

# Spirituality and science education as shared praxis

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## **Abstract**

Science and spirituality each bring a different perspective to the concerns of the world. Parker Palmer recognized the importance of developing the inner life of students, but secular education overlooks this aspect. In this paper I argue, from a sociocultural perspective, for spirituality and science education as shared praxis. On an individual level, this partnership requires students to be attentive and take notice of their experiences. On an interpersonal level, such a partnership requires students to work cooperatively to understand the interconnectedness of all components of the Earth's ecosystem. On a community/institutional level, connecting science with spirituality through a holistic approach to education, nurtures in students a post modern, deep ecology worldview that encourages them to treat all living things as subjects and engage in learning with their whole being. Scientists that incorporate a spiritual dimension in their work can be inspirational role models. This paper examines the approach of Barbara McClintock as a scientist who valued intersubjectivity. Periods of meditation facilitated her scientific discoveries and were integral to the way she worked. By including intersubjectivity in science education, the spiritual dimension of students' lives can be nurtured and developed.

## **Introduction: Identifying the problem**

In Australia we live in a technological society that has benefited enormously from scientific research and development. However, increasingly individuals are becoming disenchanted with this mechanistic, materialistic and economy-driven society that neglects the spiritual aspects of their being (Jane, 2001, 2003). The problem is, can we continue to benefit from scientific and technological advancements that make our life easier and more comfortable while simultaneously develop the spiritual dimension of our lives? This paper examines ways that science - one way of seeing, exploring and understanding reality - can be linked with spirituality - a different way of knowing that is concerned with existential questions such as, Where do we come from? Why are we here? What is the purpose of life?

## **Research approach: Shared praxis**

Thomas Groome's (1980, 1998) shared praxis approach, although devised in the context of Christian Religious Education, is useful to explore a role for spirituality in science education. Shared praxis involves five main movements: present action, critical reflection, dialogue, story and the vision that arises from the story.

### *Movement 1. Present action*

In a praxis way of knowing, one begins with the meaning of one's own 'present action' that is far more than what is happening in the present moment, and means whatever way we express ourselves, our whole engagement in the world.

Groome explains:

It [spirituality] includes what we are doing physically, emotionally, intellectually, and spiritually as we live on personal, interpersonal, and social levels. ... The present is the historical self and society that are reflected upon, since our present action is the consequence of our past and the shaper of our future. (Groome, 1980:184)

Present here means the consequences of the past, the present of things present, and the present as shaper of the future. “By reflecting on present action, we can uncover the ‘pasts’ that have brought us to such action, and raise to consciousness the ‘futures’ in that action by becoming aware of its likely or intended consequences” (Groome, 1998: 185). The whole sociocultural context makes up the present action for critical reflection.

### *Movement 2. Critical reflection*

Present action is the primary object of reflection, which is self-reflection, and the self is socially mediated. In a ‘praxis way of knowing’ there is a fusion of the rational and the affective, so praxis critical reflection involves the head and the heart. Therefore in a shared praxis approach critical reflection means dialectical critique involving rational and affective factors. For critical reflection on present action to occur, requires reason, memory as well as imagination. While it is helpful to distinguish between these three functions they cannot be separated.

#### **Critical reason to evaluate the present**

This first level of reflection begins by attempting to reveal the obvious in the present, which often goes unnoticed, as it is inevitable, or is taken for granted. We can delve deeper to discover the interest of present action, to try and work out the underlying assumptions on which it is based, and critique the ideology that maintains it.

#### **Critical memory to uncover the past in the present**

The process of remembering brings the personal and the social source of the present action to the fore. A critically remembered past informs current and future choices. As well as looking backward, remembering is also looking outward to the wider world. Reason and critical memory enable us to name our present action and what we know from our engagement in the world.

#### **Creative imagination to envision the future in the present**

Imagination that focuses on the future completes the process of critical reflection. So that we do not merely repeat or duplicate the past, imagination is a necessary action. Creative imagination gives intentionality to the future and offers hope.

### *Movement 3. Dialogue*

In shared praxis there is dialogue and critical reflection on present action that involves authentic telling (disclosure) and listening (discovery). Groome (1998) contends that dialogue begins with one’s self, and “At bedrock it is a conversation with our own biographies, with our own stories and visions” (p. 189). Dialogue is a subject-to-subject encounter that involves both telling and listening.

*Movement 4. The story*

In the pedagogical context of this paper, the metaphor ‘story’ refers to the narratives of scientists that describe the way they view the world and their unique ways of working. To maintain the unity between theory and praxis, the story is critically appropriated and encountered in the midst of present praxis.

*Movement 5. The vision*

The vision is the hope for the future. Story and vision are not separate but are aspects of the same reality so they should be considered together.

**Movement 1: Spirituality**

A contemporary understanding of spirituality does not mean talking about religion. ‘Spirituality’ is difficult to define because it has a range of meanings and there is no single identifiable entity. Drane (2005) explored this range or spiritual spectrum by identifying how spirituality is described in popular culture. He took snapshots of spirituality by examining three popular books: *The Executive Mystic* (Dolnick, 1998), *Spirituality for Dummies* (Janis, 2000) and *The Complete Idiot’s Guide to Spirituality* (Ely, 2002). His study generated the categories shown in Table 1.

**Table 1 Representatives of the spiritual spectrum (Drane, 2005:60)**

<b>Lifestyle</b>	<b>Discipline</b>	<b>Enthusiasm</b>
Values	Commitment	Experimentation
Community	Structure	Freedom
Belonging	Authority	Experience
Morality	Traditional faiths	Mystery
<i>(Idiot’s Guide)</i>	<i>(Dummies)</i>	<i>(Executive Mystic)</i>

The ‘lifestyle spirituality’ category refers to what Woodhead (2001) describes as the ‘subjective turn’, which is “a turn away from life lived in terms of external or ‘objective’ roles, duties and obligations, and a turn towards life lived by reference to one’s own subjective experience.” At the opposite end of the spectrum are people who are ‘wholeheartedly enthusiastic’ about direct experience of the transcendent. Somewhere in the middle are people who commit to structured spiritual expression or faithful ‘disciplined practice’ such as traditional religion, or keeping healthy by intentional physical activity.

In the academic literature, David Tacey (2000) defines spirituality as “a desire for connectedness, which often expresses itself as an emotional relationship with an invisible sacred presence” (p. 17). Parker Palmer (1998) thinks of spirituality as the human quest for connectedness with something that we can trust more than our own egos. Theologian Ruwan Palapathwala (2005) defines spirituality as “our transcendental awareness about the ‘more’ in us which seeks progression in and through our quest for our ‘where from’ and ‘where to’” (p. 2). Sandra Schneiders (1998) holds a holistic view: “Spirituality is the experience of conscious involvement in the project of life-integration through self-transcendence toward the ultimate one perceives” (p. 39) that encompasses a person’s

relationships to all of creation, to the self and to others, to society and nature, to work and leisure.

My definition, from a socio-cultural perspective, incorporates Rogoff's three planes of transformation:

*Spirituality is an individual desire (personal plane) for connectedness with others (interpersonal plane) and with a transcendental being that is greater than human beings. The transpersonal dimension of spirituality affects society (community or institutional plane), which may (or may not) be associated with organized religion.*

## **Movement 2: Critical reflection**

### ***Moving towards a socio-cultural approach to learning science***

For two decades constructivism has been the view of learning adopted by the majority of science educators who focus on the individual learner acquiring knowledge or concepts. They favour a conceptual change approach to teaching science. A socio-cultural perspective challenges the notion of conceptual change (Lemke, 2001). Some researchers in psychology and education have adopted a socio-cultural theory of development. What are the implications of such a shift for teachers of science? One study showed that when socio-cultural theory was first introduced in an early childhood setting teachers required extensive time to adjust as they moved from an individualistic approach to a socio-cultural approach (Fleer & Richardson, 2004).

In a socio-cultural approach learning is viewed as a cultural process, whereby people develop through changing participation in cultural activities of their communities (Rogoff, 2003). A socio-cultural perspective originated from Lev Vygotsky's ideas and others, who consider learning to be shared and far more than an individual learner discovering knowledge. For Barbara Rogoff (1994) "learning is seen as a function of ongoing transformation of roles and understanding in the socio-cultural activities in which one participates" (p. 210). Learning occurs through a transformation of participation (Rogoff, Matusov & White, 1996). "People change through transforming their participation in socio-cultural activities - in which both the individual and the rest of the world are active" (Rogoff, 1997:266).

Rogoff's three foci of participation - the personal, interpersonal and community or institutional - can apply to scientific activity. "Using personal, interpersonal and community/institutional planes of analysis involves focusing on one plane, but still using background information from the other planes, as if with different lenses" (Rogoff, 1998:688). The application of these lenses directs attention to the individual's, or groups of people's, participation in socio-cultural activities. The interpersonal lens enables the focus to be on the relationships that support or structure the shared understanding. The community or institutional lens highlights for us the value that is placed on science within a particular community. When we change our focus the interactions are analysed without prioritising any particular plane, nor isolating it from the other planes. "Foregrounding one plane of focus still involves the participation of the backgrounded planes of focus" (Rogoff 1995:140). These planes of socio-cultural participation are inseparable, yet mutual, and show an individual's participation or involvement in a cultural context.

A *personal plane of participation* shows how individuals change through their involvement in an activity by highlighting the role of the individual. The *interpersonal plane of participation* shows how people communicate with one another and engage in shared endeavours. The *community or institutional plane of participation* shows how people participate with others in culturally organized activities using cultural tools. These activities are often determined by institutional practices with inherent cultural values. Through these planes of analysis multiple pathways to learning within the community can be highlighted (Rogoff, 2003).

### ***Spirituality is missing from the VELS curriculum***

In Victoria, the recently introduced curriculum for Prep to Year 10, is titled *Victorian Essential Learning Standards* (VCAA, 2004), and has three core and interrelated strands: Physical, Personal and Social Learning; Discipline-based Learning (where Science is positioned); and Inter-disciplinary Learning. One aim of VELS is to foster values in schools, in addition to conceptual knowledge and skills associated with each domain. The five values specified in the curriculum document are: Learning for all, pursuit of excellence, engagement and effort, respect for evidence and openness of mind (being willing to consider a range of different views). Whilst an early draft of VELS included a spiritual dimension, it is absent from the final version. De Souza (2004) offers a possible reason for this omission, “The word ‘spiritual’ because of its previous association with religion and religious traditions in the Western world often provokes distrust and even hostility within secular education contexts” (p. 5). Unfortunately, while other Western countries have at least debated the importance of a spiritual dimension in education, most Australian curriculum advisors and developers continue to ignore it.

On the institutional plane, even though spirituality is not widely accepted as a secular school responsibility, some educational psychologists argue that ‘spirituality is a secular concern’ and “is symbolized by a search deep within and rising above our physical realities” (Vialle, Lysaght & Verenikina, 2005:213). Nel Noddings (1992) argues that despite its centrality in our lives, spirituality is possibly the main thing lacking in public schooling.

### **Movement 3: Dialogue**

#### ***Deep ecology***

The community plane includes topics involving controversial issues where values will be contested (Gribble, Rennie, Tyson, Milne & Speering 2000). Van Rooy (2004) justifies including controversial issues in science classrooms because they contribute to “the development in students of four main approaches to thinking: ethical, civic and social, sociology of knowledge and psychology of learning” (p. 199) which is a shift to the individual plane of transformation. In the ethical approach, students become aware of the influence of values on people and society (the community plane). While Van Rooy advocates including controversial issues in science education to promote students’ personal, intellectual, emotional and social growth, she overlooks any effects such authentic learning experiences might have on students’ spiritual growth.

Most of the issues facing the world are interrelated and can only be overcome by 'sustainable' solutions, whereby current human needs are satisfied without compromising the way of life of future generations. What is needed to solve the world's major problems is a radical change in our perceptions, thinking and values (Capra, 1996, 2002). Solutions to issues societies currently face depend on a fundamental change to a worldview that encompasses spirituality. 'Deep ecology' includes a spiritual perspective, and fosters a sense of selfhood beyond the ego, by encouraging each person to question humanity's place in nature. Capra describes deep ecology as spiritual awareness, and recognises the intrinsic value of all living things, and the world as a network of interconnected and interrelated phenomenon.

Deep ecology recognizes the fundamental interdependence of all phenomena and individuals and societies embedded in (and ultimately dependent on) the cyclical processes of nature. Humans are not separate from the natural environment and are just one strand of the web of life. (Capra, 1996:7)

Naess and Sessions devised the following *platform of deep ecology* based on an ecological worldview, where the world is considered to be an integrated whole.

1. The well-being and flourishing of humans and non-human life on Earth have intrinsic value or inherent worth in themselves. These values are independent of the usefulness of the non-human world for human purposes.
2. Richness and diversity of life forms contribute to the realization of these values and are also values in themselves.
3. Humans have no right to reduce this richness and diversity, except to satisfy vital needs.
4. The flourishing of human life and cultures is compatible with a substantially smaller human population. The flourishing of non-human life *requires* a smaller human population.
5. Present human interference with the non-human world is excessive, and the situation is rapidly worsening.
6. Policies that affect basic economic, technological, and ideological structures must therefore be changed. The resulting state of affairs will differ considerably from the present.
7. The ideological change will be mainly that of appreciating life quality (dwelling in situations of inherent value) rather than adhering to an increasingly higher standard of living.
8. Those who subscribe to the above points are obliged directly or indirectly to try to implement the necessary changes. (Naess, 1986)

A shift to a deep ecology paradigm requires people to change their perceptions, values and ways of thinking. Self-assertive ways of thinking currently dominant in modern society must be replaced by integrative ones that are intuitive and holistic (Refer to Table 2). Consistent with the principles of ecology - in any ecosystem resources and energy exchange are sustained by co-operation - in deep ecology co-operation, partnership and networking are valued (Capra, 2002).

**Table 2 Opposite tendencies (Capra, 1996:10)**

<b>WAYS OF THINKING</b>		<b>VALUES</b>	
<i>Self-assertive (Old)</i>	<i>Integrative (New)</i>	<i>Self-assertive (Old)</i>	<i>Integrative (New)</i>
Rational	Intuitive	Expansion	Conservation
Analysis	Synthesis	Competition	Cooperation
Reductionist	Holistic	Quantity	Quality
Linear	Non-linear	Domination	Partnership

Such a shift is difficult given the domination of Western societies' resources by large multi-national companies. A three-tiered (local, national and global) level of change is necessary before a society can operate according to an ecological worldview.

**Movement 4: Story**

***Spirituality and intersubjectivity***

At the local level, teachers of science could discuss how scientists, who hold an ecological worldview, draw on their spiritual knowledge to enhance their scientific knowledge. Scientists have a shared set of values that include objectivity and respect for evidence, a rigorous systematic approach to the scientific enterprise, and a practice that has aesthetic considerations. One way to incorporate values in the science curriculum is to focus on scientists who demonstrate a connectedness to the organisms they investigate, such as Barbara McClintock who viewed the corn plants she studied as subjects. By emphasizing the spiritual aspects of her work, teachers can encourage students to engage in science in a more subject-to-subject way (Jane & Gipps, 2006).

McClintock's approach to science was to understand the whole organism by focusing on the smallest details that provided the keys to the larger whole. The way she investigated the genetics of corn plants showed that she had feeling for the organisms that she studied.

It was her conviction that the closer her focus, the greater her attention to detail, to the unique characteristics of a single plant, of a single kernel, of a single chromosome, the more she could learn about the general principles by which the maize plant as a whole was organized, the better her "feeling for the organism." (Keller, 1983:101)

Her scientific way of knowing, together with a 'love' for the corn plants she investigated, enabled her to propose a theory of 'jumping genes'. Her attentiveness to the corn plants led to the idea that they changed their genes in response to their environment. She talked about the corn plants as her friends, as if they were subjects. The spiritual dimension in her way of working enhanced her ability to make some major discoveries. For example she discovered the *Neurospora* chromosomes after periods of meditation and contemplation, when her level of consciousness enabled her to return to her microscope and view things differently.

McClintock was frustrated by her inability to see the transposition of genes under the microscope. She retreated to sit under a eucalyptus tree and meditate. There she 'worked on herself'. When she felt she was ready, she returned to the microscope, and the chromosomes were now to be seen. (Lebacqz, 1997:24)

Although a scientist, she also appreciated other ways of knowing different to science. Her deep reverence for nature and capacity for union with what is to be known, reflect a different image of science from a purely rational enterprise; one in dialogue with spirituality.

Australian scientist Graeme Clark created the multiple-electrode cochlear implant that is considered to be one of the most significant breakthroughs ever made in medical science. The device restores brain function prosthetically, giving deaf people the ability to hear. The qualities Clark has that enabled him to develop this invention include ingenuity, dedication and a belief in the validity of his dream. However it wasn't until he took a break from his scientific work, and went wandering on the beach, that he made his discovery. Marvelling at nature he picked up a blade of grass and threaded it through the whorl of a shell. It was through this wondering that the cochlea implant came about. Clark describes breaking new ground in the following way:

I couldn't work out how to get the electrode bundle to go round the tiny spiral, and it bothered me day in and day out, and I went on holidays really struggling to find an answer. And then, amazingly, one day at the beach, eureka! I was playing around with a shell like the inner ear and putting in bits of grass blades, and realised that if they were bendable at the tip and stiff towards the base, they would actually go around far enough. I raced home from my holidays and tried it out in the laboratory, and it worked. I was able to put the multi-electrodes around the tiny spiral of the inner ear. That bundle of electrodes is then connected to a package of electronics that lies underneath the skin that enables us to control the stimuli by sending radio waves through the skin to that implanted electronic package. (ABC Online 27/05/2004, p. 5)

Clark said that the road to discovery was tough and he nearly gave up many times. But with the support of his wife, it was his determination and Christian faith that really got him through. He makes this connection between religion and science.

Some of the great scientists early on were Christian, and did so because of their faith. And today there are many. And I think that one can reconcile the two – they're different levels of explanation. It did become part of my walk, part of my journey. (ABC Online 27/05/2004, p. 9)

### **Movement 5: The vision: Science and spirituality as shared praxis**

Teaching practices are most effective when learning is viewed in a holistic way. In turn, the development of a spiritual conscience can help students understand the relationship between self and community. For teachers of science to include spirituality in the science curriculum, they must adopt a pedagogy that is respectful of the values of all students, their families and their communities, and be appreciative of the spiritual dimensions of human experience.

When teachers of science acknowledge a spiritual dimension science learning can be enhanced because spiritual knowledge:

- helps promote student initiative and self-reflexive thought;
- emphasises the connectedness of all things;
- can integrate heart, mind and soul to give meaning and purpose; and
- enables ethical and compassionate decision making.

In this paper I argue that the current view of science portrayed in science curricula is too limited, locked in and foreclosed of possibilities. My hope is for an interaction between science and spirituality that takes place through a shared praxis approach that involves the five components: present action, critical reflection, dialogue, story and the vision that arises from the story (Groome, 1980, 1998).

In shared praxis in the pedagogical setting, the participants share in dialogue their critical reflections on their present action that involves authentic telling (disclosure) and listening (discovery). Critical reflection (meaning dialectical critique involving rational and affective factors) on present action (praxis) requires the exercise of reason, memory and imagination.

In the context of this paper, the story/vision arises from the narratives of scientists such as McClintock and Clark. In science education, a shared praxis approach would involve participants (students) appropriating such scientists' way of working in their own praxis (science activities). Students would engage in shared dialogue and reflection in small groups. They would need criteria to guide their discernment (affirming and refusing) and decision-making.

### **Conclusion**

Science and spirituality each bring a different perspective to world concerns. By fostering a partnership between science and spirituality, science educators can prepare students to face their uncertain world of tomorrow. On an individual level, this science-spirituality partnership requires students to be attentive and take notice of their experiences. On an interpersonal level, it involves students co-operating with their peers and teachers to appreciate the interconnectedness of all things in the Earth's ecosystem. On a community/institutional level, linking science with spirituality through shared praxis, will move students towards a deep ecology worldview that encourages them to treat all living things as subjects. This shift requires a transformation of attitudes, values and actions. Scientists that incorporate a spiritual dimension in their work can be inspirational role models for students. By participating in a shared praxis approach to science education students can begin to integrate a spiritual dimension in their science studies.

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