A Critical Constructivist view on reforming the Traditional TEACHING/LEARNING PROCESS

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Abstract

In this paper we adopt a Habermasian perspective and identify major ideological constraints facing constructivist pedagogical reform. We develop a critical constructivist perspective, and argue that cultural constraints might be overcome by the generation amongst teacher and students of communicative action which entails the establishment of: (1) open discourse that aims to create an atmosphere of mutual trust and respect, and (2) critical discourse that aims to make visible and subject to critical examination the hidden frames of reference which still constitute the dominant ideology of traditional teaching and learning.

Introduction

In this paper we employ key elements of critical theories developed by the social philosopher Jurgen Habermas, especially his theory of knowledge-constitutive interests (1972) and theory of communicative action (1984, 1987), for the purpose of understanding the prevailing positivist culture of professional pedagogical practice. From this critical perspective, we generate a more insightful understanding of the ideological nature of the technical rationality of professional practice that governs the social reality of the traditional teaching/learning. This understanding highlights the inadequacy of personal constructivism as a sole referent of pedagogical reform that aims to transform traditional expository teaching/learning environments.

We examine briefly major principles of radical and social constructivism that underpin current pedagogical reform, and conclude that they offer little prospect of overcoming the prevailing technical-rationalist ideology of professional practice. Based on Habermas's theories of knowledge and communication, we then develop a critical constructivist perspective aimed at providing a theoretical framework for emancipating teachers and students from the pervasive influence of this well-established and largely invisible (i.e., hegemonic) ideology of professional pedagogical practice. From this perspective, we argue for the establishment of communicative
action that is intended to engage both teacher and students in empowering forms of open and critical discourse.

The first stage, that of developing an open discourse, is based on the results of research being conducted currently, from a Habermasian perspective (Bowers, 1988; Dryzek, 1990; Young, 1989), on the prospects of countering the prevailing instrumental rationality of tutorials and lectures in higher education computing courses (Campbell-Williams, 1992, 1993). This participant research employs Habermas's theory of communicative action to establish a form of classroom discourse aimed at enabling university students to realise, and prompting them to disclose, the extent to which their learning is governed by instrumental rationality. In this paper, we argue that, initially, a classroom community of trust and mutual respect should be established by means of an open discourse aimed at revealing the personal feelings, values, and goals of the teacher and students in relation to the teaching/learning process.

The second stage, that of developing a critical discourse, involves both the teacher and students in an ongoing collaborative endeavour aimed at making visible and subject to critical scrutiny the prevailing rationality that governs the social reality of the classroom and constrains their mutual intellectual development. We suggest strategies that might enable teachers to establish a more balanced classroom rationality that incorporates radical and social constructivist principles.

THEORETICAL FRAMEWORKS: Personal Constructivism AND CRITICAL SOCIAL THEORY

Central to some current pedagogical reform is a conception of constructivism that rejects the Piagetian stage theory tradition of generalised cognitive structures, or content-independent forms of thought, and draws upon conceptually-oriented theories of cognition developed by Ausubel (Novak, 1978) and Kelly (Pope & Gilbert, 1983). This constructivist theory emphasises the central role of each learner's extant conceptual frameworks, or prior knowledge, in their conceptual development, and has been incorporated by science educators into cognitive conflict models of conceptual change, especially in the context of facilitating a Kuhnian paradigm shift in, or radical reconstruction of, students' alternative conceptual frameworks (Nussbaum & Novick, 1980; Osborne, 1981; Posner, Strike, Hewson & Gerztog, 1982). Recently, this conception of constructivism has been labelled as the first principle of constructivism (von Glasersfeld, 1988) or the personal constructivist position (Solomon, 1987):
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)

There is a growing perception in the field of curriculum studies that the profession of education is failing to meet the evolving needs of modern post-industrial western society because the modus operandi of education continues to be underpinned largely by an anachronistic technical (or instrumental) rationality. It is argued that technical rationality, which continues to thrive in the professional institutions of western society, is a legacy of outmoded positivist philosophies of science which have dominated the intellectual and economic development of the industrialised world during the nineteenth and twentieth centuries (Apple, 1990; Giroux, 1981, 1983; Habermas, 1972, 1984; Schon, 1983).

The philosophy of positivism became the dominant form of scientific rationality during the nineteenth century. Positivism is an epistemology which asserts that only empirical scientific rationality can result in certain knowledge about objective reality. In this regard, positivism shares with rationalism a correspondence theory of truth, that is, that scientific and mathematical knowledge can achieve the status of absolute, or universal, truth. Whereas rationalism asserts that reason is the only basis of valid knowledge of reality, positivism, in the form of empirical scientific inquiry, regards observation and experimentation to be central to discovering and describing the natural laws of the universe (Abercrombie, Hill, & Turner, 1984; Reber, 1985).

As early as the 1930s, the Institute for Social Research (or the Frankfurt School) regarded positivism to have distorted science (Giroux, 1983). It was argued that positivism had subordinated reason to the extent that scientific knowledge was regarded as the only reliable form of knowledge. This subordination had separated science from the question of ends and ethics, and subsumed science within an empirical and quantitative methodology which served as an instrument for the economic and technological growth imperatives of modern industrialised society. The resultant technocratic view of science rejected subjectivity, and prevented science from adopting a self-critical stance in relation to its own ideological presuppositions.

Habermas and Constructivism

The discreditation of positivism as a viable philosophy of science resulted from widespread criticism amongst philosophers of science during the second half of the twentieth century. The
social philosopher Jurgen Habermas joined the debate as an ardent critic of positivism. In Knowledge and Human Interests, Habermas (1972) argues against the scientistic and objectivist illusion of positivism which reifies scientific knowledge by assuming that the discovered laws of the natural world are independent of the thinking subject who conceives the scientific problem, the method and the experiment, and creates the knowledge.

The critical social theory of Habermas challenges the fundamental tenets of positivism in ways that are compatible with key elements of constructivist theory, and provides a promising framework for understanding and overcoming cultural constraints that restrict the scope of constructivist-oriented pedagogical reform. There are three parts to Habermas's epistemology.

Firstly, Habermas identifies the central role of subjectivity in constituting and validating knowledge, especially scientific knowledge derived by empirical means. In a Kantian sense, "knowledge is necessarily defined both by the objects of experience and by a priori categories and concepts that the knowing subject brings to every act of thought and perception" (Pusey, 1987, p. 22). This view is in close accord with the radical constructivist position of von Glasersfeld (1990) which recognises the subjective and dynamic nature of cognition. This principle is associated with Piaget's genetic epistemology, and proposes that 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 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)

Secondly, Habermas departs from the individualism of Kant, and identifies the sociocultural and historical contexts of knowing. From a sociocultural perspective, Habermas aims to show that "there is no knower without culture, and that all knowledge is mediated by social experience" (Pusey, 1987, p. 23). Indeed, knowing and understanding are intersubjectively grounded in the patterns of ordinary language usage which are shared in everyday communication. This view is congruent with social constructivist perspectives that acknowledge that social reality is constructed intersubjectively, that is, socially negotiated between significant others who construct highly congruent meanings and social perspectives (Berger & Luckmann, 1966).
In addition to Habermas, the jointly subjective and intersubjective constitution of scientific knowledge is emphasised by modern philosophers of science, including Toulmin, Kuhn and Polanyi (Egar, 1989; Nussbaum, 1990; Phillips, 1987). A similar position has been adopted by modern philosophers of mathematics, who argue in favour of quasi-empiricist conceptions of the nature and genesis of mathematical knowledge (Ernest, 1991, 1992; Kitcher, 1984; Kline, 1980; Lakatos, 1986). Central to modern critiques of positivism is the premise that empirical inquiry is conducted within an interpretive frame of reference, and that scientific knowledge is constructed rather than discovered – observation is theory-impregnated and is made meaningful and significant from within a biologically and culturally conditioned horizon of expectations (McCarthy, 1985, p. 45).

Thirdly, and most distinctively, knowing in all domains, including science, constitutes a rational process of critically reflecting on the problematic nature of extant knowledge, rather than on nature itself. This epistemological principle forms the basis of the critical constructivist perspective discussed later in this paper.

Habermas's Knowledge-Constitutive Interests

These three aspects of Habermas's epistemology underpin his theory of knowledge-constitutive interests (1972) which argues that:

[I]n thought and action we simultaneously both create and discover the world; and knowledge crystallizes in this generative relation of the subject to the world . . . in the light of three knowledge-constitutive interests, or cognitive interests, that are given a priori in our relation to the world.   (Pusey, 1987, p. 24)

The three fundamental human cognitive interests – the technical interest, the practical interest, and the emancipatory interest – give rise to three distinctive forms of knowledge-constitutive action – empirical-analytic, historical-hermeneutic, and critical, respectively.

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 and gives rise to technical (or instrumental) rationality.

Technical Rationality and Modern Education

Despite the apparent demise of positivism as a viable philosophy of science (Bernstein, 1976), the growing interest in humanistic and critical inquiry among educational researchers, and the increasing orientation towards constructivist epistemologies in science education and mathematics education, positivism continues to exert a strong influence over the field of education, in general. According to curriculum theorists, modern positivism, in the guise of technical rationality, has remained well-entrenched as a foundational philosophy in the field of education, and as an epistemology of professional practice (Schon, 1983; Giroux, 1981, 1983; Grundy, 1987). Of particular interest in this paper is the manifestation of technical rationality in relation to teachers' conceptions of the nature of the curriculum.

The Technical Curriculum Interest

In an attempt to develop a theory of pedagogical reform aimed at overcoming the stranglehold of technical rationality, which underpins the predominant Tylerian objectives model of curriculum-as-product, Grundy (1987) adopted Habermas's (1972) theory of knowledge-constitutive interests and analysed the curriculum conceptions of teachers who were engaged in pedagogical reform. The results indicate that teachers conceive of curriculum according to the nature of their dominant cognitive interests, and that each interest gives rise to a distinctive type of pedagogical rationality.

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 conception of knowledge. From an objectivist perspective, 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).

Lawton (1980) argues that an objectivist view of knowledge leads to externally controlled agricultural-botanical and industrial models of curriculum evaluation 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.

Technical Rationality: A Hegemonic Ideology

Grundy (1987), after Habermas (1972), argues that the technical curriculum interest constitutes an ideology, that is, 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 concept of hegemony to describe the dominance or imposition of the ideology of a powerful group, and its unquestioned acceptance by less powerful members.

The imposition of ideology is not necessarily consciously enacted in an overtly conspiratorial sense. Rather, the imposition takes the form of promoting, as commonsense understandings, specific interpretations of (physical and social) reality that are congruent with the shared interests of the dominant group. The conspiracy theory of imposition is invalid to the extent that the members of the dominant group also have been subjected to an historical process of ideological hegemony, and are acting in concert to sustain a shared frame of reference whose parameters are located in their own subconsciousness. It is more accurate to claim, therefore, that the prevailing interests of the dominant group prefigure covertly which interpretations of the experiences of the less powerful majority will be given credence, or validity. Apple (1990), after Gramsci (in Williams, 1976), describes the colonising nature of ideological hegemony:

[H]egemony acts to saturate our very consciousness, so that the educational, economic and social world we see and interact with,
and the commonsense interpretations we put on it, becomes the world tout court, the only world. . . . It refers to an organised assemblage of meanings and practices, the central, effective and dominant system of meanings, values and actions which are lived. (Apple, 1990, pp. 5, 6)

Hegemonic ideology constitutes a dominant interpretive framework, or world view, which shapes the social conscience of cultural groups. Although its existence might remain undetected in the subconsciousness of the individual, ideology shapes the individual's fundamental beliefs and values, and gives rise to particular sets of actions which are validated in relation to established social norms. The hegemony of ideology is complete when the set of ideas, values, and associated actions are experienced by the individual as natural, rather than as culturally constructed. A powerful hegemonic ideology masks, therefore, the constructed nature of patterns of conventional beliefs and actions, commands an ethos of social conformity and rejects, as unnatural, alternative beliefs, values, and actions, especially those that threaten to disrupt the established social order:

It is the trick of ideology to make that which is cultural, and hence in principle susceptible to change, appear natural, and hence not open to change at all. So cultural constructions are represented as natural laws. . . . [I]t is natural that a secondary school day should comprise eight forty-minute periods. (Grundy, 1987, p. 107)

In Karl Mannheim's view (Feinman, 1975), ideology is a set of organising principles that evolve out of attempts to understand the social world. Ideology is linked, therefore, to the individual's personal history of ideas and experiences, and provides him/her with a reliable basis for understanding the present and predicting the future. However, ideology does not exist as a network of logical propositions that can be examined readily. Rather, ideology exists in the form of images which constitute the individual's reality. From an outsider's point of view the individual's ideology might seem to be only one imaginative construction among many possible constructions, but from the individual's point of view the image is experienced not as an image but as an accurate description of reality. The individual's persistent and quasi-sacred image of the social world serves as a mental grid of the possible and the desirable, and constrains the range of actions that the individual deems to be sensible:

To uncover an ideology is to reveal what people have accepted as
possible and thereby to reveal the limits that they have placed on their own actions. (Feinman, 1975, p. 6)

The concept of hegemonic ideology highlights the importance of understanding the historical role of professional institutions, such as universities and schools, in promoting covertly the ideas and interests of dominant groups in society, determining the social consciousness of teachers and students, and constraining the classroom social interactions which constitute the process of knowledge construction.

The hegemonic and ideological nature of technical rationality has been a central focus of recent critiques of modern educational theory and practice. Schon (1983, p. 34) argues that the intellectual hegemony of positivism constrains institutionalised professions, such as education, to serve predominantly technical interests. Giroux (1981, pp. 37-59) criticises the cultural hegemony of positivist rationality which underpins modern curriculum development, teacher education programs, and classroom teaching, and argues that its hegemony is extended through the hidden cultural messages that shape the social classroom roles of students. Apple's (1990, p. 1-25) critique of the role of technical ideology in curriculum identifies teachers as agents of ideological hegemony whose classroom actions give legitimacy to positivist epistemologies and serve to perpetuate the reproduction of the extant inequitable social order of society.

From the Habermasian perspective on traditional educational culture outlined above, we are in a position to generate a better understanding of the nature and resilience of the cultural constraints that govern some constructivist pedagogical reforms, especially the constraining ideology that renders personal constructivism as an inadequate epistemological referent for pedagogical reform.

HABERMAS ON Communicative action

Habermas' theory of knowledge-constitutive interests (1972) and theory of communicative action (1984, 1987) address the need to liberate humanity from the disempowering influence of technical cognitive interests. 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. Because Habermas believes that people should become empowered to be free of this insidious domination, he argues that communicative action provides an
environment for the emancipatory interest to flourish. The third part of Habermas's epistemology – critical reflection on knowledge – provides an apparent means for achieving this goal.

Emancipatory Curriculum Interest

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 technical ideology 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 seemingly 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 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 largely 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 in which teacher and student roles are expanded to incorporate the metaphors of teacher as student and students as teachers.

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 accord 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.

Critical Constructivism

Countering the hegemonic ideology of technical rationality, which underpins much of the professional practice of modern education, and which prefigures teachers' technical curriculum interests, requires a critical constructivist perspective on pedagogical reform. A critical constructivist perspective combines practical and emancipatory curriculum interests, and focuses pedagogical attention on the nexus between the subjective and intersubjective constitution of the classroom learning environment.

In relation to pedagogical reform, a critical constructivist perspective adopts not only radical and social constructivist perspectives on learning, but addresses also the constraining ideology that governs the curriculum and prefigures covertly the objectivist epistemology of much professional pedagogical practice. A critical constructivist perspective on pedagogical reform is concerned, therefore, with facilitating teachers' and students' critical awareness of the hidden curriculum of professional pedagogical practice which they perpetuate unwittingly, and which serves to disempower them from developing as autonomous intellectuals.

How can a critical constructivist perspective be generated in the classroom? What form can be taken by communicative action?

The Ideal Speech Situation

Habermas's idea of knowledge-constitutive interests provides a backdrop to his powerful notion of communicative action. For
Habermas, human cognitive interests constitute forms of knowledge that arise out of the actions of speech. He contends 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)

Habermas identifies two important conditions which are required for a social environment based on communicative action to flourish (Dews, 1986). The first is the elimination of externally imposed constraints on discourse, especially the coercive actions of others that arise from the dominance of technical interests. The second is the elimination of internal distortions within the mind of the individual, especially personally constraining beliefs that maintain the ascendency of technical interests. In earlier work, Habermas (1972) postulated that 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.

Habermas's recent notion of communicative action (1984, 1987) maintains the inherent ethical imperative and applicability of the ideal speech situation, but frees it of overly formal rigidity and prescribed conditions. Communicative action is a form of social reasoning that embodies a moral concern for the right of the individual to remain free from coercive and distorting influences while participating with others in a discourse that aims to attain genuine consensus.
The attainment of communicative rationality requires the establishment of a social environment that is shaped by the moral principles of truth, justice, and freedom, which are the cornerstones of Habermas's model of society (McCarthy, 1985). In a social environment in which communicative action flourishes, the emphasis is on the inclusiveness of participants in the building of mutual trust and respect, self-disclosure of joys and frustrations, attentive and critical listening, truth-telling and the examination of warrants for truth claims, and negotiation aimed at generating genuine agreement.

COMMUNICATIVE ACTION IN THE CLASSROOM

Of greatest concern to constructivist-oriented educational reformers is the pervasiveness of technical rationality throughout the macroculture of formal education and the magnitude of the reform task. Reform-minded teachers rightly question the extent to which they are able to reconstruct the technical rationality of their own classrooms while, at the same time, attaining the pedagogical priorities of externally-mandated curriculum and assessment policies.

The simple answer seems to be one of compromise. However, research has shown that what is likely to be compromised in the reform process is the integrity of the constructivist principles that underpin innovative attempts to develop a learning environment that serves the interests of all students, rather than the academic interests of a high-achieving minority (Taylor, 1992, in press).

What is required in the shorter-term is not necessarily a reform agenda that advocates a revolutionary (and self-defeating) policy of abandonment of technical rationality. Rather, constructivist-oriented pedagogical reform needs an additional principle which can direct an effective but subtle transformation of the influence of technical rationality on the mathematics classroom environment. This is the intention of the critical principle of constructivism which is concerned with the democratisation of the classroom environment and the emancipation of both teacher and students from the disempowering influence of technical rationality.

The full attainment of a communicative rationality in the traditional mathematics classroom is clearly problematic and is not likely to be attained overnight even by reform-minded teachers. What can be established initially, however, is a partial attainment in the form of open and critical discourse.
Open Discourse

Habermas (1984) argues that each person has a lifeworld, that is, an implicit knowledge that cannot be represented by an infinite number of propositions. It is holistically structured knowledge, the basic elements of which intrinsically define one another, and which "does not stand at our disposition" (p. 34) insomuch as we cannot make it conscious and place it in doubt as we please. Our social communications are conducted, therefore, within the horizons of our seemingly unproblematic lifeworlds:

Subjects acting communicatively always come to an understanding in the horizon of a lifeworld. Their lifeworld is formed from more or less diffuse, always problematic convictions. This lifeworld background serves as a source of situation definitions that are presupposed by participants as unproblematic. (Habermas, 1984, p. 70)

Habermas is concerned about the colonisation of lifeworlds by technical cognitive interests which invade — like colonial masters coming into a tribal society — by means of the steering media of bureaucracy and institutional funding.

In our research, we are exploring the application of the theory of communicative action to pedagogical approaches which facilitate open discourse. This discourse is aimed at building an atmosphere of mutual trust and respect and exploring teacher and student lifeworlds, especially their personal feelings, values and goals, and the extent to which their lifeworlds have been colonised by technical rationality. In higher education business computing courses, we are finding that technical rationality has colonised many students' lifeworld feelings, values, and goals to an extent that, if left unchecked, their world-views about technology and their learning goals are likely to contribute to what Bower's (1992) describes as "the moral poverty of the information age" (Campbell-Williams, 1992, 1993).

In this paper, we suggest that communicative action should be initiated by a pedagogical approach that facilitates open discourse aimed at creating an atmosphere of mutual trust and respect amongst teacher and students. Open discourse might be encouraged at the beginning of the school year by detailed personal introductions and simple team games or 'ice-breakers' (such as name-remembering games in early classes). Similar approaches might be used to enable the teacher and students to disclose progressively their personal values, goals and world-view beliefs with relevance to the teaching and learning of mathematics. For example, one of the goals of open discourse
might be to provide students with opportunities to disclosure the extent to which their learning of mathematics evokes feelings of anxiety, displeasure, or boredom, and to provide the teacher with opportunities to disclose his or her recognition of the problem and a sincere concern with assisting students to create a learning environment that is challenging, stimulating, and enjoyable.

It is usually the teacher that must begin the process of building up communicative action in the teaching/learning group. However, it is not necessary for open discourse to be restricted to small-group or whole-class 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 annoyance 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 open discourse to arise from a focus only on mathematical activity. For example, the conditions of open discourse can be established when a teacher discloses a joy or frustration about internal or external politics, art, philosophy, or a state of being in the mathematics classroom. The teacher is not, by nature, straitjacketed to the dominant technical ideology of the institution and is not compelled to act, therefore, as a colonial master whose role is to represent to students only the technical culture of the institution. The teacher can be an autonomous intellectual by engaging in open discourse and expressing himself or herself as a well-rounded human being despite a technicist curriculum. This activity is likely to involve a degree of personal vulnerability and rests, therefore, upon establishing mutual trust, goodwill and respect with the students.

Open discourse reveals the heart of what it means to teach and to learn. It rejects the intellectual arrogance and certainty of positivism. Open discourse is a form of radical humility that acknowledges the inherent difficulties of human intellectual endeavour and communication.

Critical Discourse

Fostered by open discourse, the classroom community of mutual trust and respect serves as a foundation for the establishment of critical discourse that aims to make visible and subject to critical scrutiny the largely hidden frames of reference that
constitute the dominant ideology of traditional mathematics teaching. In this paper we are concerned with two major conceptual frames of reference— the technical curriculum interest and rationalism— both of which entail an objectivist epistemology. Our central concern is that a balanced rationality be encouraged by establishing communicative action that aims to emancipate teachers and students from these intellectually disempowering cultural frames of reference.

Although the cultural reconstruction of the traditional mathematics classroom is a pressing goal, we realise that 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 dominant 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's notion of the ideal speech situation offers a promising means for achieving this goal.

Revealing the Technical Curriculum Interest

In traditional environments the teaching and learning activities are usually framed by a highly prescribed curriculum and a summative assessment policy which promote a priority curriculum interest in pedagogical 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 traditional 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 teaching/learning environments. 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.

**Conclusion**

From a Habermasian perspective on knowledge and communication, we have argued that the traditional culture of professional pedagogical practice, which has its epistemological roots planted firmly in the historical soil of positivism (which entails an objectivist epistemology), manifests as a technical curriculum
interest. In the traditional environment, this knowledge-
constitutive priority interest underpins a conception of the
curriculum as a product and directs the teacher to assume
centralised classroom control in order to deliver the curriculum
content. The cultural myth of objectivism is often implicated
also in some teacher's well-established rationalist conception of
the nature of the curriculum. This belief underpins the teacher's
role as the primary source of new knowledge, casts students as
cognitive isolates, and focuses pedagogical attention largely on
the reproduction of rules of deductive logic.

We have addressed briefly the prospects of pedagogical
transformation based on recent constructivist theory that
incorporates radical and social principles of constructivism.
Because social constructivist theory seems to be synonomous with
Habermas's practical curriculum interest, it is unlikely to
provide a means of countering the technical-rationalist ideology
of professional pedagogical practice. However, the third part of
Habermas's epistemology - critical reflection on knowledge -
seems to provide good prospects for countering the hegemony of
technical-rationalist ideology. Critical reflection is central
to the emancipatory cognitive interest. An emancipatory
curriculum interest is concerned with developing a critical
awareness of the traditional culture of professional pedagogical
practice, especially its resulting social inequities.

We argue for a critical constructivist perspective on pedagogical
reform that incorporates both the practical and emancipatory
curriculum interests. Habermas's ideal speech situation suggests
conditions that should be established in order to facilitate the
establishment of an equitable and empowering classroom discourse.
However, we are careful not to advocate the abandonment of the
technical curriculum interest in favour of utopian and impractical
ideals.

The pedagogical strategies that we suggest for the reconstruction
of the culture of the traditional teaching/learning environment
are based on attaining a balanced rationality. We argue that the
establishment of communicative action should begin with open
discourse aimed at developing an atmosphere of trust and mutual
respect that can enhance rapport between the teacher and
students, and provide a means of exploring the extent to which
technical rationality has colonised the lifeworlds of teacher and
students. Upon this foundation, critical discourse can aim to
make visible, and subject to critique, the major constraining
frames of reference which constitute the traditional culture of
the education.

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 open discourse begins to change the nature of the teaching/learning community, and from the moment that critical discourse begins to reveal the hidden cultural frames of reference, 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 education microculture, but it also will have germinated the seeds of the reconstruction of the macroculture of the educational institution and of society at large.

Educational discourse which is controlled by a technicist orientation is neither open nor critical, and disempowers both teacher and students. In communicative action, the technical curriculum interest is subsumed (albeit, only momentarily) by open or critical discourse that serves practical and emancipatory interests. Brief transitions in communicative rationality constitute, therefore, the emergence of a balanced rationality. Within the cultural web of traditional education, transitions to open and critical discourse create, in itself, a form of emancipation. We regard traditional educational culture to be an intellectually and emotionally entrapping, suffocating, and entombing web spun by the technical rationality of the educational empire. However, in accordance with the sentiments of the cultural anthropologist, Clifford Geertz, we believe that the cultural web can be transformed [our emphasis added]:

The concept of culture I espouse . . . is essentially a semiotic one. . . . Believing . . . that man [sic] is an animal suspended in webs of significance he himself [sic] has spun, I take culture to be those webs. (Geertz, 1973, p. 5)

With culture understood in this way, and with the attainment of balanced rationality through communicative action, educational curriculum might be reconceptualised as a cultural product, a semiotic flower within webs of significance spun by the community of the classroom or lecture theatre. Or, in the words of the modern philosopher of mathematics, Morris Kline, mathematics (or any body of knowledge) might be reconceptualised as:

. . . [T]he 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)

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