Some time ago, a friend of mine came to visit. Although the purpose of her trip was related to topics of teaching, learning, and research, in our time away from such tasks we attempted to redecorate my new home. I’d recently moved to a more spacious abode after years spent in tiny, temporary dwellings. My friend, Maureen, has a particular talent with design and knows me well enough to offer honest opinions. I’d seen enough of her work, in her own environment, to trust that her suggestions would be particularly helpful ones. And so, in between moments of teaching, research conversations, and plans, we transformed the main floor of my house from a clutter of furnishing odds and ends into a more attractive and functional space.

From Maureen’s perspective on home design, it is the relationships among the various components that are essential, so that furnishings and décor exist together as a whole environment rather than piece-by-piece. The couch, the dining room table, the potted plants, and my other furnishings and accoutrements needed to connect as a unified grouping. Also key in creating an interesting, appealing space were the little details: the texture of a velour throw placed carefully over a chair, the way the bamboo table runner was echoed in the framed print on the wall, the vase of carefully arranged tulips, the necessity of eliminating the ‘noise’ of clutter, so that the pattern of interrelations might be noticed, seen.

Writer Elizabeth Berg (1999) reflects, on the work of writing fiction:

> You know the phrase “It’s always in the little things”? In writing, it is always the little things—it’s the details, and the authenticity in those details, that make a character and a story come alive. (44)

This was also true for my house, an attention to the tiny details made it come alive and feel more like the space of a home than it did prior to the rearrangements and redecorating, when my environment had lacked a sense of unity.

You may be wondering what such engagements, redecorating and writing, might have to do with teaching and learning. Why might these things matter? The essay that follows explores the significance of tiny details in pedagogy and school environments, providing a link with
work in complexity science and examining possibilities for restructuring frames and environments in teaching and learning.

The little things are important, although this notion is one not always evident in traditional and modern descriptions and documents of curriculum. The texts of schooling generally attend to the larger elements, those things that can be more easily and visibly documented or charted. I remember well the simplified representations I often encountered years ago as a beginning teacher: the diagrams for arranging the classroom; the directions for organizing space, time, and materials; the ‘recipes’ and manuals which provided no doubt as to how successful instruction should proceed. However, like most teachers, I soon learned that the neat and tidy black-line illustrations, the linear step-by-step agendas and instructions usually missed something vital—the areas of terra incognita, the uncharted spaces that never seemed to exist on such maps of pedagogy.

It was always the tiny things that made the difference, that shifted classroom experience in ways unforeseen and unexpected: the times when ‘real life’ permeated existence at school, the sorts of occasions or engagements that never seemed to appear in more official descriptions of classroom life, phenomena that were unpredictable and dynamic. It seemed, too, a suitable vocabulary or frame for the description of these sorts of experiences and processes did not exist in any of the ‘official’ texts I knew.

In recent years, an emergent field of inquiry has begun to offer alternative possibilities for reframing educational description. What has come to be known as the complexity sciences has begun to branch into a wide network of inquiry including neurology, biology, economics, business management, and evolutionary theory among other knowledge domains, moving from early roots in mathematics and science. Some researchers (see, for example, Briggs and Peat 1999; Waldrop 1992) suggest that complexity science is becoming a social and cultural movement in addition to the work taking place across various fields of study. Interesting, too, is the observation that the field of education has
been rather slow to embrace the developments in complexity, with some notable exceptions (see, for example, Davis, Sumara and Luce-Kapler 2000; Davis and Sumara 1997; Senge, Cabron-McCabe, Lucas, Smith, Dutton and Kleiner 2000; Hocking, Haskell and Linds, 2001).

Although metaphors, conceptual tools, and applications grounded in complexity science have begun to influence many aspects of human existence, it is curious that education has tended, in general, to ignore such work within inquiry, pedagogical practice, and political initiatives. However, this work has become increasingly influential in terms of business applications (something which to me seems somewhat ironic, considering how education tends to use the language and metaphors of traditional corporate models). Numerous websites and e-journals can now be found on the Internet, promoting applications of complexity science for business. One such example is Emergence: A Journal of Complexity Issues in Organizations and Management, and many other sites also exist. One includes the following statement:

Since your company is also a complex system, complexity science based approaches can greatly benefit it, both by showing how it might evolve and how you could influence its evolution.

And this:

The principle is very simple: small modifications of the local rules can lead to large impacts at the global level. (Both quotations from the BiosGroup website, a business consulting organization founded by complexity theorist Stuart Kauffman. Retrieved from http://eurobios.com/flash/ eurobios.html, June 20, 2002)

Although a sense of crisis has pervaded much recent political and institutional discourse surrounding North American schooling (one example being the recent No Child Left Behind U.S. legislation, representing a move to reforms involving increased standards, testing, measurement, and accountability), efforts have tended to focus on the repair and further entrenchment of existing structures, rather than the examination of new paradigms or alternative frames and models.

As physicist Fritjof Capra (1996) recognizes, the modern paradigm, characterized by reductionist thinking and Cartesian dominance, is incapable of addressing profound contemporary global, ecological, and social problems. Instead, Capra suggests, such phenomena should be interpreted as interconnected, interdependent systemic difficulties. Within systems, including those of education, each aspect is profoundly important to all other aspects of the system. The small things matter.

**Schools as Complex Systems**

One example of this sort of interconnectedness can be found in an elementary school where a decision was made to eliminate electronic bells (Blakeburn Community and Laidlaw 2001). A typical morning in this school begins with a sense of calm, engaged interaction. Children enter the school foyer, sit on couches and comfortable chairs to read books together, while others play board games and participate in activities in the hallways, or dance to music in the library, or work with computers. It is common to see parents, caregivers, and the occasional dog or two join in for the early morning activities.

As the start of classes draws near, the children and other members of the school community initiate a few rounds of ‘campfire’ singing, with students setting off for their classrooms as the last song draws to an end. In an absence of the jarring abruptness of electronic bells, or the typical outdoor line ups and resulting entry scuffles, the school day emerges more peacefully, gradually—resembling more those events which occur in homes and the community, rather than what is generally experienced in educational settings.
It is a small thing, turning off the bells, and a simple act, to invite children and caregivers to gather together at the beginning of the day, but such tiny details have profound, continuing effects, like the ripple created when a pebble is tossed into a pond. The character of this school, the nature of the community that is formed, is shaped differently from one structured by bell time and linear waits at the door. Children are not ‘let in’ to school in this place; they are assumed to be an integral part of the school ecology, expected to manage responsibly. And they are. And they do.

This school presents an example that is particularly interesting to examine through the frame of complexity, as a nonlinear and dynamical system. In analyses offered by complexity sciences, systems are important. To provide a brief description, systems thinking and theories adhere to the notion that within living systems, the whole arises from the interrelations among the parts, and that, in fact, there are no true parts at all. All aspects of a system are patterns in an “inseparable web of relationships” (Capra 1996, 30). Also important to living systems is the notion of feedback, where each aspect has an effect on the next. Open systems, including ecosystems, human beings, schools, and classrooms, are open to a flow of energy and materials which move through the system. In living beings, for example, matter passes through the system in processes of excretion, respiration, reproduction, etc. (Margulis and Sagan 1997). In schools, this flow might include less tangible processes; however, energy, ideas, events, participants, and what we might understand as products of learning enter and leave the system of a school. All of these feed in (or out) of the school’s ecology and create a kind of balance.

Within the field of cybernetics, an area of study that is historically influential within domains such as cognitive science, family therapy, and the complexity sciences (Varela, Thompson and Rosch 1991; Bateson 1979), the concept of feedback has been employed in examining self-regulatory processes in social organisms and social systems. Both self-balancing, or negative feedback, and self-reinforcing, or positive feedback have been exemplified in folk metaphors such as ‘vicious circles,’ ‘self-fulfilling prophecies,’ and ‘band wagon effects.’

All are attempts to represent the notion that small actions may be amplified as they feed into a particular system (Capra 1996). This process of iteration (see Gleick 1987) means that what might appear as simple feedback loops can produce exceedingly complex patterns of reaction, where each aspect of feedback has a compounding influence on the next. The notion of feedback, though it is not a particularly new idea, has gained importance in the understanding of nonlinear systems, and for developing insights into social phenomena.

Unlike nonliving systems (such as weather), within living systems a combination of negative and positive feedback cycles tend to balance and counterbalance one another—one familiar example is the economic boom and bust phenomenon (based on human activity), another is the fluctuation of animal population cycles. In both phenomena, though there are fluctuations within the system, over time the eventual pattern of a system returns to a kind of balance.

Within classrooms, similar processes can be observed. As a teacher I always thought it curious that when a particular child who was a strong leader in the group was absent, typically another child would step into this role, at least temporarily. As well, if the classroom system defines itself in a particular way (e.g. as a more challenging class, or a tightly cohesive group), particular efforts are required to change such patterns. Creating a classroom or school environment within a new structure (such as a newly formed classroom or a school which has just opened) is an easier task than shifting the patterns within an existing structure, where there are returning members of a group. The notion of self-organization, that particular systems develop their own patterns of order, is one central to shifting understandings of living systems, cognition, and even alternate conceptions of self-identity.

Chilean neuroscientists, Maturana and Varela (1987), describe self-organized systems as
having processes resembling cognition—such systems are interconnected, adaptive, and constantly changing in response to fluctuations within and among aspects of the system. Shifts and changes within systems or structures become evidence of learning through adaption. These events occur not in isolation, but in relation with other elements of the system. Reciprocal perturbations, or slight shifts in the system, trigger a kind of co-evolution, as other aspects of the system also change in a counter response.

Maturana and Varela (1987) propose that cognition be understood, “not as a representation of the world ‘out there,’ but rather as an ongoing bringing forth of a world through the process of living itself” (11). Classrooms, then, or schools, or businesses—any living system of organization—can be understood as emergent, cognitive entities, and cognition itself as ‘embodied’ (Lakoff and Johnson 1999), in contrast to Descartes’ notion that minds and bodies are entirely separate entities—a notion which schools and educational systems are often reluctant to abandon.

In the example of the school I have described, adaptions have taken place in response to an initial decision to begin the day differently, without automatic bells; the children and teachers “bring forth” (Maturana and Varela 1987) a different set of relations and structures in response to starting the morning in quiet play and conversation. Indeed, rituals such as the group singing before children set off for their classrooms spontaneously emerged in the early weeks after the school opening; the singing was never a planned-in-advance activity but one that simply happened one morning and has continued to evolve in more elaborate ways.

Very tiny acts, decisions, and structures have caused this school to emerge in a particular manner—it has developed as a system where institutional structures are not taken for granted or implemented without considering the possible effects and influences. The continued ‘feedback’ within this system, where days begin peacefully, calmly, and where children, their parents, and teachers are happy to be members of this community, has resulted in a strong school identity. This school is experienced as a safe space, where risks might be taken. The reverberating effects have also moved into the realm of pedagogy. As the principal of the school articulates (Dockendorf 2002), “It’s not about covering the curriculum here, it’s about uncovering it.” The living system of the school is recognized as having its own emergent forces in response to initial decisions.

The notion of emergence has been explored through computer science, urban studies, neuroscience, and evolutionary theory as well as other disparate fields (Johnson 2001). Emergence develops from the bottom up, when

…agents residing on one scale start producing behaviour that lies on one scale above them: ants create colonies; urbanites create neighbourhoods; simple pattern recognition software learns how to recommend new books. (18)

Or, in other words, an interconnected system of elements self-organizes to create a more complex, intelligent, and adaptive larger organism. As schools are formed in practice, which may be different from what is recognized in terms of more official hierarchical school organization procedures, emergent systems are created.

Within traditional models of schooling and school organization, however, the concept of emergence has been little recognized. Instead, schools and classrooms have tended to be represented and understood in linear and compartmentalized ways: as a teacher, one would likely be placed in a teaching position based on ‘seniority’ rules or district procedures and policy rather than a good fit with a particular school. The class down the hall is deemed to have little significance for other classrooms in the school; classroom teachers are generally expected to plan the year overview before meeting the students who will be occupying their classrooms. Who these students are should not matter in terms of covering curriculum goals. Additionally, the experiences and progress of an individual child should have no implications for the experiences and achievement of the children who will live for a year
alongside that child.

However, experienced educators know well that different schools, even within the same geographical boundaries, vary greatly, developing distinctly different ‘identities.’ They understand that every class they teach is unique, and that, as teachers, they can never be exactly the same instructor or use an identical set of plans successfully every year. Effective teachers adapt (and alter lesson planning) to the group being taught, and they know how one particular child in a classroom can profoundly effect the learning and experiences of the other children and alter the identity of the class (in both positive and negative ways). As well, the classroom down the hall may matter deeply, particularly when collective relationships within a school are formed.

Of course, the processes and products of pedagogy matter, too. A particular lesson that engages the class may open possibilities that shape the remainder of the school year. Specific, tiny differences become amplified within a system, and over time bring forth a different world of experience. The intricate, interconnected details within each of these systems—school, classroom, student body, individual child—matter deeply in terms of the life of pedagogy.

On the Importance of Little Details II
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Little Details as Subtle Influence

Complexity science, particularly within the realm of mathematics, has been interested in exploring nonlinear dynamical systems phenomena, often described as chaos. Although chaos implies disorder, mathematicians have used the tools of chaos theory to examine elaborate forms that have been, until recently, difficult to replicate or quantify. In the way that models and metaphors offered by Euclidean geometry have been strongly influential within education, it would seem that new understandings of how the world might be mapped, through complexity, might offer productive and important opportunities for teaching and learning.
As Davis and Sumara (2000) outline, many of the traditional structures for organizing schools and pedagogy reflect the lines, squares, and rectangles of Euclid's geometry. For example, mandated curricula are often presented as linear and sequential, with ‘boxes’ of skills to be acquired arranged in grids according to grade or subject area. Time is commonly shaped into ‘blocks’ and organized into ‘timetables,’ while student bodies are frequently arranged in various row and line formations. Davis and Sumara propose that, for most experiences of teaching and learning in schools, the “orderly boxes” and “tidy grids” (822) teachers are asked to create are inadequate to the task of guiding curriculum theory, planning, and development, that these shapes do not accurately map or represent the complex reality of teaching and learning.

The notion of subtle influence, arising from chaos theory, presents one idea that reflects an alternative metaphor for describing teaching and learning experiences, presenting patterns that are more fluid and recursive than Euclid’s shapes. Subtle influence, also known as ‘sensitive dependence on initial conditions,’ or the butterfly effect in more popular accounts, demonstrates how chaotic systems amplify tiny differences within themselves, often with profound results. Edward Lorenz, a meteorologist, discovered the butterfly effect when he decided to round off a calculation to three decimal places instead of the original six, as a shortcut in testing a computer model of weather systems. When Lorenz returned from a coffee break (the reason for his shortcut), he was surprised to discover that the two nearly identical runs of calculations diverged greatly. The tiny initial difference between the two sets of calculations soon became widely magnified with each feedback loop, or iteration. This experiment has often been likened to the flap of a butterfly’s wing causing an eventual tempest thousands of miles away (Cohen and Stewart 1994).

The butterfly effect, or notion of subtle influence, poses immense difficulties for reductionist science, since even very small-scale chaos creates an inability to predict exact outcomes. Chaos demonstrates that what might seem to be random, or ‘chaotic’ in the traditional sense, follows a kind of rich, creative, unpredictable order. Particular patterns emerge, over time, in response to small perturbations, or changes in the system (the flap of
a butterfly’s wing).

It is important to point out, however, that the emergent complexity that occurs in phenomena such as weather systems or the patterns that may be formed in riverbeds, while more complex than Euclidean forms, still lacks the adaptive potential typical of living systems involving dynamic organisms. Living systems such as ant colonies, neighbourhoods, classrooms, and the collection of neurons that make up the brain have additional qualities that must be acknowledged.

As complexity science theorist Mitchell Waldrop (1992) indicates, complex living systems have a particular ability to “bring order and chaos into a special kind of balance” often referred to as “the edge of chaos” (11-12). Unlike nonliving chaotic structures (weather systems and river beds), complex emergent systems have the ability to fine tune and influence their own futures, in effect, harnessing chaos (McCrone 1999, 70).

Living complex systems, such as those involving human beings, are often capable of awareness and responsive action. As educators we are able to attend to many aspects involved in situations of teaching and learning. Johnson (2001) suggests, too, that this possibility for social and self-awareness, “is clearly an emergent property of the brain’s neural networks” (204). The ‘bottom up’ nature of emergence, however, means that we are not aware of interactions at the level of individual neurons, or the massive amounts of information that neurons receive. Rather, the complex adaptive system of the human mind filters out much of the information we receive and creates a coherent sense of consciousness.

Recent studies in cognitive science have come to place increasing importance on what occurs in the background of awareness, outside of the range of conscious perception, providing a wealth of experimental data which demonstrate that much of human thought occurs at a level below our focal awareness, in spite of the brain’s attempts to deceive us into imagining that we are constantly aware of everything going on in our immediate surroundings (Nørretranders 1998; McCrone 1999; Lakoff and Johnson 1999). Our surroundings are deeply influential, though they may remain unremarked upon unless something specific draws our attention.

Of course, this will not be new to many teachers—in staff room discussions teachers sometimes note, with curiosity, the difference a stormy night has made to a teaching day, what happens when the classroom is too warm or too chilly, or whether several children in a class have not eaten breakfast…and so on. Children (and teachers) respond in subtle, and sometimes not-so-subtle ways to aspects of their surroundings that may remain, for the most part, outside of awareness. As a teacher, it may not be possible to control, or even be aware of, all such influences, especially those which children bring to the classroom, but attending to such details as important ‘feedback’ within the classroom system can help to transform a learning environment if particular pedagogical adjustments are made in response to emerging conditions.

For example, the morning after the ‘flap’ of a late night thunderstorm the classroom mood is one of tiredness and unease. The teacher (who was also awakened in the night, herself) must respond to the student ‘flaps’ of playground disagreements and a morning of lessons that seem less effective than usual. By recognizing the subtle effects of the late night storm, the teacher might salvage the day, perhaps deciding that the children would be better engaged in an open ended art activity in the afternoon, instead of her planned introduction to a new curriculum unit.

Western education has typically tended to focus upon the narrow tip of learning ‘consciousness,’ that of focused awareness, while generally ignoring the larger sea of perception in which we are constantly immersed. Often educators are primarily concerned with what can be conveyed to students overtly, disregarding the surrounding contexts and peripheries that efforts in cognitive science suggest are equally important for learning.
Perhaps in thinking carefully about the little details and considering the possibilities for the emergence of a complex learning system, as in the example of the school I describe earlier, educators might help to bring forth a world where children feel safe, comfortable, loved, and challenged. As Grumet (1995) suggests, what is often basic to education is what occurs “in the middle,” within the network of relations: “What is formal and abstract…becomes intertwined with a system of meanings tied to [the] child’s world” (21).

Piaget’s early work in biology also includes a trace of ideas indicating the importance of larger ecological contexts for adaption. In his study of molluscs, Piaget observed that shells “differed in shape according to their location in still or in running water…..But by transplanting some of the molluscs from one environment to the other, he discovered that the shape of their shells seemed not to be due to phylogenetic but rather to ontogenetic adaption” (in von Glasersfeld 1995, 58), or in other words, the shells changed in response to their immediate ecology. At the level of basic biology, it seems, living beings take in and respond to information from their immediate surroundings and co-emerge with this context.

However, in mandated documents or texts, curricula rarely recognize the significance of such background details, what we might call ‘learning ecology.’ Yet this is deeply important—human perception, language, and all meaningful knowledge emerges from and is co-specified by the details of context (Cohen and Stewart 1994). How a teacher (or administrator) influences, structures, and crafts aspects of this environment becomes significant, although complex systems such as classrooms also bring their own dynamics, including learners’ individual and collective intentions, responses and interactions. As Davis and Sumara (1997) note, teaching, when there is acknowledgment of how complex systems function, becomes more a matter of “occasioning” learning than “prescribing” it.

Conceptions of emergent or responsive educational environments and curriculum, such as those developed in early childhood education, offer a number of descriptions and models for how learning ecologies can be developed to respond to and emerge from learners’ interests, needs, and intentions, while also extending further learning challenges. One prominent example may be found in Italy’s Reggio Emilia schools (for a description, see Edwards, Gandini and Forman 1998). Reggio schools present a world-renowned model of what is possible when school environments and curricula are developed to be responsive to needs of present learners. These programs see environment, pedagogy, and pedagogical relationships as complexly intertwined and that these must all be founded upon similar principles, such as ‘community,’ ‘osmosis,’ or ‘multisensoriality’ (Ceppi and Zini, 1998). Such models are gaining increasing attention within North American education (see for example, Bruner 2000), and within early childhood settings, which are often less encumbered by the drive for increasing test scores and the need to meet district standards or initiatives (see Fraser 2000; Wien, Stacey, Keating, Rowlings and Cameron 2002).

Importance of Initial Decisions

As Lorenz’s experiments with weather systems demonstrated, beginnings are important. A decision to slightly alter one tiny aspect at the start of a calculation created a huge divergence in later results. The principle of subtle influence and the importance of initial decisions are also relevant to the complex systems of education. As teachers and administrators often note, the beginning of the year is a critical time. The system of the classroom, and the school, is often in a kind of flux as interrelationships between students are beginning to form: among students and one another; between teacher and students; between students and texts; students and learning content.

Although this part of the school year requires much effort from educators, a window of opportunity is also available, holding promise for how the year might eventually evolve. Tiny decisions, setting up this structure and not that one have the capacity for creating immense differences in the eventual dynamics of the classroom. This is a time when the shape of a classroom or school ecology can be most easily formed and shifted. Small,
critical decisions create increasing effects over time.  

As most children know, the first days of school are important ones—it is the time when their world at school becomes defined for the year, and is often the time when they are, too. Whether the year begins with disruption, discord, or boredom, or a sense of welcome, engagement and inclusion in a community, these things influence the particular tone that is developed. The system in which students are active participants begins to structure itself; modifying existing structures and patterns of interaction becomes more difficult as time passes. Teachers who begin working with a new class at a midpoint in the school year know well the challenges involved in setting up new routines, attempting to alter established patterns in social structure, and in shifting structures of teaching and learning. 

In the school discussed previously, the year also commenced with a week of workshops, activities, and community gatherings, events that focused on a curricular emphasis for the year. Community guests were invited to lead workshops and activities, and teachers were provided with an opportunity to briefly observe children in multi-aged family groupings before children were assigned to particular classrooms. Class configurations were developed with real individuals in mind and the possible collectives and relationships that might form were anticipated. Additionally, teachers were able to begin curricular planning based on some knowledge of the children who would be members of their classrooms, something that would have been difficult, otherwise, in a new school. 

Small, initial decisions are often important in relation to difficulties encountered in classrooms: for example, the repercussions of failing to respond to a child or adolescent who bullies another, ignoring racist and homophobic language, or not noticing a child who has been struggling with a concept or task to an extreme level of frustration. Larger, systemic problems often hinge on the tiny details. 

In Maturana and Varela’s (1987) complex ecological perspective on learning, the elements of a system evolve in relation to one another in a process of what they name *structural coupling*, where change in one aspect of the system elicits reciprocal changes elsewhere. A learner, as part of a larger collective, reacts, adapts, and continues to engage in a complex process of response and change. Small changes in one aspect of a classroom may often evoke reciprocal changes within the larger system as a whole. The knowledge of such processes, then, might be harnessed to diminish changes that are undesired or will lead to harm within the system and, as well, to encourage shifts that will help to establish a robust academic community. 

**Collective Details** 

Complexity science, with its recognition that complex systems are composed of webs of interconnection, would also suggest the need to view learning as a collective process rather than solely an individual one. Of course, this presents a challenge to many conventional structures and approaches to curriculum where learners are often encouraged to remain separate and apart, where individual products are valued over shared projects, and the ranking and sorting of individual student ability are the expected and required practices of schooling. As much as cooperative learning and collaboration have been recent catch phrases in education, learning is still primarily regarded as an individual matter, occurring separately and discretely, as knowledge is transmitted from teacher to learner. 

In perspectives closely aligned with complexity, Lave and Wenger (1991) relate that learning occurs within a “community of practice,” and that knowing occurs in a social world, located within the complex relations and interconnections among participants, practices, and “the artifacts of that practice” (122). Learning is viewed as a process of participation within communities of practice, often beginning with peripheral involvement and increasing in complexity and engagement, as an evolving and emergent form of membership occurs within the community. Within emergent systems, “global wisdom” often results from “local information” (Johnson 2001). Interactions between ‘neighbours’
within a system create opportunities for further problem-solving and the development of new ideas or products of learning.

Learning, then, does not occur with transmission of knowledge from teacher to student, but resides within the structure and relations of the community, of which the teacher is also a part. As Johnson (2001) outlines in his examination of emergent complex systems, it is important to “Pay attention to your neighbours” (79). In this way, learning can be understood more complexly, and collectively, as emerging within and among the relations of a self-organizing system. As Grumet (1993) writes, “No one knows alone”: knowing and learning are collective endeavours, processes that occur within the context of relation.

Tiny things matter

Mary Catherine Bateson (1994), anthropologist and writer, comments:

Learning is the fundamental pattern of human adaption, but mostly it occurs before or after or in the interstices of schooling. (197)

The complexity sciences and a deeper knowledge of emergent phenomena might help us to notice the unobserved sites of learning to which Bateson refers. Perhaps too, the “crisis of perception” (Capra 1996) which exists within modern frames of schooling might lead to a reconsideration of the models and metaphors through which educators perceive and structure educational experience.

If the significance of the little details is recognized in teaching and learning, the small things that occur alongside, before, after, and in-between learning and teaching will also begin to matter. Pedagogy does not exist as separate from the details of the life of schools, classrooms, and the students to whom it is directed. Rather than the traditional maps of schooling that tell students who and where they are, the maps offered by complexity science hint at an unruly terrain and the possibilities that reside within such terra incognita.

Such new maps not only provide possibilities for understanding pedagogy differently, they also might offer (like all good maps) the opportunity for new journeys in future events of teaching and learning and for changing the routes that might be taken to find our way there.

To conclude, I return to the story I presented at the beginning, the anecdote of the rearrangement and adaption of the spaces in my home. Small changes and redecoration attended to the interrelationships within this environment, enabling the development of complex, interconnected systems of organization to emerge. In a sense, such shifts are not unlike what may occur within pedagogy, when intentional small changes and subtle influences occur.

It is interesting to note the reverberation of other small changes subsequent to my friend’s efforts at improving my home design. I’ve entertained guests more frequently, acquired two dogs (who have also influenced home decoration), and continue to work on further decorating projects. The tiny acts involved in rearranging and adapting my environment have inspired additional changes. Though such actions and events were not directly caused by the redecorating in a linear way, the small changes (having a more comfortable and aesthetically pleasing environment for entertaining, and for staying at home) provided a necessary shift, a slight perturbation, which has led to other changes. Not unlike the flap of that butterfly’s wing.

The tiny things matter. In homes. And in schools.

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**Endnotes**

[1] Unfortunately, things have not changed very much As a university instructor of pre-service teachers, I continue to encounter many such examples.

[2] Johnson (2001) provides numerous examples of current practices and businesses have used principles of emergence, including the Internet and the ways in which corporations such as IBM have been reorganizing.

[3] At a recent American educational conference I attended, this legislation was also described as, “No Child Left Untested” and “No Teacher Left Standing.”

**About the Author**

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