Pedagogies for Persistence:
Cognitive Challenges and Collective Competency Development

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Abstract: Education for sustainability is a challenge that is being met in many different innovative ways under many different circumstances in many different parts of the world. In this article, the author draws on his personal experiences with radical systemic pedagogies within a context of agriculture and rural development appropriate to an emergent Era of Persistence in Australia, to design and conduct a graduate course in the United States of America that linked sustainability with systems thinking.

The organizing framework for the short duration, single unit course exploited the integration of five characters of sustainability that the author claims were appropriate both to the context and to the particular circumstances: Cognition, complexity, contestation, contingency and collectivity.

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Introduction

Much has happened within the academy since Milbraith (1989) challenged many academic conventions in calling for us to collectively "learn our way out" of the ecological mess that he argued we have got ourselves into and to move towards more sustainable relationships between ourselves and the rest of the biosphere. A review of the current literature on education for sustainability reveals a very wide spectrum of innovative, non-conventional, and sometimes truly radical responses from within higher education institutions, to the complex and multi-dimensional intellectual, moral, aesthetic, practical, political and spiritual challenges that are involved. The claim has even been made in a recent monograph that sustainability is becoming an integral part of university life (Corcoran and Wals 2004) with academics in many parts of the world thoughtfully addressing the essential "problematics, promises and practices" inherent to

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the task. The emergence of the hybrid sustainability science, that seeks to both "understand the fundamental character of interactions between nature and society" as well as "to encourage those interactions along more sustainable trajectories" (Kates et al 2001), is adding further to the intellectual foundations of these typically multi-disciplinary and inter-disciplinary initiatives as well as providing the important aspect of academic respectability that comes with the designation of a science: So too is the increasing focus on "research systems for a transition towards sustainability" (Clark 2001) while Milbraith's (1989) call for an emphasis on social or collective learning for sustainability is finding growing support among educators (Wals 2007).

The meta-narratives of many of the curriculum initiatives reveal however, that as educators begin to explore the challenge, they quickly come to appreciate that the design of innovative pedagogies for sustainability or persistence raises a host of complex cognitive and normative issues that extend beyond the conventional foci of curriculum content and pedagogical practice. It soon becomes apparent to these would-be innovators that, paraphrasing Einstein, we can't solve problems by using the same level of cognitive development we used when we created them. From this perspective, it is systems of knowledge and systemic processes of knowing that ought to merit the primary attention of sustainability educators rather than the natural and social ecosystems that all too frequently command their major attention (Bawden 2007). Sustainability from this perspective becomes an emergent property of learning systems which themselves rely on open and frank discourse between those people who identify themselves as components of those systems (Bawden 2004).

A focus on systemic ways of knowing and of making moral judgments is entirely appropriate to pedagogies for persistence for, at the heart of the notion of sustainability, lie both empirical questions about what 'systems' could be designed to persist - assuming we knew enough about their nature as well as the nature and dynamics of their relationships with their environments - as well as normative ones that relate to what should be ethically permitted to persist (Thompson 2004). In this context, one of the many could/should dilemmas to be confronted when relevant pedagogies for persistence are being considered is what many see as a fundamental conundrum: On the one hand there is an ever-increasing appreciation of the vital need to conserve the integrity of a nature that has taken eons to evolve to its present state of complex functional interdependencies - both among species (that of course include *Homo sapiens*) and between myriad biotic and abiotic elements. On the other hand, there is the vital human imperative for nature to continue to be changed and developed so that it can provide for the needs of a population that will continue to escalate in size into the foreseeable future. From this distinction it is clear that moral development and the acquisition of competencies in ethical judgment are as central concerns - to those who design and conduct pedagogies for persistence - as intellectual development and competencies at technical (techno-scientific and neo-liberal economic) rational decision making.

To profoundly engage with education for sustainability is to confront issues concerned with the processes of cognitive development and indeed, to the cognition of cognition itself. As Maturana and Varela (1987) have posited, it is "the very ignorance of knowing"

that lies at the core of all of the troubles that we face in this late modern age: Accordingly, as these neurobiologists suggest, "it is not knowledge but knowledge of knowledge that compels".

Given the complexity of this cognitive challenge, it is difficult to disagree with Cash et al (2003) when they state that "building knowledge systems for sustainability takes time and patience". Two decades of experience at Hawkesbury Agricultural College by my colleagues and I with pedagogical initiatives for the systemic development of Australian agriculture within a context of inclusive persistence, would certainly reinforce this claim (Bawden et al 1999).

Knowing for persistence

The original motivation in the late 1970s for the work at Hawkesbury was a collective perception that Australian agriculture needed a fresh approach to its development; the quest for further improvements in productivity we argued, needed to be placed within a more inclusive context of improvements in the wellbeing of rural communities as well the integrity of the bio-physical environments in which agriculture was conducted (Bawden et al 1999). We came to select Persistence over Sustainability as our conceptual perspective because we saw it as a more active term that connoted an evolutionary capacity to persist in the face of change through a combination of generative as well as adaptive strategies. Further, we would come to focus on Systemic Development rather than Sustainable Development because rather than highlighting some form of visionary state, our focus was to be on the inclusive and holistic nature of the developing cognitive process that embraced the essential systemic nexus between the intellectual and moral development of critically self-reflexive 'actors' and material and social 'acts of development' under complex, frequently confrontational circumstances.

The Hawkesbury innovative curricula and pedagogies that we developed in response to this complex challenge had, as their radical objective, the intellectual and moral development and systemic cognitive transformation of our students who were enrolled in agriculture, rural development, or social ecology (Bawden 2005). With the passage of time, we consistently found that students came to understand and become competent at manipulating the development of such complexity in the material and social worlds, only as they developed, with time and through consistent theoretical and experiential challenge, cognitive frameworks that allow for the appreciation and embrace of such complexity. The more complex the issues under consideration in systems in the material and social worlds, the more complex the epistemic state, or the stage of development of these "evaluative frameworks" (West 2004), needed to be for those who are actively involved in the search for improvements to them. Such frameworks or "meaning-perspectives" as they have also been termed (Mezirow 1991), demand the explicit attention of educators to what Kitchener (1983) refers to as third level or epistemic cognitive processes through which we can come to explore the often idiosyncratic epistemic assumptions that we each hold as individuals with respect to philosophical issues that include the nature of nature (ontology) the nature of knowledge

(epistemology) and the nature of human nature with particular respect to ethics and values (axiology).

And as we learned very early in our Hawkesbury initiatives, you don't facilitate the transformative development of such complex epistemic states or advanced cognitive systems, through once or twice-weekly one-hourly didactic bursts spread out over a single four-month semester. This begs the vital question about whether or not it is feasible, or even desirable, to attempt to do something innovative under the rubric of education for sustainability or pedagogies for persistence, when, for one reason or another, time is strictly limited.

This is a question that I have recently had occasion to personally explore as a visiting professor at a US Land Grant University when, in the fall of 2006, I was invited to present a single credit graduate course – a once weekly 50-minute session spread over the 15-week spring semester – on the theme of *Sustainability and Systems Thinking*.

The design and conduct of such a course would prove to be a novel experience for me in many ways. It had been almost forty years since I had offered a single credit course to students. Even at that time a fifty-minute teaching session in once-weekly episodes, with me doing virtually all of the talking had seemed a grossly inadequate learning experience for all concerned. Of further significance was the fact I had spent the majority of the intervening years between then and now at Hawkesbury (which, in 1989 had been incorporated into the newly established University of Western Sydney), not as a conventional instructing teacher but as a participant facilitator of experiential, systems-oriented and competency-based education structured on workshops and the conduct of real-world situation-improving projects (Bawden et al 1999).

Lessons from Hawkesbury

The essential lesson from our Hawkesbury experiences has indeed been that desirable and feasible acts of development to improve complex situations in the material and social worlds typically require the intellectual and moral development of those who need to be the actors or stakeholder agents in those acts (Bawden 2005). And, as Salner (1986) had recorded from her work in a quite different context, we have also come to consistently observe that such epistemic development comes only with persistent existential and conceptual challenge – and this is of particular significance with respect to the development of those systemic competencies that we have concluded are vital for dealing with the complexities of the development and management of any natural resources. Hence the central importance to our initiatives of experiential pedagogies and of our developmental competency-based focus on *systemic praxis* as the dialectical expression between practice and theory (Bawden and Packham 1993). In essence we have concluded that the capacities for *systems thinking* and *systems practice* come only through the development of *thinking systems.*

We came to conceptualize this critical systemic inter-connectivity between the epistemic development of people and the development of the world about them, as *systemic*

development. We have actively pursued the logic that pedagogies for systemic development need to critically and concurrently address the entire developmental complex of (a) the particular system-of-interest under review (e.g. a particular agri-food system), (b) the environment in which that system is seen to be embedded and which has the potential to both significantly influence and be profoundly influenced by the system-of-interest, and (c) the critical learning or knowing (sub) system that brought this system of systems, including itself, into existence (Bawden 2000).

Our adoption of this essentially constructivist approach to systemic praxis - of what Checkland (1981), in his own context, had implied with his emphasis on the nexus between *systems thinking* and *systems practice* - followed our appreciation of the need for the epistemic transformation of the collective worldview of agricultural development that we regarded as prevailing among most of the stakeholders in Australian agriculture at that time. This appreciation placed the matter of critically reflexive cognitive development at the very epicenter of our pedagogical endeavors that we saw as important contributions to the paradigmatic challenge of what we argued was as an emerging Era of Persistence that would (or at least ought to) replace the Era of Productionism that had long prevailed within modern agriculture (Bawden 1997). The notion behind these different eras was that each reflected in action, the worldviews of particular collectives who held different epistemological and/or ontological and/or axiological assumptions without necessarily appreciating these distinctions themselves. The transformation from one era or epoch to another was thus no trivial matter for educators but something that was equivalent to a paradigmatic revolution in science (Kuhn 1962).

Personal experiences in the United States of America following my translocation to Michigan State University (MSU) in 2000, had left me with no reasons to doubt that the situation in contemporary North America called for a similar epochal transformation as we had worked towards in Australia; and not just for agriculture but for all domains of natural resource management. Hence it was with considerable enthusiasm for pedagogical reform that I accepted the challenge of designing and offering a single unit graduate course in Sustainability and Systems Thinking when it was proposed to me as a new option to be offered within the Environmental Science and Policy Program at MSU.

The contrast between the Hawkesbury initiatives in transformative education through persistent 'experiential immersion' with a focus on the development of competencies of systemic praxis on the one hand, and the prospect of once-weekly 50 minute sessions spread over a 15-week semester on the other, could not have been more stark. As I reflected back on my Australian experiences in preparation for the new challenge of the Sustainability and Systems Thinking unit for graduate students however, and as I continued to read the literature on education for sustainability, five dimensions or aspects of sustainability seemed to consistently emerge as potential pedagogical foci that would allow for a sensible integration of process and content: Cognition, complexity, contestation, contingency and collectivity. These five "Cs" seemed to offer much more scope as themes appropriate to the introduction of graduate students to the connections between sustainability and systems thinking than the populist three "Ps" of planet, people and profit. For one thing, each of these five elements has intellectual foundations that

allow scholarly expansion of some of the key aspects of sustainability or persistence. Moreover, when integrated together they also provide a conceptual scaffolding on which to construct experiential exercises that are relevant to, at least, the creation of an awareness of needed competencies if not actual competency development.

The five Cs briefly exposed

It is not appropriate here to provide an extensive commentary on the theoretical and philosophical foundations of the five Cs selected as the organizing structure for the course, nor to provide the justification for their particular selection over other options. It is important however to offer a brief exposure to the characteristics of each along with the logic for their respective inclusions, and to reference some of those whose work is of signal importance in each of the five domains below.

Cognition

In the present context, the meaning of cognition extends significantly beyond its conventional use in describing the mental activity of acquiring knowledge through thought and the senses, to embrace the much more expansive idea of cognition propounded by Maturana and Varela (1987) that refers to the manner by which all living organisms actively relate to the world about them. Fell and Russell (1994) explicate this idea in defining cognition as "the process by which an organism maintains its identity in a changing world by altering its awareness through its interactions". This expansive idea of cognition includes emotions and intentional actions or dispositions as well as knowledge among its characters. These elements are captured within the map of the cognitive (critical learning) system that was developed as the organizing core of the graduate unit. In its final form (Figure 2) Maybe renumber figures so that Figure 1 is mentioned first, rather than Figure 2 first, this systems map included two inter-connected sub systems - the experiential sub-system, with its three reflexive levels of cognitive processing based on the model proposed by Kitchener (1983) and the single level intuitive inspirational learning sub-system, that, by its very nature was non-reflexive - that are embedded within a systems boundary that has emotions and dispositions as elements of the system's internal ambience. Each of the learning sub-systems is, in turn, composed of four particular cognitive sub-sub-systems which, in the case of the experiential sub-system, are significantly functionally affected by worldview perspectives or meaning-making frameworks: the particular epistemic lenses that we bring to bear as we engage with the observing, thinking, planning and acting processes of experiential learning (Kolb 1984). These perspectives can be seen to be expressed through the different cognitive styles that have been associated, for instance, with different approaches to environmental issues (Miller 1983)

The cognitive system as developed here attempts to rectify the major deficiencies of the prevailing view of cognition from the perspective of modern 'normal' science, from which, as Barnes (2000) asserts, "sense perception, imagination, intuition, feeling and ultimately what we may call our deepest moral sensitivity" have all been eliminated.

Complexity

Dietz and his colleagues capture well the systemic complexity of the cognitive challenge for pedagogies for persistence with their claim that "[d]evising ways to sustain the earth's ability to support diverse life, including a reasonable quality of life for humans involves making tough decisions under uncertainty, complexity, and substantial biophysical constraints as well as conflicting human values and interests" (Dietz, Ostrom and Stern 2003).

There are three dimensions to the cognitive complexity here. Firstly, there is the issue of how the knowledge that needs to be known about the complex inter-relational diversity that constitutes the natural ecosystems of planet earth can be effectively known in sufficient detail and with sufficient cognitive diversity for them 'to be supported'. Then there is the complex nature of the human knowing systems that are responsible, not just for making sense out of the systems of nature as the basis for making collective, essentially contestable decisions about sustainable change under contingent circumstances, but for bringing them into being in the first place.

And finally, with the emphasis on inherently conflictual human values and interests, there is the matter of what Vickers (1965) referred to as our "appreciative systems" through which we concern ourselves with both "reality judgments" and "value judgments" about what is humanly good or bad. Developing our epistemic capacities to know about our own epistemes and how they might be developed, must therefore also embrace appreciative systems that extend the cognitive conventions of the instrumental rationality of knowing systems.

Contestation

As Douglass (1984) was among the first to assert - writing specifically of agriculture more than thirty years ago - sustainability means different things to different groups of people. He was only talking about it from the perspective of the different motivations or constitutive interests of three different groups of stakeholders each representing what he referred to as a different 'school'. Douglass distinguished between those with a primary concern for food production, those for whom entire ecosystems were the focus, and those whose emphasis was on the integrity of entire rural communities. Reviewing the subsequent contributions of a host of other writers on definitions of sustainable development, Parris and Kates (2003) have recently produced an instrumental taxonomy of goals or characteristics of sustainable development in which they identify three major categories of "what is to be sustained" (nature, life support systems, and community) and three further categories of "what should be developed" (people, economy and society). They conclude that while in practice there is an acknowledgement of the many multiple and conflicting objectives to be sustained and developed, individuals and collectives alike not surprisingly, tend to privilege particular objectives to sustain and/or develop. Under these circumstances, debates about what could be made to persist and what should be allowed to persist under any particular circumstances, are destined to be innately conflictual and confrontational.

Importantly, the contestability of the sustainability concept has been seen by some as a strength rather than a weakness, and thus a vital focus for any pedagogy for persistence.

As Davison (2001) has submitted, such inherent contestation gives rise to an agenda of good questions concerning how we ought to live our lives.

Contingency

There is an inherent indeterminacy that characterizes any form of intentional development: What does constitute 'better'? Who decides on the criteria? And under what decision conditions? Who holds the power to decide who decides? How is the betterment to be achieved in practice? Who and what will benefit and who/what might be disadvantaged? And specifically in the case of sustainable development, how long does anything need to persist to be classified as sustained? (whatever that 'anything' might be). Furthermore, just because something could feasibly be sustained into the future does not mean that it is desirable to allow it to do so.

This necessary conjunction of values with facts adds yet further contingency to all of the decision questions above about who, what, how, for how long and so on, that essentially amount to judgments about boundaries – about what's in and what's out, and about how those judgments are to be knowledgeably made (Midgley 2000).

A crucial assumption underlying the pursuit of 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs', to echo Brundtland (1987), is to presume to know, or to at least to be able to foresee with some accuracy, that which is essentially unknowable – we cannot know what the needs of future generations might turn out to be under circumstances that we have no way of predicting. There is also the far from trivial issue of how the potential long-term detrimental consequential impacts that development 'interventions' might have both on the future availability of natural resources and on the integrity of the 'ecosystems' of nature, can even be known.

A further epistemic aspect of this paradox reveals itself here: As Dresner (2002) has pointed out, if the goal of sustainability is to be achieved, the ability to predict or at least foresee the future is clearly indicated, and yet the very idea of sustainability has arisen out of an increasing pessimism that human institutions are not able to handle intellectual, moral and aesthetic challenges that are far less difficult than that. And of course a crucial aspect of this fundamental institutional incompetence is the instrumental insistence within the academy, of dis-integrating these three facets of the human episteme into independent academic domains and 'disciplines' that are typically each handled through distinctly different pedagogies. This situation is further exacerbated by the conventional academic separation of the subject knower from the object to be known, and further, of each knower to be isolated from all other knowers in failed recognition of the significance of the 'social learning' that Milbraith (1989) was among the first emphasize in the context of the collective quest for sustainability. It is also complicated by what some commentators see as the "politics of knowledge" and the dialectic between expert knowledge and citizen knowledge (Fisher 2000).

Collectivity

A key competency of systemic development is the facilitation of public discourse in the pursuit of an informed but citizen-generated consensus about the right and proper thing to do within the context of the *coulds* and *shoulds* of development that embraces the ethos of persistence. As Plough and Krimsky (1987) have claimed, there are often opposing rationalities involved here: On the one hand there is a "technical rationality" that emphasizes "logical consistency and universality of findings" while on the other there is a "cultural discourse" that privileges "personal and familiar experiences rather than depersonalized technical data". The all too common reaction within higher education circles, of portraying public resistance to expert scientific opinion as ignorance or irrationality adds to the difficulties of public judgment while further reinforcing the often "tacit public ambivalence about being dependent upon social actors (experts) who engender such alienation and social control" (Wynne 1996).

Collective learning demands a genuine appreciation and accommodation of different ways of knowing and different knowledge, of different ways of valuing and different values, of different worldviews and cognitive styles and of the factors that make them different, and of different ways of making decisions and value judgments – all within the complexity, contingency and cognitive diversity that characterizes an ethos of persistence as sustainability.

The nature of a tempered innovation

For the graduate course at MSU, my opening gambit was to decide what type of educational experience I wanted to offer to the dozen or so enrolled students, who were drawn from many different discipline areas across the university. Even though the total time available for 'teaching' would be so limited – in terms both of each individual session and of the course as a whole – I nevertheless decided to adopt a competency-based, experiential pedagogy. As I was to write in the course promotional material: *This seminar will explore the basic assertion that systems thinking - that is 'thinking in terms of wholes and inter-connectivities' - is a vital competency for those concerned with both substantial and operational aspects of sustainability. In the spirit of competency development, the seminar will take the form of an on-going critical conversation among the participants about the nexus between sustainability and systems thinking which will be informed by a series of short papers/book chapters.*

With that decided, the second task was to develop a conceptual framework for the course that would integrate process with content. I selected intellectual and moral development as the central cognitive organizing principle for the course and then decided to employ a combination of experiential exercises, seminar presentations and inter-session course readings to illustrate how competencies at dealing collectively with the complexity, contestabilities, and contingencies inherent with the quest for sustainability, would both inform and be informed by the ever more complex cognitive development core as I unfolded it.

The format and schedule of the course sessions are illustrated in Figure 1, where the learnings from the experiential exercises and the interactive seminar presentation are

shown as feeding directly into, and augmenting, the continually unfolding cognitive map or critical learning system that formed the developmental core of the course. The complete version of this map or system model is illustrated in Figure 1.

In the schedule, the inter-sessional readings are shown feeding indirectly into the succeeding session's activities. At each session I would add further detail to a progressive conceptual map of collective cognitive development and explain how the particular exercises, presentation and pre-readings of that particular session contributed to that development. Every session had some elements of complexity, contestation, and contingency with different sessions having different emphases, and with collective learning as the norm, with the students doing all of the experiential exercises in small groups.

Each session, which through the consent of the participants themselves, was extended from 50 to 60 minutes, was divided into three activities each reflecting a different pedagogical practice, supplemented by the one or two readings that I selected for the inter-sessional work. Unconventionally, these readings, taken as chapters from different books or as published journal articles, would not be the specific focus of the following class, but rather would be regarded as an ever-expanding theoretical and philosophical foundation as the whole experience unfolded.

During the first 10 minutes of each class, the participants would be encouraged to talk openly and in personal narrative style, about events that they had experienced and/or ideas that they had had or read or heard from others during the time between classes, that they thought relevant to the overall theme of the course. The following 25 to 30 minutes of the session would be devoted to an experiential exercise that would actively engage the participants, working collectively in a manner that reflected one or other of the themes and which was designed to contribute specifically to their epistemic development.

Thus, they would not be expected to *talk about* contestation or contingency or complexity, but to collectively experience and explore the respective nature of those phenomena *in action*, as it were - and then reflect on the experience in the three cognitive dimensions. In this manner, they would be exposed together to the respective themes as domains of competency rather than as topics of interest. Instead of merely discussing contestation for instance, they would be given an issue that would experientially provoke contestation within their group. Or instead of simply talking about complexity and what others had written about it, they would be given an issue that was innately complex, to collectively and experientially explore using a formal systems methodology like Soft Systems Methodology (Checkland 1981). Or rather than debating the meaning of contingency and discussing its relevance to sustainability, they would be given an exercise through which they would actually experience the very essence of uncertainty and contingency. And so on. Pre-prepared handouts would be available for each of these tasks, while a second set of material – usually in diagrammatic form that illustrated the linkages of the exercise just completed into a cognitive framework of growing complexity – would be handed out at the close of each exercise. With time so limited, debriefings would be kept to an absolute minimum, if conducted at all, while the

participants would be encouraged to critically reflect on the exercise after the class had ended and to record those thoughts in the learning log that they would be expected to maintain throughout the duration of the course. Unless the students wished particularly to share this log with me or with any of the other students, this would remain an utterly private record. Learning logs would explicitly not be considered as an element of the assessment protocol.

The third phase of each session, the remaining 25 to 20 minutes, would be devoted to a more or less conventional seminar format in which I would discuss and expand upon the logic behind the selection of the particular exercise just completed as well as that presented in the second set of handouts, and briefly explicate the rationale for the choice of the next reading. In a learning experience as episodic and as complex in the object of the study as this seminar would be, I held that it was important for the participants to have some way of knowing where they were in development terms and whence they were heading. Previous experiences, both in the formal classroom and in working with citizen or organizational communities in a wide variety of settings, have convinced me of the importance of what I might call a progressive map of cognitive development which I typically and explicitly develop progressively and share regularly as the initiative unfolds.

As the issues that were explored became more complex and more diverse, so the map developed ever greater detail. The formal logic of the cognitive development that the map attempted to express was drawn from the work of a number of workers drawing most centrally on the longitudinal research of William Perry. This longitudinal study (Perry 1968) provides a crucial example of the nature and significance of both intellectual and ethical development with a particular emphasis on epistemology. Perry essentially concluded that aspects of the intellectual and ethical development that he observed in his students could be described in what he referred to as an orderly way (Perry 1968) and he developed a complicated schema that identified nine different positions or stages through which a majority of the students that he studied, 'moved developmentally'. In essence, Perry's schema reflects three successive epistemological positions - *dualism*, *multiplicity* and *contextual relativism* – while emphasising further intellectual development in the name of *commitment* that the students made when faced with the uncertainties of a contextually relativistic world (Culver and Hackos 1982).

Salner (1986) concluded that Perry's work related specifically to 'structural reorganization of epistemic assumptions in the direction of increasing complexity' and she suggested that this had profound implications for what she termed 'general systems learning'. In order to understand complexity and deal with complex, contingent situations, one needed to have developed complex cognitive frameworks (West 2004). The notion of epistemic assumptions Salner drew from the work of Kitchener (1983) who had earlier introduced the concept of 'epistemic cognition' as the third level of her three level model of cognitive processing (Kitchener, 1983) (reflected in Figure 2). The focus of such epistemic cognition is the epistemological reflections on the "limits of knowledge, the certainty of knowledge and the criteria of knowing".

There is little to be gained from explaining the full details of how these and other theories were illustrated and explored during the various sessions in the course. That level of detail would be simply overwhelming. As is revealed in Figure 1, the class schedule did indeed cover a very broad spectrum of issues related to the nexus between Sustainability and Systems Thinking (or more accurately Systemic Praxis). The experiential exercises and the readings were equally eclectic, while the cognitive map as progressively developed particularly through the seminar component of each session, progressed from a simple model of an individual's learning cycle at the start of the course to eventually illustrate by the final session, the full complexities of a critically reflexive, collective, transformative, learning system engaged in sustainability discourse

The description of a single session will illustrate how this worked in practice

Session 5

By the start of fifth session of the course, the cognitive map had progressed from the simple model of an individual's experiential learning cycle (Kolb 1984) that had been introduced in the first session, up to a collective 'knowing system' that comprised a nested system of three levels that reflected the model of three levels of cognitive processing as described by Kitchener (1983). In this particular session, the addition to this model, as presented during the seminar component, was the inclusion of worldview perspectives as expressions of epistemic (epistemological + ontological + axiological) assumptions. The two pre-readings, on the multiple meanings of sustainable development by Gordon Douglass (1984) and on four challenges of sustainability by David Orr (2002) were also selected as contributions to the matter of worldview perspectives and their significance to sustainability.

The experiential exercise in the session was designed to illustrate both inconsistencies in personal worldview perspectives over different issues and tensions between different individuals who held different worldview perspectives on the same issues, so revealing the significance of differences in epistemic assumptions to collective learning which in turn present such formidable hurdles to achieving social consensus in practice. In the exercise itself, each participant was first asked to record her or his personal responses as acceptable or not acceptable to a sequence of three simple questions that each related to a different circumstance involving the intensive husbandry of animals. Once having recorded their answers, they were asked to reflect on the nature and pattern of their personal responses and then to share these with their neighbours and compare and contrast responses. They were then asked to try to seek a consensus on the one issue which was the most contested among them.

In the process of comparing their responses it quickly became apparent to the participants that the issues were much more complex than they had at first appeared, and that their responses to them were contingent upon a very wide variety of factors once they started to defend their positions. These aspects became greatly amplified when attention turned to the quest for consensus from the most contested issue, and as the social tension increased as factual interpretations, personal values, opinions, and even ideologies, were confronted in the process.

One of the two readings (Chapter 2 of Bryan Norton's 2005 book on Sustainability) issued at the end of the session, which, in addition to the exercise, had also included the seminar on the nature and significance of worldviews to social learning under circumstances of complexity, contingency and contestation, had been selected to bring the relevance of these issues back to the matter of the nexus between environmental sustainability and social learning. The second reading (Chapter 1 of Fikret Berkes and Carl Folke's 1998 edited volume on Linking Social and Ecological Systems for resilience and sustainability) was intended to provoke ideas about the nature of reality as it relates to the ontological status of systems – and whether systems really exist at all other than in the mind of the beholder!

And so, in this manner we progressed through the entire 15 weeks of the semester – with the one exception of Week 9 when a philosopher colleague took the session with the class while I was on an international assignment for a couple of weeks over an extended mid-semester break.

My key intention throughout the course was to help participants gain a flavour of the competencies that appear to me to be vital for dealing collectively with the complexities, contestations and contingencies inherent in the quest for sustainability and to relate these to forms of cognitive development appropriate to a sustainability discourse and to its expression as sustainable development. In this manner, my expectation was that the class experience would represent little more than an exposure of those who participated, to a *sense of competency* in contrast to any attempt at the development of specific competencies. The class enrolment included students of engineering, economics, education, business, journalism, agriculture, and natural resource development.

With regard to assessment, it must be emphasized here that a single credit course is of little consequence to the grades of graduate students at this institution who must complete a total of 30 or 36 credits to meet the coursework requirements of a Masters or PhD degree respectively. Accordingly, the assessment for those students who were formally enrolled in the course consisted of 50% of the grade for attending the sessions, plus a further 20% for active engagement in them. The remaining 30% was allocated to a final 'paper' in which each student reported on 'what they had <u>really</u> learned through the experience of this class'.

End note

This course, about which I had so concerned myself prior to its commencement, proved to be an extremely engaging experience – both for me, and as the participants summarized in their evaluations at the close, for the great majority of them too. In their feedback summaries, as well as in their final assignments, they chose to particularly commend the combination and integration of the different phases of each of the sessions. It was, they concluded, a fairly tough course, where the intellectual and personal demands were high. Such was their enthusiasm however, that a request came from a majority of

them for me to conduct a full two-day retreat to extend their learning, during the summer vacation. In the event this did not prove feasible although we did meet for an afternoon to talk about the experience and to reflect on the utility of the five "Cs" as an organizing theme for learning about sustainability and systems thinking – and as a vehicle for the development of competencies appropriate to the nexus between them, as practice.

It has certainly not been my intention here to recommend cognition, complexity, contestation, contingency and collectivity as five exclusive elements essential to any pedagogy for persistence. The objective rather has been to illustrate a process and logic behind a particular challenge that was far removed from my previous experiences in education for sustainability while exploiting key ideas drawn from them.

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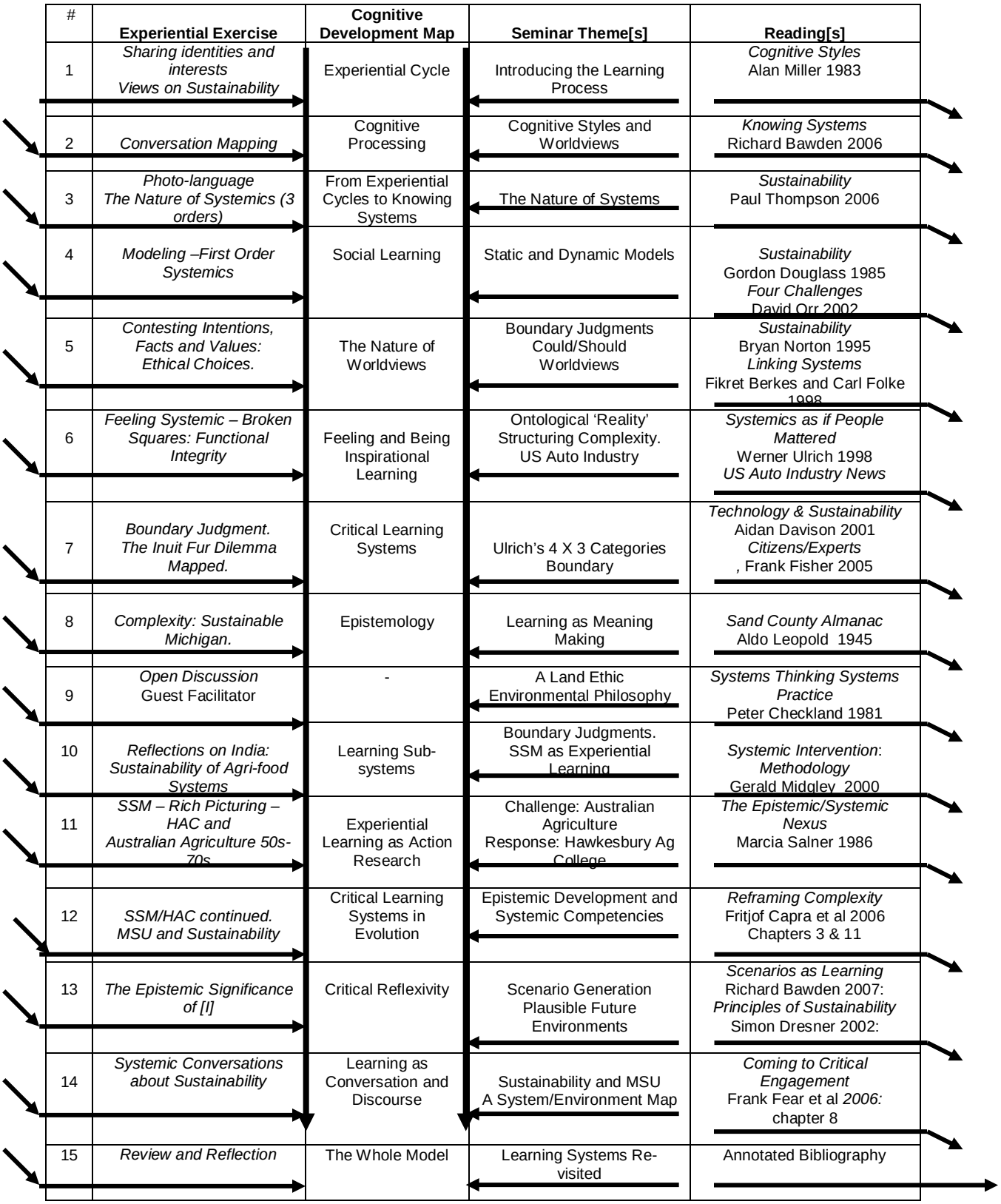

Figure 1: Sustainability and Systems Thinking: Class Schedule.

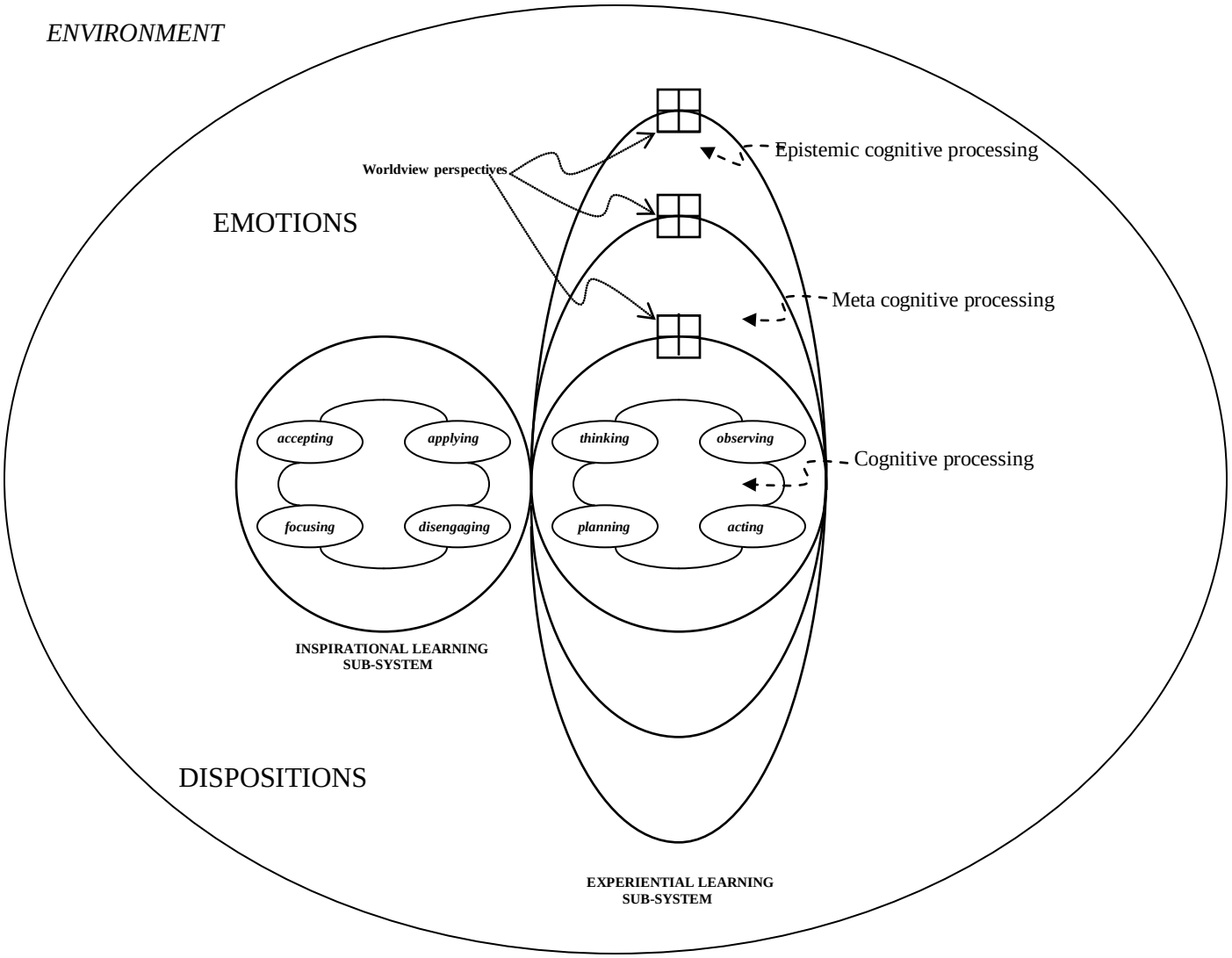

Figure2. The Progressively Developed Cognitive Development Map for the Graduate Course *Sustainability and Systems Thinking*.
(Adapted from Bawden 1998).