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ABSTRACT

This paper examines research in science education, making a case for the interpretive researcher to value both reason and emotion for generating a reflective and reflexive understanding of the classroom experiences of teachers and students. It discusses the role of rationality and emotions in fieldwork, and presents two impressionistic "tales" based on observations of teachers of college science and mathematics in Florida. These composite accounts attempt to portray, through the lens of the researcher's own experiences, the experiences of the persons under inquiry. Literary and artistic metaphors are used to explain the construction of such accounts. The paper argues that a major challenge for ethnographic fieldworkers is how to include the emotions while avoiding the construction of a "self-absorbed self" who loses sight of the culturally different other. Two appendixes present the tales, "A Stern Tale About Learning" and "Familiarity Breeds Intimacy," along with the actual research context of the two accounts. (Contains 32 references.) (MDM)

Tales of the Field: Impressions of College Education

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> But as for the beauty of it, the *Microscope* manifests it to be all over adorn'd with a curiously polish'd suit of sable. Armour, neatly jointed, and beset with multitudes of sharp pinns, shap'd almost like a Porcupine's Quills or bright conical Steel-bodkins; his head is on either side beautify'd with a quick and round black eye. [Robert Hooke, 1665]

> And for all that concerns ornaments of speech, similitudes, treasury of eloquence, and such like emptiness, let it be utterly dismissed. [Francis Bacon, 1620]

Elsewhere, I have argued the need for science educators to create a richer *tapestry* of education, one that weaves together in a well-considered way the threads of knowing (epistemology), being (ontology) and valuing (axiology) (Taylor, in press). These are essential threads that are constitutive of the intersecting and overlapping daily lifeworlds[1] of teachers and students. Educational reforms aimed at improving the quality of students' educational experiences cannot afford to ignore the importance to pedagogy of any one thread.

Here, I extend the tapestry metaphor to interpretive educational research, particularly to the doing of fieldwork activity aimed at understanding (and, sometimes, reshaping) the pedagogical quality of life in science classrooms. In this paper, I make a case for the interpretive researcher to value both reason and emotion for generating a reflective and reflexive understanding of the lived classroom experiences of teachers and students. My focus is on the representational aspect of interpretive research, that is, the writing of the research in which the fieldworker attempts to portray, through the lens of his own experiences, the lived experiences of the persons of his inquiry.

I turn to John van Maanen's *impressionistic tales* as a potentially valuable genre for constructing thoughtful-emotional portrayals of life in science classrooms. To illustrate my argument I present two impressionistic tales based on my recent fieldwork amongst teachers of college science and mathematics in Florida. Arising from this research is the question of the legitimacy of impressionistic tales. Because these tales are allied with literary genres, rather than the traditional Baconian genre for reporting scientific research, the question arises of the need for new standards of judgement for legitimating their research status and assessing their quality.

To answer this question, I consider first Guba and Lincoln's (1989) criteria for hermeneutic interpretive research. But, because these are lacking in scope, I turn next to Max van Maanen's dialogical criteria for the text of phenomenological interpretive research.

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[1] I use the term 'lifeworld' in the sociological sense of the everyday world as it is experienced by ordinary people rather than by researchers who tend to theorize about it.

The Rationalistic Fieldworker

Research in science education underwent a revolution during the 1980s when it intersected with a number of seemingly alien fields of scholarship. From cognitive science came a unique interest in understanding what goes on in the minds of teachers and students (Clark & Peterson, 1986), an interest that took us behind the surface features of behaviorist-oriented process-product research. Cultural anthropology supplied powerful ethnographic research methodologies (Erickson, 1986) for examining the dynamic relationship between teachers' and students' patterns of thought and their social classroom roles. And sociology made us aware (through the voices of social constructivists) that the social reality of the classroom is pluralistic, dynamic and contingent rather than singular, static and immutable (Berger & Luckmann, 1966; Tobin, 1990). Thus, science educators adopted qualitative-interpretive researcher persona and began to represent in their research accounts the multiple meaning-perspectives (i.e., beliefs, values, perceptions) of the teachers and students with whom they participated in school classrooms (Gallagher, 1991).

In time, some interpretive researchers took a 'reflective turn' (Schon, 1983) and realised the centrality of their own meaning-perspectives in portraying the lived experiences of others. The inextricable co-participation of self and other in the 'hermeneutic circle' (Gadamer, 1976) means that these portrayals are inescapably partial, intersubjective and context-dependent. In subsequent attempts to account openly for their interpretive activity, researchers have sought to make visible their own (orienting and constraining) frames of reference. It is not uncommon for an interpretive research report to contain a 'theoretical/ interpretive framework' section which precedes the 'results' or 'data analysis' section. Depending on the duration of the study, the interpretive-researcher-as-learner also might reflect critically on their initial frame of reference and weave into the research report an account of their own personal maturation (e.g., see Taylor, 1993a, 1993b; Taylor & Dawson, in press). Thus, interpretive research reports seemingly can tell as much about their authors as they do about those who were the initial focus of the research.

In science education, however, interpretive research accounts remain, by and large, unashamedly rationalistic. The rich descriptions, vivid vignettes, and multiple voices of many interpretive research reports are assembled with a dispassionate rigour that signals the hegemonic influence of modernist science with its sacred (but disguised) standards of value-neutrality and unfeeling objectivity (Milne & Taylor, in press). Although 'personal experience methods' and 'narrative' modes of inquiry (Bruner, 1990; Clandinin & Connelly, 1995; Geertz, 1989) have become commonplace in educational research, in science education they remain highly susceptible to the colonising influence of the socio-cultural myth of 'cold reason' which strips away the swirling currents of feeling that flow between people (Taylor, 1996). A 'cold' view of cognition (as prescribed by Francis Bacon in the introductory quotation) eschews the emotionality of human experience while privileging the logical reasoning associated with a mind-as-machine metaphor. When cold reason prevails, interpetive research reports are characterised by a *logico-scientific* reporting style (Bruner, 1986) which creates an emotionally-neutral textual 'space' for portraying (perhaps, distorting) the complexity of human relations.

The reader of such reports is not able to judge the impact on the research process of the emotional interplay between the participants, most noteably between the researcher and the researched. Thus, we are led to believe (often by default rather than design) that the 'good' interpretive researcher does not let her emotions influence communicative relationships in 'the field'. What, then, of the interpretive researcher who wishes to establish a trusting relationship with a teacher whose

classroom she wishes to examine? Regardless of whether the relationship is premised on a 'non-participatory' observational role or a fully collaborative (action) research relationship, is there not a need for an ongoing flow of empathy between the researcher and teacher? Logic, alone, seems a woefully inadequate means of sustenance.

What, also, of the interpretive researcher who is interested in studying the quality of the communicative relationship between a teacher and her class, one that exemplifies a 'relational' ethic of mutual care and reciprocal understanding (Noddings, 1984)? How is the researcher to 'understand' this interaction? Should she rely on reason alone or attempt to include a 'feeling' response to the emotional climate of the classroom? And, what also of the emotions that can 'flare up' when a teacher contests a researcher's interpretation (perceived as judgement) of the efficacy of his pedagogy? Should the researcher retreat to a rationality of transcendence or, perhaps, ask herself whether her attitude of cool reason has not, in fact, precipitated the crisis of confidence in their relationship?

In each of these (not-so-hypothetical) cases there are implications for the reporting of interpretive research. If we acknowledge the importance to fieldwork of emotionality then we need a literary genre that provides an appropriate language of emotional expression.

The Thoughtful-Emotional Fieldworker

That emotions do have a legitimate role in interpetive research is evidenced by the growing interest being shown of late amongst ethnographers. Sociologists Sherryl Kleinman and Martha Copp (1993) (drawing on *symbolic interactionism*) recognise the distracting 'emotion work' of sociology fieldworkers whose rationalism forces them to try to disguise and suppress negative feelings towards participants. They urge fieldworkers to eschew the scientistic detachment of positivism, to avoid privileging the cognitive and behavioral and, instead, become more aware of their feelings and tell how they actually helped them to understand the field setting.

Of course, a major challenge for ethnographic fieldworkers is how to include the emotions while avoiding the construction of a self-absorped self who loses sight of the culturally different other. From a *postmodern* perspective (which recognises the necessarily socially constructed, rather than realist, nature of ethnographic accounts) critical self-reflection on one's emotional responses can offer rich and insightful understandings of the other (Kleinman & Copp, 1993; Manning, 1995).

In a recent review of representation in ethnography, John van Maanen (1995) describes the emergence of new non-realist styles of ethnography in which the fieldworker makes the subject of her research the fieldwork itself. In *auto-ethnographies*, the writer's own culture is textualized and her confessional tale offers "a passionate, emotional voice of a positioned and explicitly judgemental fieldworker", thus obliterating the distinction between the researcher and the researched (van Maanen, 1995, p.9).

The writing of Max van Manen (1990) (which draws on *phenomenology* and *hermeneutics*) extends the case for interpretive researchers to couple emotionality and rationality when researching everyday lived experience in education. Van Manen's *hermeneutic-phenomenology*[2] orients the educational fieldworker towards

[2] Van Manen describes phenomenology as the study of the lifeworld — the world as we immediately experience it pre-reflectively rather than as we conceptualize, categorize, or reflect on it (Husserl, 1970; Schutz & Luckmann, 1973).

understanding, from a pedagogical perspective, the lived experience of the other (e.g., a child, a teacher). To achieve this understanding requires the fieldworker to enter empathetically (with due care and concern) and existentially (with a heightened awareness of being and becoming) into a shared lifeworld experience. After the French existentialist, Sartre, understanding the other involves understanding (through sensing and thinking) one's situatedness in a shared social reality: "I see myself because *somebody* sees me. I experience myself as an object for the other" (Sartre, 1956, pp. 252-302 cited in van Manen, 1990). This pre-reflective experience generates in the fieldworker a rich and insightful *descriptive* (or phenomenological) understanding, but one that is sub-vocal and embodied.

Subsequently, in representing the meaning of this experience — the thoughtful *bringing to speech* of something — the fieldworker generates via some 'text' (i.e., spoken or written language) an *interpretive* (or hermeneutic) understanding which, because it presents a particular reading, remains necessarily partial and contingent. The writing process is doubly interpretive inasmuch as it entails consideration of the quality of understanding to be generated by the reader when she meshes her lifeworld with that of the author. Van Manen's is a wholistic approach to fieldwork, one that involves the researcher's whole thinking-being-sensing self.

Thus, if it is legitimate and desirable for the interpretive educational researcher to place emotionality and rationality on an equal footing in order to generate a thinking-feeling understanding of the lived classroom experiences of teachers and students, the methodological question arises of how to do so. Here, I restrict my interest to the representational part of this question, that is, the *second moment* of ethnography (van Maanen, 1995).

Impressions of Lived Experience

> If knowing a culture is anything like [anthropologist, Clifford] Geertz implies — "grasping a proverb, catching an illusion, or seeing a joke" — it is a most ambivalent matter. . . . The magic telling of impressionistic tales is that they are always unfinished. With each retelling, we discover more of what we know. [van Maanen, 1988, p.118]

Sociologist, John Van Maanen (1988), provides a powerful and colorful means for portraying the complex interplay of reason and emotion that creates the mood or ambience of a social setting. Van Maanen draws on the Impressionist art genre, that ill-defined revolutionary art school (of Degas, Monet, Renoir, Seurat, van Gogh, et al.) which rejected the realist landscapes and portraiture of the Classical school in favour of a figurative approach with a focus on the *sociology of emotions*. Earthy unposed scenes in situ are favoured over formal studio portraits; tangled wheatfields over roses and vases. The familiar is made strange by valuing the unclassified, shuffling conceptual categories, producing incongruities. The artist tries to evoke in the viewer an open and participatory sense; at times, to startle the complacent viewer. The associative link to fieldwork writing lies in the artists' self-conscious use of their materials, particularly through striking use of color and close attention to light.

An appreciation of its raison d'etre can be gained from examining paintings of 19th century French Impressionists (Thompson & Howard,1988). In Monet's lake-scape, 'La Grenouillere', there is a recognisable public space inhabited by people whose social habits are identifiable but of minor concern to the artist. Monet's main concern is to express the mood of this particularly sunny day. The choppy brushmarks of

pure colour result in a mesh of light and atmosphere which is the true subject of the painting. More dramatically, Van Gogh's land/sky-scape, 'Starry Night', is a partly imaginery or composite image that amalgamates elements from two of his earlier paintings as well as a fictional church spire drawn from memory. These devices contribute to a synthesis of the artist's present and past experiences. But the painting is not so much about landscape forms as it is about the theme of a wonderful restless life force that sweeps upwards through the trees and swirls across the sky, a theme that is conveyed through self-conscious use of vibrant colour and heavy brushstrokes. These paintings engage the viewer as a participant in the rich lived experiences of the artists.

For ethnography, Van Maanen's *impressionistic* mode of writing — *tales of the field* — is an attempt to bring the knower and known together in representational form as a means of "cracking open the culture and the fieldworker's way of knowing it so that both can be jointly examined . . . [keeping] both subject and object in constant view" (van Maanen, 1988, p.102). The fieldworker draws on her experiences to write stories about remarkable and memorable (rather than recurring) events, which she makes striking by skilful use of words, imagery, phrasings and metaphor. The writer aims to draw the reader into the story, to have them relive the experience from begining to end, to work out its puzzles and problems. To intensify the relived experience, the writer may exaggerate, be entertaining, be uncharacteristically kind (or unkind), or use crude figures of speech typically forbidden.

Literary Standards

Impressionistic tales draw on literary (poetic) standards of narrative rationality and, so, should be *plausible* or *believable* rather than accurate (in the sense of scientific rationality). Thus, the criterion of verisimilitude replaces that of accuracy of representation. An impressionistic tale should be judged, therefore, in terms of its *interest* ("does it attract?"), *coherence* ("does it hang together?"), and *fidelity* ("does it seem true?"). Van Maanen suggests the use of the following literary devices for writing impressionistic tales.

- *Fragmented Knowledge.* The fieldworker's learning process can be exemplified by a novelistic style which lets events unfold in a way that makes the reader uncertain of meaning or destination.

- *Characterisation.* The fieldworker must take a stance (rather than feign disinterest) by expressing, for example, befuddlement, sensitivity, compassion, anger or scepticism; and characters must be given names, faces, motives, and lines to speak.

- *Dramatic Control.* The fieldworker should recall events in the present tense, avoid giving away the ending, and build a degree of tension; provide condensed but contextual descriptions; use artistic nerve, unusual phrasings, fresh allusions, rich language, cognitive and emotional stimulation, puns, and quick jolts to the imagination.

Two Tales of the Field

During a recent inquiry that I conducted into college science and mathematics teaching I wrote two impressionistic tales of my fieldwork experiences: *A Stern Tale About Learning & Familiarity Breeds Intimacy*. These tales occupy a central place in my report of the study. In the introduction, I wrote:

> These tales were intended to highlight cultural activities that I valued because of their impact on my sensibilities and sensitivities. They are as much a tale of their author as they are of the teachers whose activities I tell about. It is my hope that their evocative power will cause the reader to reach into their own store of value-laden memories and ask 'felt' questions about the kind of culture that we should hope to generate in future college classrooms. [Taylor, 1995b]

Reflecting on Impressionist paintings and on van Maanen's (1988) literary guidelines for impressionistic writing, the following artistic metaphors helped me to breathe life into the writing of these tales.

- *Showing the Brushstrokes*. Taking as a metaphor the visibility and textuality of the brushstrokes in Impressionist paintings, I wove together into the same tale the 'methodology' and 'findings' of the study. I talk about the immediate impact on my thoughts and feelings of classroom observations and interviews. In *Familiarity*, I paint the context of my situatedness as I wait for Dr Mary Buenos in the college environs or accompany her to the cafeteria for a lunchtime conversation about her pedagogy. I talk also about my impact on the thoughts and feelings of Mary as she finds a space for me somewhere between her busy daily schedule and her altruistic dreams. In *Dr Stern*, I reveal my disquiet about a professional educator who seems to thrive on a pedagogical spirit of competitive individualism.

- *Illuminating the Mood*. Taking as a second metaphor the artists' concern with the relationship between their subjects and the light that illuminates them, I made visible the role of my own feelings and values in illuminating chosen features of teachers' pedagogies. In *Dr Stern*, my own stern voice speaks out in protest at the figurative character of a college science professor whose cold, hard pedagogical grasp of his students reaches out to assault my own sensitivities. I allow myself to rebel on behalf of all supressed students. In comforting contrast, I speak with warmth and praise in *Familiarity* of the care and compassion of Dr Mary Buenos whose pedagogical humanity was palpable in her bilingual classroom. My celebration of Mary is due in no small way to my recollection of the few moments of true connectdeness that I recall experiencing in the brief company of one or two compassionate teachers during my student career of over 20 years.

- *Composing the Subject*. Taking as a third metaphor the composite character of van Gogh's landscape painting, 'Starry Night', I constructed from my experiences in the field a semi-fictionalised and composite character. Dr Stern is an amalgam of the disparate features of a number of college teachers who were united in the common belief that the place for 'real learning' is not inside their classrooms. Dr Stern speaks for teachers who have little respect for students as people, who are captives of a technical rationality that underpins their unremitting didacticism, and whose scientistic attitudes privilege the smug authority of their own knowledge. I speak with passion about Dr Stern because he reminds me of the way many of my own teachers treated me with contempt by ignoring my learning needs and my personhood.

These impressionistic tales represent an attempt to portray evocatively a sense of mood or ambience and a thoughtful understanding of pedagogical issues such as the impact on student learning of teacher epistemology and the ethical nature of teacher-student educative relationships.

Tales as Research

Before proceeding, I offer the reader of this paper a choice between a first reading of the tales as a literary event or a research event.

A Literary Event

If you turn first to Appendix 1 then you can read the two tales 'out of context' and appreciate them as a literary event to be judged, in the first instance, by literary standards alone (outlined above). I recommend this approach because it is likely to evoke a response in you that has a high emotional weighting which, after all, would illustrate the major emphasis of the paper.

A Research Event

Alternatively, if you turn first to Appendix 2 then you can read how the two tales are framed by the research context of the college teaching inquiry in which they were written. There, I draw on my research report (Taylor, 1995b) to explain briefly the rationale and methodology of the inquiry. I believe that it is important for the reader of the tales to understand their research framing. What distinguishes a literary event (such as a novel, work of art, theatre performance) from research is that, in the former, meaning remains implicit whereas, in the latter, meaning is made explicit (van Manen, 1990). In this respect, it is important for the reader to understand how the meaning of my tales is framed by specific research purposes and methodological constraints. Each tale is framed also by an interpretive commentary (see Appendix 3) which discusses its educational significance. Without an understanding of the particular research framing of the tales it would be impossible to know how to judge their contribution to science education research or, more importantly, their research legitimacy.

Which Research Standards?

In science education, Guba and Lincoln's (1989) *trustworthiness* and *authenticity* criteria were designed originally as standards for regulating the activities of educational program evaluators. They are being adopted increasingly by classroom-based interpretive researchers (e.g., Richie & Rigano, 1996), especially *researcher-developers* who employ constructivism as an epistemological referent and work collaboratively with teachers in professional development programs to improve the quality of student learning (e.g., see Tobin & Roth, 1996). The trustworthiness criteria were designed to be congruent with the conventional methodological standards of scientific research (i.e., validity, reliability). As standards for interpretive research, these criteria draw attention to the need for the reader of the research report to understand participants' experiential realities, trace the unfolding methodological process, identify original data sources, and judge the applicability of the research results.

The authenticity criteria are designed to hold the researcher-developer accountable, both morally and educationally, for the impact of their research activity on all participants (or 'stakeholders'). The reader of the research report should be provided, therefore, with evidence of the researcher-developer's genuine attempts to represent fairly participants' disparate views of what constitutes good practice, empower them to have significant roles in the research and development process, and engage them in an educative experience aimed at improving their (teaching or learning) practices.

Of course, not all interpretive researchers would find all of these standards to be relevant to their research studies. The further a study is removed from the status of a collaborative and inclusive program of professional development, the less relevant are many of the authenticity standards. For example, when a research study is designed only to understand how a teacher's beliefs govern their classroom teaching practice, without any intention to engage the teacher in a sustained program of pedagogical transformation, then it would not be necessary to adopt educative standards of accountability. Rather, it might suffice to offer only a moral standard of accountability (e.g., fairness) that guarantees to protect from possible malfeascence the teacher and students. This example illustrates the purpose of my interpretive research study of college teaching, the study whose results are presented in the form of two impressionistic tales.

How do the tales of *Dr Stern* and *Familiarity* measure up against the trustworthiness and authenticity criteria? I asked this question of Dr Mary Buenos (a pseudonym, of course). Because *Familiarity* paints a positive pedagogical image of Mary, I had no hesitation in either referring the tale to her or undertaking to rewrite any part that she deemed as being substantially in factual error. Being very familiar with these criteria, Mary examined carefully the tale which purports to portray an important aspect of her pedagogical beliefs and practices. Her 3-page report bears testimony to the trustworthiness and authenticity of the tale to an extent that, rather surprisingly, exceeded my limited intentions[3]:

> All in all, the story was very well written, rich in facts and details, very trustworthy and authentic. It does reflect my values, my philosophy on teaching and learning and my philosophy of life.
>
> [Buenos, pers. com.]

What then of *Dr Stern*, the tale of a highly figurative character? There was no real (in the 'flesh-and-blood' sense) person from whom to elicit similar testimony. His literary character draws, to a greater or lesser extent, on a number of real-life college professors. There is a clear lack of (Guba & Lincoln's) trustworthiness in this tale. The experiential reality portrayed is much more mine than that of others whose pedagogies I examined. The original sources are not detectable, and rightly so. Because Dr Stern is 'larger than life', it would not be reasonable or fair to equate his pedagogy with that of particular teachers (regardless of whether the portrayal is that of a demon or a saint).

What of the counter-argument that I should have written firstly trustworthy (but secret!) portrayals of each of the (partly constitutive) professors whose pedagogies I examined? On the one hand, it was not practically feasible to do so because of the limited resources of the research. On the other hand, there are moral grounds that outweigh rationalistic, and possibly self-serving, considerations of achieving trustworthiness. When considering the feasibility of a process of verification (or 'member check'), a number of questions arose for me. Would these college professors feel personally slighted by my (implied) criticism of their pedagogies? Would they feel betrayed by a foreign visitor who they had hosted so graciously? How could I justify asking them to expend emotional energy and time on an activity that might

[3] It could be argued that a 'halo effect' displaced Mary's critical assessment of the tale. How could tale have had an educative authenticity when, during the fieldwork, I did not attempt to engage Mary in a process of pedagogical transformation? But, from the perspective of van Manen's *dialogic* criteria (see below), Mary's later reading of the tale might have oriented her to reflect deeply on her pedagogy and thus, through my eyes, learn something about herself.

appear to run counter their own interests? My answers to these questions continue to persuade me of the undesirability of conducting a 'reality check' on these teachers.

So, from an interpretive research perspective, is *Dr Stern* illegitimate? The answer depends on how we define interpretive research, for there are varieties which can serve different research purposes. The hermeneutic variety of interpretive research that has become increasingly popular amongst science educators has its roots in the ethnographic practices of cultural anthropology (Erickson, 1986; Gallagher, 1991). This approach has tended to privilige the experiential realities of the 'natives' to an extent that there is a dearth of criteria for judging the reporting of the fieldworker's own experiential reality (particularly the emotional dimension). In this respect, the researcher is provided with little guidance in writing her research account other than to make explicit her own *voice* (e.g., 'first person' pronouns) and to show evidence of her role as a *learner* by presenting answers to emergent reseach questions. The Guba and Lincoln criteria of trustworthiness tend to reinforce the dominant emphasis on representing others' experiential realities by focusing attention almost exclusively on the hermeneutic process of interpretation.

However, van Manen's (1990) phenomenological variety of interpretive research foregrounds the educational fieldworker's own lived experiences which are chosen because they are also the possible experiences of others. The writing of this research involves the production of a text that establishes a particular *dialogic*, or educative, relation with the reader, one that engages, involves and requires a thoughtful response. Dialogical text avoids defining (in a propositional sense) issues such as pedagogy because of the ineffable quality that is not capturable by or in text. By representing the researcher's lived experience in narrative and poetic form (eg., story, anecdote) the *textuality* of the text aims to open up, in an indirectly teachable way, questions of pedagogy.

> Dialogically constructed texts allow us to recognize our lives in the mimicry of stories and conversational anecdotes. . . . they allow for a certain space, a voice, which teaches by its textuality what the sheer content of the text only manages to make problematic. . . . The reader gains something more important than a definition . . . the experience of being oriented (turned around) . . . in a way that is profoundly conclusive.
>
> [Van Manen, 1990, p. 144]

In education, the purpose of the dialogical text of phenomenological interpretive research is, therefore, to engage readers in vicarious and mimetic experiences that aim to teach them something profound about their pedagogical selves. Thus, a change of orientational metaphor for interpretive research writing signals a major shift away from an emphasis on *research as reporting*, which presents findings about the (external) cultural world of education, towards an emphasis on *research as reading*, which aims to transform by engaging its readers in critical self-reflective thought and action (ie., praxis). Van Manen presents four evaluative criteria for the dialogical text which emanates from and portrays research on lived educational experience.

- *Orientation*. The text should be oriented to answering the question of how the researcher as educator stands in relation to life: what are the valued beliefs that shape the educator's lifeworld?

- *Strength*. The text should be committed to a strong pedagogical perspective which addresses the question of how we should be and act with children.

- *Richness.* The text should provide rich and thick descriptions of the exploration of experiential phenomena that cause the reader to be engaged, involved and thoughtfully responsive.

- *Depth.* The text should enable the reader to explore the depthful character of their pedagogical nature beyond what is immediately experienced, to appreciate the inherent complexity, ambiguity and mystery of life.

Clearly, there is some common ground shared by the interpretive research approaches of Guba and Lincoln (1989) and van Manen (1990). Both advocate a hermeneutic engagement between self (the fieldworker) and other (teachers, students) in order to generate insightful understanding of others' lived experiences. Writing rich and thick descriptions, therefore, enables the reader to generate an understanding that is similar to the researcher's understanding. However, the greater emphasis of phenomenological research on portraying the lived experiences of the researcher separates the two.

And, yet, the separation is not clear cut. Neither type of interpretive understanding can be considered as possible in isolation from the other. Because of our socio-cultural embeddedness, the self is always situated in relation to others. As Fig 1 illustrates, both forms of understanding, or constructing meaning, must co-exist, but often to differing degrees. The educational researcher faced with a choice of relative emphasis will be guided by the goals and resources of her study. These constraints also will effect the choice of standards for regulating the conduct of the research and the writing of the research report.

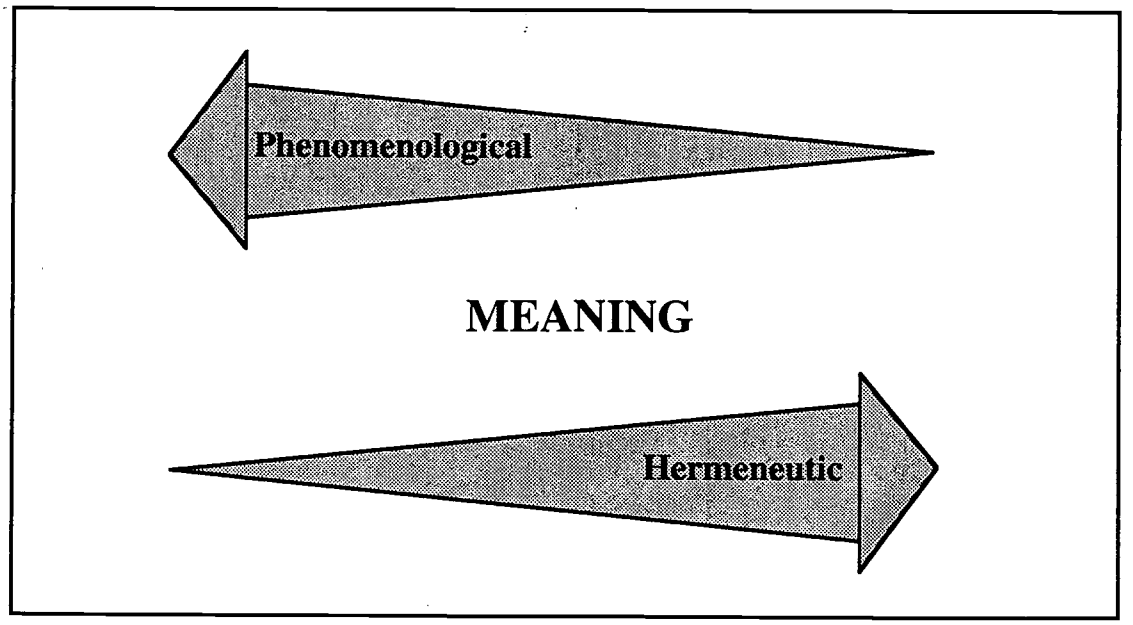

Fig 1. A model of the relative degrees of phenomenological and hermeneutic meaning generated by the interpretive researcher

Which standards, therefore, are appropriate for assessing the two tales, *Dr Stern* and *Familiarity*? In the case of *Familiarity*, my writing of the tale drew on an almost equal measure of phenomenological and hermeneutic understanding: I portrayed a high degree of meshing of the lived experiences of both Mary and myself. In judging the research quality of the tale (in the context of the research report in which it appears), it would be appropriate to use Guba & Lincoln's criteria of

trustworthiness and the ethical authenticity criterion, as well as van Manen's four dialogic textuality criteria. By saying this, I do not imply that the tale necessarily will measure up very well against each of these criteria. What I do mean is that these criteria are the appropriate ones to use.

In the case of Dr Stern, however, the role of the trustworthiness criteria is diminished because I drew much more on the phenomenological understanding of my own lived experience in the field and only to a small degree on my hermeneutic understanding of the college professors' lived experiences. This tale (in context) should be assessed against Guba & Lincoln's authenticity ethical criterion and van Manen's four evaluative criteria for dialogic textuality.

Because the research was not interventionist, in the sense of aiming to transform college professors' pedagogies, neither tale should be judged against Guba & Lincoln's educative authenticity criteria. On the other hand, if this judgement is located in van Manen's (1995) *third moment* of ethnographic research — the reading of the tale — then it is appropriate for the reader to decide the extent to which she has been enagaged dialogically by and with the text. The question of the educative authenticity of both *Dr Stern* and *Familiarity* is appropriate if the reader wishes to judge the extent to which she has learned something about her own pedagogy as a result of reading the text.

Confession 1

> Ethnography is no longer pictured as a relatively simple look, listen and learn procedure but, rather, as something akin to an intense epistemological trial by fire. [van Maanen, 1995, p. 2]

I remember keenly the excitement of the metamorphic experience of sloughing off the constraining shell of my own rationalist heritage and transforming into a thoughtful-emotional writer. It felt good; it felt right; it felt like I had rediscovered my very early love affair with writing, the affair that had ended abruptly, but unconsciously, once I committed myself to an intimate relationship with high school and, later, university science. Thankfully, a barren marriage to the ghost of Francis Bacon is now over and I feel liberated. But, as the academic imperative demands, I am compelled to abide by the (contingent) standards of the science education community and write a scholarly justification of the role of impressionistic tales in my own interpretive research.

When I started to write this paper, I was keen to commit a scholarly act of legitimation of the two impressionistic tales that I had written some time ago. Since their genesis, I have presented them to many teachers taking professional development courses that I teach. The tales have proven their own pedagogical worth. Invariably they stimulate rich, animated and reflective discussions about teaching and research, and precipitate the writing of narrative-style accounts of teachers' lived experiences. My postgraduate students are embracing enthusiastically this literary genre and putting it to good use in telling about their own lived fieldwork experiences. But I had yet to fully convince myself of the legitimacy of 'tales' as science education research, despite their provenance in the inspirational ethnographic writings of John van Maanen.

As I prepared to write this paper, I had in mind the need to deal with the increasingly powerful presence of Guba and Lincoln's rigorous standards of interpretive research. Although I value these standards (and promote their use by my own postgraduate students), I felt uneasy about their potential for becoming a new totalitarian framework. But I felt uneasy, too, about adopting an adversarial

position and attempting to 'slam dunk' these standards. The history of science education, it seems to me, is littered with fascist thought which closes down possibilities after each new (epistemological) argument has been won. Thus, in pointing out the limitations of Guba and Lincoln's standards, I have tried to enact a thoughtful-emotional approach to seeking a rapprochement between the old and the new.

In this case, the new is an emotional dimension that sensitizes the science education fieldworker to the mood or ambience of an educational setting. As well as a thinking being, the fieldworker is an emotional being and it is legitimate to 'listen' to his feelings. By coupling emotionality with reason, interpretive researchers can enrich and deepen their understanding of the pedagogical climate of science classrooms. On the central question of how to legitimate such a seemingly unholy marriage, and thus reunite our masculine and feminine selves, I explored the pedagogically rich writings of phenomenologist Max van Maanen. With a central concern for the issue of representation, or the writing of the research, I found the justification for which I had been searching. But, as with all good interpretive research, I got more than I bargained for.

I learned a new metaphor for interpretive research — *research as reading* — one that arises from the researcher's phenomenological understanding of her lived experiences (both in and out of the 'field') and her desire to engage dialogically the reader's imaginative self. But, in seeking a rapprochement with the old metaphor of *research as reporting*, I have learned that a new and exciting challenge now exists for interpretive researchers in science education. Figure 1 suggests a new range of possibilities for guiding and evaluating the epistemology of our research activity, including both the doing and writing of the research. Therefore, we must be assiduous in making explicit, both to ourselves and to the readers of our research, the standards against which we wish our research to be judged; especially if our writing is intended to engage the reader in an intense epistemological 'trial by fire' over the legitimacy of their own standards.

Confession 2

My intention in offering the textual characters of Dr Stern and Dr Mary Buenos is to engage the reader in an act of pedagogical thoughtfulness about the future of college education. With the realisation that new teachers of our children are most likely to imitate the teachers of their own lived experiences, we are compelled to ask:

What formative learning experiences should we value most for our children's prospective teachers?

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Appendix 1

Two Impressionistic Tales

A Stern Tale About Learning

There, I heard it again, an increasingly familiar declaration!
"That's where the student will be doing most of the learning - at home with his textbook", declared Dr Stern.
I had just witnessed Dr Stern lecturing to his Health Science class, a small class of about 15 students. Now, we were seated in his office and were well into a conversation about his teaching.
"In college, the learning takes place at home, and the function of the classroom is to explain difficult concepts that can be learnt at home. If the student doesn't learn at home the whole thing falls!", continued Dr Stern, as if to leave me in no doubt about his view.
"Hmm", I wondered, "*the whole thing falls!* What an interesting metaphor. What does that signify - learning as the building of an edifice, perhaps? Quite a contrast to the New Physics view of the universe as being in constant evolutionary transition and of learning as personal evolution or becoming, as Skolimowski reminds us".

The theme, that learning should occur outside, rather than inside, class, was beginning to emerge from my inquiries. I had detected it in conversations with other college professors.

Today, it was emphasised boldly and unashamedly by Dr Theodore Stern, a professor of health science and a man of imposing physical stature whose deep bass voice and declarative opinions signalled an aura of exceptional confidence in the authority of his own expertise, both in his teaching and in the conversation we were having right now.

"So, how", I contemplated, "does Dr Stern construe the purpose of his lecture class? And how does it relate to his philosophy of a college education? And what does he mean by learning?".
I wanted to ask these questions all at once, but it was clear that Dr Stern preferred to answer one question at a time. He seemed to have a high regard for correct answers (it is very apparent in his teaching) and wanted to ensure that he could deliver to me an answer that was in need of no revision.
I recalled his adamant response to my earlier assurance of confidentiality in relation to the audio recording of our conversation. He declared confidently that he was certain that he would not need to retract anything that he might say to me.
Clearly, Dr Stern was not in the habit of making mistakes!

That afternoon, I had observed Dr Stern explaining to his Health Science class, with unwavering certainty, the intricate details of cell membrane transportation. With frequent reference to the textbook's diagrams, Dr

Stern decorated his blackboard with sketches and notes about what happens when cells are placed in solutions of varying saline concentrations (a hypothetical empirical account), what official labels should be attached to the different concentration states (the official language of science), how the cells would appear physically as a result (a further hypothetical empirical account), and the nature of the biochemical mechanism that accounts for changes in cell size (the theoretical account).
It was as though this scientific account, whose unquestioned authority reflected on Dr Stern, was an accurate description of the real world, rather than a constructed account. The context of the account was ahistorical, independent of preceding theory and, apparently, empirically verifiable.
"Ah, the old Empiricism of the seventeenth century lives on! Only sharply refined senses are needed when studying Nature. But didn't Kant's critique of pure reason identify the active mind as central in imposing structure on perceptions of the world ", I thought from the side of the room, "and, therefore, observations are governed by theoretical suppositions. So, it is our theories on which we need to reflect critically when making sense of our observations. And, if that is the case, isn't it important for the teacher to understand students' extant theories in order to understand what sense they are making of what they 'see' in class and observe in the lab? And, therefore, shouldn't the teacher spend some 'lecture' time questioning students and letting the replies moderate his explanations?".

At no stage did Dr Stern relate the significance of his scientific account to the world outside of college. Nor did he engage the students in a process of inquiry that might have enabled them to construct scientific understandings by first pondering on their understandings of the phenomenon to be explained.

"Why not give them a few raisins and grapes to stimulate an inquiry into why one is shrivelled and the other is smooth and juicy?", I wondered at the time.
It was not until students commenced their next laboratory class that they got to test the permeability of membraneous material and consider the implications for medical processes such as dialysis. However, the 'experiment' consisted of following routine instructions, recording pre-determined observations, performing standard numerical calculations, and inferring a conclusion identical to those of the rest of the class. Where was the inquiry in this 'cookbook' approach to laboratory learning?

Dr Stern talked to me about the complex relationships that existed amongst the multitude of concepts and principles of his field yet, in his teaching, he did little to enable students to construct their own relational knowledge. He reduced his own knowledge into bite-size chunks and spent much time explaining it to the class. How students were to 'see' the important relationships he valued was somewhat of a mystery, even to him. But one thing was certain: it wouldn't occur in class.
"I would be surprised if the student really learned [in class] . . . . I think they learn this little bit, and how this little bit connects to this little bit, and the big picture develops on the sidewalk after they've left class or when they are preparing for their exam or something sometime, I hope."

As he was talking, several thoughts flashed through my mind. "Is Dr Stern is laboring under a legacy of behaviorism which evokes an image of good teaching as the ability to present component pieces of detached factual knowledge and to measure students' reproductive performance?".

"Although he talks about concepts and their inter-relationships, his concern seems to be not so much with students linking new ideas to their existing ideas and understandings, as with transmitting his concepts to students and checking whether they have received them. How they go about receiving and relating them seems to be a non-teaching issue".

Dr Stern bemoaned the lack of self-motivation of many of his students, blaming their immaturity and blaming their high school teachers.
"It's absurd to think that freshmen are capable of inquiry!"
But where was his sense of moral responsibility for stimulating students' inquiring minds and, thus, their attitudes towards learning science?
"How can conventional science teachers stimulate students to reflect on their own knowlege when the explicit purpose of their teaching is to "deliver information" or "present the material" that students can take away with them in order to "truly learn" outside of class, presumably in the library or at home", I wondered.

Dr Stern was rather intimidating, if you assented to his construction of you as 'in deficit'.
I wondered how his students felt when confronted by the frequent questions that punctuated his commanding classroom delivery. I had watched through the viewfinder of my video camera as most of the class continued to reject Dr Stern's implicit invitation to expose their 'soft underbellies' to his unremitting authority. If you got it wrong you were left in no doubt that you were deficient. It was safer to pretend to be reading your textbook rather than to make eye contact with the professor at moments like these.
I couldn't help thinking, "His questions seem designed to reveal students' ignorance and to justify him pouring his expert knowledge into their empty minds, rather than building on what they do seem to know and drawing them forward in self-reflective inquiry into the quality of their own understandings".

During our conversation, I was careful to 'dance' with Dr Stern in a way that neither antagonised him nor allowed myself to be subjugated by the controlling power that he seemed to direct at me. I resisted the temptation to contest his opinions, especially the arrogance of his attitude toward the silent majority of students whose failure to engage with him in class was labelled haughtily as undue passivity instilled by their high school teachers.
This was not like other conversations I had had with college professors, conversations where dialectics had a place, where I might expose and explore conflicting interests and values. Nor was it a conversation of co-participation where I might proffer my own professional opinion in the interest of mutual learning.
Dr Stern controlled our conversation by willing it to be an expose of his uncontestable expert opinion. It was an experience that I had had before with medical doctors who insisted on diagnosing my health on the basis of theoretical understandings of how, in their opinion, I SHOULD feel. I reminded myself not to let my discomfort escalate to irritation.

It seemed to me that anytime a group of students met with a teacher for an hour it was inevitable that learning would occur. Clearly, Dr Stern and I had different views on the relationship between teaching and learning, and on learning itself!

"We are getting [students] prepared to learn . . . our efforts are spent in getting the students the things they will need in order to truly learn after they leave the classroom", I was told again.
Dr Stern's objectivist proclamations continue to echo in my mind.

Reflecting on this epistemology, I am reminded of a metaphor of mining. Students attend class and are given apparently immaculately conceived semi-precious gemstones which they must take away and add value to by cleaning, polishing, and mounting in prescribed settings. The final exam evaluates their mechanical skills at each of these steps.
The problem with this metaphor of learning is that the students don't get to know how to be miners (ie., how to construct concepts from within a matrix of inquiry and need), how to design the settings (ie., how to construct the relationships between the concepts) or how to appreciate the beauty of the jewelry (ie., standards of parsimony, elegance and explanatory power).
The term 'lecture' seems to be truly apposite as a label for the classes of science professors such as Dr Stern.

Familiarity Breeds Intimacy

It was time for lunch as Mary and I walked toward the student cafeteria chatting aimiably.

Mary was intent on restoring her energy levels after a particularly busy morning and did not yet feel ready for the intensity of the interview that she anticipated having with this person who had come to learn about her teaching methods.
"What will he want to know? How shall I explain myself clearly enough? Will he really understand? He did seem to be open-minded when we talked yesterday. What did he think of my teaching? I think he prefers fancy problem-solving methods, but this class cannot be like that. He was looking at his watch. Did he expect me to start the class on time, even though most had not arrived? I hope he didn't mind my joke about the class running on Hispanic time! How much of the Spanish could he understand? Could he tell they were a little shy today?".
These and other questions darted through her mind, but she forced them aside and continued to engage Peter in idle conversation.

That morning, Dr Mary Buenos had taught two 95-minute mathematics classes without a break, one of which, of course, was her favourite — her bilingual class. This class prepared students for a State-controlled scholastic aptitude examination that served as a filtering mechanism for entry into professional career courses in the State's universities.
Mary was especially proud of the class and was so pleased yesterday when Peter had shown interest in visiting it.
As usual after each class, she had stayed behind to advise students and the morning had rushed past. Arriving back in her office she had been drawn by colleagues into the usual end-of-semester crises. Thankfully, Peter had had the grace to leave her alone for half an hour and she had managed to either resolve the problems or, at least, defer them until later.

Sometimes she wondered whether the entire department would self-destruct if she was not there to serve as everyone's consultant and mentor, a role that had been recognised by the college when she had been awarded a 'personal chair'. But then she reminded herself of how much she loved her work.
"Ah, but teaching is not just a job; it is my way of life! And the young people, especially, they are the joy of my life!", she mused and an intense feeling of fulfilment and compassion displaced her concern about Peter and the interview.

Mary wanted to help young people as best she could. So many needed her care, particularly the Hispanic students, strangers in a strange land.
Her doctoral study, completed five years earlier, had confirmed what her common sense had told her at the time, that Hispanic students were grossly under-represented in university courses. Reflecting on her own experiences, she had surmised that they needed special assistance to succeed in their studies, and her research had confirmed that teaching bilingually was the key.
Since then, she had offered one bilingual class in mathematics each semester, a class in which she and the students moved freely between speaking Hispanic and English. It was a class that never failed to attract around 30 students.
After the first week, she knew them well enough to tell who had been born in the USA and who had arrived as an immigrant. After the second week, she knew how many hours of paid employment each worked to support themselves and their families as they grasped the life-enhancing opportunity of a college education. After the third week, she was drawn into their lives, learning about their dreams for the future and their struggles to survive in neighbourhoods where crime, racism, poverty and violence were rampant.

As they entered the cavernous student cafeteria Mary was deaf to the rock music pulsating from speakers high in the open roof space. She inhaled the atmosphere of the room savouring the luxury of having lunch away from her office for the first time in months.
In the space of a moment, she reflected on the path she had taken since arriving in the United States at the age of fifteen and speaking 20 words of English. Silently, she thanked God for having been selected as one of the priviliged few who could do His work.
She become lost in her reverie as she guided Peter instinctively toward the buffet area.

I was intent on giving her space. I walked quietly beside her and recalled how consuming of my own energy teaching had been. Sometimes there had not been enough left for my body to combat the marauding viruses that continually pursued the children and that laid me low for a week at a time. That was 20 years ago! Today the challenges were of a different kind.
Right now, I was hoping that Mary would choose to eat lunch outside. I preferred fresh air and was concerned about the impact of the resonating music on his planned recording of their lunchtime conversation.
Like most small audio-recorders, the one that he was carrying in the palm of his left hand preferred recording background noise rather than the person he was interviewing.

I had just spent the last hour relaxing in one of the shaded gardens of the college, taking the opportunity to reflect on what I had seen of Mary's teaching and to prepare myself for the interview.
The unbearable sticky heat of a few weeks ago had been replaced by the freshness of cooling air and the warming sunshine of a Floridean Fall; it was no longer essential to seek refuge in airconditioned buildings.
The mid-morning outdoor college environment, with the rich aroma of freshly brewed coffee, a comfortable chair to relax into, and the greenness of exotic trees and shrubs, was exceedingly pleasant; too pleasant, in fact, to dwell on negativities.

Although I was critical of the image of mathematics implicit in Mary's teaching — rule-oriented and largely decontextualised — I had sensed something vibrant and exciting about the class, something that usually was absent from conventional mathematics classes.
There was a spirit of 'joie de vivre' in Mary's mathematics class. As students arrived, Mary appeared pleased to see them and greeted each one personally. The formality that distances many teachers and students was absent here.
Rather than sitting in isolated silence or conversing in hushed tones waiting for the class to begin, students were voluble, relaxed and smiling. They conversed in Spanish with Mary and amongst themselves, sharing their life stories, at least those parts that they wanted to make public.
Today was an important class. It was to serve as revision for next week's final exam. Mary knew that she must help the students to tie together the seemingly infinite number of algebraic rules they had been learning during the preceeding 14 weeks.
She felt a need also to pass on the accumulated wisdom of her 22 years of experience on how to prepare for the multiple-choice questions of the examination, questions that required an accurate recall of algebraic rules and their simple application to single-answer problems.
She didn't much like this type of formal algebraic mathematics. It was so difficult to relate to students' everyday lives. Nevertheless, this was her assigned role, and she must do her very best to help them jump over an obstacle that blocked their path to university courses and professional careers.
As she conducted the class from the front of the room, the students listened attentively to Mary's mathematical explanations, memorising her tips and problem-solving advice, and feeling bolstered by her entreaties and strategies for dealing with the forthcoming examination. The condescension towards students that can occur in conventional college classes was replaced here by a genuine concern and a caring attitude.
The tone of Mary's voice, her gestures and facial expression, and her emotional intensity communicated to her students that she wanted them, indeed was willing them, to succeed. Whereas many teachers badger students about the need to develop a positive attitude toward their studies, Mary chose to speak respectfully to her students whenever she spoke about the demands of study.
For the most part, students responded spontaneously to Mary's questions, questions that sought to help them recall mathematical theorems and procedural rules. For some reason, there was little sense of shame in getting a wrong answer. Many students were prepared to take a risk in this class.
In turn, students were not reluctant to ask questions of Mary, questions about the very work they had been struggling with last night. Mary either replied directly with an answer or referred the question to the class.

Students' questions were welcome here. They helped Mary to judge the quality of students' learning. She used this insight to shape her teaching. Sometimes, students sought help from one another in quiet tones as they tried to avoid disturbing the class. This was legitimate activity. In Mary's class, being a successful student was the rationale for whatever activities occurred.

Throughout the class, the discourse was vibrant, rich, and inclusive. It wasn't just a few bright or brave students who spoke up, as often is the case in conventional classes.
And, when students did speak up, often it was in their native Hispanic tongue. The only person in the room for whom this was an unusual experience was me.

As I carried my tray of food through the cafeteria door and followed Mary into the garden beyond, I recalled a sign that I had seen that morning in Mary's office. It read:

"Familiarity breeds intimacy"
Since intimacy is so scary to so
many of us, we seem more
comfortable with a proverb that
keeps a distance.

Mary seated herself at the table and looked longingly at her carefully selected plate of tasty Cuban food.
"How am I going to eat and talk at the same time?" she wondered to herself.
She had so much to tell Peter. She had planned to explain that her teaching was based on three valued principles that guided her own life: faith, hope and charity.
It was so obvious to her that a spiritual dimension was missing from the lives of so many of her students, impoverished lives, lives of despair, directionless lives. No wonder so many of her students were unable to cope with the traumas they experienced. The world had changed so much since she was a child. The world today was a difficult place in which to grow up. The simple truths and values of yesterday had all but disappeared for so many, and in its place was a vacuum.
Mary had committed herself to communicating these simple but life-enhancing principles through her teaching.

I placed the tape recorder on the table between us and asked my first question:
"Mary, what do you value most about teaching?"

Appendix 2
Research Context of the Tales
(extracts from Taylor, P.C. (1995b))

Context of the Inquiry

During a 6-week period in 1995, I visited seven of 28 community colleges to observe the teaching of science and mathematics. My role is described best as a preliminary ethnographic reconnaisance in which a minimally-resourced expeditionary force-of-one sallied forth into largely unchartered cultural terrain. My commission was not to create a detailed topographical map of the cultural terrain but to generate firsthand *impressions* of striking social activity amongst the 'natives'. I reported the experiences of my brief forays into specific cultural sites — the lecture theatres, laboratories and offices of teachers of college science and mathematics — as impressionistic tales of the field (Taylor, 1995b).

My inquiry was designed to serve as an introduction to a long-term research study planned to illuminate the learning experiences of prospective teachers of science and mathematics during college degree courses they undertake prior to embarking on teacher certification programs. Why the need for such a study? Many in teacher education are concerned about the unpreparedness of young people entering teacher certification courses to adopt contemporary teaching and learning practices that are becoming an increasingly important part of the school curricula of the 1990s.

Epistemological reforms sweeping through school science and mathematics curricula are involving teachers as reflective practitioners in the reconstruction of their own teaching practices. The metaphor of *learning as socially mediated knowledge construction* is replacing the metaphor of *learning as absorbing objective facts*. Historical views of science and mathematics as activities that yield privileged truths of Nature are giving way to more relativistic views that recognise the cultural contextualisation of scientific and mathematical knowledge, the provisional status of scientific theories, and the experiential basis of mathematical theorems. Metaphors of *hard control* that underpin teachers' traditional images of their classroom roles are being deconstructed in favour of metaphors of student *empowerment* and *co-participation* in the design of learning activities and in the evaluation of learning.

In our experience as teacher educators, however, intern teachers experience great difficulty in viewing school students as active constructors of contingent knowledge or in initiating classroom social roles that engage students in rich reflective knowledge-building discourse. Rather, they tend to remain wedded to their traditional views of students as absorpent sponges of universal truths and of teachers as dispensers of privileged knowledge. Why is this so? We suspect that the answer lies, in no small way, in the impoverished nature of the learning experiences provided them by college degree programs, experiences legitimated by the daily didactic practices of college teachers. Based on student teachers' contemporary anecdotes, our own residual images of ourselves as learners in college courses, and a small amount of research on college teaching, we felt that a largely traditional culture of didactic teaching practice continues within the lecture theatres, tutorial classes, and laboratories of many college teachers. These formative experiences are likely to serve as a source of powerful images of teaching and learning that interns draw upon to govern their own teaching practices. But how much of this is speculation?

Clearly, we need to generate a more insightful understanding of the culture of college teaching, particularly the nature and scope of the cultural restraints that serve to maintain traditional patterns of teaching and learning practices. In our research on epistemological reform in school science and mathematics, we had found that the process of transforming classroom-based social roles of teachers and students often is blocked by the resilience of established patterns of social behavior (Taylor, in press, 1993; Tobin, 1994). Social roles are underpinned by extensive networks of beliefs, values and images that, together, constitute a robust culture sustained by ritual, taboos and unwritten protocols and codes of behavior. What makes the enculturating influence of these networks so strong is the invisibility of much of the beliefs and values and the apparent naturalness of the accompanying social patterns of behavior. What could we learn about the culture of college teaching, especially in relation to the dynamics of enculturation that conserve and regenerate traditional teaching practices?

An ethnographic research approach enables one to generate a rich understanding of interlocking cultural practices and valued beliefs, an understanding built upon local knowledge and the perspectives of those whose practices are being studied (Geertz, 1973, 1989). Thus, we initiated this preliminary ethnographic study of the culture of college teaching. A major focus of the study was the practices of experienced college teachers of science and mathematics, particularly those teachers recognised by their colleagues as bearers of the conventional wisdom of college teaching.

At the same time, we were aware of transformative teaching practices being conducted by a small number of reform-minded college teachers. These teachers were well-known to us through their involvement in the Higher Education Consortium for Science and Mathematics, a State-wide organisation of college teachers interested in improving their own teaching practices. A number of these college teachers had enrolled in a distance learning course offered by Ken Tobin at Florida State University that was designed to enable them to develop skills as interpretive teacher-researchers. These teachers were instrumental in organising my visits to their colleges, particularly in paving the way for me to visit the classrooms of their colleagues, and in enabling me to develop a second major focus for this study: innovatory college teaching of science and mathematics.

The advantage of having two focii in the study was the opportunity it provided me to compare and contrast continuously widely divergent teaching practices. I was able more readily to disentangle myself from the cultural web of 'sameness' — "make the familiar unfamiliar" (Erickson, 1986) — and provoke my imagination to reflect on the practical viability of college teachers reconstructing their culturally-bound teaching practices.

Methodology

I undertook the fieldwork largely in accordance with the epistemological and ethical framing of my own well-established interpretive approach to classroom-based research on teaching (Taylor, 1993), an approach that is based on Frederick Erickson's (1986) account of qualitative research methodologies.

Local Organisers and Site Entry

In planning this study, our intention was to generate data about the teaching of both first-year College Algebra and first-year Biology courses. We felt that this strategy would enable us to make comparability studies across colleges. However, for several reasons, this goal proved not to be entirely feasible (or, perhaps, even realistic?). Because I visited each college for a relatively brief period (2-3 days), my choice of

classes to visit and to record was limited by both timetabling restraints and the willingness of college teachers to accommodate my needs with no obvious benefits accruing to them.

Ethics and Data

Several local organisers requested that I 'share' the data that I was generating so that they might make use of it in their own research studies. This request is not without its difficulties from an ethical viewpoint. Where the request was for a video recording of the person's own teaching practice, I had no hesitation in making it available. Indeed, I offered most of the participants a copy of the video recordings I had made of their teaching. However, where the requested data was of their colleague's teaching, my response was that I would need to obtain the colleague's permission before releasing the data. This obligation now passes on to those who are to become responsible for storage and use of the data.

Conversations with Host Teachers

I am very grateful to the college teachers who welcomed a stranger with a video camera on his shoulder into their classes and who found the time in a very busy day to allow me to sit in their offices and audio-record their replies to a series of penetrating questions aimed at uncovering their valued beliefs. Without that degree of selfless risk-taking and charitable good will studies such as this just would not get off the ground! With some teachers, I had time to develop a rapport prior to recording an interview with them. We engaged in informal rich conversations that involved us in disclosing something about ourselves, getting 'off-task' and being sociable, and exchanging views and opinions. With other teachers, regrettably, there was no time for such relaxed informality. A short time after observing their teaching I would find myself sitting in their offices providing a brief explanation of my visit and offering guarantees of confidentiality.

Meeting Students

We also had planned to obtain data on students' perspectives of their learning experiences, particularly students with an interest in a teaching career. However, arranging students for me to meet during my visit seemed to be a very difficult task for local organisers. Students usually had little available time between classes and, with my tight schedule, it proved to be very difficult to meet at spontaneously arranged times. Mature-age students attending evening classes, which finish at around 9 pm, are understandably reluctant to make themselves available. Consequently my research focussed increasingly on teachers' practices and perspectives.

Recording Classroom Social Activities

When visiting a 'lecture' classroom with the video camera, I attempted to capture as much as possible of the formal social activity of the teacher and students. For this purpose, I placed the camera on my shoulder rather than on a tripod. Thus, I was able to start recording unobtrusively at the rear of the room and move gradually towards the front. Nevertheless, some teachers told me later that the students had been unusually subdued during the lesson and attributed their unresponsiveness to the presence of the camera. Not one teacher claimed to have been unduly effected by my recording activity, although I noticed that some had dressed specially for the occassion, wearing smart ties or new dresses and hairdos that elicited admiration from their colleagues.

I tried also to capture the informal social activity of students arriving in class and the social activities that occurred after the formalities of the class had ended. At these times, students consult their teacher or chat with their friends. These moments can be revealing of the types of relationships that teachers foster with students. Some teacher-student relationships are quite formal and little interaction occurs or interactions are confined to 'official' learning activities (eg., test results, homework, class problems). Other teacher-student relationships can be of a personal nature where the teacher takes on the role of a counsellor; sometimes students take on this role.

Commentaries on the Tales

A Stern Tale About Learning

It is important to be aware of two framing features of this tale. First, Dr Stern is a composite character constructed from data generated from my visits to a number of college teachers of both science and mathematics. Dr Stern is not a tale about any single teacher, although his character relies to a greater degree on some teachers and to a lesser degree on others. Second, Dr Stern is meant to represent the 'worst case scenario' of teaching that I believe one is likely to find in college teaching. Already I have received comments from 10 or so readers of earlier drafts of this tale that his character is very recognisable; bad experiences with college teachers of the past were recalled with knowing and regretful looks. Interestingly, these readers all are experienced teachers of high school science and mathematics.

I chose to construct Dr Stern in order to evoke that very response. Dr Stern is a tale for reliving bad experiences. Why might this be a worthwhile activity? Not because I enjoy stimulating nightmares in others, but because I believe that this activity can serve to reconnect us very vividly with our own past, probably long-forgotten, experiences. My purpose is to stimulate us to engage one another in a discourse of critique about actual teaching and learning practices that form part of our own life-histories. Having reached a shared sense of dissatisfaction, we might then be better prepared to lay to rest ghosts of the past that have been haunting us and move forward to co-construct better ways of teaching.

In the introduction of this report, I outlined some of my concerns about the impact on prospective teachers of, what I have called, 'conventional' college teaching. By this, I mean strongly didactic teaching shaped by an implicit commitment to an objectivist epistemology and a behaviorist psychology of mind. While not wishing to suggest that all conventional teaching equates with Dr Stern's teaching, I do want to point out that Dr Stern's teaching is composed of nothing less than elements of conventional teaching that is occurring right now in colleges around Florida and, most likely, around the world.

On the one hand, I don't want to incite a 'monster hunt' because I do not believe that Frankenstein's monster is loose in our colleges. On the other hand, to the extent that any one teacher matches closely Dr Stern, there might be some monstrous teaching going on! Having raised the spectre of Dr Stern, I invite all college teachers to examine their own practices and make that decision for themselves.

But you must not forget that Dr Stern is a character whose construction depends very much on my own valued beliefs about teaching and learning. I have attempted to make my values as explicit as possible without distracting from the flow of the tale about Dr Stern. Because of my own peculiar way of framing my observations and interpreting my experiences I have, of necessity, focussed on some issues and

have glossed over or ignored others. Dr Stern is not, therefore, a universal character. He is mine and, to the extent that he can work for you, he is yours as well.

Familiarity Breeds Intimacy

Unlike Dr Stern, Dr Mary Buenos closely resembles a particular college teacher whose classroom I had visited. Even so, as I constructed her textual character, a character that differs necessarily from the real person, I was mindful of other college teachers with similar characteristics. What struck me about these teachers (both male and female) was their enthusiastic commitment to ensuring that students had opportunities for rich learning experiences INSIDE their classrooms.

This was achieved by engaging the class in an 'open' discourse (Taylor & Campbell-Williams, 1994), that is, a discourse that encourages and rewards students for disclosing their ideas, no matter how tentative, that entails communicative relationships based on mutual respect, and that complements the technical rationality of science and mathematics with a celebration of the personal experiences of teachers and students in ways that bring to life science and mathematics. Whereas Dr Stern constructed learning as a largely cognitive activity (involving 'cold reason' and 'hard control'), and regarded language as a vehicle for transmitting his knowledge, these teachers added an important social dimension to their images of students as learners, and engaged in classroom discourses intended to communicate positive human values as well as scientific and mathematical ideas.

Mary is a particularly interesting case, not only because of the bilingual nature of her classroom discourse, but because she based her teaching on a strong set of explicit moral virtues that compelled her to adopt an enduring 'duty of care' (Noddings, 1983) toward her students. This is not a cloying type of care that breeds emotional dependence, but a care that fosters respect for self and respect for other. The resulting learning environment is rich in possibilities for enhancing, in a reciprocal way, the personal evolution of both students and teacher. Whether you find Mary's particular virtues appealing or not, I urge you to consider the benefit of enacting a caring attitude toward your own students.

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