Chapter 3
A Batesonian Perspective on Qualitative Research and Complex Human Systems

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Introduction

For years, we have been discussing how educational research in the complexity sciences is distinctive from other research, if it is at all. We need to continue this conversation to which I hope that this chapter will contribute. What we are talking about is an emerging paradigm of complexity (see Glossary) in education. However, in order to establish such a paradigm we need to look critically at the underlying assumptions of contemporary research approaches and of the research we have been doing and are planning to do. This chapter begins with an exploration of these three ideas of paradigms, assumptions, and complexity. The remaining parts of the chapter delve into the implications for how we might view and conduct complexity research (See Glossary for further explanation). The major emphasis throughout is on the work and ideas of Gregory Bateson.

The complexity sciences have roots in the early work on cybernetics and systems theories (Capra, 1996). Much of the development of cybernetics took place at the Macy Conferences, which occurred from 1946 to 1960. Gregory Bateson, Norbert Wiener, Heinz von Forester, Margaret Mead, George Evelyn Hutchinson, Warren McCulloch, and Kurt Lewin among many others were key participants in these conferences. These rather informal gatherings of some heavy hitting intellectuals from a variety of fields initially grappled with ideas that danced around the notion of cybernetics, including communication, learning, neural networks, teleological mechanisms, computers, neurophysiology, analog vs. digital brain functions, perception, etc. (a nice summary can be found at http://www.asc-cybernetics.org/foundations/history/MacySummary.htm). The first conference was entitled, "Feedback Mechanisms and Circular Causal Systems in Biological and Social Systems." As the conferences proceeded, they became more focused and formalized, but in the

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early days there were few records of what took place. Mary Catherine Bateson's (1972/2005) account of a later Macy Conference is quite illuminating in terms of the content discussed and the interpersonal dynamics. But what was unusual was the interdisciplinary makeup of the membership, which changed each year. The first year was composed of people with expertise in mathematics, physics, neurophysiology, medicine/physiology, anthropology, behavior, economics, psychology, psychiatry, philosophy, and sociology. The list of areas of expertise expanded each year. Overall, the Macy Conferences established cybernetics as at least a field of study, which in turn led to the development of the fields of systems and complex systems (Capra, 1996), as well as much of the current work in computers, artificial intelligence, information systems, and so forth.

Although Bateson and the others pursued their own intellectual agendas and wrote extensively, many of the ideas in the present chapter were more than likely discussed in depth by others in the group. Distinguishing the origins of these ideas may often be difficult, if not impossible. However, the emphasis in this chapter is on the ideas expressed by Gregory Bateson and his impact as I see it on how we might approach research from within a complexity sciences framework. Briefly, the major components of Bateson's work that I discuss in this chapter and that comprise a "Batesonian approach" include: (a) his emphasis on *nonlinear* ("nonlineal") patterns of causation, (b) not *confusing quantification and measurement* with what should be described, (c) primacy of *relationship* (see Glossary) over separation into entities and parts, (d) not confusing the *map* (an abstraction) for the *territory* (reality), (e) *epistemology* (see Glossary) as personal and social constructs, (f) *change* as a given, (g) the importance of *double description* and *multiple perspectives*, and (h) the critical importance of *context* for any kind of meaning.

Clash of Paradigms and Conflicting Assumptions

Those of us who are engaged in the complexity sciences face a number of challenges from those involved in establishing a new and emerging paradigm to those involving the baggage carried over from the dominant paradigms of the past few centuries. Among the top challenges are the ways in which we deal with the conflicting assumptions between complexity and positivism (including reductionist and mechanist assumptions). We certainly seem to be in the throes of a scientific revolution. As our particular field of complexity sciences in education and the social sciences continues to grow and develop towards an established paradigm, we need to pay close attention to what we do and how we do it, including how we think about the complexity sciences as a paradigm and the concomitant views, assumptions, and practices.

The notion of paradigm in this chapter can be situated within Kuhn's redefined concept of "paradigm." From an operational perspective he described the importance of paradigm in the following way:

> Without commitment to a paradigm there can be no science. . . the study of paradigms is what prepares a student for membership in a particular scientific community. Men whose research is based on shared paradigms are committed to the same rules and standards for scientific practice. That commitment and the apparent consensus it produces are prerequisites for normal science, i.e., for the genesis and continuation of a particular research tradition. . . .scientific revolutions are inaugurated by a growing sense that an existing paradigm has ceased to function adequately in the exploration of an aspect of nature (Kuhn, 1970, p. 11).

However, an expanded understanding of paradigm seems to include the following aspects that paradigms:

- Involve a **worldview** (see Glossary) (Cobern, 1991; Pepper, 1970) or set of reasonably compatible worldviews, including the values and assumptions associated with these worldviews. Some may argue that worldviews may be more fundamental to human experience than paradigms, which is likely true. However, for the present treatment of paradigms, the association of paradigms to worldviews may be useful for developing a feel for the interconnections and nature of the effects of paradigms.
- Involve a set of **theoretical and conceptual frameworks** (see Glossary) that comprise the particular domain of interest and inquiry.
- Are usually associated with one or more compatible **philosophical frameworks** (see Glossary).
- Involve **research methodologies** (see Glossary) that comprise the array of inquiry tools used within the paradigm, which also are consistent with the worldview(s) and theoretical frameworks.
- Involve the **practices and discourses** (see Glossary) characteristic of the particular paradigm.

Even with these descriptions and characteristics, the notion of paradigm is still quite slippery. Is "positivism" a paradigm? Is "feminist studies" a paradigm? Although various people may refer to both of these ideas (i.e., positivism and feminist studies) as paradigms, they are not equivalent. These two questions point to two different logical levels or types (Bateson, 1972/2000, 1979/2002, 1991; Bateson & Bateson, 1987/2005; Bateson, M. C., 1972/2005; Copi, 1971/2011; Korzybski, 1948/2010) or categories of thinking—acting (I am suggesting "Thinking—Acting" as a way of capturing the everyday aspect of paradigms in terms of how and what you think, and how you act and talk within your particular professional community.) Positivism is a higher level of categorization under which other ways of thinking—acting appear, such as behaviorism. And there are yet other ways of thinking—acting that appear at lower levels of categorization, such as classroom management.

A more useful way of discussing paradigms may involve a notion of levels of categorization, such as super-paradigms, paradigms, sub-paradigms, and even sub-sub-paradigms. Positivism seems to be at the level of super-paradigm in that it spans and includes many other more specific ways of thinking—acting that not only occur in research domains, but also occur across societies and cultures. At the

same time, "behaviorism" may occur at the level of paradigm. Behaviorism falls within positivism, but also includes other more specific ways of thinking—acting, such as "classroom management," which may be a sub-paradigm. I am not sure that we can solidify such categorization schemes as absolute. The process of such categorization is more like a process of pattern thinking, where the utility of the categorization or pattern is in the justification or rationale for the categorization in the context or contexts (see Glossary) in which one is working. This approach to thinking about paradigms is still slippery, but the slippery-ness is acknowledged and addressed upfront. Typically, from our positivist heritage we want one right answer and one right way of doing things, which was the ultimate of Descartes' view of the world and of a Newtonian approach to science. However, even our notion of "paradigm" cannot fit nicely into a packaged definition. By "slippery," I am referring to the exceptions, the changeability, the hybridizing, the expanding, and the contracting of what we may think of "paradigms." We just need to take care in describing our paradigmatic orientations in ways that promote cohesiveness and consistency.

From the perspective of research, a careful alignment with a specific paradigm or set of compatible paradigms can provide a framework of consistency and cohesiveness. A significant danger arises when research or any sort of thinking involves conflicting paradigms. For instance, a teacher may be trying to deal with a situation involving a student's behavior in the classroom. A teacher considers herself a humanist, who values the cognitive and emotional aspects of her students. She encounters fundamental conflicts when she tries to address the problem using prescribed behaviorist approaches that do not take cognition and emotions into consideration and only use simplistic stimulus—response approaches to classroom management. Using such conflicting paradigms creates confusion for both the student and the teacher and may undermine the teacher's overall goals for student identity, relationships, and self-efficacy.

Since this chapter focuses on Batesonian and complexitivist implications for research, the primary paradigmatic conflicts involve those that undermine the emerging paradigm of complex systems. The paradigms (including super-, basic, and sub-paradigms) that seem to be particularly contradictory to complex systems are positivism, mechanism, reductionism, behaviorism, among many others. One of the major problems we face in our society and in research is that we live in a world that is deeply entrenched in positivism, mechanism, and reductionism. The underlying assumptions of almost everything we do and say have been molded by centuries of positivistic patterns. These underlying assumptions are so insidious that they work themselves into the way we think about complexity and complex systems. As a result, we risk creating further confusion and misconceptions and promoting views and approaches that undermine actions that can solve some of the major threats to schooling and to the very survival of humanity. I need to insert here that I do not view this situation of conflicting paradigms and conflicting assumptions as merely an academic exercise. In fact, I view these conflicts and their remediation as critical to understanding and addressing the major issues we face

in and across multiple contexts and across scales from the individual to all of humanity and from the molecular to the biosphere.

The following list describes some of the more common conflicting paradigmatic assumptions that we encounter in research and society. In this list of binaries of conflicting assumptions, the ideas on the left side tend to be characteristic of positivism, mechanism, and reductionism. The ideas on the right side of the "vs." tend to be characteristic of complexity, complex systems, and Batesonian approaches.

- **Quantification and Measurement vs. Description.**
  We tend to try to quantify "things" that have no quantity, such as learning, behavior, and teaching abilities. The same issue applies to "measuring things" that have no dimensions, which include intelligence, learning, etc. Bateson (1979/2002, 1981, 1991) refers to such issues as epistemological errors, where such errors confuse quantity for quality and pattern. When I have brought up this issue of not being able to quantify or measure learning with a variety of different people, the responses range from looks of perplexity to angry refutations. The confusion is so deeply embedded that we cannot conceive of any alternative. Some people respond with, "so, how do we assess kids' learning?" But, more often than not, people stumble over what words to use instead of "measure." We do not value *description* as a meaningful and legitimate means of understanding learning or any other phenomenon.
- **Predictability vs. Unpredictability.**
  Maybe the focus on predictability is embedded in a primal desire for certainty, but predictability with any certainty only occurs in simple physical systems, such as objects colliding, planetary motion, and so forth. From the terms coined by Carl Jung, Bateson (1979/2002, 1991; Bateson & Bateson, 1987/2005) suggested that the nonliving world of *pleroma* is predictable and governed by linear cause and effect relationships. However, the living world of *cretura* is unpredictable and governed by multiple, nonlinear feedback loops and complex interrelationships with multiple interconnected causal factors. Descartes' and Newton's mechanical view of the world has perpetuated our desire to apply mechanistic predictability to all kinds of phenomena within living and ecological systems.
- **Complicated vs. Complex.**
  Complexity involves multiple interacting systems that perpetuate themselves through various nonlinear processes. In complex systems, the multiple interconnected processes cannot be explained separately from everything else. There are no separate parts. In fact, complex systems are generally interconnected with other complex systems. So a bear is a complex system, but cannot be understood separately from the forest (another complex system) in which it lives. A living organism, an ecosystem, the biosphere, and cognition—learning are all interrelated complex systems. However, we often describe events or objects as complex, when what we actually mean is that they are

complicated. A car is complicated, but not complex. An assessment approach may be complicated, but is not complex.

- **The Thing vs. Sets of Relationships.**

  Almost all educational research and pedagogy focus on "things" as separate entities and as extensions of Cartesian duality. Mind is separate from body. Children learn about a tree as a distinct object made of parts. We examine a teacher as an individual. We isolate "best practices" as distinctive and separate from context. From the perspectives of Bateson and complexity sciences, "things" as separate entities do not exist. Rather, everything is composed of sets of relationships, both within the thing itself, between the thing and context, and between things. Our tendency in research is to focus on things and not on the relationships. We look at the teacher and the role of the teacher, but do not look at the teacher within the contexts of classrooms, schools, communities, and so forth. When we focus on the role of the teacher, we exclude that role within the sets of roles of children, parents, and principals. As Bateson (Bateson, N., 2011) suggested, when we look at the role of someone, we are looking at a "half-assed" relationship. We do not look at classroom events, teacher thinking and practice, or children's behavior and thinking, as sets of relationships within various overlapping contexts. In relating with students, rather than look at them as separate entities and label them with some sort of judgment, I have tried to look at them as bundles of relationships. What kinds of experiences have students had that made them who they are? What could account for this or that kind of attitude, behavioral characteristic, and so on? Such a process changed the way I saw and related to my students, but I still had to fight the tendency to judge. When teaching about some sort of content, I tried to take the same approach by emphasizing the interrelationships involved. If students were observing earthworms, at some point we would talk about gardens, similarities to ourselves, birds, soil, ecologies of forests and fields, foods, anatomy, behavior, sex, communication, beauty, and so forth. The relationships make up the contexts in which the meanings are embedded.

- **Objectivity vs. Subjectivity.**

  The positivistic notion of objectivity is generally dismissed among qualitative researchers, but the influence of this faulty assumption still affects how we conduct research. At very subtle levels, we take observational notes as if we were objective observers. Within this process, we rarely record our emotional reactions and explicit theoretical or belief reactions. We also rarely pay attention to how our presence in a classroom, school, or other context affects the dynamics of the setting and those individuals in this setting. A significant number of books and papers address concerns of validity and reliability. The qualitative versions of credibility, dependability, confirmability, and transferability (Lincoln & Guba, 1985) are utilized as if they are the equivalent of the positivist notions of validity and reliability. Qualitative researchers feel driven to take defensive postures against the predominant positivist paradigm by showing how their research is legitimate in ways that are understandable to positivist researchers. This position does not dismiss the value of credibility, dependability,

confirmability, and transferability. Rather, I am suggesting here that our motivation to justify our work with these ideas is driven by more subtle drives to achieve recognition in positivist circles. As a Batesonian complexitivist (for the lack of a better descriptor), I do not dismiss positivism. It is useful in some contexts, such as some kinds of engineering. But I do not think it is at all useful in the social sciences and education, where we are dealing with living systems that are inherently complex and should be studied from that perspective.

- **Whole as Sum of Parts vs. Whole as Greater than Sum of Parts.**

  Reductionism contends that if we understand all of the parts, we can understand the whole. A Batesonian or complexitivist contends that wholes are much bigger than the sum of their parts. However, complexitivists often avoid looking at the parts and criticize anyone who looks at the parts. Such actions or reactions are problematic. The problem does not lie in the parts, but in thinking that the parts will lead to a complete understanding of the whole. Looking at the parts is necessary. However, a recursive process should involve zooming in to the depths of the parts, then zooming out to the whole, then back to the parts and so on (Bateson, 1972/2000, 1979/2002, 1991; Bateson, M. C., 1972/2005; Bateson, N., 2011).

- **Map vs. Territory.**

  Gregory Bateson (Bateson, 1979/2002) focused heavily upon Alfred Korzybski's (1933/1994) notion of "the map is not the territory" or that one's concepts and conceptual models are not the same as the objects or phenomena to which they refer. "Naming is always classifying, and mapping is essentially the same as naming" (Bateson, 1979/2002, p. 27). From Bateson's perspective, confusing the map for the territory is another fundamental epistemological error. In research, such error potentialities menacingly loom over every part of the process. As we construct explanations from observations, we may begin to believe that our explanations are the reality, rather than our interpretations of reality. Our explanations may be projections of our own theoretical and belief frameworks, which may not reflect the actually reality. A "map" is any level of abstraction, any representation, and is not the actual thing (Korzybski, 1948/2010). The Cartesian view of the natural world as a giant machine is a classic example of confusing the map (machine or mechanistic view) for the territory (natural, biological/ecological world). People actually thought the natural world worked like a machine. In fact, people still think this way.

- **Linearity** (see Glossary) **vs. Nonlinearity and Lineality** (see Glossary) **vs. Recursion (and Process—Outcome).**

  Bateson made a point of distinguishing between linear and lineal, although at present the notion of "lineal thinking" seems to have been appropriated by "linear thinking." Bateson distinguished between these two terms where "linear" is a mathematical relationship resulting in a straight line or a graph and "lineal" refers to sequential relations among causes or within an argument. "The opposite of linear is *non-linear*. The opposite of lineal is *recursive*" (Bateson, 1979/2002, p. 212). As Bateson contended, "lineal thinking will always generate either the teleological fallacy (that end determines process) or the myth of some supernatural controlling agency" (p. 56). Again, the lineal and positivistic—mechanistic

tendency is to assign a singular cause to a particular effect. From the perspective of complexity and recursive thinking, when we see a particular effect, we may consider that the effect is due to the interaction of many different factors, relationships, and contexts. In addition, such recursive thinking places greater emphasis on process than on the end product and sees that there are a variety of possible end products for any given process (Weinberg, 1975/2001). Much of educational thinking ascribes causes for particular issues and problems. Teachers are blamed for low student test scores. Lack of "time-on-task" is a cause of low learning outcomes. Children's lack of respect for teachers is the cause of classroom behavior problems. These types of linear cause and effect relationships are prevalent in both the popular and research literature in education, as well as in political speech and media reports.

- **Rigidity and Stasis vs. Variation and Change.**

  Both rigidity and stasis, as well as stability, often describe the state of some "thing", object, entity, or process. Once again, such notions contain epistemological errors. Even some seemingly rigid object or stable process is undergoing continual change. One of Bateson's (1979/2002) favorite examples, is the tight rope walker who is continually adjusting body and balancing pole positions in order to maintain balance. What may appear as stable, static, or rigid is actually undergoing continual change. Bateson (1979/2002) emphasized the importance of random variation and change as the characteristic of what he called the two great stochastic processes: (a) learning and (b) evolution. In contemporary practices, approaches to learning are rigidified, sequentialized, and controlled to the point where any random variation is excluded. In research, the methods of data collection and interpretation tend to disregard the importance of random variation by viewing and presenting events as stable and invariable. We make "conclusions" that this is the way it happened and this is what happened. We do not suggest that all kinds of variation and random events occurred and may occur. Rarely do we suggest that there were patterns in the way random occurrences and variation were handled or not handled.

- **Single Description vs. Double or Multiple Description or Multiple Perspectives.**

  Research commonly utilizes single vision. We examine particular phenomena from a single perspective. Within qualitative research, even the notion of "triangulation," which appears to address the issue of multiple perspectives, is still situated within a singular perspective. One set of triangulated data may include observations from the researcher, commentaries from subjects, and a variety of artifacts. Although these three sets of data provide information from different sources, they tend to be interpreted from a single conceptual or theoretical perspective. Such an approach is certainly useful, but a truly double or multiple description is most likely absent. One of Bateson's examples of double description involves relationships. Each component of a relationship describes that relationship. These descriptions are not the same, but they both describe and establish the relationship from different perspectives (Bateson & Bateson, 1987/2005). Our challenge as researchers is to find and elucidate these

double or multiple descriptions. We also need to both describe "something" from our own epistemological frameworks and assumptions and describe the same "something" from one or more other epistemological frameworks and assumptions, in the same way Gregory and Catherine Bateson (1987/2005) wrote *Angels Fear* from theistic and nontheistic perspectives. The taking of multiple perspectives—from the arts, natural sciences, social sciences, philosophy… or from one's own perspectives as well as the perspectives of widely different people, societies, cultures—can provide possibilities for approaching some sense of bringing the map closer to the territory. Such approaches are powerful versions of transdisciplinarity (see Glossary) and transcontextuality (see Glossary). They play with contradictory assumptions and conflicting views in ways that prevent being trapped by those very assumptions and views, while allowing glimpses of accuracy and truth to emerge. In fact, such approaches provide the ability to see, describe, and utilize what Bateson (1979/2002) calls *metapatterns* (see Glossary) or patterns which connect: "It is that metapattern which defines the vast generalization…" (p. 10). These patterns are what we are trying to expose and understand through research. However, the fragmentation from specialization and the mechanization of our thinking has led us away from transdisciplinary inquiries and robust contextuality (Montouri, 2005).

- **Disconnected vs. Contextualized.**

> Without context, words and actions have no meaning at all. This is true not only of human communication in words but also of all communication whatsoever, of all mental process, of all mind, including that which tells the sea anemone how to grow and the amoeba what he should do next (Bateson, 1979/2002, p. 14).

The word "context" is used frequently, but is rarely defined and probably has as many meanings as people using the word. Context can be referred to as a physical setting, as a social or cultural setting or framework, as a period of time, as social interaction, and so forth. Bateson (1979/2002) suggested that context is "pattern through time" (p. 13). But he also suggested that context is connected to the notion of story, and that contexts can be temporal, spatial, and formal. Formal contexts are those that focus on the sets of relations or patterns that underlie the particular phenomenon. A simplistic example that Bateson (1979/2002) liked to use was that of the trunk of an elephant. The trunk's location between the eyes designates a nose from the perspective of a spatial context. The function of the trunk as a nose for breathing relates to a temporal context. And the embryological history of the tissues of the nose relate to the formal context of ontological relations. The idea here is that the use of context, in fact, the use of multiple contexts, is necessary in providing a depth and extensiveness of meaning, which is generally rather thin in much research.

There are other conflicting assumptions, but this list comprises some of the more common assumptions that impact research practices. In general, the positivist, mechanist, and reductionist assumptions tend to insidiously work their way into our thinking and practices. Although we may align ourselves with subjectivity and decry objectivity, we still may operate under the influence of objectivism. We write as if we are taking an objective perspective. We design a study to address the suppositions of objective research. We discuss causation as if there is one cause for a specific effect. The effects of these assumptions can be subtle. They almost seem to operate like Andy diSessa's (1993) "phenomenological primitives." By "phenomenological" diSessa means that these understandings are based on our everyday experiences, such as seeing the moon rise in the east and set in the west. And they are "primitive" in that they do not necessarily operate at a conscious level. They can be so deeply embedded that they come into play automatically. So such a "p-prim" could result in a highly resistant to change notion that the moon moves around the Earth from east to west, just the way it appears to move. So many of our assumptions seem to operate in a similar way to these p-prims. They seem to be self-evident truths. However, the danger is that the effects of such assumptions can compromise or threaten the accuracy, depth or robustness, and usefulness of our understandings. We may place emphasis on the end product of some process (such as test results), while from a systems framework the product is not nearly as important as the process (such as the learning experiences) (Weinberg, 1975/2001). While emphasizing test results, rather than learning experiences, we also fall into thinking that we can quantify or measure learning, which is inherently immeasurable. As a result, we have created what Bateson (1972/2000) called an epistemological error or "muddle."

Systems Thinking and Complex Systems

Not all systems are equivalent. There are simple and complicated mechanical systems, such as bicycles, automobiles, planes, and planetary systems. Such systems operate according to specific physical laws and principles and are predictable. In contrast, ecological, biological, and social systems operate in different ways. Even though physical laws and principles continue to operate in such living systems, much more complex sets of interrelationships are at play. These sets of interrelationships operate in complex recursive pathways that help to maintain the systems of which they are a part. The processes involved in such self-maintaining systems are referred to as autopoiesis (see Glossary). This concept of self-maintaining, self-regulating, self-generating, and self-transcending systems are the defining features of "complex systems".

The kind of thinking required for investigating and understanding simple and complicated systems can be referred to as mechanistic thinking. We can think about simple cause and effect relationships, linear processes, and predictability. On the other hand, if we wish to understand ecological, biological, and social systems, we

need to think in more complex ways. When I conceive of "systems thinking", I am focusing on ways of thinking about complex systems. Such systems thinking has to focus on trying to understand the complex relationships and recursive processes. The following list highlights the primary foci of systems thinking:

- Nature and interactions of multiple interacting systems (not just how *one* system works).
- Relationships between parts and (a) processes, (b) wholes, and (c) other parts.
- Relationships between processes.
- Multiple perspectives of systems and processes.
- Contexts within which multiple systems operate and upon which the systems affect.
- Nature and dynamics of relationships.
- Patterns within and among the systems and their component parts.
- Function and nature of feedback loops and other nonlinear processes in terms of the flow of information and/or materials and in terms of their functions in regulation, adaptation, maintenance, and so forth.
- Nature of transformation and other change processes.
- Relevance and usefulness of processes and systems (Bateson, 1979/2002; Checkland, 1985; Daellenbachand & Petty, 2000; Paucar-Caceres & Pagano, 2009; Roberts, 1978; Ulrich, 2003; Weinberg, 1975/2001; Werhane, 2002).

These particular foci (and very likely additional foci) describe a different way of conceiving of research in education. Rather than looking at linear cause and effect relationships and at outcomes of various treatments, such foci can help us put more emphasis on the processes that affect other processes, etc. We can examine how the unique characteristics of a teacher affect the processes of her teaching and how these processes affect multiple other processes of student learning, thinking, talking, interacting, and so on. We can examine how educational systems affect teacher thinking, teacher practices, student learning, etc. Rather than focusing on rather simplistic relations and processes, we can begin to expand our vision to include the multiple interactive, interdependent, and interrelated systems that comprise children's learning, thinking, and psychological development and well-being; teachers' learning, thinking, practices, and psychological well-being; classroom and school community development and maintenance; parental participation and learning; local community functioning; and local and national political functioning. The extent of interrelatedness extends across contexts and levels of scale. Without recognition of such interrelations, we limit the relevance, meaning, and potential impacts of our research.

Research as and About Complex Systems

We, as human beings, are complex systems. We establish various scales of complex social systems. And we live within and affect complex ecological systems. Consequently, our approaches to research should be consistent with the nature of complex systems. In fact, our research is a complex system. The way we think and make sense of our world is a complex system. Our thinking and our research can serve to perpetuate and maintain our individual and social lives. We can adapt to emergent situations and changing conditions. We can refine and adjust the ways we live so that we can live in ways that are more in tune with the environments in which we live, which, by the way, has not happened with the reductionist, mechanistic, and positivistic research approaches of the last few centuries. In fact, although reductionist, mechanistic, and positivistic research has led to incredible scientific and technological advances, such research approaches have created the life-threatening crises we are now facing, including over-population, global warming, peak resources, and so forth. Our involvement with social contexts of learning, teaching, and education is no longer isolated and only relevant to specific contexts of schooling. Our work as educators and researchers must address the fundamental issues of our cultural and social survival, not to mention our survival as a species. Our work can no longer be an academic pastime. And we certainly should not perpetuate the assumptions and suppositions that have brought us to the brink of social and ecological collapse. As Gregory Bateson suggested, "the major problems in the world are the result of the difference between how nature works and the way people think" (Bateson, N., 2011). We have reached a critical point where we have to take Bateson's point seriously and change the way we think about research, learning, thinking, teaching, society, ecology, etc., and the way we do research.

Several years ago, Tyler Volk and I developed a model of research (which also can be applied to learning and teaching) based on Bateson's ideas (Bloom & Volk, 2007, 2012). There are three basic aspects to this model: (a) depth, (b) abstraction, and (c) extent or abduction (see Glossary). These three aspects interact recursively in ways that encapsulate the ideas that have been discussed thus far in this chapter. "Depth" involves examining the intricacies of the relationships, patterns, and processes within any particular system or sets of systems. "Abstraction" involves creating explanatory models or frameworks, the "maps" that describe the territory, and examinations of one's own and others' epistemologies. "Extent" or "abduction" refers to the processes of using and testing the concepts from "depth" and "abstraction" in other contexts. These contexts can involve levels of scale and contexts across various differences. For example, we may have examined teacher thinking from within a working group of teachers and have found certain areas of concern and how these areas are interrelated in various ways. Throughout this process we may have constructed various models of how these concerns can be explained by generalized patterns of relationship. And, concurrently, we may test out how these patterns of relationship and models seem to explain phenomena at various levels of schooling, from classrooms to schools to districts to states to the national institution

of schooling. We also may find that these patterns of relationships and models explain phenomena in other contexts, such as businesses, organizations, and state and national political groups.

A Batesonian approach to research is in marked contrast to approaches that rely on false notions of objectivity with narrow foci and highly sequential series of predetermined steps. In addition, the typical separation of mind–body, self–other, or self–context and the separation of systems as distinct do not exist in a Batesonian approach. The entire approach can be seen as one that is rigorous (*note*: I use "rigorous" with great trepidation, since it implies a certain stiffness or rigidity, which is not descriptive of a Batesonian approach), yet relies on the complex knots of interrelated human propensities, such as rationality, emotion, aesthetics, perceptions, and belief frameworks (a "contexts of meaning" approach—Bloom, 1990, 1992) to provide multiple perspectives of the interactions between parts and wholes and between various wholes (systems) (Bateson, 1972/2000, 1979/2002, 1991).

Getting Past the Limitations of "The Researcher" and "The Research" as Separate and Special

The tendency over the past few centuries has been to make research and researcher appear to be inaccessible to the general population. Technical jargon among many other aspects of technical disciplines has created barriers to understanding. In school and in the media, we have represented science and other research oriented disciplines as something for particularly smart people and not for the general public. However, research as a way of using one's observations to create explanations and knowledge is a characteristic of being human. Of course, not all research is equivalent, but the processes of exploring, examining, questioning, abstracting, abducting, and so forth are common characteristics of research. We can refine these processes and the ways we think about these processes and the data we collect, but the fundamental approach is shared among people of all ages. Some groups may devalue or suppress these natural research processes, but, nonetheless, we use these processes from the time we are born.

The other major assumption that is problematic is this notion of research occurring in a specific location and during a discrete period of time. We assume that we do research in a lab or in some other setting, such as a classroom or school and that the research stops when we leave or when we are not analyzing data. However, if we consider that research is a natural propensity and that we do not turn on and turn off our brains, we begin to realize that research is occurring throughout a day, a week, a year, or for that matter our entire lives. Gregory Bateson did not turn off his research, then turn it back on again. He thought about these ideas throughout his days and throughout his life. All of his experiences became his laboratory. We can find many other scholars who operated in this way. The idea that we have to have approval from some human subjects committee to engage in research is very strange indeed.

How can we not observe others and our environments and utilize what we see and our insights in our continually developing explanatory frameworks? We teach about and represent research as some technical and mechanistic enterprise. Many people operate in this way. In such cases, there is a basic disconnect between ourselves as learning beings and the activities from which we learn. Experts talk about their research as if it is some external "thing" that has no connection to themselves, the way they think, and the way anything else works.

Research as a complex system is integrated into our own complex systems of living and learning. Research about complex systems is relevant and meaningful research that focuses on our biological, ecological, personal, social, and/or cultural contexts. Yet people are stuck in seeing the world through mechanistic, reductionist, and positivistic lenses. They see no other possibility. In a recent online conversation, I commented about the complex issues around a new technological development in solar panels. I posed questions about the multiple contexts that are not addressed, such as (a) shortages of resources that will be needed to produce and replace the technology on a regular basis, (b) energy costs, (c) net energy effects, (d) wear and tear, and (e) financial costs. People's responses ignored these complex issues. For them, technology was the answer and we'll find technological answers. Such lineal thinking is short-sighted and ignores the connections between various systems that are involved. And, by the way, if you missed it, this last snippet of an everyday event is an example of how our research as a way of living cannot ignore the events we experience throughout our lives.

We need to "flip," transform, or transmute our thinking about research. We need to move from a view of research as separate from our everyday lives, as exclusive to an elite group, as a mechanistic process, and as a lineal process. Research needs to span multiple contexts and disciplines and pay close attention to networks of relationships. And we all need to work at making the results of our research widely available to the general public. The media and politicians are not communicating accurate or relevant information, so we need to make that effort to help establish an informed public about issues in education and beyond.

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