

# *A New Science Look at Negotiating Curriculum and Classrooms*

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*Chaos and complexity theories provide a new perspective on curriculum design and application, especially in the area of Teaching English as a Second Language. Since language learning is a fluid process, teachers need to be able to react in real time to factors beyond their control. Rather than seeing these factors as interruptions to a closed system, teachers can make decisions about what to focus on and what to gloss over, when to pick up the pace and when to slow down, finding a natural rhythm that helps to create a symbiotic relationship with the students, the classroom and the university or school structure. Time and identity figure largely in the ESL classroom, and as each semester progresses, an essential layering process occurs and narrative structures are built. As language skills develop and as the classroom takes form, personalities are defined and redefined not only for the students but for the class as a whole. This paper attempts to make new science theories more accessible to ESL teachers with the hope that they can describe and discover ways to allow for necessary classroom flexibility while also respecting conventional curriculum standards and outcomes.*

It was the Friday before spring break. I was tired. The twenty-somethings were tired. The sun had decided to shine for the first time in many days and a sweet warm breeze crept into our open windows. "Composition Practice" glared at me as I considered how, once again, to make writing fun. The students had been working hard, focused for the TOEFL, and really, I felt there wasn't much I could teach them on a day like today. I steeled myself for the tedium, but on a last-second impulse, I grabbed a Ziploc bag of small toys and game pieces on my way out the door.

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It was when their bleary eyes actually opened and began to focus on the brightly colored bag of toys that I realized I had to use them in class. I flipped open the composition book and was greeted by the ubiquitous contrast/compare assignment. Sigh.... As I began to explain, I dug around in the bag for something simple to use as an example, a toy ring and... a... yes, a Mardi Gras necklace. I started listing qualities of each toy on the board under the headings of similarities or differences. The students started making suggestions: plastic, not edible, made in China! They were soon digging deeper for ideas about these small items until eventually I had enough ideas on the board to organize an outline for a couple of decent paragraphs.

They were still eyeing the toys. Were there going to get to play with them too? I could see it in their postures. They may have been in college, but they were still kids. I handed the bag without really thinking to one student. "OK, now it's your turn. Pick out two toys."

She did – slowly, carefully inspecting each option and running through possibilities in her head. Intuitively, I didn't rush her. The others were attentively patient. Twenty-five minutes later, their books remained unopened, but each student had two toys and a nice list of notes from which to form their paragraphs. And I was able to leave the room a bit of a hero, having celebrated the last precious moments before spring break rather than let them drag.

What happened here is an example of applying chaos and complexity theories in the classroom. Chaos theory comes from the field of Mathematics; complexity from science (Smitherman, 2005). Both theories deal with the notion of systems behavior. Chaos theory (among other things) holds that small changes in initial conditions can have monumental consequence at the end of a process (see Edward Lorenz's work regarding weather prediction). According to chaos theory, while we can have a general idea of how things might turn out, we really can't predict outcomes with absolute certainty (Kahn 1998). However, the classroom is not a completely chaotic place. It can, to some extent, be predicted to organize itself according to its notion of itself.

The classroom is a complex environment: spontaneous, adaptive and dynamic. It is an open system that can be trusted to "never quite lock into place, and yet never quite dissolve into turbulence" (Waldrop, 1992 p.12). Time and motion are integral to the workings of open systems, as are the recursive relationships that occur there. Teachers often strive for stability, but this can sometimes come at the risk of stasis. One very important aspect of complexity theory is that "Stability does not imply a static system; stability describes a moment of equilibrium in a dynamic system" (Smitherman 2005, p.165), but once a system becomes stable, it risks becoming stagnant or dying. Linearity is a risk to the balance of the overall system and to the individual. Thus, rigid adherence to a single classroom variable can have catastrophic effects.

Like the skateboarder grinding the pavement outside my window, balancing speed, movement, weight and attention are all necessary in order to control the board. If he stops oscillating between the extremes of any of these factors, he's in trouble. If he even stops to think about his movements, he's out of the game. Such is the emergence of

learning when a student or class arrives at a teachable moment also known as the edge of chaos.

There is a magical moment that occurs when one is able to find a balance between too much movement and too little, between too little structure and too much. It's the moment when people will say that they are "in the zone." It's when ice-skaters make the most daring leaps, or when the paint practically arranges itself on the canvas. It's when the child begins to walk toward the nearest outstretched arms, or the language learner finds sentences emerging from his lips. This moment cannot be prescribed. But it can be prepared for. Aldous Huxley expressed this idea in 1942 in *The Art of Seeing*, when he wrote, "Consciousness is only possible through change; change is only possible through movement.... Where there is no movement, there is no perception" (70). If we fail to "see," visually or imaginatively, we lose our balance point and falter. As physical beings, we respond and are "response able" to the primal circadian rhythms that created us, rhythms which no amount of desk-sitting or test taking can deny. It is just this ability to move through the mass of information we encounter every day that makes us aware of who we are in relation to the world.

The classroom, seen as a closed system, with its books and desks and student bodies and smart boards, is much like a beach where the sand and water rearrange each other. There is a constant rhythmic movement of forms, in and out, back and forth, and yet we know that it is unlikely for the beach to suddenly turn into, say, a grocery store or a Laundromat. Even with all its thrashing around, at the end of the day, the beach is still beach (Smitherman, 2005). Thus, we must see the classroom as an open system with a personality of its own. A "good class" is a construct of our imaginations and can, as such, disintegrate into something completely else.

The beach, oddly, seems to know how to keep itself going. It never slows down so much as to forget what time the tide comes in, and even with an occasional Tsunami, the beach holds true to its costal role. It's as if it were aware of its "beachness" and what it needs to do to keep on being a beach. Maybe someday it will stop, quite likely if theories about entropy are true. But it's more likely that my students will fall asleep, skip class, or just stare glassy-eyed as I try to explain periphrastic modals. So, seen as an open system, the classroom can be understood to develop its own personality over time.

Preventing entropy in the classroom requires a different sort of balancing act. The players are more than just waveforms pushing around sand and water, and the motivating factors are more multifaceted than the moon. In the classroom, the flow between student and teacher has to allow for a great many elements that can either slow down the process or speed it up. For example, students and teachers both come to the classroom with a set of social ideas about how classrooms are supposed to flow. Textbooks bring with them yet another perspective and set of assumptions. Teachers, having experienced the subject matter and/or the student demographic, supply yet another notion of classroom identity. Last but not least, the room itself can furnish an idea of what it means to be in class. In essence, though, all the players agree on one thing: school is where students learn and teachers teach.

As we negotiate the classroom, we learn how and when to inject a new variable (or let one in) in order to create more flux and consequently more learning. We develop a communal sense of “when is enough” and “how much is too much,” and we choose to respond to our knowledge as individuals and as a collective self-organizing system. We then arrange ourselves in the manner that best suits our own perspective, and we stay there until we feel it’s in our best interests to move on or up or out.

If we remain in one position, however, and use only one approach, we can easily be thrown off course. This is why a uniform approach to classroom dynamics and curriculum can work in some situations and not in others. In *Chaos*, 1987, James Gleick explains that “a linear process, given a slight nudge, tends to remain slightly off track. A nonlinear process, given the same nudge, tends to return to its starting point” (292). This is because non-linearity allows for real time integration of unexpected variables, including the changing perception of identity of students, teacher and classroom. The layering process that occurs in non-linear processes encourages flexibility and allows students and teachers to accommodate new ideas without losing their image of who they are.

In a complex, non-linear environment, as students respond or don’t respond, teachers modify their own behavior and vice versa. Like plants, we train our keepers by producing flowers or fruit depending on what they have done that nourishes us. Our keepers, in turn, respond to us by providing more sun or water in a given situation. Michael Pollan (2001) explores this concept in his book *The Botany of Desire* where he questions the roles of the participants, challenging our notion of who is actually manipulating whom in the garden of life. As the individuals in relationships respond symbiotically, participants are able to reify themselves as they move through their lives. As time moves on, we continue the process of identifying ourselves by alerting others to our ever-changing notion of who we are. Hence, it is no cliché when someone decides that they need to leave their present environment in order to “find themselves.” It’s survival.

In the process of arriving at our sense of selves, we create memories and lace them together as stories or narratives which we use to make predictions. The process is cyclic, with every impression affecting the next. Every being at every level is able to do this, albeit with varying degrees of awareness (Weissert, 1998). As humans, we can trust that other humans come into our path with their own set of stories and structures on which to pin information. These stories, accumulated over time, make us who we are and give us our own perspective, a perspective not only of the world but of ourselves in it. The communication of these stories is important to the well being of the individual as well as to the health of the group or community at large.

Communication, then, can be seen as crucial to survival. It is a basic instinct that allows us a bit of immortality. We can move outside our limited venue when we communicate. Imagine reading the words of Lucretius as he explained his theory of the universe, or the day-to-day notes on a calendar made by your grandmother. Our experience lives on after us if we can only communicate it in some way, and as such can be used beyond our own sphere of influence during our lives. If we can communicate

beyond our experience, we can then continue to have influence after we are gone. It is said that people die three deaths: one when the gaze no longer holds its sparkle, one when the body itself stops moving, and one when no one remembers us anymore (The Day of the Dead, 2002). Our stories and legends can be seen as very basic survival mechanisms that cross time and culture.

One of the oldest “stories” recorded was done as a rock carving that said, simply, “Tolfink carved these runes in this stone” (LeGuin, 1980). As a writing teacher, I find worlds of existence behind these words, regardless of the lack of a linear structure that includes the usual elements of character, plot, and setting. Tolfink told his tale as best he could because he desired to. There was no clear reason for him to impart this information, but he did it; we received it, and what is to be made of it is up to anyone.

Language learners in particular must be allowed to develop their own voice at their own pace. Many students are undergoing a great deal of self-analysis as they learn not only a second language but a second culture. Concepts of identity are being tested and developed, adopted and discarded, and the physical structures in the mind are actually growing and changing during this process. All students have memories, desires, and stories to tell, and if they are given time and a minimal structure, they can begin to tell their tales, but if they are forced to follow certain paradigms of narrative, their ability to integrate information will be blocked. The teacher can really only give the student environmental and practical tools with which to express himself and rest assured that the student has a natural desire to communicate at some point.

Thus, we can let go of the idea that all students should learn and produce language in the same amount, at the same rate, in the same situation. But we can hold onto the idea that learning does occur. Sometimes the process is active (students ask questions and work together on projects) and sometimes it’s passive (listening to lectures or staring at maps.) Back at the beach, the players take turns being actor or acted upon, so shouldn’t the players in a classroom be allowed the same luxury? If so, the task of the teacher is to respond to communicative attempts that may or may not turn out to produce anything in particular. This is not to promote rambling, unstructured discussions or free-form interpretive dances in every class, but only to give teachers the power to respond in real time, rather than doggedly follow a prescribed curriculum sent down by too many minds with too many specific outcomes that may or may not reflect the situation in the classroom on that day.

One major question in regard to applying these theories to the ESL classroom is: how? We know that too much input causes overload and too little has no appreciable affect. We know that input is relative. Thus teachers must become acutely aware of the volume and velocity of their own actions as well as to the responses they receive. If teachers keep in mind that no lesson plan “works” in every situation, they can make use of a teachable moment as they intensify or speed up a lesson, or they can slow down and spend a day reviewing past concepts. Scaffolding takes time – time to admit, interpret and retain those bits of information that we have deemed relevant. Thomas Weissert in *Time, Order, Chaos* explains that “Time and identity are the constituent organizing features of our cognitive system; we create and impose them on the world in the process

of narrative" (163). So, as narratives are built up, memories are made, and selves are created.

If a person has little or no sense of time, they have great difficulty in determining who they are in the world because they have no context. Oliver Sacks discussed this problem in his book *An Anthropologist on Mars* regarding a young autistic artist named Stephen Wiltshire. The artist's work was impeccable exactly because the young man did not attach any sense of self to his work, which allowed for a lack of affective filtering that the average person contends with. His drawings, as a result, were devoid of interpretation and stood entirely on technical observation. This lack of sense of self is a double-edged sword, however. In regard to language, too much or too little sense of self can affect a person's ability to attach meaning to information and thus prevent the development of any true narrative.

As many ESL teachers know, it's important to be acutely aware of affective issues in the classroom. If a student's affective filter is up, learning is much more difficult. These issues can stem from something within the student or from some interaction the student has had with the environment. We are affected on one hand by collective assumptions that affect what we perceive as relevant. Shotter (2005) in his article "Bringing Corporeal Life Back In" refers to this as Vico's "sensus communis" or "common sense". In addition, we are affected by individual assumptions and interests at hand. Sometimes these two urges find themselves in conflict with each other and the individual has to pull back, examine their behavior, and make decisions about what to do next. Do we follow the stream or jump to the shore for a bit? Being aware of the general expectations and standards is the only way for individuals to actively affect not only their own path but the reciprocal path of others. Group and cultural concepts of time come into play as people navigate the new terrain.

People's notion of time varies from culture to culture, and yet time is often the most inflexible variable at the teacher's disposal. Time is seldom on the teacher's side in an average classroom. Whether it be a 50 minute college class or an after school art program, students finish their work at different times so that some sit and wait for instruction (or climb the walls) while others have to be torn away from a precious project that has engaged their attention. However, simply being able to create some flexibility in the amount of time that various students can spend on projects is extremely helpful. Teachers have found that one way to create a flexible time schedule is to create multiple stations with different tasks so that students can move freely within a limited number of options. Time can either be seen as the teacher's nemesis or their only real friend.

It's also important to be aware of timing not just in regard to the hours of the day, but also the time of year. In one class, a certain concept might work as a "seed" during the very first days of the class while in another that same concept might end up as a capstone. It's not possible to determine the optimal time for any action because infinite possibilities can result. One can, however, seek out general predictable patterns of when it is best to introduce certain topics or use certain methods with particular types of students. For example, playing a name game on the first day might have two different

effects depending on the students' cultural expectations of what should happen on the first day in a college class. It could be a great success, or a grand catastrophe. A receptive teacher eventually learns when to press on and when to back off, but they may not be able to make a precise plan prior to meeting their students, and they may not have explicit permission within curriculum standards to respond to what they discover in the classroom. Students are not the only ones who learn how to navigate the classroom.

Another important aspect of timing is the fact that most concepts need to be repeated in different ways at different times in order to make it into long-term memory. Language learning in particular requires recursion. Vocabulary, sentence structure, and all manner of subject matter need to be reiterated until the students can all begin to fit them into their own story. Simple repetition is not sufficient if it occurs without context. Many textbooks now feature sections in which concepts are presented contextually and reiterated as the lessons progress. Unfortunately, the textbook doesn't know or respond to the fact that some students might have missed a previous lesson. However, if the flow between teacher and students is moving comfortably, the process of remembering and applying past concepts is natural and effortless. It's successful because it makes use of and creates pathways on which to scaffold more learning. Again, lesson plans can create a structure for this opportunity to happen, but they don't guarantee that it will. It's up to the teacher to recognize these chances for emergence simply because he or she is the only one on the educational team *who is actually there*.

Students and teachers, like all other organisms, respond to circadian rhythms: night/day, light/dark, cold/hot. Waveforms, those basic pulses that taught us to put one fin or foot in front of the other, must be honored. Time must be recognized as a workable variable in our system if we are to inject life into our classrooms and allow our students to develop meaningful narratives within their minds. We are more than just chaotic participants in an experiment, we are able to self-organize and adapt to an infinite amount of variables while still maintaining our sense of who we are. In fact, as complex beings, we require that complex environment to become who we are. If we are to find fluidity, and teach fluency, we have to create an environment where every variable is seen as an opportunity and where rhythm is reciprocal. Students and teachers must be allowed to adapt, change, control, affect and be affected within the structure of the classroom.

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