In particular, formalism fails
to account for the mental activities of mathematicians when they are engaged in
working with mathematical ideas. Mathematical thinking involves intuitive reasoning
which cannot be formalised. Intuition is plagued with uncertainties and, therefore,
mathematical thinking also is uncertain, fallible, tentative, and evolving (Hersch,
1986). However, formalism equates formal mathematical logic with human reasoning,
rather than with a 'limited form of reasoning used by mathematicians to construct
mathematical proofs' (Lakoff, 1987, p. 224).

Nevertheless, a formalist conception of the nature of mathematics constitutes a major
invisible frame of reference which is embodied in modern school mathematics.
Formalist conceptions of mathematics promote a distorted perspective on the content
of mathematical text. From a semiotic perspective (Lemke, 1985, Solomon, 1988), the
textual content of the syllabus, textbook, or teacher's blackboard notes are codified
signs which signify, but do not bear a one-to-one correspondence with, the
mathematical conceptualisations that are located in the minds of the authors. A
pedagogical concern only with students' accurate manipulation of these signs (i.e.,
solving algebraic equations, transforming algebraic expressions) fails, therefore, to
address the meanings which students attribute to their mathematical activities.
Because of the focus on mathematical signs rather than on their conceptual
significance, formalist views of mathematics disregard interpretation and mental
imagery, other modes of representation (e.g., pictures, diagrams, graphs), and practical
applications (Davis & Hersch, 1981; Hersch, 1986).

At the high school level, the popular algebraic topic of Factorisation often is framed by
a formalist conception of mathematics which provides conceptually impoverished
learning activities aimed only at developing students' algorithmic abilities, that is, the
ability to transform algebraic symbols according to seemingly *a priori* rules and the application of deductive logic (Taylor, in press, 1992). It is common for students to be prescribed sets of single-answer practice exercises which require only algorithmic ability for their solution. A false sense of the certainty of mathematics obtains from the correspondence between students' answers and those of the textbook.

From a social constructivist perspective, the other major pedagogical problem associated with a formalist conception of mathematics is the emphasis on the mental activity of the individual student, and a failure to address the sociocultural context of learning. Without an appreciation of the constraining nature of the pervasive formalist frame of reference it is highly likely that students will continue to subscribe to the myth that algorithmic ability constitutes the full range of mathematical thinking, that mathematics is a solitary acculturative pursuit, and that mathematical knowledge is preordained.

Attainment of a balanced rationality requires the teacher to establish in the mathematics classroom a critical discourse on: the distorted nature of mathematical learning experiences which are seemingly irrelevant to students' social and physical worlds; the nature of mathematical thinking, especially the difference between algorithmic ability and conceptual development; the extent to which the technical curriculum priority interest (e.g., time constraints, common syllabus content) results in algorithmic ability constituting the primary goal of school mathematics; the difference between mathematical codifications (e.g., the algebraic symbol 'a') and mathematical concepts (e.g., the concepts of 'place holder', 'unknown number', and 'generalised number'); and the difference between observable mathematical behaviors and unobservable mathematical ideas.

Of special importance in the attainment of a balanced rationality in the mathematics classroom is the requirement of a critical discourse on the relationship between students behaving in accordance with traditional teacher (and student) expectations (e.g., passive listening, uncritical acceptance of solution strategies, working in isolation, accepting lack of comprehension, an unchallenging attitude to discourse) and the self-suppression of intellectual development. In other words, attaining a balanced rationality requires that the teacher adds the social reality of the classroom to the curriculum agenda, and promotes a discourse which critically examines the constitutive roles of both the teacher and students in its propagation and reconstruction.
POSTSCRIPT

This paper has suggested pedagogical strategies for the reconstruction of the culture of the traditional mathematics classroom based on Habermas' concepts of knowledge-constitutive interests and the ideal speech situation in the spirit of Habermas' notion of communicative discourse. The paper argues that a teacher's establishment of a critical discourse which aims to make visible the major constraining frames of reference which underpin the traditional culture of the classroom can serve as a starting point for the attainment of a balanced rationality in the mathematics classroom.

However, it is not necessary for critical discourse to be restricted to small-group or whole-group classroom discussion. It can occur in other contexts such as: a passing comment to an individual student as the teacher walks around the classroom; informal discussion between teacher and students in the school grounds; a teacher's written note on assessing a student's work (written communication also is discourse); or self-disclosure, especially when the teacher expresses anger or frustration at the way in which a textbook or a curriculum policy constrains his or her pedagogical actions in accordance with a technical curriculum interest.

Because students perceive the teacher, by and large, to be part of the mathematics curriculum, it is not necessary for critical discourse to arise from a focus only on mathematical activity. For example, the conditions of critical discourse can be established when a teacher discloses a joy or frustration about internal or external politics, about art, about philosophy, or about a state of being in the mathematics classroom. The teacher is not by nature straightjacketed to the dominant ideology of the institution and, therefore, is not compelled to act as a colonial master and represent to students only the technical culture of the institution. The teacher can be an autonomous intellectual by engaging in critical discourse and expressing himself or herself as a well-rounded human being despite a technicist curriculum.

In the short-term, teachers and students might continue to act for strategic purposes largely in accordance with the established goals of the traditional curriculum culture. However, from the moment that the hidden cultural frames of reference begin to become visible, teachers and students will become mutually aware of the boundedness of their conceptualisations and of the technical curriculum interests which have shaped them. New choices will emerge about the extent to which it is preferable or
desirable to continue to comply unquestioningly and uncritically with established cultural goals. A pedagogy which promotes a discourse based on the critical appraisal of new choices will have begun not only to reconstruct radically the traditional microculture of the classroom, but it also will have germinated the seeds of the reconstruction of the macroculture of the educational institution and of society at large.

Classroom discourse which is controlled by a technicist orientation is not critical and disempowers both teacher and students. In critical discourse, the technical curriculum interest is subsumed (if only for brief moments) by practical and emancipatory interests. Critical discourse constitutes the process of the emergence of a balanced rationality in the mathematics classroom and is, therefore, in itself a form of emancipation. With the attainment of critical discourse in the classroom, the true nature of mathematics might be revealed as a 'gossamer floating with other speculations in the partially explored regions of the human mind.' (Kline, 1953, pp. 481, 499).

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