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Understanding science curriculum and research in rural Kwa-Zulu Natal

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2006-10-31T07:25:29Z
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CHAPTER 2

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CHAPTER 2

THEORETICAL matrix

> *"A human being is the instrument of qualitative methods… and the 'instrument' is sharpened by developing self-awareness…"*
>
> (Patton, 2002:64)

Introduction

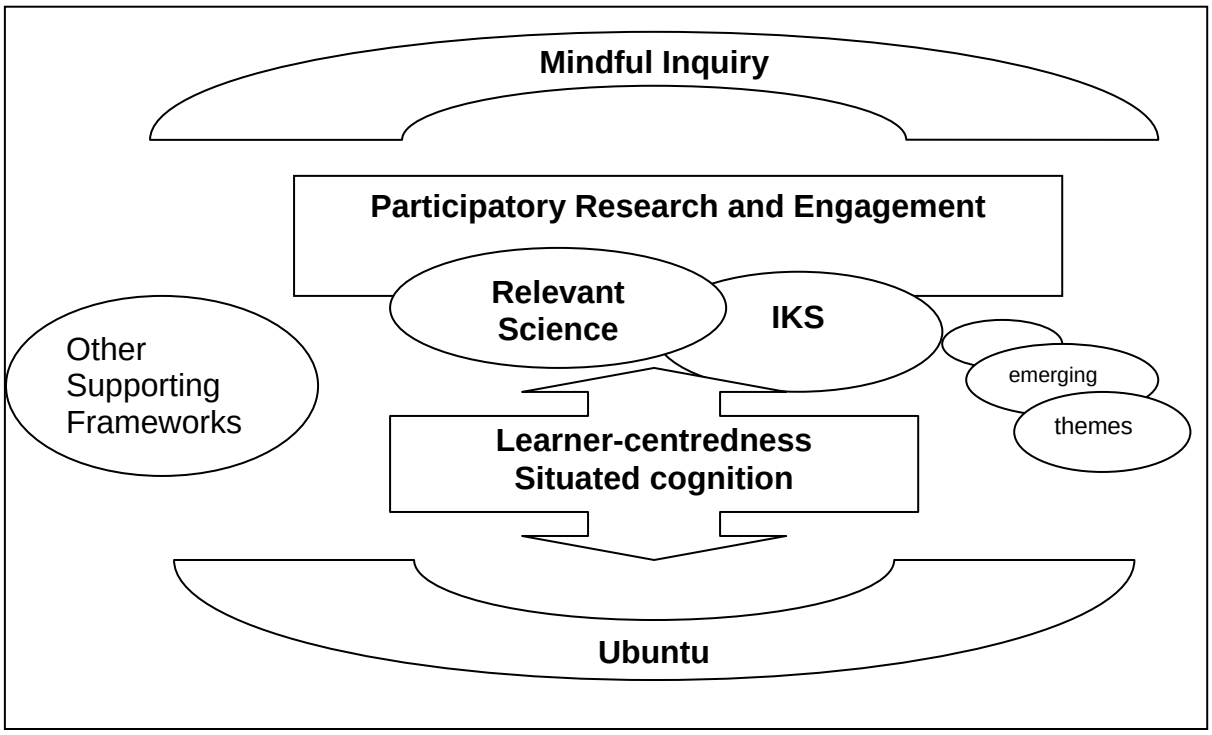
I present here an overview of the theories that have supported the research and findings. I have drawn on a variety of philosophical, pedagogical and methodological frameworks that complement each other. This is consistent with the notion that science education extends beyond pedagogical implications. It is socially and culturally embedded, involving culture, power structures, politics, socioeconomics, philosophy and religion (Lederman 1998).

I first describe each framework briefly, and then present an overall summary in Table 2.1. I show how different traditions of qualitative inquiry have influenced different aspects of the research. Rather than the common metaphor of a lens through which to view the world, I suggest that a diffraction grid is more the case in this research - or a crystal with different reflective sides. Different themes that emerged took shape through slightly different paradigms. Denzin and Lincoln (1994:ix) explain that "qualitative research is defined primarily by a series of essential tensions, contradictions and hesitations." Fortunately, as well, amid the complexity there is resonance among data creation, data analysis and a variety of methodologies and frameworks.

Theoretical Frameworks

The perspective that I emphasize (and elaborate on later) is Mindful Inquiry, which is a combination of hermeneutics, critical theory, phenomenology and Buddhist philosophy (Bentz & Shapiro, 1998). I draw on other frameworks for the pedagogical aspects: situated cognition and learner-centeredness. I discuss these in themes and in the literature review. Figure 2.1 places the main paradigms into a holistic illustration of the research study.

Figure 2.1 Philosophical, methodological and pedagogical frameworks



Mindful inquiry provides a meta-perspective as a philosophical foundation more than a research methodology (Bentz & Shapiro, 1998). Mindfulness is akin to how Patton describes the perspective of 'reflexivity' – which is self-questioning and self-understanding. It is to "be attentive to and conscious of the cultural, political, social, linguistic and ideological origins of one's own perspective and voice as well as the perspective and voice of those one interviews and those to whom one reports" (Patton, 2002:65). Mindfulness is hence not unique to Buddhist philosophy: it is however strongly emphasized in Buddhism as the primary tool of knowledge creation.

By presenting such a wide array of frameworks I attempt to show how these theories complement each other. A contrasting motivation is a faint pass at parody. In this complexity of multiple 'theoretical frameworks' I am also hinting that reality cannot be known through theories. I say here only that various theories provide facets that may help to illuminate the world.

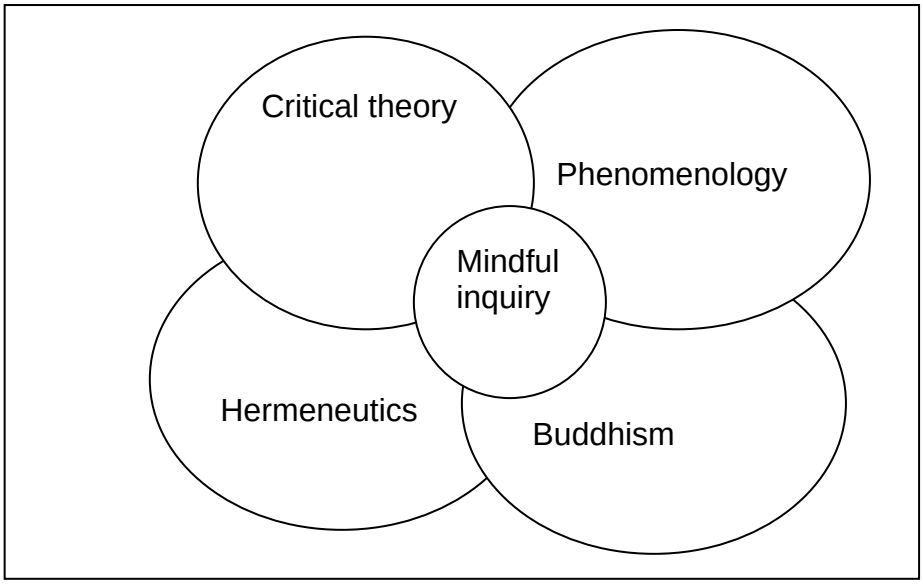
Mindful inquiry

> *"Good research should contribute to your development as a mindful person, and your development as an aware and reflective individual should embody your research."*
>
> (Bentz & Shapiro, 1998:5)

I synchronistically happened upon this paradigm of Bentz and Shapiro (1998) – also mentioned in Patton (2002) – as a way of combining the frameworks I was already exploring. The inclusion of Buddhism fits well with *ubuntu* and my own orientation. Buddhism also emphasizes a combination of empirical inquiry, introspection, and debate. Suzuki (1968) describes its knowledge creation methods as radical empiricism or experientialism. It maintains that awareness of assumptions is the way to greater understanding and that the purpose of greater understanding is to alleviate suffering of oneself and others. It has parallels with *ubuntu* in that there is appreciation of connectedness and community (*sanga*). In a number of its ideas about reality it shows close parallels to science. Hence there are a number of well-known books by scientists (mostly physicists) on this theme: The Tao of Physics (Capra, 1976); The Dancing Wu Li masters (Zukav, 1979); Dialogues with Scientists and Sages (Weber, 1986); 'The embodied mind: Cognitive mind and human experience' (Varela et al., 1991); Gentle Bridges (Hayward and Varela 1992); Einstein and Buddha: the Parallel Sayings (McFarlane, 2002).

Mindful inquiry provides a framework for what Mason refers to as the 'inner research' which is supported by Heidegger's concept of 'being in the world' (Mason, 1994 in Fensham, 2004). A strength of mindful inquiry is its interdisciplinary character.

Figure 2.2 The sources of Mindful Inquiry (Bentz & Shapiro, 1998:38)



Overlaps among the four frameworks are focused into the paradigm of mindful inquiry. Mindful inquiry creates a bridge between the more outward-looking frameworks of critical theory and hermeneutics and the more inward, experiential-based phenomenology. Buddhist-philosophy provides a model for combining inward inquiry and outward action.

In becoming aware of previously unconscious attitudes and views, there is a chance for change. Some of these previously unconscious perspectives may be useful and others not. The 'well-being' that is possible through increased awareness is both that of the individual and the community (a deliberate distinction is indeed not made). In Mindful Inquiry, limiting perspectives and attitudes are dissolved through awareness of them. This shortcuts the external revolutionary process of paradigm change proposed by Kuhn (1970). Although he was talking about collectively held paradigms within scientific communities more than individual paradigms.

Mindfulness is an on-going practice of looking at pervasive thoughts, attitudes, motives and feelings with a view to acknowledging what *is*. What is the state of being? The human mind is central to the creation of the 'lived experience' of phenomenology. In parallel with the practice of mindfulness in Buddhism, is the development of 'mindful-action'.

I however, find the framework of 'Mindful Inquiry' as theorized by Bentz and Shapiro (1998), when used as a process, unwieldingly complicated: Bentz and Shapiro

postulate 16 ‘turns’ – cyclical progressions – through the various paradigms. These can be deeper or shallower and occur in no fixed order; they are reiterative, with pauses, progressions and regressions which Bentz and Shapiro (1998) illustrate with five separate diagrams of the cyclical process.

I prefer to say that these frameworks have some natural overlaps: some relate easily, some less so – like members in a community. Interdisciplinary approaches can enrich and advance research possibilities. Further, the research methodology of Participative Action Research (PAR) is closely aligned to the methodology I choose to call Participative Research and Engagement and fits in with the link between awareness and well-being, knowledge and action.

Buddhist philosophy

One of the strong contributions that mindful inquiry makes (in its Buddhist orientation) is the deliberate intention to alleviate suffering. Again, this is obviously not unique to Buddhism and one could say it is common to Christianity as well – which is the dominant religion in the community – along with African religion. However, as a research framework I am emphasizing the non-theistic aspects of Buddhism as a knowledge creation tool and orientation. This orientation is different from ‘power paradigms’, contractual structures, knowledge for knowledge sake and economic advancement motivations of research. It is also closely aligned with the emergent framework of *ubuntu* which is based on respect, empathy and compassion for others (Ramose, 1999).

Mindfulness is an attention to what is present in the moment: an appreciative awareness of both inner and outer phenomenon. It is also antithetical to harmful action. Mindfulness is linked to promoting well-being – and thus distills some of the essence in other paradigms such as critical theory and feminist inquiry.

In western worldview (notwithstanding the psychology of existentialism), there is a great emphasis on ‘doing’ with a neglect of the value of ‘being’, Buddhism focuses on this state of being. It is interesting that some qualitative paradigms have included terminology that attempts to capture this aspect, for example: ‘being in the world’ and ‘lived experience’ from phenomenology. Awareness creates knowledge but may also lead to action. This is not different from the creation of scientific knowledge. Eddington

claimed that “The common root from which scientific and all other knowledge must arise …is the content of my consciousness.” (McFarlane, 2002:36). The contribution that Buddhist philosophy makes is to deliberately develop that consciousness.

The ‘Buddhist turns’ of the hermeneutic cycle that are described by Bentz and Shapiro (1998) are:

- Identifying one’s ego needs and attachments
- Being aware of how ‘other’ is constructed
- Practising compassion
- Increase ecstasy

The first has had particular bearing in an externally funded, large participative project. I comment on this aspect further in the chapter on data analysis. I have drawn on the second point particularly in the theme of ‘Insiders and outsiders’ as well as ‘Relevant Science’ and ‘IKS’. The third is central to my framing of Ethics and also in our emancipatory agenda and farming project venture. I do not find relevance in the fourth.

While I have found the paradigm of ‘mindful inquiry’ an inspiration and useful tool, I disagree with some of the interpretations and extensions that Bentz and Shapiro use especially in relation to Buddhism as a methodological framework. For example, they claim that mindfulness increases acceptance of the world as it is. This conveys a simplistic conflation of an inner mind state with the acceptance of *whatever happens*. This gives the impression that activism, or even critique, have no place in the framework. In the context of critical theory and emancipatory action research there is an intention to provoke change. Further, Bentz and Shapiro emphasize a certain ‘loveliness’ of it all in allowing a thing to “come forward in its shining” (p.54) and to experience the “pleasure of Nirvana” (p.53). Frankly I find this ‘over-the-top’. Nairn (1997:3) a Buddhist scholar, author and meditation teacher, defines mindfulness as: “knowing what is happening while it is happening, no matter what it is.” Some of the research experience and reflexivity will inevitably and necessarily be difficult, painful, and confused. This does not necessarily mean there is something ‘wrong’ with the research process. Jung advocated the need not to ignore the uncomfortable: “One does not become enlightened by imagining figures of light, but by making the darkness conscious.” (Jung, quoted in Haarhof, 1998:47). This is consonant with my advocacy of ‘healing truths’ in the theme on ‘Ethics’.

Phenomenology

Phenomenology has its origins in the philosophy of Edmund Husserl. The emphasis – which is resonant with concepts of mindfulness – is that "we know only in and through consciousness" (Bentz & Shapiro, 1998:41). Phenomenology goes deeper than many methodologies by linking our experience with consciousness and using that as a starting point of investigation. Our conscious experience is, of course, linked to the way we encounter the world and hence Husserl's phrase 'back to the things themselves'. Our consciousness shapes our experience and hence it is helpful to be freed from our preconceived ideas. Husserl proposed that the 'lifeworld' we inhabit is constructed upon past events, ideas, beliefs and culture. In the research process we need to be aware of this. Connecting with 'what is' is also the focus of mindfulness/ bare attention.

Two poems in the Zen haiku tradition illustrate the similarity of 'bare attention' and 'back to the thing itself' in the approaches of mindfulness and phenomenology:

> "*An old pond. Ah!*
> *A frog jumps in,*
> *The splash of water."*
>
> (Basho, 16644-1694 in Lowenstein, 2000:123.)

> *Tall fence: locked school gates.*
> *Gaping simple boy outside*
> *Sits alone waiting.*
>
> (mk)

Robert Oppenheimer similarly presents the importance of connecting with the world in the creation of scientific knowledge in a way that in Buddhism is called 'beginner's mind':

> *"There are children playing in the street who could solve some of my top problems in physics because they have modes of sensory perceptions that I have lost long ago." (* quoted in Haarhoff, 1998:19)

Phenomenological inquiry attempts to discover the essence of both individual and group experience of phenomena. In presenting the community's experience of traditional rural life we used descriptions, observations and stories to arrive at the 'lived experience' and 'life-world' of community members. This could be captured for example

in statements such as ‘Our community is a good place to be’. This also included interpretations as seen in drawing and photographs.

In phenomenology, as in Buddhism, there is an aim “to help us get ourselves out of everything that we take for granted about the world and about ourselves.” (Bentz & Shapiro, 1998:41). The phenomenological process calls this process ‘bracketing’. Bracketing refers to the way our notions about reality tend to become automatic. An example in this research was an interpretation I made when asking students about farming. My focus was mainly on trends in students’ goals. Although so many of them (and indeed the whole community) had said that farming is important – that they wish to learn farming – no students in a session of career choice mentioned ‘being a farmer’. My western-urban assumption is that farming would thus be seen as a low status job. When I checked this interpretation with community members they were surprised and said that to be a farmer you had to be rich: only Whites were farmers. Both of us were unaware of the possibility that our assumption could be inaccurate. This data could draw too from hermeneutics: what does ‘farmer’ mean? I assumed that it meant what the community was doing daily – no: for students it means a rich commercial sugar farmer or forester. This discovery of our ‘typifications’ is taken from phenomenology: how have I and the community construed our conventions of ‘farmer’? By being aware of this we could explore career choices of ‘farming’ in a new way.

Other facets I have taken from phenomenology are the importance of my experiences described in my journal; and descriptions of participants and their ‘lived experiences’.

Critical theory

While I argue for the development of awareness of assumptions that are brought to research, and the illumination of contexts both internal and external, there is also a *deliberate* motivation that is brought to the research.

In our case the orientation is one of human rights and democracy and the dedication to emancipation from oppression. This places the research into a critical perspective (Horkheimer, 1982). It seeks to critique sources of oppression – and provide redress through modeling democratic procedures and initiating interventions. Critical theory is not so much a separate methodology but a critique of existing methodologies (Habermas, 1987); it is concerned with how knowledge is *used* (Habermas, 1984). Equality between researchers-participants, teachers-students, farmers-committee members is important. In its synthesis into mindful inquiry, it contributes by focusing attention on "the social and historical contexts of both the researcher and the research topic, including attention to domination, injustice, and oppression." (Patton, 2002:134). Awareness of this perspective led to the development of a theme on research ethics – which was not a research goal at the start of the project. Critical theory and the feminist perspective value equity, intuition, and going beyond knowledge for knowledge sake (Morrow & Brown, 1994).

Drawing on the compassion and ethics foci of Buddhism provides a means of addressing the concern by the German school critical theorists who ask why modern society, with a wealth of rational knowledge, personal freedom, technological progress can "bring about extreme barbarism, authoritarianism, irrationality, and the manipulation and brutalization of consciousness." (Bentz & Shapiro, 1998:40). The obligation of science to consider its contribution to ethical and moral wellbeing is expounded clearly in the article of Malcolm (2003b). Similar arguments can be made for research. Critical theory motivates for mindful inquiry to become engaged in the world.

Hermeneutics

This research framework was first applied in social science research and it concerns interpretation in a specific cultural and historical context. Its origins are in the interpretation of Biblical texts but this has been extended to include 'text' as voice,

visual depictions, buildings, dance etc. (Brown, 1987). The data in this study have included this wide variety of expressions. For example I discuss in the context of 'school' the meaning of the square fenced concrete block of the school buildings; the socially acceptable medium of dance to convey taboo ideas; the revealing use of language of English Second language learners etc.

Another helpful contribution I draw from Hermeneutics is that meaning is negotiated for a particular time and place (in contrast to the abstraction from context in logical empiricism). For example, in our study, the history of apartheid education, the attendant erosion of a culture of teaching and learning and the tacit resistance to politically-motivated policy needs to be taken into account in the interpretation of the functioning of the school.

In the structure of my report I draw on the hermeneutic orientation of making context central and the subsequent production of themes from texts (Bentz & Shapiro, 1998). I have also used the process of the 'hermeneutic spiral' to go back through a series of reinterpretations of events and data to progress to deeper levels of understanding.

Heuristic inquiry

Heuristic inquiry follows on from phenomenology to include the personal experiences and insights of the researcher. "Heuristic" derives from the Greek *'heuriskein'* meaning to discover or to find. It is concerned with meaning rather than measurement, quality not quantity and experience rather than behaviour (Douglass & Moustakas, 1985, cited in Patton, 2002). I have used this particularly in my journal extracts. I have drawn on it in data analysis and reporting in the tradition of creative synthesis using intuition and tacit understandings.

Heuristics is also compatible with *ubuntu* in that it emphasises relationship and connection. I have extended the research framework into the German-founded 'qualitative heuristics', which postulates a number of rules which fit my methodology:

1. The research should be open to new ideas and change…
2. The research topic is preliminary …
3. Data should be collected under the paradigm of maximum structural variation of perspectives…
4. (The fourth rule was not part of my aim: trying to overcome difference…)

Ethnographic case study

Although this methodology is well known in anthropology, it has also been developed in situations where groups of people develop their own behaviour patterns and beliefs, expressed in their decisions and actions. These patterns can be considered as cultures and manifest in programmes and schools. Ethnographic case study can therefore be applied in educational research and anthropological programme evaluation (Patton, 2002). In our research the school and the community formed two distinct 'cultures'. It is not possible to explore relevant science education without taking into account these disparate cultures – especially as western science forms yet another disparate culture.

Ethnomethodology

Ethonomethodogy is a methodology concerned with 'ordinary' group members' understanding of their own social world. It follows on from ethnography and also has its roots in phenomenology. It is resonant with the social justice and democratic orientation that seeks to foreground the voices of participants. Our quest to define relevant science from the community's point of view contrasts with the assertion of Kuhn (1970) that only the scientific community and its members are qualified to contribute opinions about a scientific paradigm.

Grounded theory

This has been claimed as the currently most influential research paradigm in social sciences (Denzin, 1997). Unlike the other paradigms, grounded theory focuses not on aspects of human experience but on the *process of generating theory* (Patton, 2002). It is premised on the axiom that how you study the world determines what you learn from it. It means getting close to the field of study, 'lifting the veils' and testing and retesting emergent concepts. In the claim that I make for using grounded theory it may be more honest to say that it appeared as an appealing way of saying 'yes: I have a plan – I just don't know what it is yet'. This applied particularly to the specifics of data collection and to the exploration of relevant science. (And describing and observing this disorder is an example of drawing on Chaos theory to value meaning in disorder.)

Grounded theory relies on inductive processes. It provides rigour in the systematic testing of emergent theories amidst the other orientations that are deeply (and intentionally) subjective. At the same time it is highly consonant with participative inquiry as it "… looks at how 'variables' are grounded – given meaning and played out in subjects' lives. …Their meanings and actions take priority over researchers' analytical interests…" (Charmaz, 2000, in Patton, 2002).

Grounded theory influenced my conception of Participatory Research and Engagement. This is based on Participative Action Research (PAR) but I argue that the researcher cannot assume from the outset that action is what the community will advocate – hence 'engagement' allows for holding open the possibility of different paths – from discussion to non-participation.

Ubuntu

In Zulu *ubuntu* is expressed: '*umuntu ngumuntu ngabantu'* (a person is a person through other persons; I am what I am because of you).

Having claimed the use of grounded theory it would be natural to wonder: so what theory emerged? It is appropriate therefore to follow the overview of grounded theory with the introduction of *ubuntu*. From a grounded theory and participative perspective it is fitting that the framework that emerges is consistent with the worldview of participants: hence the introduction of *ubuntu*. This process of drawing from the worldview of participants is an established technique in relation to data collection: Lofland (1971, in Patton, 2002) states that a researcher needs to use the categories of participants to explicate *their* reality. I stated that mindful inquiry provides a coherent combined framework, but contributing to this is the worldview of *ubuntu* that is strong in the South African context – and particularly strong in rural areas. It would not make sense to claim to be engaged in participative action research and yet to ignore the framework of participants especially as it has shaped the project process as well as interpretation of findings. I will also argue that the framework of *ubuntu* has close correspondences with Buddhist philosophy. I discuss this more in 'Findings', particularly in the themes 'Community' and 'IKS' in Part 2A.

What is *Ubuntu*?

Ubuntu is a way of life expressed throughout Africa: it is caring for each other's well-being and a spirit of mutual support. Each person's humanity is ideally expressed through relationship. *Ubuntu* visualizes a community built upon interdependent relationships. This is seen, for example, in the concept of group work or 'shosholoza' (work as one) and the prevalence in South Africa of 'Stokvels' (collective enterprises), which are similar to the model used in the Heifer farming NGO that we introduced into the research project.

As I mentioned, Western worldview emphasises thinking over being while in *ubuntu* identity centres on 'I am because I participate'. This is fundamentally different from Descartes 'I think therefore I am'. Descartes draws on our experience of the independence and abstraction of thought, pointing to separation of mind and matter, and hence to objective epistemologies; *ubuntu* points instead to participation, interdependence and collectivity, and hence to subjective epistemologies, where intuition, revelation and inspiration are all valid ways of knowing. A Buddhist teaching in parodying the 'absence of *being'* in Descartes' maxim would say: "I think therefore I am not!" This implies that thinking leads to *disconnection* from the 'here and now', and hence the negation of being (Samararatne, 2000).

I find that the *ubuntu* worldview has much to contribute to Western worldview especially in the emphasis on co-operation and co-existence. *Ubuntu* is not inconsistent with ontological views of scientists. For example:

> "*A human being… experiences himself, his thoughts and feelings as something separated from the rest – a kind of optical illusion of his consciousness. This delusion is a kind of prison for us, restricting us to our personal desires and to affection for a few persons nearest to us. Our task must be to free ourselves from this prison by widening our circle of understanding and compassion to embrace all living creatures and that of nature in its beauty."* (Einstein, in McFarlane, 2002: 26)

Not only is this consistent with the main concept of *ubuntu* 'I am because of others' but it is remarkably like a statement by the Dalai Lama (and consistent with my framework of mindful inquiry):

> *"True happiness comes not from a limited concern for one's own well-being, or for those that one feels close to, but from developing love and compassion for all sentient beings."* (Dalai Lama, in McFarlane, 2002: 26)

The concept comes so naturally to participants in our research that primary school children, when asked to draw their home, drew the homes of the community and one wrote: "a person without a neighbour is not a person". I discuss this in the theme on Indigenous Knowledge.

In such a brief overview of *ubuntu* there is some danger in portraying it superficially. It goes deeper than the commonly quoted phrase: 'I am because of you'. *Ubuntu* or "African Humanism is resiliently religious" (Prinsloo, 1995:4), and as such has ontological and metaphysical origins. Louw (1999) points out that for a Westerner, the maxim: "a person is a person through other persons" has no obvious religious connotations. It could be equated with a general appeal to treat others with respect and decency. Louw goes on to point out how a cynical Westerner may interpret *ubuntu* as nothing but "…the startling observation that if you treat people well they will perform better". "However, in African tradition this maxim has a deeply religious meaning. The person one is to become 'through other persons' is, ultimately, an ancestor. And, by the same token, these 'other persons' include ancestors. Ancestors are extended family." (Louw, 1999:15).

I also express some caution that *ubuntu* and Africanisation of education needs rigorous critique. This is particularly difficult in South Africa as 'political correctness' and a certain tendency to trendiness precludes examining African traditions with the some scrutiny that may be applied to other paradigms. Enslin and Horsthemke (2004) however provide a valuable critique in the context of citizenship education, arguing that *ubuntu* is neither unique nor are aspects of its pressure to conformity compatible with democracy. (They also criticise other traditional practices such as gender stereotyping.) They further point out that Western values of autonomy and individualism are not synonymous with selfishness and egoism – as is often asserted (for example (Makgoba, 1999; and Adeyemi & Adeyinka, 2003 – cited in Enslin & Horsthemke, 2004).

Horsthemke (2005) illustrates this point using Einstein's commitments to both humanitarianism and independence as an example:

> *"My passion for social justice has often brought me into conflict with people, as has my aversion to any kind of tie or dependence that I do not consider necessary. I always pay attention to the individual and have an insurmountable aversion to violence and towards excessive clubiness."*
> (Einstein, Berlin, 10 November 1930, quoted in Horsthemke, 2005).

As an icon of both humanitarianism and intellectual independence, Einstein provides an example of the unnecessary essentialising of autonomy and community. It is perhaps in the development of values of altruism that community is important while community needs to allow individuals the freedom of expression and critique.

> *"It is no secret that we have been far more successful in developing the mind than in developing the personality. It seems that even the quest for knowledge is threatened by lack of persons of a truly universal spirit."* (Einstein, Princeton, 1951 – quoted in Horsthemke, 2005).

While Enslin and Horsthemke (2004) argue that values of altruism are not unique to African culture, there are many social conventions set up in traditional African communities to facilitate its expression on the one hand and a deep ontological basis to support it on the other. However, if altruism and community spirit were not universal values there would be little possibility of promoting this as a research and educational approach.

Enslin and Horsthemke (2004) advocate the examination and revision of all cultural practices that are oppressive and antithetical to democratic principles. I think it necessary to acknowledge that the desirable dynamic evolution of culture applies to all cultures. The South African Bill of Human Rights and Constitution as well as our very progressive educational policies stand out as examples of this. However even Enslin and Horsthemke's confrontational opposition to harmful cultural practices and particular conceptions of democracy is at odds with *ubuntu* and thus has less chance of leading to fruitful dialogue.

Like *ubuntu* the African notion of Sudicism rests on and works though consensus. It is the ideological commitment to harmony. A person needs to be in harmony and achieves this by performing acts that lead to harmony in the community (Asante, 1998). Whether certain harmful practices (or considered harmful practices) are a part of culture, a distortion of culture, or absence of culture, is beyond the scope of this

discussion. I wish to show that in exploring community and ways of knowing it makes sense to understand relevant epistemological and ontological frameworks. Ramose (2004) argues that *ubuntu* and African philosophy needs to be inscribed into the research agenda in education in South Africa.

There are other issues in choosing *ubuntu* as a research paradigm. *Ubuntu's* conceptions of community affect access protocols as well as the type of questions and data collection techniques that make sense. Because *ubuntu* was an emerging paradigm in this study I provide further motivation and explanations of how this worldview affected the unfolding of the study as well as data interpretation in the 'Findings' in Part 2.

In summary I find that *ubuntu* provides an appropriate worldview for approaching research in Africa. I also propose that no framework be accepted uncritically. I agree with Nakusera (2004) who, while advocating African philosophy, points out that without critical analysis there *is* no philosophy, and that ancestorship and supernaturalism cannot be beyond debate.

Methodologies that flow from African philosophy are centred on mutual care and participation. A research methodology based on *ubuntu* will mean the way we approach ethics in research will be transformed.

Constructivism / Constructionism/ Situated cognition

While most cognitive research has focused on mental processes, situated cognition takes into consideration the person connected to context and community. Roth (1998b:162) observes that "…structural properties of activities arise from the interaction of multiple aspects of a setting including psychological, material, social-historical, political and economic factors as they are seen by the actors themselves." Research therefore needs to know what these factors are (and there are many of them and many participants). This is no small task. Further: we need to know these from the "actors themselves".

In the strong focus on participation, situated cognition is easily aligned to *ubuntu.* Nsamenang explains:

> *"… mutually interdependent activity is a highly valued behavioural norm and forms the framework for children's socialization along the lines of what Rogoff (1990) and Lave (1990) have described within the apprenticeship system as guided participation."* (Nsamenang, 1999:32)

In *ubuntu* this apprenticeship is founded on the philosophy of interrelation whereas for Lave, the emphasis is more pedagogic: understanding is developed in practice.

Nsamenang however contrasts purposes of *ubuntu* and situated cognition:

> *"Socialisation is not designed to train children to acquire technological intelligence, nor to become competitive individuals outside the ancestral culture; rather, it is organised to teach social competence and shared responsibilities within the family and ethnic culture."* (Nsamenang, 1999:33).

Guba and Lincoln (1990) point out that humans have the capacity to interpret and construct their experience and therefore the study of their 'reality' requires different methods from those used to study the 'natural world' (Guba & Lincoln, 1990). Acording to Buddhism, this constructed reality could be more or less 'fantastic' along a continuum with greater or lesser correspondence to an external 'reality'. In this perspective, distortions in the mind may be projected onto 'reality'. In this sense, a Buddhist conception of reality is more in line with Platonic worldview than postmodernism: there *is* a 'reality' *out there* in an absolute sense, while the 'relative reality' is what we have to work with until we 'see things as they are'.

Social constructionism

Social constructionism maintains that different worldviews lead to ontological relativity – our entire experience is dependent on socially constructed views. This is useful for encouraging sensitivity when working in different cultures: where there is a tacit collective construction of reality on both sides. In a research framework of human rights and social justice, researchers give more weight to marginalized voices whose constructs have been oppressed or ignored (Patton, 2002).

Constructivism

Constructivism is aligned epistemologically with social constuctionism but is more concerned with how knowledge is constructed in the student's mind (Crotty, 1998). As a pedagogic principle constructivism is enabling and acknowledges the position of students. In participative research it acknowledges the biased reality constructed by the

researcher. It serves as a dialogical tool to mediate different perceptions of 'reality' and thus contributes to a meta-awareness of knowledge construction. The relativist positions of contructivism and social constructionism make them useful for navigating different perspectives towards understanding. Both "refer to constructing knowledge *about reality*, not constructing reality itself" (Shadish, 1995, cited in Patton, 2002).

Chaos theory – non-linear dynamics

While this framework is more aligned to pure science in its quantitative sophistication, it has, at least in metaphor, an appeal for understanding the dynamic instability of rural community research. Patton (2002:123) comments: "Chaos challenges our need for order and prediction…" and helps us to resist the compulsion and external pressure of analysis to impose false order. The discomfort of unpredictability was very real throughout the research process. This created the scope for spontaneous innovation and a type of 'group rallying' as communities tend to do in crisis. Borrowing from Gleik (1987), the author of the popular 'Chaos', Patton (2002:124) says this theory has value especially in "understanding those settings that feel like walking through a maze whose walls rearrange themselves with every step you take." For me (as I report elsewhere) the speed and pressure were increased to feeling like 'learning the rules of a game while playing it'! And this was probably true for all participants. Students presented their first play on AIDS without a formal rehearsal in front of a large audience. Community members engaged in their first workshop (conducted partly in English) to have their inputs publicly recorded, farmers made new, risky and long term financial commitments to a programme that was completely novel to them, Rohm and Haas gave funding to an unknown community embarking on an uncertain venture… and all this was happening at once.

Participative Action Research (PAR)

I discuss this in more detail in the theme “Participative Research and Engagement” in Part 2B, and in the Literature Review in Part 1, Chapter 3. It is sufficient to note here that, consistent with the frameworks above, I wanted to go beyond the technicist, ahistorical, apolitical conceptions of Action Research that are common in classroom-based studies, and enable participation, learning and action to proceed together in open-ended ways.

Summary

Table 2.1 Influence of theoretical traditions (Adapted from Patton, 2002:132)

Perspective	**Influence on theme**	**Focus questions**
Mindful inquiry	The whole	How may action and compassion inform understanding? What *is* this?
Buddhist inquiry	The whole	How can this promote well-being? What am I not aware of?
Phenomenology	IKS; Making the invisible visible – Part 2A	What is the meaning and essence of people's lived experience?
Critical theory	Relevant science – Part 2A Ethics - Part 2B	How is the established perspective manifest here?
Hermeneutics	Relevant science; (*data analysis)*	What conditions contribute to interpretation?
Heuristic inquiry	Community; Participation	What is my experience? What is the experience of others of science, education, community?
Ethnographic case study	IKS, Ethics, Community	What are the cultural influences in understanding science and community?
Ethno-methodology	IKS; Community; (AIDS)	How do people make sense of their everyday activities so as to behave in socially acceptable ways?
Grounded theory	*Leading to Ubuntu* and *PAR*	What theory emerges from the fieldwork?
Ubuntu	Community; IKS;	How will this help the community? How will I become more of a person?
Constructivism / Situated cognition	Relevant Science	How have participants constructed reality? What are the reported truths?
Chaos theory – non-linear dynamics	*Methodology*	What is the underlying order in unstable/disorderly environments?
Participatory Action Research	*Methodology*	How can/does the research process lead to transformation?

This table of theories is more illustrative than definitive. That is, most of the themes (in the second column – and that I report on in Part 2) were influenced by all the frameworks: I have identified the more prominent paradigms relative to themes. Those topics in Italics in the table denote sections other than the themes, e.g. *methodology*.

Closing comments

In addition to these methodological frameworks is my orientation to the educational inquiry and intervention. This is necessarily a pedagogic position. The framework I chose is one of situated cognition (mentioned briefly above) and learner-centredness. As well as being consistent with the research frameworks above, this is consistent with human rights and democracy, and participation itself.

In summary, the central aims of the research are to discover the nature of relevant science in a rural South African community (and this includes indigenous knowledge) and to search and extend the research methodologies that are most appropriate. Hence the complex intersection of various theoretical frameworks. I realize, and find interesting, that these frameworks are mainly from outside the conventions of science education research, borrowed primarily from social sciences. Bundick points out that "Often, research in one discipline is isolated from another, not by difference in philosophical orientation but rather by the sociological barriers of a fragmented academia." (in Bentz & Shapiro, 1998:91).