A Framework for Teaching a Foreign Language Class based on the Principles of Chaos/Complexity Theory

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ABSTRACT

Chaos/complexity theory first emerged in the study of the natural sciences over thirty years ago. Through the years, experts from a variety of fields have held this theory up as a new way in which to view the world around us, including its applications to the study of second language acquisition. The language classroom, like the natural world, can also be observed from this perspective because it exhibits many features of chaotic/complex systems. Language instruction in a classroom setting not only produces strange attractors and fractals, but is dynamic, complex, nonlinear, chaotic, self-organizing, unpredictable, sensitive to initial conditions, open, feedback sensitive, and adaptive.

In this paper's introduction, I briefly define these characteristics and explain how I began to apply them to my teaching practicum. The body of the paper deals with my observations of the language classroom and how it exhibits features of chaos/complexity theory. I have found that an impediment to constructing a better learning environment for my students resides in the fact that the characteristics of a natural, chaotic environment are not present in the classroom. As a result, I also explore ways of bringing chaos/complexity into my lesson and course planning. Because language influences thinking, teachers familiar with c/c theory will develop a greater awareness of what is going on in a language classroom and be able to reflect on their teaching with a new framework.

ERIC Descriptors:

Classroom Techniques

Creative Teaching

Instructional Improvement

Instructional Innovation

Second Language Instruction

Teaching Guides

Teaching Methods

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Introduction

Chaos/complexity theory has its origins in the physical sciences that study our universe. It is an attempt to explain nature's diverse interconnectedness and to reveal the complex beauty that is inherent in any living system. Since learning a language is also a natural process, an effective language classroom reflects the behavior of a natural system by demonstrating characteristics of chaos/complexity. Through my observations of these characteristics, I have developed a better awareness of the web of relationships between the students, the material, and myself. I have also learned to be more attentive to what takes place during my lessons, and less discouraged when apparently random things happen and the lesson does not follow my plan exactly. In order to develop a more natural learning environment, I also try to implement aspects of the theory in my teaching. In this paper, I examine my teaching practicum in order to shed light on areas of my classroom instruction that I believe benefit from a framework based on chaos/complexity theory. Through a greater awareness and a more active use of the theory, my goal is to reduce teacher anxiety, raise the level of student interest in language learning, and facilitate the students' acquisition of knowledge in the classroom.

I have attempted to use clear examples and to write in a straightforward manner that can be read, enjoyed and put to use by language teachers. My intention is not to overload the reader with scientific explanations and technical jargon, but rather to demonstrate an application of chaos/complexity in a practical way based on observations of my teaching experiences. I do not presume that this framework for observing a language classroom will be of vital interest to all language teachers. However, I will say that

chaos/complexity theory has been extremely beneficial in revitalizing my classroom instruction since I began to incorporate it into my own teaching.

My introduction to chaos/complexity came while reading a groundbreaking work on the subject titled Chaos: Making a New Science by James Gleick. I began to see the world around me in a new light and developed a greater appreciation for the astonishing complexity that shapes our planet. In 1999, I had the good fortune to meet Diane Larsen-Freeman, who was one of the first linguistic scholars to directly link language and chaos/complexity theory. I enrolled in her extension course "Chaos/Complexity Theory and Second Language Acquisition," and I began to more clearly perceive how various principles of the theory appear every day in my classroom.

After further research and observation, I developed a workshop based on the presence of chaos/complexity in the classroom and how teachers can better instruct their students by taking advantage of this awareness. I have presented this workshop twice, in the August 2000 Sandanona Conference at the School for International Training and in the November 2001 Los Padres/CATESOL Conference at Santa Barbara City College. The positive feedback from the participants encouraged me to continue my study of the link between language pedagogy and chaos/complexity.

Chaos/complexity is not an entirely new concept, as parts of the theory have appeared in different cultures and branches of thought throughout history.[1] Its recent incarnation in modern science emerged during the 1950s when Konrad Lorenz began applying chaotic principles to the description of weather phenomena.[2] In the 1970s, mathematics, together with advancements in computer technology, revealed the amazing patterns that

[1] Ziauddin Sardar and Iwona Abrams, Introducing Chaos (Cambridge, UK: Icon Books, Ltd., 1999), 3-4.
[2] James Gleick, Chaos: Making a New Science (London, UK: Sphere, 1988), 11-31.

result from a seemingly random set of numbers or coordinates produced by chaotic, nonlinear equations.[3] Astronomers also used portions of the theory in the 1980s to work out riddles of planetary and lunar orbits within our solar system, which were being caused by the feedback effects of gravity.[4]

What makes chaos/complexity theory so attractive and useful for scientists is that it provides a way of unraveling the mystery of what appears to be pure randomness. It gives a new perspective that demonstrates the existence of deeper explanations for the multi-faceted world in which we live. Questions related to natural systems that have been discarded or ignored because they appeared to be unsolvable have begun to be answered.

One example of a previously impenetrable riddle is the inconsistency of weather patterns. Accurate weather prediction has always confounded meteorologists, and the inherent unpredictability of weather lent itself to an attempt at finding an explanation for what made long-term weather patterns erratic. It turns out that such unpredictability is a result of an aspect of chaos/complexity, the "butterfly effect," whereby something as insignificant as a butterfly flapping its wings is responsible for a tremendous atmospheric disturbance, such as a hurricane, in a distant location. Because of the infinite number of "butterflies" and other minute details to account for, we now know why it is ultimately impossible to provide accurate weather forecasts beyond a few days. Thanks to Konrad Lorenz's research, we understand that this lack of predictability is built into a natural system.

[3] Ibid., 111-118.
[4] Ziauddin Saudar and Iwona Abrams, Introducing Chaos (Cambridge, UK: Icon books, Ltd., 1999), 94-95.

In many disciplines, wherever inexplicable patterns of behavior in a system have emerged, chaos/complexity theory has been used to analyze the causes. Thus, it has reached various new fields of study in the past several decades. Economics is one field where it has been used to predict and explain market fluctuations.[5] Management is another area that has benefited by a new perspective that takes more of the complexity of human beings into account.[6] Medicine has begun to look at the human body more holistically as a chaotic/complex system, and less as a machine that can be easily taken apart and put back together again.[7] Human behavior, in the form of the growth pattern of urban areas, has come under the light of chaos/complexity theory to help explain and predict dynamic future changes.[8] In addition, as previously mentioned, the theory has entered the field of second language acquisition.

Before continuing, it would be helpful at this point to introduce the twelve principle features of chaos/complexity theory that I use in analyzing my classroom instruction.[9] Several of the characteristics and their definitions are new and may seem exceedingly technical; however, their usage is necessary in order to more accurately describe the ideas behind this innovative theory. These characteristics are reflected in any natural system, and their appearance in a language classroom reveals fascinating processes at work.

The first chapter describes the appearance and effect of three characteristics that are fundamental parts of a chaotic/complex system: **dynamic**, **complex**, and **nonlinear**. A dynamic system constantly changes over time, and a complex system contains different

[5] James Gleick, Chaos: Making a New Science (London, UK: Sphere, 1988), 92-93.
[6] Mihaly Csikszentmihalyi, Good Business: Leadership, Flow, and the Making of Meaning (London, UK: Penguin, 2004), 34-36.
[7] Ziauddin Saudar and Iwona Abrams, Introducing Chaos (Cambridge, UK: Icon books, Ltd., 1999), 137-143.
[8] Ibid., 124-131.
[9] Diane Larsen-Freeman, "Chaos/Complexity Science and Second Language Acquisition" in Applied Linguistics: Vol. 18, No. 2, 1997, 142-146.

elements that react to each other in a variety of ways. In a nonlinear system, the effects are disproportionate to the causes.

Chapter two presents two states of activity, **chaotic** and **self-organizing**, that occur in any natural system. Chaotic describes a period of randomness that is entered into irregularly and unpredictably. Self-organization occurs during a chaotic period, when the various elements suddenly form an orderly pattern.

Chapter three looks at two more characteristics of such systems, **unpredictability** and **sensitivity to initial conditions**. Unpredictability refers to the difficulty of knowing when chaotic or self-organizing conditions will occur or how long they will last. Sensitivity to initial conditions means that any small difference at the beginning may have a disproportionately large final impact on a system.

In chapter four, I explore the advantages of a classroom that is **open**, **feedback sensitive**, and **adaptive**. An open system avoids entropy by receiving new energy through fresh input. A system that is feedback sensitive constantly adjusts to the influence of its own output, while an adaptive system makes effective use of outside environmental changes to evolve.

Finally, chapter five explores two factors that are inherent in any natural system, **strange attractors** and **fractals**. A strange attractor sets up boundaries for a system; nevertheless, the system still has unlimited freedom and will never repeat itself exactly. A fractal is a pattern that is identical at an infinite number of levels.

As a language classroom exhibits many features of the natural world, it may be observed from the perspective of chaos/complexity theory. An effective classroom is dynamic because it changes over time, complex since there are many elements reacting to

one another, and nonlinear because the learning process does not always proceed in a steady, upward manner. It is chaotic because the teacher never has complete control, and self-organizing since chaos is only apparent and an underlying pattern that emerges with time is always present. A classroom can be as unpredictable as human nature and is sensitive to initial conditions because seemingly minor things can affect a person's mood, which is expressed through language. It is open because students need to be exposed to fresh input from the target language and culture, feedback sensitive since the teacher and students profit by communicating with each other, and adaptive because we are frequently challenged to think on our feet. An effective classroom has strange attractors to provide direction for students' unlimited learning potential, and fractals as they represent the patterns and the purpose behind what the teacher has planned.

When I first became aware of these characteristics of chaos/complexity theory in my classroom, I began to take a more holistic view of teaching. For me, the classroom is now a living organism where all the elements of chaos/complexity are apparent and beneficial to the learning process. Although this new awareness does not prevent unexpected occurrences, it does reduce the feeling of panic when I am not in total control or things do not go exactly as planned. As a result, it has improved my course and class preparation as well as my ability to react positively to the unknown. In addition, I have a better perspective and more realistic expectations of the varied results possible for any given activity. I also try to implement characteristics of chaos/complexity theory when I notice they are absent to maintain a natural classroom environment, which takes full advantage of the complexity of a living system. I completely agree with the point of view expressed by the authors of the book Introducing Chaos: "Together, chaos and

complexity seem to be driving our world. Everything that is real is chaotic – space flight, electronic circuits, deserts, ecology of jungles, the stock market, national economies…the list is endless. And all living systems, and most physical systems, are complex systems."[10] As students react more positively and learn better in a more realistic setting, I hope this paper will help serve other teachers in their quest for a more effective classroom.

[10] Ziauddin Saudar and Iwona Abrams, Introducing Chaos (Cambridge, UK: Icon books, Ltd., 1999), 87.

Chapter 1: Dynamic, Complex, Nonlinear

Dynamic

Dynamic refers to the process of becoming. It is defined by change, which is a constant in the learning environment of a language classroom. One of the clearest examples of a dynamic process is language acquisition. Every human being is, instinctively, an extremely adept learner. Our lives depend on the fact that we are in a continuous state of learning every moment. In the classroom, this state of learning is at a heightened level; as a person is acquiring knowledge, they are changing and becoming. This change happens every time a learner encounters a new concept.

Since each student is constantly becoming a new learner, a class syllabus that does not allow for change can become an obstacle. It is impossible from the outset to account for all the variation that takes place during a semester; therefore, a fixed syllabus does not correspond to a realistic classroom setting. A pre-programmed, inflexible program does not leave room for adaptation. I find it advantageous to use an organic syllabus that provides overall structure, but can vary and adapt to the needs of the students over the course of the semester. By using this kind of plan, I am prepared to alter dates of exams, topics, etc. based on what the students are able to learn, how fast they can learn it, and even what they would like to study. An organic syllabus serves as a balance between chaos and order by inviting and accepting the possibility of change without provoking disorganization.

I have observed that learning a foreign language also provokes psychological and behavioral changes in students. In my classroom instruction, I often introduce dialogues

and other role-playing activities in which students act out their parts. This theatrical element leads to the students' exploration of a new facet of their personalities. By learning to alter their behavior towards their surroundings and other people, learners studying a foreign language may encounter less of a struggle when adapting to a new culture. People from the target language culture will perceive them in a new way, just as they themselves will perceive the world around them differently. One important reason I bring culture into the classroom is to impress upon students the change that is taking place as they enter the foreign language context. It is beneficial for students to fully recognize this new world from the moment they enter the classroom by adopting slightly new forms of behavior and even choosing a name from the target culture.

In addition to the cultural changes, the language classroom environment itself often presents a brand new setting for many students. Walking into the classroom for the first time, students get a chance to meet people that they might never have personal contact with normally. For example, in my EFL classes in Korea students of different ages would often freely share personal information in small group discussions; however, in a Confucian society, people of different age groups do not commonly share such information. In my EFL class in the Dominican Republic, there were students from a variety of different occupations such as doctors, students, homemakers, engineers, factory workers, etc. This kind of group diversity is rare in many countries since it is difficult for people with different occupations to gather together and have discussions. In my experience, ESL classrooms in the United States are usually composed of students who speak different languages and have a wide range of cultural backgrounds. The classroom

setting is a dynamic environment where different types of people living in the same country can interact and learn to communicate in a new way.

Keeping a teacher's journal is a way for me to stimulate dynamic change in my classroom. Writing about how a class developed, including the trials and tribulations, will hold these moments in time for me to observe and reflect upon. Through reflection, I profoundly consider the cause of a problem or recognize a success, and am forever changed. Journaling supports "becoming" because it provides me with a feeling of renewal and innovation. When writing my teacher's journal, I realize the infinite possibilities contained in each lesson since things rarely happen exactly as planned.

Student feedback is another type of reflection, done by learners and addressed to the teacher. The purpose of student feedback is to improve and change a class for the better based on student input. Ideally, reading or listening to the opinions of the class will stimulate a teacher to react and initiate an organic change. By giving feedback, students also change their perspective of the class because they have been given a voice. In my teaching practicum, I attempt to respond dynamically to student suggestions in order to maximize their learning.

Complex

A complex system contains many elements that react to each other differently. The I-Thou-It pyramid of relationships between the teacher, the students, and the material is an example of complexity in the classroom. The three parts have a connection to each other on an individual basis and to the entire pyramid as a whole. This web of relationships is

evidence of the multiple dimensions of communication that underlie classroom instruction.

The interactive nature of communication is most apparent in classroom dialogues and discussion activities that create a social use of the target language. Teaching both form and meaning is an essential component of instruction; however, students must be allowed to actively use what they have been taught in order to fully acquire the language. The words themselves are ineffective unless accompanied by an audience who can react to them. This meaningful exchange also takes place when the students are provided the opportunity to publish their work instead of just handing it over to the teacher. The social environment of my classroom invites an infinite number of complex, communicative reactions between the various elements (teacher, students, material) present.

Total communication requires the use of all four skills--reading, writing, listening, and speaking. When I teach a course that has a focus on a specific skill, I supplement the course through additional instruction in the other skills. The reason for this combination is the natural, complex bond that unites all of them. If one skill is taught in a vacuum, I have found that students easily lose interest and their level of learning diminishes. For instance, reading classes in which students only read and circle multiple choice answers can be enhanced by adding discussion and response writing activities. The fact that reading, writing, speaking, and listening are best taught together demonstrates a complex relationship. They are inseparable in language learning and support each other in an intertwined network of relationships.

When conducted in a group, teacher reflection also introduces a higher degree of complexity. Cooperative teacher journals provide me an opportunity to share my

teaching experiences with colleagues and to give them feedback on the challenges they are having in their own classrooms. Through this teacher-to-teacher interaction, knowledge is shared and a rewarding professional experience results. On their own, teacher journals are beneficial but become more effective when a complex relationship is added.

An additional dynamic activity that offers the potential for complexity is oral feedback from the students. When the whole class hears and responds to oral feedback in my classroom, it differs from written feedback in that students are immediately affected by the contributions of other students. One comment influences every subsequent observation, whether it is because someone does not want to repeat what was already said or because the comment sparked a new idea.

Nonlinear

A system that is nonlinear never follows a straight line. It sometimes regresses before going forward, and is capable of making sudden, unpredictable advancements.

By recycling material, I give students the opportunity to make a jump in knowledge that may arrive spontaneously and unexpectedly. Students need to be provided more than one opportunity to understand a concept and put it into active use. Every time students are exposed to the same point in a different way, their understanding grows until finally, they make a leap forward in their learning. It may be due to the activity, the teacher, the student's attitude, or their preparation. It is impossible to know exactly what triggered their learning, since it appears to be the result of a variety of causes rather than just one particular classroom activity.

Recycling material using various methods is a nonlinear technique that allows the students to practice a concept from many different angles. A teacher cannot always know what a particular student needs in order to fully understand a concept; even the student may not know what to do to get a certain point to stick. For example, the same set of vocabulary is grouped according to parts of speech; then, students attempt to define each word in groups; finally, it is used to write a dialogue. I find it beneficial and stimulating for students if I take into account multiple learning styles and combine different teaching approaches in order to help them learn a concept.

The nonlinear nature of learning may be a significant cause for the decline in popularity of the audio-lingual method to the exclusion of all other teaching approaches. Instead of only learning in a straight line through rote memorization, we often learn in curves, circles, and zigzags. Just finishing the textbook does not mean the students have acquired the material. Outside the classroom, a language is not organized according to chapters; rather, it comes at you all at once, and students may never have the exact same conversation in real life that was taught in the textbook. I have found that ALM is still effective, but only when used in conjunction with other pedagogical approaches such as the Silent Way, Community Language Learning, and Suggestopedia.

Student participation during the lesson can also appear suddenly in a nonlinear manner. Sometimes my students do not arrive to class ready to participate. They might gradually need to get comfortable and be inspired by an idea later on. They then begin to actively take part, and I am surprised by the sudden flurry of participation. By providing every student frequent opportunities to contribute, I allow students the chance to conquer their fear of self-expression and to involve themselves in the class.

Chapter 2: Chaotic and Self-Organizing

Chaotic

The mere mention of chaos in the classroom causes many teachers to imagine a scene of total pandemonium, with chairs turned over and noisy students running around the room. This type of chaos with no pedagogical objective, however, is more of a discipline issue and not the subject of this chapter. But there is another kind of chaos that is a positive and necessary factor in the learning process. Unfortunately, it may also cause teachers to panic for a moment because they are not in direct control of the students. It is a temporary period of randomness during the lesson when order and control step back and allow free thought to result in unlimited possibilities. I believe that such chaotic moments are an essential part of every learning experience; in fact, these moments could be the birthplace of learning itself.

When planning or teaching a class, I try to keep in mind the importance of balancing teacher control (order) and student initiative (chaos). However, from my perspective as a teacher, it is easy to perceive student initiative negatively because things are happening outside of my direct control. I am tempted to jump in and assume control in the classroom as soon as I doubt whether students understand the material or activity. I sometimes resist allowing students to take the vital step of creating their own learning. Though it may not appear to be as efficient as a teacher-centered activity, an activity that gives students the chaotic space to create with the target language can have an enormous impact on the quality of their learning. Within this space, they develop their own individual learning style, which allows them to make a more personal and lasting

connection with the language. In addition, working in groups without a lot of structure can empower the class as it learns to operate with a burden of freedom and openness.

To illustrate the effectiveness of giving students freedom in the classroom, I would like to describe a learning experience I had at the School for International Training. Group presentations were a significant part of the M.A.T. program, and it was the very first group project that left me with the strongest impression of the potential of chaotic conditions. My group was asked to present about our environment at the school, and we were provided with nothing more than a topic. I remember being a bit anxious because we were on our own without further direction. Given this apparently chaotic situation, we decided to get together and begin sharing suggestions on how to proceed. This stage seemed to lack order since we were just exchanging random ideas, and going off on tangents of thought in all directions. At that point, no one had any idea where the project was heading. Interestingly, the ideas generated during this phase later became the genesis of the central ideas and direction of our project. As a group, we had chosen to not limit our options by making a set plan immediately. Instead, we had bravely gone with the flow and allowed time for brainstorming. I believe any group project is made more productive through an initial period of chaotic freedom in which students can let their minds wander to explore infinite possibilities. The amount of freedom may vary according to the proficiency level of the students, but I provide upper level students opportunities to demonstrate their creativity with the target language through more open-ended group projects.

As my experience demonstrates, an effective way of letting productive chaos into the lesson plan is with the free flow of ideas. As a preliminary step for essay writing, I give

my students the opportunity to develop a topic for their compositions through brainstorming. Many methods of brainstorming can be used, such as class discussion, listing ideas, and free writing. The interaction provided by a discussion about a topic allows students to see different points of view and sparks new ideas. Listing ideas and free writing are ways of recording one's thoughts, and the chaotic element behind these methods is their emphasis on randomness and non-judgment. Initially, the less students analyze where their ideas are coming from, the more creative and interesting their results will be. By tapping into the chaotic maelstrom of ideas, brainstorming gives us the opportunity for true freedom of thought.

Self-organizing

Self-organization is a temporary, organized phase of a chaotic pattern in nature. For instance, a pack of swallows spinning and twirling may look completely chaotic; nevertheless, they do not collide with each other or any nearby objects. Buried deep within what appears to be total chaos are actually the blueprints for an orderly pattern. This balance between chaotic randomness and structured order in the classroom produces creativity and genuine learning. Self-organization is the narrow path upon which chaos in nature treads in order to develop an effective result.

After gaining important insights through brainstorming, clustering these ideas is what happens when chaotic conditions begin to self-organize. Given a main topic and several sub-topics, students can begin to efficiently organize the ideas that resulted from class discussions, making lists, and free writing. As they continue to add to the cluster, more detail emerges and a viable first draft begins to take shape. Seeing the clusters develop

on a piece of paper provides students with a powerful visual that helps them concentrate their ideas, yet maintain a high degree of freedom in their thinking. This method focuses the students' thoughts on a main topic and several sub-topics, but simultaneously allows for creativity in the details. Brainstorming, clustering ideas on paper, and then constructing an outline all form a natural progression from complete chaos to order in writing.

This progression is collectively known as process writing, which gradually self-organizes raw ideas into a cohesive, orderly product. The free association of ideas is the initial stage, after which follows clustering. Constructing an outline from the clustering is the next link on the chain that subsequently leads to a first draft, a second draft, and a final draft. Each draft is modified and improved by the student after receiving input from other students and the teacher. This process occurs gradually and cannot occur in a single moment, but only through the course of revising and editing. Process writing incorporates both chaotic and orderly thinking. It requires an artistic blend of both to attain the clearest form of self-expression a student can make in the target language – the final draft of an essay.

A similar phenomenon takes place in the process of a group presentation. As previously mentioned, an initial period of chaotic brainstorming is just the beginning of any well-conceived group project. At first, students begin to find their roles in the group, and a plan of action is formed. The members work on particular tasks and periodically check in with each other to maintain unity. The project self-organizes as a balance is struck between the group ideas and individual ideas without the direct intervention of the teacher. A group effort can be a frightening challenge that requires one to fully

contribute, yet at the same time limit one's role in order to function as a part of the whole. At the outset, it seems to be a desperate chaos of ideas until that jumble slowly starts to become a cohesive pattern. This gradual self-organization finally leads to a successful presentation.

Learning a second language is an ongoing process of self-organization that takes place through meaningful repetition, trial and error, and new material. Language learners feel like they are assembling an enormous jigsaw puzzle. At first, the project seems daunting and impossible, but with patience and effort, parts of the puzzle become evident. The self-organization of countless pieces (grammar, pronunciation, vocabulary, etc.) rewards the learner with a continuing sense of accomplishment. The whole puzzle does not take shape all at once; instead, various sections begin to form independently. Later on, the gaps between the sections slowly diminish and, from the chaos, a completed puzzle emerges as the learner achieves fluency.

Chapter 3: Unpredictable and Sensitive to Initial Conditions

Unpredictable

At what point have students really learned a concept? When is the appropriate time for an examination? How will the class respond to a particular activity? How will a student respond to a particular question? Many such questions regularly occupy a teacher's attention. They reflect the unpredictable quality of the classroom, the unknown elements that can either distract or motivate a teacher depending on their degree of comfort with a natural learning environment. There are many random factors in language teaching, and coming to terms with this unpredictability can enhance the classroom language learning experience.

When I ask my students a question, I am often surprised by their responses. It could be because of a sudden jump in linguistic ability, or it may be related to the content of the answer. I can never be sure how students will reply. Of course, I have the option to ignore the unexpected and proceed according to my own previous expectations. This mindset will lead to a more orderly, but duller, classroom. The alternative is to be more attentive to how students respond in class. For instance, if I notice that students' responses demonstrate more trouble with pronunciation than with the grammar topic *du jour*, I adapt the lesson to include some pronunciation practice.

Class discussions are another source of tremendous unpredictability. For example, I plan a lesson based on giving an opinion and choose the topic of euthanasia, but the class discussion swings to a more pertinent issue such as immigration policy. Instead of forcing the class to return to what I thought we should talk about, I can take advantage of

the students' enthusiasm and go with the topic that they find more stimulating. By being highly alert to students' responses, a teacher sensitive to unexpected opportunities will create a real learning ambience that is more receptive to their needs.

It is extremely difficult to predict what students will learn during a given lesson. For instance, I may be introducing the past tense, but what some of the students actually gain from the lesson could be a better understanding of vocabulary. A teacher can only attempt to focus the students' attention on a particular point; there is no guarantee that they are seeing exactly what the teacher wants them to see. Students are not machines; therefore, information cannot be downloaded into their minds like a computer. In reality, the learning that is taking place in the classroom is both non-linear and unpredictable. Everyone learns differently, and I believe this fact empowers the students by giving them more responsibility for their own learning. Consequently, I am more patient with the students and less frustrated with myself if an activity does not work along the lines I planned. The class may or may not have grasped the concept in the way I intended, but I can still maintain a hopeful attitude because of my confidence in the students' instinct to think and gain knowledge on their own terms.

Given the fact that learning is virtually impossible to predict, accurate assessment proves to be a major challenge for the language teacher. I have encountered two principle difficulties in evaluating students due to the unpredictability of language learning. The first is my incapacity to ensure validity when making a subjective measurement of a student's ability. This problem mainly occurs in evaluating written and oral performances. I have found rubrics to be helpful aids, yet they still provide only a rough estimate. The second problem with obtaining a legitimate measure of student

ability is the timing of an evaluation. As I never know precisely how much time students need to comprehend a given concept, I can only guess that I have provided them enough time to prepare for an evaluation. Additionally, because of the negativity often associated with taking exams, it is impossible to predict the resulting impact of mood on the learners' affective filters and performance. I believe the best way to account for all of the unpredictability that surrounds evaluations is to realize that students cannot be expected to perform to their maximum capacity simply because it is the day of an exam. To help remedy this uncertainty, I administer shorter tests more frequently and use a combination of less threatening measures of student performance such as group projects, portfolios, participation, and effort. By exploring a larger variety of grading methods, I adjust to the unknown factor associated with measuring a student's ability and potential for success.

Sensitive to Initial Conditions

Sensitivity to initial conditions refers to the great effect a relatively minor thing can have on a system. In a language classroom, even something that appears insignificant (such as the weather outside) can make an extraordinary difference in the lesson. "The devil is in the details," as the saying goes. Of course, it is impossible to be aware of the infinite number of factors involved in the environment of a classroom. Such lack of awareness could cause teacher anxiety. Ironically, I find that it allows me to relax since I accept less responsibility for the perceived success or failure of a lesson. After having shed this burden, I am able to more objectively perceive my classroom and make subtle improvements. For example, after noticing that the students have been sitting in one

place for too long, I try to include an activity that requires the class to move around the room. I can also make the surroundings more comfortable by opening the windows or turning on the heater. This "fine-tuning" of the classroom environment produces a large effect as it causes students to feel more at ease because the teacher is sympathetic to their feelings as well as responsive to the real, existing conditions.

The use of suggestopedic material in the language classroom is an attempt by the teacher to exert a subtle influence on the students' attitude towards the language. Posters, maps, magazines, grammar charts, photos, or a bulletin board with articles are all small ways to awaken the students' thought process about the language when they enter the classroom. Whether the stimulus is visual, olfactory, or auditory, the effect can be significantly disproportionate to the cause. For instance, one day I was trying to get my EFL students in the Dominican Republic to write a paragraph in class. Instead of writing, they were chatting in Spanish and not concentrating on the task. In order to create a mood for reflection, I started to play classical music. They reacted instantly; everyone stopped talking and began to reflect on the assignment. One student, a psychologist, even thanked me after class for playing the music. The music had a calming and productive effect, far beyond what I expected or intended.

During my teaching practicum in South Korea, I realized that the arrangement of students in the classroom could have a considerable effect on their learning. When students were sitting in rows, the class was very teacher centered, with little sense of community. In addition, students did not pay much attention to each other. The more participatory students sat in the front and the quieter students in the back. After shifting the seating arrangement to a semi-circle, I found that many positive changes occurred.

The class became more student centered, there was a greater sense of community, and everyone paid more attention to whoever was speaking.

Just one student can set off a ripple effect significant enough to change the mood of the entire class. An uncooperative or quarrelsome student has the potential to divert the group's attention and precious learning time can be lost. In addition, this delicate situation may severely impact the well being of the teacher. As conscientious professionals, we take a disruption of the learning environment quite seriously. However, one or two students do not necessarily indicate the collective mood of the class. In this situation, my first objective is to realize that my behavior must remain exemplary. Even a slightly improper emotional response by the teacher could significantly affect the class. The rest of the group is relying on me to maintain a positive atmosphere and stay on track; therefore, I must not let myself be overly affected. The troublesome student is also carefully observing my reaction, which offers me a window of opportunity for tremendous change. By using this sensitive situation as a learning moment, I can change the dynamic and set the tone for a greater feeling of classroom community.

A productive lesson often depends on the initial physical conditions of the classroom space. One of the characteristics of the modern classroom is a dependence on technology (computer, smart board, CD player, etc.). These elements are outside the teacher's control and have an annoying tendency to malfunction at the worst moments. I think many teachers know the frustration of having a terrific lesson plan that requires the use of technology, and in the middle of the class the power goes out. Clearly, I need to have a backup plan prepared every time I plan a lesson that includes technology. Even the breakdown of something less significant, such as the heater or the lighting, has a negative

effect on the learning of some students. Therefore, I should be proactive and either fix the problem or make adjustments to the lesson plan. Good preparation habits go a long way to alleviating the detrimental effect of the unexpected; for instance, I can prepare photocopies well ahead of time in case the copier brakes down. In other words, although a lesson always gives me surprises, I am able to lessen any negative impact with foresight and preparation.

Making a good first impression is essential. The initial day of class has the potential to be the most important time of the whole school year. A teacher can use this opportunity to make a positive impression on the students. I try to make the first lesson a mini-demonstration of what the rest of the year will be like, so I fill the entire period with activities for students to get to know each other and practice what they know in the language. If conducted in a stiff, perfunctory style, the first class can easily discourage students by raising their affective filters. I also do not think it is productive to simply hand out a syllabus and dismiss the students. I have found that the mood generated from an enjoyable first lesson can have a lasting impact on the students' attitude for the entire year.

Chapter 4: Open, Feedback Sensitive, Adaptive

Open

During nice weather, the desire to have class outside takes control of even the most serious students. I believe this yearning comes from a natural urge to liberate the mind. To learn is to free the intellect, to remove the barriers of ignorance and to illuminate the darkest corners of misperception. When I am stuck on a problem or have writer's block, my first reaction is to temporarily change my environs. Whether it is a stroll to the kitchen or a walk around the block, I feel compelled to take time out and look elsewhere for the solution. Of course, it is not always possible for me to literally take a group of students outside and conduct class in an idyllic setting. However, I can welcome external input into the classroom to make the language more relevant, thereby stimulating the creative impulses of my students. The more my language classroom is open to imagination and fresh ideas, the greater the energy level and motivation among the learners.

The most obvious way to open the classroom is by taking the class outside. I believe the womb of the official classroom space is overrated; it is merely a convenient place to meet and not a sanctuary of knowledge. Learning is not confined to its four walls, nor does it possess any magical qualities. In addition, always teaching in a particular classroom can simply be a result of habit and not due to any logical reason. Given the demanding schedule of teachers and subsequent time pressures, it is easy to rationalize keeping the lesson in one customary place. However, the positive reaction of my students to the occasional change of scenery compensates for the loss of time and/or

organizational difficulties. In my EFL classes in Korea, I allowed students to discuss a topic or prepare a conversation outdoors, and they later regrouped to present their results with renewed enthusiasm. By using the language in different environments, learners gain a better idea of the potential and adaptability of the language. When I think outside the box and provide my students a new context, they develop the confidence to actively use their knowledge outside the protective walls of the traditional classroom.

Openness not only signifies what goes out, but also what comes in. The doorway of the classroom is a two way street that should allow for novelty and realia to enter unimpeded. A guest speaker (or possibly another teacher) is a living example of the culture and brings the class a new perspective on the language. When I received a visit from a native-speaker friend in Korea, I invited her to my classes. The curiosity of the students got the better of their shyness, and they could not stop asking her questions. It also gave them an opportunity to explain their customs and discuss cultural differences. Additionally, drawing on students' personal experiences for projects and presentations enlivens the lesson plan and builds a stronger connection to the world outside. I find "Show and Tell" to be a simple, but powerful, activity that links the classroom with the learners' lives. The use of cultural artifacts is another effective method that focuses the class' attention around a tangible item and has an almost magical capacity to transport the group to another place.

Technology also opens a window to the outside world. Movies, TV shows, and even television advertisements allow my students to witness the language in action. They provoke a cathartic response (laughter, sadness, etc.), which strengthens the learners' connection to the grammar and vocabulary. In addition, current events stimulate student

interest in the language by capturing their attention through stories that affect their lives directly. The Internet and current periodicals are incredible portals through which my high school Spanish classes in the United States explore an infinite variety of stories to connect with other cultures. Songs are another way I expose the students to an artistic, creative source that liberates the language and brings a fresh perspective of its potential.

Student generated material also helps make any lesson more relevant. When teaching young learners, I attempt to make use of their tremendous creativity to infuse the lesson with productive energy. Their active minds need a break from repetition, and when given the opportunity can transform and produce incredibly creative dialogues, poems, stories, and even activities. The imagination of students is an energy source with infinite potential. While I was teaching a lesson on how to give directions to a class of secondary school Spanish students, one student suggested using the desks as city blocks rather than staring at a map in the book. I hesitated, and then decided to take a chance with the idea. The classroom transformed into a town, complete with stores, banks, etc., and the activity flourished. By opening my lesson plan to the class' input, I improve and adapt ordinary activities in order to make them more pertinent and memorable.

Being open to new instructional methods has given me the confidence to let the students have a hand in teaching the class. As a review activity, I let students work in pairs to prepare a presentation that recycles information from the textbook. I am often surprised by their ingenuity in designing activities that I end up later incorporating into my future lesson plans. The "teachers," as well as the rest of the class, benefit remarkably from such a simple change of roles. The act of teaching forces them to fully concentrate on the material, which leads to greater confidence and understanding.

Students also seem to pay more attention to their peers and, when given the reigns, have the capacity to enlighten the teacher as to how they best learn the language.

Feedback Sensitive

Openness to change provides a multitude of benefits. In nature, change happens because the system is open to its own feedback. Feedback is the output of the system that encounters the outside environment, is modified, and returns to affect the original system. It serves as a messenger from the outside, which informs the system of what it needs to do to continue existing. The systems that modify their behavior according to feedback continue to evolve, adapt, and thrive; otherwise, they will likely stagnate and disappear. In linguistics, this stagnation is referred to as fossilization. Our words cause immediate and profound reactions on other people, and we function better in society if we are sensitive to these reactions and adapt our use of language.

To assist in the evolution of the classroom, there is an abundance of feedback from many different sources. The teacher-student relationship produces assessment of graded assignments and error correction. Student-teacher feedback can be through formal evaluations, informal written opinions, and oral responses in a council format. Between students there is also significant feedback through peer editing and immediate reactions to language use in the classroom. Finally, teachers can benefit from their colleagues' feedback through class observations and meetings that focus on sharing ideas.

For the teacher it is important to provide a steady amount of positive feedback on students' production of the language to have a significant effect on their improvement. With written work, I have found that my students learn more from interactive feedback

activities in which I merely indicate where the error occurred and the type of error. Their job is to discover the problem and correct it with help from classmates and myself. If I simply hand back their work with all the corrections the effect is diminished, and they come to rely on the teacher for what should be partly their own responsibility. I also write a short message at the bottom of their compositions indicating a summary of their strengths and a response to the content of their work. By keeping the tone positive, I reduce the affective filter and undo some of the damage caused by negative feedback, which results in a psychological barrier that obstructs the feedback loop back to the learner.

In my classroom, I try to receive as much student feedback as possible. Formal teacher evaluations are just one method of obtaining the learners' opinions. Both the quantity and frequency of student feedback improves the quality of my lessons. Therefore, it is necessary and beneficial to all if informal feedback (written and oral) becomes a regular part of the lesson plan. There exists the stereotype of the veteran teacher who has stagnated and teaches the same class the same way year after year. I believe this dilemma has a simple solution – plenty of student feedback coupled with a proactive approach to the implementation of change based on that feedback.

Peer feedback of written work combines the advantage of empowering a student with the responsibility of helping a classmate improve. In addition, my students are more aware of and sensitive to corrections done by their peers. Lots of peer feedback occurs when students speak in the classroom as well. Especially with adolescents, the pressure to perform well and not "sound funny" causes anxiety when speaking in front of their peers. In this case, it is possible for the reactions to be negative, which could have an

impact on the confidence level of a feedback sensitive learner. As the teacher, I encourage positive reactions by applauding students' oral participation and by reminding the class of the tremendous effect they can exert through their comments.

To maintain a positive, professional atmosphere among colleagues, it is vital to include classroom observations and teacher meetings that foster the sharing of ideas as well as a practical approach to problem solving. Observations and meetings are also important ways of establishing a feedback loop with colleagues about our teaching. In order for such interactions to function most effectively, an atmosphere of mutual trust and respect needs to exist wherein all parties feel comfortable enough to share in a mutual learning process. As teachers, it may feel natural for us to assume a teacher to student role while observing or commenting on a colleague's teaching style. However tempting this model may be, the primary goal of an observer is to be a good listener and resist the impulse to criticize. The professional dynamic between teachers differs from the teacher-student relationship, and care should be taken so that the affective filter does not block the pathway for positive feedback.

Adaptive

Adaptation is evolution. To survive in the real world, one must continually adapt to the challenges that life presents. In the language classroom, adaptation is a skill that makes use of environmental changes to evolve. Since the classroom is dynamic, the teacher's reaction to change is significant. Instead of reacting negatively or not at all, I try to accurately assess the situation, "go with the flow," and use the changes to the class' advantage.

During my first year teaching Spanish to a group of ninth grade high school students, I used a textbook designed for beginning-level university students. Although the accelerated pace of the book was advantageous, the style of activities was sometimes too dull for adolescent learners. Instead of immediately changing to a more fun, less demanding textbook, I decided to observe my classes carefully and adapt the exercises to their learning styles. I have now created a bank of activities that speaks to different learners. I sometimes borrow activities from the textbook; however, even these activities I modify. For example, the print size is so small that I recopy the exercise on a larger sheet of paper so that my students can easily accomplish the exercise and not have to spend precious class time searching for it. The detailed grammar explanations can also be daunting for young learners, so I often transfer the essential material to a Power Point presentation on the large screen television in the classroom.

The schedule also plays a large role in the ambience of a particular class meeting. In general, I find that a Tuesday morning class is generally much calmer than one on Friday afternoon. Two sections of the same course may meet at different times, one before lunch (hungry and energetic) and the other after lunch (sleepy and unresponsive). When I ignore these differences, I set myself up for frustration with an inflexible lesson plan. A teacher cannot always invoke the right conditions for students to respond positively to an activity; however, if I look for patterns in the mood of students carefully, I can determine a more logical lesson based on when the class meets. The awareness of external factors at work on my "audience" helps me to avoid simply pigeon holing a group of students as uninterested. I can also use this knowledge to raise their level of motivation and participation. For example, after lunch I sometimes ask the class to stand up and answer

review questions. After a student participates, they may sit down. It is a very simple, but significant motivational tool that gets the class moving as well as increases their interest in the activity.

In addition, I have noticed that the learning needs of each class are different; therefore, my teaching is more effective if I adapt the lesson plan (and even syllabus) to focus on their strengths and/or weaknesses. For example, while teaching the same intermediate Spanish course to two groups of students, I became aware during the semester that one class needed to review more grammar. The other class, however, knew the grammar much better and was prepared for more active use of the language. I adjusted to this difference by occasionally giving the more proficient class time for open-ended conversation practice. Awareness of and adaptation to each new group of learners at the start of the school year is yet another effective way of recharging my batteries and avoiding stagnation as a teacher.

Chapter 5: Strange Attractors and Fractals

Strange Attractors

Like "chaos," "strange attractors" may not be something a teacher would like to have hanging around in the classroom. Nevertheless, strange attractors are responsible for establishing parameters in a system, thereby achieving a balance between chaos and order. "Strange attractor" is a mathematical term and represents the state to which a multi-dimensional system eventually settles. A strange attractor sets limits and provides structure for a system. Without strange attractors to form boundaries, the system ceases to function effectively because it has too much freedom. For example, a student will become frustrated and give up on a homework assignment without adequate directions on how to complete it. The instructions for completing an assignment represent a strange attractor, as do the rules of a classroom activity. It is advantageous for an activity to be open and chaotic, yet it will get bogged down and have difficulty self-organizing without any strange attractors.

A number of strange attractors appear in the classroom and organize the learning experience for the students. The teacher is the primary example since they develop the program and plan the lessons, which coalesce the course objectives into an organized structure. The textbook is another tangible, concrete source of information that helps to direct the students. Additionally, classroom rules provide guidelines of conduct and respect. The teacher can control the number of strange attractors in the classroom to allow for more or less organization based on the needs of the learners.

If an activity seems to not function properly, I reflect on the amount of freedom I gave the students. Many repetitive drills will invariably result in boredom, so I need to limit the strange attractors and allow students to use what they are practicing in a more creative way. For example, my EFL students composed Haiku style poetry after practicing a series of pronunciation exercises. Similarly, a lack of boundaries paralyzes a system due to the overwhelming number of possibilities. After asking students to talk about their weekend plans, I am often greeted with silence. However, when I add a strange attractor such as a list of verbs on the board, the discussion takes off. Likewise, it is important to provide clear examples for activities so that students focus on language production and not waste time on deciphering the instructions. In addition to reading over the directions together, I model the activity with another student or have a pair of students demonstrate the activity in front of the class.

The addition of a strange attractor enables the system to keep an underlying order while still self-organizing in an infinite number of ways. Many times I have been asked to say "something" in a particular foreign language, and the effect of this seemingly simple request is that my mind goes completely blank. I have to think first about *what* to say and then respond. I can focus on something concrete if I am asked a more specific question such as "How do you say '*she is happy*'?" The same result happens in my classes. When students prepare a dialogue or write a composition without any guidance, their language production stalls or their work becomes repetitive. When I specify the verb tenses that they should use or I add a word bank, the students are more productive and the activity is more practical. Additionally, no matter how many times the class does the activity, the results are never exactly the same.

When students read an article, they each present a unique interpretation based on their own level of background knowledge. The more pre-reading activities I include to activate schema, the more this knowledge is activated and the better the understanding of the learners. For example, before we read an article about sports in Mexico, my Spanish class has conversations about sports in general and what they know about Mexican culture. By including this strange attractor of a pre-reading activity, students first share information and experiences, and everyone contributes to a class pool of background knowledge. In addition, when I use authentic reading materials such as newspaper articles, I alter the number of strange attractors depending on the level of the students. An advanced level class may simply read the article and discuss their opinions. A lower level class, however, gains little from such an open-ended activity and needs to have more strange attractors. In this case, I provide a glossary or have students identify all the verb tenses before answering comprehension questions.

Fractals

According to traditional Chinese medicine, the human body is a fractal. One single part of the body, such as the foot, represents the entire body. Therefore, acupressure can be applied to specific parts of the foot to relieve physiological ailments throughout the body. In addition, even a single toe can serve the same purpose since it also represents the entire body. In nature, fractals abound. A tree, a branch, and a leaf all share fundamental similarities in their structure. Electrons orbit a nucleus, moons orbit a planet, planets orbit a sun, etc. Human society produces such repetitive, identical patterns as well. A single household is part of a neighborhood, a neighborhood is part of

a city, a city is part of a state, a state is part of a country, etc. Fractals incorporate the basic structure or philosophy of a system and infuse those ideas into all levels of the system.

In the classroom, one of my main course objectives is to build community. I mention it in my syllabus and I explain it to the students during the first day of class. Since I consider building community an important goal, I try to demonstrate that message in every lesson by including communicative activities that allow students to get to know one another. In each of these activities, I also make adjustments so that students feel positive about working together. For example, students engage in information gathering conversations to share experiences or future plans, and I ask them to speak to several class members and not simply their neighbor. We also celebrate holidays and birthdays by doing a fun, light-hearted activity such as singing or playing a game. By including this basic philosophy at many levels, I construct a fractal pattern of community in the course, the lesson plan, and each activity that permeates the atmosphere of the classroom and effects a positive change.

In my current teaching context as a Spanish teacher at a boarding school in the United States, the concepts of honor and mutual respect form the backbone of our community. If they are to have real significance, these values must exist in each link of the system. The school's administration adopts these values in the honor code; therefore, its treatment of each individual teacher sets the tone by being professional and honest. Likewise, the teacher-to-teacher relationship serves as an example through friendly interactions and open, sincere conversations about the program. Obviously, the relationship between the teacher and the student is the most vital link and my obligation as a teacher is to

demonstrate honor and respect to each learner in the classroom. As a result of the "trickle down" effect of the code, students are remarkably honest, and respectful of one another's possessions. For example, students will often tell me when an incorrect answer was marked correctly on their test, and they can always find their backpack exactly where they left it on campus hours ago.

Building community and a code of honor are examples of positive fractals; unfortunately, a negative fractal can just as surely take hold in the classroom if a teacher is not careful. Stress is a constant in today's society, and education is no exception. Administrators are concerned about enrollment, students (and parents) are anxious about achievement, and teachers are caught in the middle. Educators face a tremendous challenge in separating true learning from a student's desire to only achieve high grades. In a boarding school, time pressure is also a negative fractal that can leave little room for reflection. As administrators, teachers and students alike are multi-tasking and hurrying from one place to another, the weeks seem to breathlessly pass by without sufficient time for relaxation. My role as a teacher is to be aware of such negative fractals and to try and limit their appearance in the classroom. To that end, I include in my lesson plans room for open-ended, light-hearted activities such as free writing, chatting about daily activities, listening to songs, and watching television in Spanish. Laughter and happiness are fundamental for long-term success in learning a foreign language, and it is vital that my students attach a positive emotional experience to the subject matter if they are to develop into truly successful language learners.

Chapter 6: Presentation: "Language Classroom Dynamics in Relation to Chaos/Complexity Theory"

Sandanona Conference 2000 / CATESOL Conference 2001

In this chapter I will describe the presentation that I gave on two different occasions, once at the Sandanona Conference at the School for International Training and the second time at the CATESOL Conference at Santa Barbara City College. My challenge was to explain and demonstrate complexity in the classroom to teachers who may not have had any previous knowledge of chaos/complexity theory. In a limited amount of time (approx. 45 minutes), my goals were to make the participants aware of the connection with teaching and to provide some practical suggestions to implement c/c theory into their lesson plans.

Purpose of presentation (as submitted to Santa Barbara CATESOL Conference)**:** To provide a new way of looking at how a class develops and to examine some factors that lie behind the success or lack of success of a particular activity/lesson/course. Discovered as a result of the search for more accurate weather predictions, chaos/complexity theory has been utilized to make sense out of incomprehensible patterns in the fields of business as well as language acquisition. Because language influences thinking, teachers familiar with the terminology of chaos/complexity theory will develop a greater awareness of what happens in a language classroom and be able to reflect on their teaching within a new framework.

A classroom is a natural system that operates similar to all natural systems. For example, process writing has the same organization as a fractal structure in nature (i.e., a tree), so we can draw on this knowledge to enhance the activity and become more confident in its application. It is comforting to know that seemingly random classroom occurrences have an explanation and an underlying order if we merely place ourselves at the proper perspective. This presentation will provide vocabulary that links our natural environment with what we hope to accomplish in the classroom.

Set up and materials: I decorated the room with pictures of dramatic weather phenomena such as impressive cloud formations, lightning strikes, hurricanes, etc. since I wanted to associate nature (particularly weather) with the classroom. Additionally, I put up posters of symbolic representations of the twelve characteristics and how they take place in the classroom. I also placed flowers on the front desk to enhance the natural connection and played classical music at the beginning and end of the presentation to create an atmosphere of relaxation and harmony. I used a variety of visual aids to present the material: an overhead projector, white-board, and large paper; participants were also given colorful handouts and slips of paper for the two small group activities.

Procedure: I began the presentation with a word splash about chaos to allow everyone an opportunity to express their feelings about the term "chaos," and I was not surprised to find the majority of the associations to be negative. One of my objectives was to let teachers gradually become comfortable with the natural existence of chaos in the classroom.

The participants were, in most cases, being introduced to new terminology; therefore, I gave them the opportunity to work in pairs to match the characteristics with their corresponding definitions. I decided to approach the explanation of the vocabulary in this more "participant-centered" manner to activate background knowledge and form a stronger connection with the material. Afterwards, I presented the answers on the overhead, explained the characteristics, and cleared up any questions about the definitions. The overhead slide also included classroom examples of each characteristic in order to start building a connection between chaos and the classroom.

I then asked participants to form groups of three to four members. Each group received 10 strips of paper with examples of classroom situations. The task was to decide which characteristics of chaos/complexity were represented in each example. Afterwards, we discussed the choices and there were a variety of interpretations since most of the examples represented several different characteristics.

For the final activity, I showed an outline of the entire presentation and described the appearance of chaos/complexity throughout the activities. I had designed the presentation with the characteristics of c/c theory in mind in order to give the participants an interactive demonstration of the material.

Of course, I requested written feedback which all of the participants were kind enough to complete. As I expected, many participants arrived with little or no prior knowledge of c/c theory; therefore, I was pleasantly surprised to find the majority of their feedback to be very positive. Their opinions supported my research and, as a result, I am encouraged to continue my investigation of the relationship between natural systems and the classroom.

Feedback from the participants of the CATESOL conference:

"Very interesting and stimulating. ☺ Liked the opportunity to see/experiment with how well we were grasping the concepts. Liked the alternating 'lecture' and 'student-centered learning' activities."

"Very thought provoking! It was difficult to see drawings on other side of room, perhaps a handout where we could compare and contrast to identify each concept. I found your presentation highly interesting (and inspirational)!"

"Interesting concept to understand classroom learning and dynamics. Concept and class were presented in an interesting manner. Thank you!"

"Fabuloso! Great info and engaging methods – really made us think and reflect rather than just passively taking in. Now I want to learn more about chaos theory. The sign of a good teacher – makes me want to learn more. Great weather photos."

"Your session was very interesting and excellent for teachers to revisit/review the teaching/learning process. The time went quickly because you engaged us fully with the interactive activities, pair work, etc. Great visuals, music, flowers, colors. Well done, A+! P.s. Got me thinking and learning and rethinking."

"I thought the presentation of the material was clear and simple but understandable and brief enough to put into application in the class. The interaction/hands-on was perfect."

"Opens fascinating new perspectives into classroom interaction and the patterns that underlie it. The pacing was a bit off (excuse me!), a little more speed throughout would have enabled the group to do more activities. Illustrations with posters and pictures lent a nice visual touch and also made more tangible the content. Very nicely done!"

"Very thought provoking – just enough chaos to keep us on our toes! Well prepared and organized. We were doing what you/we were talking about – learning by experience rather than just talking about it. The drawings and photos really added good examples and helped clarify concepts in many ways better than words. Applying concepts to specific activities was very useful. Excellent!"

"It was fun to explore the concepts. It was work to explore the concepts. I still don't understand the 1st definition on the overhead you showed us for self-organizing: It just sounds like a non-sequiter to me. However, that's okay because the definition that you have on your handout does make sense. I've got a lot to think about from this session."

"This attempt to reflect on our classroom and understand its dynamic using an inductive method interested and confounded me. Seeking to understand our experiences in life or in the classroom will always be unfathomable but it does merit an attempt."

"This has been a real brain-stretching exercise and maybe best offered in the morning, not after lunch. The concept of chaos/complexity is brand new to me. Did you prefer not to explain the concept 1st thing in the class? You have been certainly open and helpful with our questions. You are very comfortable in front of the classroom."

"In a way, some of the definitions were confusing to me. I especially liked how you brought in pictures, music, flowers, etc. to create an atmosphere conducive to the presentation of chaos/complexity. Perhaps a morning hour would be better for this presentation because of the high level of intellectual discussion it inspires."

"I really liked the way the workshop was conducted. Having the participants work largely in groups doing info-gap-like activities to match and to discuss the concepts being treated required us to analyze and process the concepts deeply and interestingly. We leave with a feeling that we experienced the concepts and now own their meanings."

"Really interesting! Music at beginning set mood. I want to study this more. Good use of multiple materials: music, drawings, pictures, overhead, handouts. Good use of small groups."

"The workshop was very interesting. Although I expected something about 'how to handle the chaos in the classroom', I found here many very relevant things. I don't agree with some names of class characteristics (for example, strange attractors) because they don't give a clue what it really is. But, thank you!"

"It will be valuable to be able to see what's taking place in the classroom and interpret it in new ways. Good music! I enjoyed working interactively with the activities and I thought the presentational and hands-on portions of the time were well balanced. Thanks!"

Conclusion

Foreign language instruction presents unique challenges since it requires an environment in which learners are able to recreate their form of self-expression. As a teacher, I am obliged to accept a certain amount of responsibility for my students' learning; nevertheless, there are a number of factors that are beyond my control. When I reflect on the effectiveness of a lesson, I find it helpful to use chaos/complexity theory as a starting point. By using the characteristics as a rubric, I can more effectively measure whether I am providing my students a natural learning environment to best develop their language skills.

There is so much to account for in a language classroom that a teacher can easily feel overwhelmed (different learning styles, various teaching approaches, etc.). Chaos theory provides me a clearer overall picture of what is going on in the classroom and a structure to actively implement the many pedagogical concepts I learned while studying for my Masters in Teaching. For instance, when I put the concept of "student initiative" into a framework based on natural systems, I gain a deeper perspective on why this particular concept is important.

We have a lot of terminology in language pedagogy to describe such concepts; however, the vocabulary is generally used in isolation. In my case, these terms have failed to "stick" without a broader framework. For example, the heart pumps blood, but this individual organ loses importance without some connection to the rest of the body. Just like the medical field, my teaching has benefited from a more holistic approach. With chaos/complexity theory, there is an overall structure that unites many pedagogical

concepts like student initiative, building community, process writing, feedback, etc. Of course, it does not offer all the answers; part of the theory deals with tolerating ambiguity and coming to terms with the unpredictable. But it does give me a starting point from which I can feel confident enough to treat my classroom as a natural system and make allowances for the unexpected.

In the end, what matters most is the learning experience of the students. I have discovered that the application of chaos/complexity theory creates a multi-dimensional classroom that facilitates the learning experience by accounting for a complex array of variables. The language classroom environment is accurately mirrored by the twelve characteristics, which highlight the elements present in all natural systems. As my understanding of the learning process grows, I can continue to apply that knowledge so that my students feel more comfortable in the classroom and are able to flourish as language learners.

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