Chapter 20

Principled Practice: New Science for the Classroom

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The Bear Roots of Chaos

It's hard to tell where journeys really begin, especially after twenty years. From the beginning, I had always envisioned that my classroom would be a rather active place. But in those early years, teaching first grade, learning to organize learning, I relied upon my training and I was trained to organize learning roughly like this. The teacher chose a unit of instruction. (Curriculum experts, guides, or textbooks had already delineated the units important for a specific grade level.) The teacher broke that unit into the important pieces of knowledge and/or skills, developed lessons to deliver the knowledge and/or skills, sequenced the lessons logically, delivered them, and then assessed at the end to see if anyone got anything, if students had "accepted the delivery."

I remember the emphasis in delivering these pieces of knowledge was on simplicity, efficiency, and logical progression (or linearity). Creativity on the part of the teacher was a plus, but not a requirement. If a student didn't get it, the teacher redid parts of the progression. The school year was spent moving through curricular units. Any connection between the units was a plus, but not a

requirement. A child's education by the end of the year amounted to the sum of all the pieces.

I cannot say that I valued this approach back then. No one asked if I did. (It wasn't a question one was asked.) It was the way education worked. It was educational reality and "teacher" played the pivotal role in that reality. I wanted to be a teacher so I focused on the role of "teacher," learning to do what teachers do.

Art activities are important in the primary grades. One of the initial units my fellow first grade teachers taught was the "teddy bear unit," complete with bear facts, jump rope lyrics, a teddy bear picnic ("Don't go out in the woods tonight!"), and teddy bear art. In one activity, children made a bear out of paper. The teachers, behaving as trained, designed the final product (the bear) and had produced the pieces (ears, nose, eyes, and other assorted body parts) that would create that desired product. The teachers would show students a finished bear (the outcome) and then give clear and concise directions on how to glue each piece in the prescribed order to reach the desired outcome. All the students had to do was to follow the linear directions and they were rewarded with a cute bear (complete with bow tie).

But even back then I wanted children doing more than sitting, following directions, and cutting/pasting. I wanted children "doing"

things. I wanted them to be involved in authentic art processes, to do what artists do, going through the processes artists go through as they produce works of art. So I presented no outcome at the outset. I just put paper on a table and told my first graders to make a bear.

From the beginning, this desire for activity (for "doing") posed problems. Kids needed different materials at different times in different amounts. Each child had unique problems to solve. They interpreted the assignment in personal ways, some making factual bears while other chose fantasy. They each required different scaffolding, both emotionally and technically, in order to accomplish the task. They finished their bear at different times with varying standards of quality. Some of the bears were cute. (Some, I'm sorry to report, were not.) But there seemed to be something to this approach that excited my kids…and me.

I remember the complexity of those first attempts at a "doing" curriculum in art. The complexity bordered on chaos at times. But teachers didn't talk about complexity and chaos back then. According to my training, classrooms were to be clear and concise, not complex. Chaos meant "out of control." No teacher wanted to be out of control! But "doing what artists do" was what I wanted my kids to do. I liked the learning I observed so I opted for the chaos. Rather than backing away from complexity, I chose to understand it so I could manage it.

When process writing made headway into the elementary curriculum I remember the same sort of feelings. Once again, I wanted my first graders "to do what writers do." And again the kids moved at different paces, required different skills, accomplished different goals, and ended at different times. I again worked with ways to manage the complexity. Looking back to those days, I now see the emergence of the writing workshop as an initial tool to help me manage complexity, and perhaps even my first step into the world of chaos theory.

Writing workshops gave me a new structure to organize complexity. More importantly, I began to develop a new language, a new way to talk about my teaching. The mini-lesson, which began each writing workshop, drew "teaching points" from the work of the previous workshop, requiring me to be a keen observer of children's writing. The mini-lesson framed the writing period that followed, setting the tone, establishing the principles, and helping the kids focus on the task at hand. I added a check-in routine to further help kids focus. It also gave me a chance to touch base with children, refreshing my recollection of their writing.

During workshops I discovered a new teaching role that had not been addressed in my training. I became a facilitator of the many writing processes unfolding before me and I worked to understand this new role. I refined my conferencing techniques, talking to children about

the purposes behind their writing, applying concepts from the day's mini-lesson and at the same time discovering the next day's lesson. At the end of each workshop there was a check-out routine where children publicly declared the work they had done, imbuing an ethic of ownership into the culture.

Ten years later, teaching children in a 4th/5th grade classroom far from that first grade beginning, I still pursued a "doing" curriculum. My tool to create that classroom, the workshop, started to flourish, spreading into all parts of the curriculum. And the nature of curriculum began to change. Inquiry processes began to form the core of that curriculum. But with inquiry came more open-endedness and a tremendous amount of complexity.

Through this new curriculum children proposed, designed, and implemented independent inquiries in science, math, and culture, writing reports that were published in a local elementary journal. Storytelling became a tool to understand history and culture. Together we gave performances at teacher conventions around the state. Kids interviewed candidates for school board, held a caucus to endorse a candidate, and wrote letters to the media announcing their endorsement. As a team we explored a local marsh, collecting data on water quality, plant life, and the assorted critters that lived in the ecosystem. We presented our findings at watershed conferences and wrote articles for journals.

After ten years, my journey through teaching had led me astray from my training. I had learned to facilitate and organize learning in new ways. The learning environment I had envisioned in the beginning began to materialize. But the tools I had used, the theories I had read, the people who had helped me along the way were not the ones I had heard about in my teacher training. The language and metaphors that guided my teaching was not the language and metaphors that guided most of my colleagues. And I wondered where my journey had taken me!

Lessons Learned in Mud

Somewhere along the road I began to envision the "pieces" of my curriculum differently. While I still taught lessons on specific skills, as I was trained to do, I moved away from the traditional "unit" of instruction. I found myself referring to "projects" in order to describe the learning that took place in my classroom. Projects dominated our life. Some were small and relatively quick. Some were rich and on going. Some were yearlong, culminating in grand performances. Because of the inquiry, open-ended nature of these projects, the time frame was not always easy to predict. They were all complex, depending upon student energy levels, creative tangents, the number of problems encountered and a host of other variables, some anticipated and most unexpected.

Over time I began to refer to the big projects as "centerpiece projects." These centerpiece projects not only served as major vehicles to "cover" traditional discipline knowledge and skills, they also began to have a major impact on the culture of the classroom community. The centerpiece projects and their processes began to transcend the prescribed skills of the curriculum. Many of the projects became authentic inquiry initiatives for both the kids and myself. I would often have no predetermined outcome in mind (no cute bear) and I found myself entering into academic knowledge areas that I knew little (if anything) about. Together, as a community, we posed authentic questions and encountered authentic problems. And we solved those problems in the finest of collaborative efforts.

One such centerpiece project that had a powerful influence in shaping my approaches to organizing classroom learning was "the pothole project." For eight years my $4^{th}/5^{th}$ grade students monitored the ecological health of a local marsh, a small prairie pothole. The teacher with whom I collaborated and I had several basic reasons for doing the project. We wanted to do an environmental project that focused on watershed issues. We knew the pothole ecosystem would one day be threatened by the urban sprawl that was quickly racing toward it. Armed with longitudinal, biological data, we wanted to put our kids on the front lines of an environmental debate.

We had never undertaken such a project on such a large scale. We understood that we did not have the expertise, the biological knowledge, to identify and explain all the flora and fauna species we would encounter. We also understood that if we held off on the project until we gathered the necessary knowledge the project would never become a reality. In short, if we wanted to do the project we could not organize the pothole learning experiences in the traditional ways we had both been trained.

We decided to plunge ahead into the water and the mud armed with a few guiding principles. We knew that the project had "kid appeal." And we wanted to encourage various forms of "doing," observing, asking and answering questions, measuring, and drawing. In short, we wanted our children to "do what scientists do."

As the pothole project grew and shifted, as we collaborated with the Madison Children's Museum and presented our research findings at various gatherings of watershed scientists, we always held true to the things we valued, the principles behind the project. Authenticity, inquiry, ownership, and a basic faith in the curiosity of children led the way. The kids grew intellectually and emotionally.

Art and process writing had blazed a path to the science of the pothole and my teaching was once again transformed. I abandoned much

of my training as a teacher and began, once again, to redefine the role that I played as "teacher."

Opening the Door to Process

I was trained to deliver knowledge in linear ways and assess whether or not that knowledge had been received. But when I first opened my curriculum to the creative processes inherent with art, writing and science, my definition of "teacher" and "teaching" began to shift. I could no longer precisely predict the knowledge that would be needed during the course of the work. Knowledge became highly contextual and dynamic, emerging from the work of the children. Because knowledge became process-based, I redefined my role as "teacher" to that of "facilitator." I became part <u>of</u> and responsible <u>for</u> the learning that took place. I also found myself embracing certain <u>principles embedded creative processes.</u>

Creative process must, by definition, be owned by the person doing the creating. If I, as teacher, tell a child what to draw and how to draw it, the self-actualizing power inherent within the creative process is diminished. (The same can be said for writing or scientific endeavors.) <u>Ownership</u> of the creative process is critical in order for the process to make available its greatest learning potentials.

But ownership alone is not enough. Since the exact outcome is unknown in any creative venture, each new drawing, each new piece of writing,

is a process of inquiry. But it is a process that is made explicit so that it can be used another again. The creative processes become a topic of study, reviewed, analyzed, tweaked, and refined. This reflective quality is another inherent component of creative processes.

But writers, artists, and scientists never work in total isolation. They share ideas with colleagues, read the words of others, share rough drafts asking for feedback, and in general rely upon the opinions and outlooks of others to give direction and clarity to their inquiry. Their work is social in nature.

Also inherent within these creative processes are standards of quality and acceptance. An inquiry needs to have a perceived end-point, or outcome. At the beginning of the creative process, the form of that end-point is rather nebulous, the exact product emerging from the inquiry itself. But the desired state of that end point is usually known. Not all writing is good writing. Not all art is good art. And not all outcomes of scientific inquiry are important. This basic truth means that the quality of any outcome or product must be part of creative processes. But once again, the standards for "good" or "worthwhile" can only be reached through a socially responsive, reflective, inquiry approach that concerns a personally meaningful venture.

As I write these words, I have completed my second year of teaching second grade. I have also finished my second year at my current school. After ten years in the same school teaching the same grade, I wanted to test the validity and strength of the educational approaches I embraced. So once again I chose chaos, changing grade level, changing schools and the neighborhood it served, and changing school culture.

But while there have been so many new facets to the contexts of my teaching, some things have remained constant. When entering my new school, I carried with me five guiding principles that form the foundation of a learning theory. The principles helped me understand, organize, and manage the learning in my classroom. These principles were found in the first minute of the first day to the farewells on the last hour of the year, from the small assignment to the grandiose project. The principles articulate a set of beliefs and served as my models, metaphors, and images. The principles are outlined below.

Learning is more powerful when…

…it is owned by the participants of the community.

…it is a social activity.

…it is reflective.

…it is inquiry based.

…it is based on standards.

Stories from a New Year

My new school is racially and economically mixed, typical of most Madison schools. It could be labeled a "school in transition," with student ethnic diversity and poverty levels increasing dramatically over the last seven years. My first year of teaching second grade was filled with new realities. I was surprised at how the continuity of the learning community was continually disrupted by institutional realities. The school instituted a "pull out program" for all students who received "supplemental" instruction, which included English as a Second Language, Title I, Reading Recovery, as well as all students with Individual Educational Programs (IEP). The net effect on the classroom was a constant disruption. There was little effort spent building continuity between the various programs.

My first year also brought a new principal. This principal valued "inclusion" over the fragmentation created by "pull out programs." Inclusion and collaboration became the institutional agenda for the second year. For that second year, I agreed to collaborate with the special education teacher. While I agreed with the philosophical underpinnings of his agenda, I was also hoping to limit the number of disruptions in my classroom. While I did manage to limit the number and the effect of institutional disruptions, I experienced a very different, profound kind of disruption that second year.

Because of a state program, I had 15 children in my room. Five of the children came to the class with an IEP. They were classified as either Learning Disabled or Emotionally Disabled. Some had demonstrated severe emotional/anti-social behavior in the past. By the mid-point of the year, I had 14 children, seven of whom were receiving special education instruction. Of these seven, four were especially disruptive to the community and the work we were trying to accomplish. During the course of the year, they engaged in violence, destruction, profanity, crime, and intimidation. Yet, despite their often-deliberate attempts to undermine "the team," our community held tight, grew, and flourished. I believe that the power of the learning community and the growth of the individuals within it came from my understanding of and adherence to the five guiding principles articulated above.

The First Moments of the First Day

Those first few moments when a community comes together are fragile. Like particles orbiting in space, members of the community are thrust into proximity by the gravity of the school. All teachers want the new classroom to "get off on the right foot." All teachers establish a community, creating norms and expectations. Some spend time on school rules or make a classroom contract. Others create opening day "ice-breaking" activities. ("What did you do on your summer vacation?") But no matter the learning theories and subsequent

practices, all communities must establish a working protocol, a way to go about the business of the community.

My goals for those first hours of the first day of the new year were certainly no different. However, I wanted those moments of "first contact" to be imbued with the five principles. So floating among the typical first day events was the language of my guiding principles. Embedded within that language were the processes, attitudes, and dispositions that would guide our work for the entire year.

On that first morning, children entered the room packing school supplies, which they deposited on their tables. No seats had been assigned, so they gathered wherever they chose. After supplies were dropped, they all sat down, waiting to be told what to do. Their schema of traditional schooling became immediately apparent. Some of them were good at playing the roles that were delineated within that schema. Some were not.

But I knew that the protocols and processes we would use throughout the year were not traditional. I knew that those initial moments were just as powerful as any other moment during the year. As facilitator, my language was laced with words that reflected the guiding principles. The principles were activated with the first, "Hello. We have much to do today."

I asked the kids to leave their seats and to join me in another area of the room where we could sit in a circle, a more socially conducive setting for conversations. Because we would be engaged in many conversations over the year, both large and small, the discussion format was entered into our community's tool kit and immediately became one way that we "went about our business." Some of them were good at playing the social roles required for meaningful conversation. Some were not.

We took care of administrative necessities and began to get organized as a community. I began to make the implicit processes of the community explicit. They emerged as we talked. The word "system" was introduced and defined. Implications (end states) of classroom systems were discussed. I deliberately labeled us a "team" and conveyed an attitude that said, "we are in this together," that the classroom was not "mine," but "ours."

As facilitator, I led the children into a discussion about how to best operate as a team. Children's ideas and behaviors became the topics and curriculum of our first conversation together. Behavioral disruptions evolved into mini-lessons on group dynamics. A seating arrangement system was created and the fairness discussed. In order to foster ownership of the classroom, the team's first project was to decorate the classroom.

All of this took place within the countless interactions of the first thirty minutes of the school day. I took my discourse cues from the activities and actions of the newly forming community. All of the interactions were guided by the five principles. Even situations that could be labeled "negative," were filtered through the lens of the principles.

Two Children

As the children entered the room on that first day, some came in quietly, some came in noisily. Everyone had their own memories of first grade. Everyone had a schema. Along with their school supplies everyone had also brought with them the roles they had created for themselves within that schema. I knew T. would be in my room. I also knew that he had a violent past, spending much of his first grade year suspended from school for disruptive behavior.

T. entered the room that morning with everyone else and immediately sought out a friend. They sat next to each other and began to catch up on news. They took out their supplies and were ready to begin school. When I asked everyone to leave their seats and join me at the carpet, T. refused. He waited for my response. His buddy waited with him. The rest of the class was waiting for my response as well.

School had not officially started. The bell had not yet tolled and we had already reached a critical moment in the new life of our

community. T. was testing his schema. He had given me a choice. I could ask T. to join us. I could demand that T. join us. I could move into the world of reward and punishment and establish that world as the norm of our community. I could send a message to the entire community that said, "I am in control. My will will dictate."

But the principles guided me. I wanted children to buy into and be part of our emerging community. I knew that my reactions to this first small moment could have unforeseen, major implications in the life of our community, implications that could ultimately undercut the learning I wanted to undertake. So when T. said that he did not want to join us, I said, "That's your choice. But don't bother the rest of us cause we have work to do."

That simple message is packet with significance. I gave T. a choice, just as he had given me. He had received his response. I would now gauge his. I had also set the stage for all members of the community. They would all be given choices during that first day and for every other school day of the year. I sent the message to T. and the rest that a member's choices must not interfere with work of the community thereby establishing a basic relationship between the individuals in the community and the community as a whole.

As the rest of the class moved to the carpet to proceed with the business of the morning, T. sat at his table, reading from a piece of

paper that he had brought with him. His voice filled the room as he read "words" about a teacher. As we sat on the carpet, T.'s voice booming in the background, I had to make another choice concerning T., a choice that was just as vital as my first.

It was clear to me that his actions were an attempt to establish his dominance in the group. Again he was gauging my reaction to verify his schema for school. He escalated his behavior expecting me to punish. But I was establishing a new way of doing school. T. did not get the response he expected. And once again, all children in the community witnessed a response that foreshadowed their developing reality.

I validated T.'s need to be noticed and at the same time I turned the situation into a social inquiry. I asked the group, "Why do you think T. is doing that?" The answers of the children turned into a quick mini-lesson on social/group dynamics with the ultimate message being that all humans need to be noticed, that the emotions and needs of all group members are to be respected and understood. My comments were designed to establish not only social inquiry processes into the community, but to show that their social realities had a place in our culture, thus increasing the ownership of that culture.

All of this took place within the first ten minutes of the day. T. chose to join our group, sitting in a chair behind me rather than in

the circle on the carpet. During the ensuing conversation, he continued to reach into his bag of school-tested tricks, testing my response to each. Each time I continued to turn his choices and behavior into positive learning for the group. While he never fully dropped his role as "the misbehaving boy," he did manage to participate in the remainder of the activities.

As we sat in the circle, sharing stories, joking, getting to know each other, I pointed out that I had not completed decorating the room. While I had made the environment tidy and appealing, several bulletin boards were untouched, displaying only a simple question mark. That question mark appeared in several spots around the room, on our door, and in the hallway outside our room. The first activities and projects of the year were imbued with the same principles that would guide all our work. I wanted the children to own not only the work of the room, but the environment as well. We would decide together on the décor of the workplace through inquiry processes that were reflective and social in nature. And we had standards. We wanted the outcome of our work to "look good."

Before we could leave our circle and begin the work of the day, we had to talk about a seating arrangement. I had not assigned seating. I told the children they could sit wherever they wished, but a "system" had to be discussed first. T. asked what the word meant. "It's a way of doing things," I replied. The simple act of finding a seat became

connected to one of the most important words in our community. A focus on "systems" helped make the implicit processes of the classroom explicit. Once invisible systems are visible, they become a topic of discussion and a tool for children to use. Once used, the systems also become objects of reflection.

We discussed several systems for finding a seat. We discussed the "outcomes" of each of the proposed systems. "Was the system fair? What will happen if a problem arises?" After a brief yet important discussion, the children scurried to find a seat, alliances of friendship being formalized in transit. Within four minutes, everyone had a seat that pleased. Except C. The only seat that remained was across from T. and his friend. She did not want to sit there.

As I had done with T., I framed C.'s dilemma as a choice. As I facilitated her decision-making process, her problem was made public. C. said that she sat next to the boys in first grade and their talking was a distraction. While the boys denied the accusations, I replied that I understood her dilemma.

I had no solution to the problem in mind. I probably would have moved some children around to accommodate C.'s request or I would have asked her to sit across from the boys against her wishes. Either decision would have been worse than the solution C. proposed. She broke my mindset on the way I had placed the chairs and asked if she could

squeeze between two friends. There was room. It was a perfect solution. I said, "Sure." The work of the morning progressed.

The Fall

The range of academic skills my children brought into the community was staggering. Several kids were grappling with basic understandings of multiplication while others could barely count past 50. Some were through with the major struggles of decoding and were beginning to delight in aspects of literature. To others, letter/sound relationships were a mystery, one they were nearly ready to abandon.

But even more amazing than the breadth of academic skills was the mismatch in emotional health. After a relatively smooth beginning, the disabilities that caused several children to be unavailable for learning began to eat away at the edges of our community. During the first month of school, several children had to be physically removed when their violent outbursts became physical, threatening the safety of others. Chairs were thrown. Wastepaper cans kicked. Work destroyed. One girl refused to do any work. When encouraged and cajoled to do so, she would explode into a diatribe of profanity, punctuating her anger with slamming doors. T. missed 20% of his schooling due to suspensions.

I had agreed to teach an inclusion classroom because I wanted to limit the disruptions that were created by "pull out programs." The

disruptions I saw unfolding before me were more disturbing. I was concerned that the type of learning I valued and the open-ended projects that had been the foundation of that learning could not take place within our community. The fall was a series of evaluations, reflections, and soul searching. I wanted to understand and manage chaos. I had no idea that chaos could take the form that it did.

The choices I grappled with during the fall were similar to the choice T. presented to me on that first day. The voice of my traditional training kept telling me to abandon student-centered projects. They were laced with the problems of individual choice and contributed to the complexity of the learning environment. But just as I had embraced my principles to manage T.'s behavior and facilitate C's dilemma, I decided to hold firm in the chaos of the fall.

I felt that many of the special education students did not have an emotional or intellectual connection to the community. Their skill level and their behaviors isolated them from their peers. While I had talked about "the team," by the end of September we had not really done work as a team. Those students on the fringes had not been given an opportunity to show their worth, other than "being good" during workshop assignments. My emotional and intellectual energy had been focused on stabilizing individuals at their emotional and intellectual levels. The needs of the larger community had gone unmet. Without addressing that piece, the principles lacked their influence.

So, on top of the everyday classroom assignments, I created a major team project. We began to write a play for Halloween. At precisely the moment the special education teacher was advising me to narrow the complexity of the classroom, I chose to engage in theater performance, a tremendously complex endeavor. I knew the project had a built in motivation. The project was designed to tap into that motivation and reaffirm the principles that governed our culture.

Writing the play took over three weeks. For each daily writing session, all children sat for extended periods of time, listening to the idea of others and adding their own. Ownership was high. Kids who could not sit still for a five-minute lesson on weather bought into the creating of the play. Since the play was a creation of the community, it was a social endeavor, inquiry in nature. Since we were inviting others to see the performance, our standards were high. We rewrote, each writing session beginning with a reflection on our words to see if it "sounded right." The kids rehearsed and followed directions. The play was an overwhelming success. It was a total team effort. The team now had a successful event in their history to build upon.

Words with Parents

I enjoy meeting with parents for conferences in November. I prefer conferences to the standard report cards used in our district. But

this school year, the conferences took on additional significance. What would I hear? I was still a new entity in the school. Some parents were skeptical about the principal's inclusion initiatives. Would the stories of profanity and chairs be thrown back at me? I could see the progress that the group was making. I felt that all children were progressing down the road of learning. But I lived on the inside. The parents for the most part were looking in.

I told the principal the day before conferences that the verdict would soon be in. I expected the worse because I had been troubled so by the events of the fall. I also told him there was no way that I would teach in the inclusion classroom the year.

The night of conferences came. All parents were supportive and delighted in the education that was taking place. All children were being challenged. The corner was turned. My faith restored.

The Museum

Another large-scale project developed in the fall, this one involving collaborations on several levels. A coalition of community organizations came together to sponsor an event called Terrace Town 2002. Madison's Convention Center (Monona Terrace) was providing the space for elementary school classrooms to display work. The project was an open-ended inquiry where classrooms investigated various aspects of urban design. They would then plan and build a "kid

friendly city." All "towns" would then be open to the general public at the Terrace. Because I had participated in a similar event in the past, I was invited to participate. I asked a 4th grade teacher in my school if she would like to join, creating a cross-age collaborative project. She agreed and the Terrace Town project was born.

Work on the project began roughly about the time my kids were practicing their play. The classroom was a very busy (complex) place in October. Not only were we attending to the daily routines and assignments (spelling, reading groups, math projects), but we were involved in two high energy projects. Children had to follow my lead as we wove our way through the complexity, constantly reevaluating our efforts, plotting new directions, and implementing plans. It once again required a team effort.

The Terrace Town opening took place in mid-January. It was a gala event, culminating a fantastic experience for all members of our community. Parents attended the event in high numbers, impressed by the colorful town laid out before them. Children were proud of all that they had done. The project had given them an opportunity to work along side 4th grade children. They not only held their own with the older kids, in many cases they took the lead, organizing groups, expressing ideas, and creating quality products.

For me, the project embodied all five principles of learning on a grand scale. By engaging in the play and the Terrace Town 2002 project children learned that they could accomplish goals as a team. By November, when parent conferences were held, the children had developed a faith in me as their guide. The principles I used to guide us, the language I used to explain the ever-shifting contexts of our learning, were all now engrained into the culture. We were ready to move into the culminating project, a four-month collaboration with the Madison Children's Museum. The product of the project was to be the creation of a public exhibit for the museum.

The museum project built upon concepts that emerged from Terrace Town. Greenspace became a key component in a "kid friendly city." For three months during the spring, children examined the greenspace of our school. The front lawn became our "outdoor classroom." The kids engaged in scientific inquiry, collecting data on the lawn as an example of an urban ecosystem. We took field trips to the Children's Museum, visiting the exhibits, trying to isolate the standards that would help us create a "good" exhibit. We visited the museum's exhibit workshop, where kids met with exhibit designers to brainstorm possible plans for an exhibit. Along the road, museum staff came to our classroom, to work with us our ideas of the unfolded. Our exhibit opened to the public the first weekend in May.

Words from Parents

I began to have the thoughts around February, when the pain of the fall was forgotten by the successes of the winter. As I saw my children work, as I saw them interact, as I experienced the excitement of their learning, I began to think about moving to third grade with the group.

People were shocked when they heard my first public utterances of the thoughts. I had one of those classes that other teachers talked about. But with the principles as our guide, we had traveled so far since those days in August. The learning community I had envisioned was now before me. I wanted the journey to continue.

Institutional realities create opportunities for decisions. Because of changes in student enrollment, our school lost several teaching allocations. Teaching assignments had to be rearranged for the 2002-2003 school year. In April, I was presented with the opportunity to teach a combination 2/3 classroom, taking my second graders to third grade, adding a new group of second graders. My current children could now be allies in helping me create a larger, stronger learning community. I agreed. Parent meetings were held. Of the 14 children in my room, all but four wanted to continue the journey we had started.

Principled Practice

Much of my professional journey began with the writing workshop. Writing workshops were guided by a simple principle: you work toward the completion of your project by understanding process writing. But these simple realities led to a highly complex writing community with children writing, conferencing, creating art, and editing all within the same confined place. To an untrained observer, the environment appeared unorganized and noisy. But to the participants of the community, there existed a simple reality: everyone was working on writing.

When a child sits in the corner of the room reading a favorite book, it is a simple scene. But the cognitive and emotional activity in which the child is engaged is tremendously complex. The simple and the complex live together in that child just as within the writing workshop.

Much of the science that constructs the learning theory of our educational "reality" today was formulated in the beginnings of the 20th century. When we listen to proponents of this "old science" learning theory, we hear that children must master the simple before engaging in the complex. Teachers trained in this theory have tried complex projects and have become overwhelmed by the complexity. They reacted as they were trained to do. They broke the complexity into "manageable pieces" and established rules to govern each piece. They

fought complexity by making it linear and the learning situation suffered.

When this science emerged a hundred years ago, it was new. It fulfilled a need in the scientific community that was rooted in the historical, cultural, and political context of the times. It replaced an understanding of science that was deemed no longer appropriate for the times. We have reached such a breaking point again.

Education has shifted its focus away from "the teacher" and onto "the learner." The "old science" of linearity is no longer adequate to explain the complex reality that accompanies this shift. Today, I see the educational universe through a different lens, one I was not given in my teaching training. I now use language from the new science of chaos theory to understand my role as teacher in the learning of children. Just as I had used language from the writing workshop model to organize the complexity of process writing, I now embrace a new model woven from the new sciences.

There are many books on chaos theory ranging from histories and overviews to the application of theoretical concepts in psychology, business, organizational structures, and personal fulfillment. My goal in articulating the three properties of chaos theory listed below is to briefly synthesize and articulate key concepts that have

resonated within me because of their usefulness in understanding, organizing and managing complex learning experiences.

In outlining the concepts that have an appeal to those of us in education, I am drawing quotes from Seven Life Lessons of Chaos by John Briggs and F. David Peat (1999). Try not to understand these concepts as discrete facts that are attached to specific situations. Think of them instead as a family of relationships, connected through their multiple influences. It might be best to first start by clarifying the term "chaos."

Chaos

"Chaos turns out to be far subtler than the commonsense idea that it is the messiness of mere chance – the shuffling of a deck of cards, the ball bouncing around in a roulette wheel, or a loose stone clattering down a rocky mountainside. The scientific term 'chaos' refers to an underlying interconnectedness that exists in apparently random events. Chaos science focuses on hidden patterns, nuance, the 'sensitivity' of things, and the 'rules' for how the unpredictable leads to the new." (Briggs & Peat, 1999)

Chaos in the world of old science has connotations of disorder, randomness, and destruction. As an educator, my principal would be greatly disturbed if I told him my children had a chaotic day or that

my teaching was currently in chaos. But there is now a new set of new connotations developing.

Chaos is not randomness. It is not reality falling apart into nothingness and disconnectedness. The new science of chaos theory tells us that complex systems are held together by relatively simple principles. When a system moves to the edge of chaos the principles act as a universal gravity to hold the pieces together so that it can adapt and reemerge in a new form.

For me, this new science definition of chaos echoed the reality of my teaching experiences. This basic concept of chaos theory added a new reality to the five guiding principles I had found embedded within creative processes: learning is more powerful when it is owned by the participants of the community; a social activity; reflective; inquiry based; and based on standards.

When T's behavior in those first few fragile moments of our community threatened the complex system I was attempting to form, I embraced the principles rather than respond with traditional reward/punishment regimes. His negative behavior served as an opportunity to establish choice (ownership), the importance of the team (social), and the need for systems to operate a community (reflection and inquiry). C.'s dilemma, while seemingly different from T.'s, embodied the same principles. She expressed an opinion about a classroom situation and

was given a choice (ownership), her decision processes became public (social reflection and inquiry), and her decision led to an equitable conclusion outside the boundaries of the prescribed seating arrangement (ownership and standards).

During the fall, when the community seemed to be unraveling at the edges, I was tempted to revert back into traditional modes of thinking. I thought about breaking the social channels that bound the kids yet distracted from the daily work. My focus was increasingly upon the pieces, individual behaviors, and skills, rather than the common culture of principles that was connecting those pieces. I started to view chaos as a hindrance, rather than opportunity to strengthen the community. But in the end I held to the principles that I valued, the principles that had grown through years of reflective teaching. And my faith was rewarded.

Because the principles became the norms of the second grade community, children took on the highly complex problems of Terrace Town and the Children's Museum Project with confidence. As facilitator, I could enter into opened-ended collaborations with fellow teachers and community institutions because I knew that the complexity and uncertainty that accompanies such collaborations would be unified by the principles. I did not have to worry about "things falling apart." I knew that new directions would appear.

Sensitive Dependency Upon Initial Conditions

> Because weather is a chaotic system full of iterating feedback, it is nonlinear, which makes it incredibly sensitive to tiny influences. This sensitive comes from the fact that even small increases in temperature, wind speed, or air pressure cycle through the system and can end up having a major impact. (Briggs & Peat, 1999)

Sensitive dependency on initial conditions is an effect of complex systems that has been dubbed "the butterfly effect." It basically means that the smallest event can have profound, unpredictable effects somewhere in the system's future. It also means that each isolated event is the start of other possible events. And conversely, each current event is connected to a history of prior events.

Like any other teacher in any primary grade around the country, my first moments with the kids were important. But one main difference existed. I was working from a chaos theory perspective. Sensitive dependency upon initial conditions told me that the first moments in the life of a complex system are filled with a power that influence the future of a complex community. Small beginnings point to the future and connect to the past.

At the start of that first day, I moved the kids out of the traditional school setting, away from their tables and into a circle

on the carpet, an important initial detail. Within the circle, we were conversational equals. My words called us "team" and the circle echoed those words. The initial activities of the day, framed around guiding principles, set the stage for the work of Terrace Town and the museum exhibit. Likewise my initial reactions to T.'s disruptive behavior and C.'s positive example of problem solving had profound effects later in the life of our community.

As teachers, we understand that working with children is not solely about academic subject matter. The smallest event can trigger very unexpected events, both positive and negative. A child's restless night, the visit of a puppy, or a sudden thunderstorm can lead a community on countless paths.

With the metaphor of the butterfly effect, classroom events can once again be connected in ways that were not possible within the reality of the old sciences. Within chaos theory, there are no isolated, unimportant events. All events are weighted with a power that influence and guide the future. Each single event is a learning event, connected to the whole learning of that community. A greeting of "Good day!" at the start of the day is directly connected to a lesson on fractions.

Fractals

> A coastline is produced by the chaotic action of waves and other geological forces. These act at every scale to generate shapes that repeat, on smaller scales, a pattern roughly similar to the one visible at the larger scale. In other words, chaos generates forms and leaves behind tracks that possess what chaos scientists refer to as *self-similarity at many different scales.*
> (Briggs & Peat, 1999)

On that first morning of school, the children engaged in several small-scale activities and projects. A system for seating had to be invented and discussed. Lockers had to be assigned in a fair and equitable way. Lockers had to have nametags that reflected team colors. A process to design and decorate our room had to be introduced, discussed, and implemented. The processes we engaged in that first day were guided by the five principles.

But these principles were enacted time and time again throughout a variety of scales, through daily, weekly, and monthly activities and projects. The first conversation on that first morning was similar to the discussions we engaged in to create and perform the play. The processes the children participate in to create a museum exhibit were the same processes that guided the creation of nametags on that first day five months before.

Because the fractal pieces are connected by the principles, my role as teacher had to evolve. In traditional learning theory, the pieces of the curriculum are disconnected and static, organized and managed before interactions with children. But in this new learning reality, the connections that hold the pieces together emerge through the learning of children. I needed to be actively involved in the emerging conversations, making on-the-spot connections between the pieces of knowledge the children provided. All connections were guided by the five principles.

While sensitive dependency on initial conditions helps us understand the power of even the smallest event in a complex system, an understanding of fractals, self-similarity across scales, reveals the connections between those little, day-to-day pieces of classroom culture and the larger, grandiose projects that can dominate weeks. With an understanding of fractals serving as a management model in the classroom, teachers are grounded. Seemingly disparate experiences are connected. Children experience coherency and continuity.

The Journey's Circle

I have always valued learners being actively engaged in their learning. I now see this as a fractal principle that has guided my teaching from the beginning. As a fractal, this principle has remained constant along different "educational scales," whether I was working with student teachers trying to make sense of becoming a

teacher or first grade children creating a paper teddy bear. But how was I to know back then the power invested within that simple art activity? I understand it now as an example of sensitive dependency upon initial conditions. That simple activity propelled me on a complex, twenty-year quest.

As long as I have been in the teaching profession, there have been several dichotomies that have framed discussions within the profession. One such dichotomy has been the distinction between teaching and learning. When I was being trained as a teacher, trained in old science learning theory, most of the emphasis was on me, the teacher. Little was said about the learner or learning. Learners learned if the teacher did the job right. The quest in the profession was for the teacher to do the job right.

Somewhere along the road, things began to change. The focus shifted away from the methodology of teaching to the processes of learning. Diversity of cultures and learning styles entered the professional conversation. Brain research began to describe the brain as a self-organizing complex system and new learning theories were shaped. Learners possessed multiple intelligences that played themselves out through a variety of channels.

Complexity is a given within this new focus on learning. Learning is described as a complex array of overlapping systems, a complicated

interplay of personal culture, background knowledge, intelligences, emotional states and situational realities. And to make things even more complicated, this interplay shifts from monument to moment, day to day.

A mismatch developed between the language and theories used to understand teaching and the language and theories used to understand learning. I now understand this mismatch as the conflict between old science and new science.

As a teacher, who has always focused on the learning of students ("I want my children to do what learners do"), I understand that I am the one who must adjust my practices to account for the complexity of learning. But I also understand that because the focus was on the teacher, the language of old science learning theory did not allow me to embrace new learning theory. My quest over the last few years has been to discover a new language, embedded within a new science, which will allow me to become the teacher I wish to be.

During the fall of 2001, I was caught between two opposing forces. The traditional science of my training told me to isolate the pieces, to remove the complexity. But new science told me to hold true to those things that I believe, to the principles that have made my teaching a joyous profession. The new science of chaos theory has given me a language to understand the pedagogy I practice. And with

that language has come concepts, knowledge, and methodology that help put theory into practice. I can now create a new educational reality that not only makes a place for complexity, it embraces it.

References

Briggs, J., & Peat, F.D. (1999). Seven Life Lessons of Chaos: Spiritual Wisdom from the Science of Change. New York: Perennial.