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## **INSTRUCTION, CURRICULUM AND SOCIETY: ITERATIONS BASED ON THE IDEAS OF WILLIAM DOLL**

*“How wonderful that we have met with a paradox. Now we have some hope of making progress.”*  
Niels Boh

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This paper explores the relationship between society and school from the point of view of chaos theory with the purpose to understand the deficiencies in teacher education programs and to offer suggestions for their improvement. Based on the ideas of the postmodern curriculum theorist William Doll, it examines the paradigm shifts of world views from pre-modern to post-modern times and their implications for education. The methodology is theoretical analysis. The findings will show that classrooms are fractal in nature and reflect the society of which they are a part. Therefore, it is necessary to understand that the function of school goes beyond passing generations along or changing society. Today's schools must bridge the gap between a modernist education system and a post-modern, globalized knowledge society. The paper concludes with examples that use those findings to improve the praxis of pre-service teacher education.

Key Words: William Doll, chaos theory, fractals, schools, pre-service teacher education

### **INTRODUCTION**

As an instructor for pre-service teachers, I start every semester with groups of students who have come to my courses with two objectives: 1. they expect me to make them “effective teachers” by giving them blueprint instructions for teaching and 2. score an A at the end of the course. Most of the students are wholly focused on the end product or grades rather than the process of shared learning experiences (Bain, 2004) as they are indoctrinated into a deterministic, competence-based education system. What the soon-to-be teachers have yet to realize is that curriculum and instruction is too complex to neatly follow predetermined linear goals. As I can only hypothesize about their prior knowledge and experiences, interests, fears and questions, it cannot be useful to lay out the course based on a priori objectives. And even with all those

uncertainties, as their instructor I have an advantage over them as future teachers because in my classrooms we have come together with a common interest – teaching. The diversity my students will encounter in their own classrooms will be yet greater. This gives rise to the question how meaningful lesson planning based on the same preset standards and methods for all learners can be.

The opening quote from Bohr reflects a philosophy of life and learning that is not reflected in a positivist education system. As it is driven by preset goals, a learner's knowledge, experience, interests, fears and questions are often understood as exceptions from the norm, considered of little importance and therefore excluded from the curriculum.

In this paper I will explore the paradox in curriculum theory by looking at it from the point of view of chaos and complexity theories. In order to do so, I will begin by understanding the following three premises: 1. classrooms are open systems and therefore fractal in nature (self-similar on different scales); 2. as open systems, they are sensitive to initial conditions and have emergent properties; 3. therefore, they are dependent on feedback (iterations).

As the methodology to explore the usefulness of these ideas, I will employ a theoretical analysis based on ideas of post-modernism with a particular focus on the work of William Doll, who “speaks directly to the differences between modernism and postmodernism, and in doing so very usefully summarizes the meaning of postmodernism” (Pinar et al., 1995).

According to Richard Rorty (as cited in Noddings, 2007), we cannot understand a phenomenon unless we look at the parts it consists of, which we cannot comprehend until we have some idea of how they contribute to how the phenomenon functions as a whole. In regards to school, it must be understood as a part of society which it simultaneously mirrors and shapes. However, often school is thought of only in terms of the latter, namely as a major agent in creating change within society. This might explain Americans' frustration with education expressed by everyone from parents and students to governors and city planners or why one of the most important determinants when choosing a place to live is good schools (Florida, 2008). With this one-sided point of view it is no surprise that anyone in education is overwhelmed by the demands set before the system.

It appears that it is the neglect of that other agency of school, namely its innate fractal character by which classrooms mirror the larger society they are part of on a smaller scale, which constitutes the paradox that might open the possibility to progress. In 2011 this means to bridge the gap between a modernist education

system, an artifact from an industrialized society, to one that mirrors a post-modern, globalized, fractured society (Griffith, 2007).

### **From a Curriculum of Order to a Curriculum of Chaos**

*“Every great and deep difficulty bears in itself its own solution. It forces us to change our thinking in order to find it.”*  
Niels Bohr

The key words here are “in itself” and “change.” Kuhn’s paradigm shift (as cited in Noddings, 2007) tells us that a paradigm will be questioned once we look at its abnormalities at which point we develop theories for their explanation. As these are incommensurable with the old paradigm, it comes to a clash expressed in debates and academic battles, and finally a new paradigm evolves which is quite opposed to the old one. The key point here is that each phenomenon, paradox, or paradigm bears in itself the answer. We find it once we change our approach by looking at the interrelatedness of the elements that constitute the phenomenon and its inconsistencies rather than outside of it in search for more knowledge.

In his book *A Post-Modernist Perspective on Curriculum*, William Doll explains the megaparadigm shifts from pre-modern to modern and from modern to post-modern. The pre-modern paradigm covers the time from the ancient Greeks to Copernicus. In its center is order and balance. “Every object ‘aims’ for this ideal and natural state; this is its function and purpose” (Doll, 1993, p. 25). With this teleological view, all purpose was predetermined, and choice was not an option. In terms of learning, the goal consisted in achieving harmony by fulfilling a pre-set role based on understanding one’s essence.

The pre-modern paradigm became insufficient when Copernicus replaced the geocentric world view with a heliocentric one in the 16<sup>th</sup> century. A hundred years later, Descartes rejected teleology in favor of reason. These fundamental changes in the scientific and philosophical world views culminated in the 18<sup>th</sup> century when Newton introduced the “clock-work” universe. The pre-modern paradigm was replaced by a mechanistic one that followed the laws of nature. In terms of learning, the goal consisted in discovering ever more knowledge, which was transferred by a teacher, in order to be able to predict and eventually control nature.

Copernicus developed the heliocentric view in his attempt to understand the discrepancies in the movements of celestial objects. Based on his findings, Newton was able to understand that their motions are elliptical, not circular. The point is that while those findings led to a major paradigm shift, these discrepancies contained their solutions in themselves and were understood as a result of the willingness to change our thinking about long-held assumptions.

What does that mean for learning? If understanding is created by looking at the interactions of the relationships inherent within a system, growth and development cannot occur by accumulating external knowledge as is assumed to be the case in the modernist paradigm, which rests on the idea that growth happens gradually in a linear fashion and continuously increases depending on how much knowledge a learner *discovers*. In terms of learning, neither the pre-modern nor the modern paradigm take the individual into consideration and the way a person constructs meaning for himself by incorporating prior experiences and knowledge. With this result-oriented view, the goals of learning are separated from the processes needed to accomplish them.

In his article *A Structural View of Curriculum*, William Doll expresses his concerns on how both educational models of the 1970s, namely the behaviorist model on one end of the spectrum and the humanist model on the opposite end, fail to understand that we cannot separate the ends from the means by prioritizing one over the other. According to Doll, the humanist model has not been successful because it focuses too little on the means as its underlying idea is that children learn willingly because they are naturally curious. The teacher's purpose consists in simply unleashing students' innate potential. The behaviorist model, on the other hand, focuses too much on the means by developing a priori purposes. Drawing on Goodlad and Dewey, Doll says that not all goals can be pre-determined, and often "ends do not lie outside action, but rather lie within action and are the result of the reflection on action" (Doll, 1979).

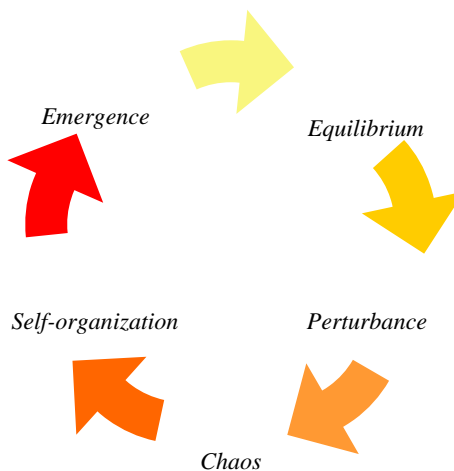
Thirty years later we still find many aspects of the behaviorist model in our classrooms. We focus on pre-determined standards that are the same for all children regardless of their diverse interests, backgrounds, talents, etc. The accomplishment of pre-set goals is measured with standardized test scores and grades, which do not indicate growth but rather the gap between pre-determined objectives and the learner's deficit in terms of student performance (Doll, 1993, p. 172). As classrooms reflect the larger society they are part of, this system was appropriate during the age of the industrialized society from the 19<sup>th</sup> to the mid-twentieth century whose cornerstone principle was to continuously increase production in order to accumulate more manufactured goods. This simplistic, deterministic paradigm was certainly the answer at a time of uncertainty in the centuries following a heliocentric world view.

While our society is still focused on economic growth, it does not lead to prosperity, either on a societal or on a personal level. The ideas of chaos and complexity theory offer us an answer to explain this seeming paradox. These concepts introduce the latest paradigm shift from a linear, modernist view to a post-modern paradigm at the heart of which lies the idea of contingency and

indeterminacy, which we should extend to the smaller societies of our classrooms.

But our measured curriculum still reflects Newton's simplistic, reductionist principles. Anything that deviates from the a priori objectives is understood as a disturbance that needs to be eliminated. Based on the work of Prigogine and, in a wider sense, Piaget, Doll proposes a transformative curriculum which understands the connectedness of students and teacher as an open system whose impetus is perturbation leading to chaos. From a post-modern point of view, the word chaos does not have the usual negative connotation but is understood as the fertile space which opens up the possibility to change our thinking and look at a paradox understanding that it contains its own solution.

This is a key idea in the work of William Doll. Therefore, his purpose is not to provide curriculum theorists with a "how-to" framework "but rather to provoke thought and generate concerns about existing curricular practices and assumptions" (Stuever, 2009).



### A New Paradigm for Curriculum and Instruction

Terry Marks-Tarlow, a practicing psychologist who applies chaos theory and complexity sciences in her work, understands mental health as our ability to react and self-organize at the edge of chaos, which she defines as "a transitional zone located between poles of stagnant order at one extreme and utter disorder at the other" (Marks-Tarlow, 2008). This definition allows us to understand disorder or conflict as an opportunity rather than a shortcoming.

The education "system" is a social system, our body is a biological system, and an ant hill is a fitting example for both. A system starts in a state of equilibrium and continues its existence until it experiences a perturbation: someone throws ant poison on the hill. At this point, the system is in the state of chaos. Driven by survival instinct, the ants attempt to rescue the larvae and the queen as the source of propagation by moving them to a safe location. The system makes all necessary changes, or self-organizes, in this case for the purpose of survival. In the example of the ant colony, the insects build another hill. The system emerges at a new equilibrium.

Doll cites Prigogine's favorite example of the Acrasiales amoebae (Doll, 1993, p. 103) to make two very important points: the system as a whole survives only when its individuals join together. More strikingly yet, he points out that "self-organization is not teleological (moving to a pre-determined end); it is not even teleonomic (purposeful adaption to the environment, as in the preservation and function of life). Self-organization is open-ended" (Doll, 1993, p. 72).

This is an extraordinary insight which changes many previously axiomatic assumptions. It appears that the reason for a system to self-organize is not survival but *becoming*, in which case its continuous existence is merely a side effect as much as a necessary, underlying condition. This concept seems reminiscent of Hegel's dialectic which is based on the idea that our driving force is the contradiction of spirit and mind (Geist) and its integration on a higher level; nothing is permanent, everything is becoming whereas becoming is the self-development of Geist (Hegel, 1841).

Classrooms are not complex-adaptive systems such as ant colonies or amoebae, but they do resemble small societies and have emergent qualities. Unfortunately, these are severely restricted by our modernist curriculum, which is a "functionally closed system" (Doll et al., 2005). By forcing all children through a K through 12 education system that is based on rigid goals which are predetermined with utter disregard for children's prior experiences and diversity, we deny them any chance for interpretation, reflection, or self-development.

However, the other extreme, a system with no structure, is equally ineffective. In *A Structural View of Curriculum*, Doll notes that one of Goodlad's graduate students shows "that abrasive behavior in the form of language and discipline is more prevalent in humanist classrooms than in behaviorist ones" (Doll, 1979). He explains that this "abrasive behavior" is caused by the mismatch between the humanist education model and the industrial-technocratic society of the 1970s. Today this gap has become yet more extensive as our education system does not match the needs of our knowledge society in the age of globalization and innovation. While our schools prepare children for the job market in order to enable them to become independent individuals who contribute to society, they do so in a way that reduces them to human capital. All focus is directed towards ends instead of *becoming* as is reflected in our standards-based education system and our hunt for diplomas and credentials. Classrooms resemble society on a smaller scale, and our modernist education system cannot fulfil the needs of our post-modern society.

So how can chaos and complexity theories help us to overcome this disconnect between our classrooms and the society they are part of? In his article *Educational Philosophy and the Challenge of Complexity Theory*, Keith

Morrison states that they cannot because they are “descriptive” rather than “prescriptive” theories and essentially “post hoc explanations” (Morrison, 2008). He comes to the conclusion that these theories might help us with suggestions but cannot tell us what to do as they are based on understanding uncertainty as a fundamental characteristic of open systems. However, there is another equally important characteristic in open systems, namely self-organization. Based on this aspect and in an attempt to use self-organization in ways that lead to emergence on a higher level, Doll recommends that we focus on the dialectic between “closed/open (to give) a sense of structure to the system and also open the system to the new” (W. Doll, personal communication, December 2, 2010). He suggests we do so with the help of a curriculum that is based on “richness, recursion, relations, and rigor” (Doll, 1993, p. 176). A rich curriculum offers those who construct it, namely students and teachers together, the chance “to transform (it) and be transformed” (Doll, 1993, p. 176). In a phenomenological sense, it allows those who engage in it to contribute their experiences and understands curriculum as “currere,” a course to be run (Pinar et al., 1995). As knowledge is constructed based on reflections, recursion must be an integral part of a curriculum that allows for emergence. When Doll suggests that an effective curriculum is relational, he reminds us of Bohr’s quote above that each problem contains its own solution. It can be found in the interrelatedness of all parts and opens the system for emergence by means of synergy. Finally, rigor refers to mastery far beyond standardized testing. In the process of being engaged in a rigorous curriculum, students and teachers become deep thinkers and reflective learners who are “continuously exploring, looking for new combinations, interpretations, patterns” (Doll, 1993, p. 182). With that Doll “gives meaning and substance to the language of disequilibrium, reflective intuition, surprise, puzzlement, confusion, zones of uncertainty, non-rationality, and metaphoric analysis” (Slattery, 2006).

### **Implication for Curriculum and Instruction**

If we understand that systems develop through iterations, the implications for a classroom, or better a learning community, are that understanding occurs through self-reflective knowing (Lemisko et al., 2001). But our positivist classrooms do not afford this kind of emergence as the teacher pre-sets the goals without considering students’ interests or developmental stages in terms of their construction of knowledge.

In their article *Reshaping Teacher Education in a Knowledge Society*, Lemisko, Griffith and Cutright suggest that we begin by understanding students’ interests and allow them to develop their own questions. Students must then find their own ways to seek answers, their own answers, which are meaningful and personal to them. Once they reflect upon their experiences, students learn how

to think (Lemisko et al., 2001). This approach resembles Doll's "four R's" as described above (Doll, 1993, p. 176).

From my experience as an instructor for pre-service teachers I know this is often an arduous task because most students have followed the banking model (Freire, 1993) of education rather than taking ownership in their learning. They come to class with the expectation that I will make them effective teachers. They are strategic learners (Bain, 2004) who try to figure out what kind of professor I am in order to devise a strategy to get an A, which, in the beginning of the semester, seems to be their main goal. I try to shift their focus onto themselves by allowing them to get to know themselves better as learners. Many of my students have never heard of Gardner's concept of multiple intelligences, and once they understand it and its connection to emotional intelligence, they understand themselves better as learners and see the need to afford the same opportunity to their own students.

As the construction of knowledge is personal, I find it important to incorporate multiple literacies. I have a collection of music videos and poems which I share with my students based on themes. The reason I work with music and poetry rather than photography or other genres is because these make it easier for me personally to construct knowledge and share my thoughts. The most important aspect, however, is that students reflect upon how what they see makes sense to them. I originally had asked them to write a poem titled *Who Am I* as an optional assignment which would not be graded. Actually I just wanted to present an alternative to writing a reflective essay, and I wanted to see if students would engage without extrinsic motivation. The response was very positive: many of them asked if they could approach the issue in a different way, such as in form of collages, cartoons, or songs, which I had not thought of. At this point, the students' focus had shifted from the extrinsically motivated completion of assignments validated by a grade to working on what interested them in ways that were meaningful to them. This was accomplished by allowing for emergence; the goals were developed from within based on previous actions and experiences and might not have been achieved if they had been predetermined. Moreover, as we listened to and better got to know one another, my pre-service teachers and I experienced the fractal character of a learning community in a meaningful way by being both a student and a teacher simultaneously.

This way of learning also facilitated the approach of another difficulty, namely to develop a discourse with students. Since they begin the semester very focused on me as the omnipotent teacher, a thoroughly overwhelming and unrealistic role, the problem consists in focusing their attention onto each other. To remove myself from the center of the learning community is also my only

chance to become a real member of it, one who can receive and is not just expected to give. Our first classroom discussions are rather one-sided as only a few outspoken students participate. The majority waits for me to share my opinion in order to adopt it. For that I find online discussions very helpful. They take place in an asynchronous setting and are less intimidating for those students who are not yet comfortable to share their thoughts in a traditional classroom. When conducting online discussions, three things are important: first, a discussion is a discourse, which means that students *respond* to each other repeatedly as opposed to just posting a comment. Second, I do not participate as this has a very constricting effect on the emergence of the discourse among students. Finally, students must find a way to reflect upon what their original position was, what their peers contributed to their thinking, and how their view has evolved (or not) as a result of this discourse. At this point, having followed their emerging thoughts closely, I get to participate in this learning experience, which by now, following Habermas' communicative action, has impacted all "three worlds": the students and me, our relationships with each other and the topic itself ("Communicative Action," 2010). As long as the discussion topics are meaningful to students, subsequent classroom interactions develop into true discourse, and self-organization leading to emergence is evident.

I find these approaches to teacher education helpful in communicating how important it is for me that learners develop purpose and autonomy and hope to enable pre-service teachers to use their experiences to transform their classrooms into those that reflect our post-modern society while using our classroom as an example.

However, this is realistic only when they have achieved a level of mastery in designing lessons that are effective and meaningful for their students. In order to accomplish that, I have pre-set albeit flexible goals. For beginning teachers it is important to understand that presenting information does not automatically result in learning and that classroom management is not accomplished through classroom control. I think this can only be achieved by planning and teaching lessons that are relevant to their students' lives. Once again, I find three basic aspects important here: first, my students choose what and how they teach. Once this decision has been made, they share a draft of their ideas and approaches. In preparation for those class meetings, they bring their lesson plans and questions for which they receive feedback from each other before creating their final drafts. At first, they try to solicit my feedback only, but as I ask their peers for input, they come to value each other's opinions equally.

Second, every assignment can be resubmitted indefinitely until they meet my flexible, pre-set qualitative requirements which are reflected by a letter grade.

The results of this approach have been encouraging: students take a risk because they understand the non-threatening nature of all assignments. Moreover, they learn that mistakes are invaluable feedback for their construction of knowledge. And finally, students resubmit their work even if it is marked with an A- because they feel that they know now what is needed to make a lesson potentially truly effective. While this increases my grading homework exponentially, it allows me to observe how student learning occurs in spurts rather than gradually.

Finally, the third aspect to achieving mastery is to allow students to reflect upon their planning and teaching activities. With that, the ideal outcome of planning (becomes) planning” (Lemisko et al., 2001), which shows that it is a process-oriented activity, fractal in nature as it is accomplished through continual iteration. When designing learning opportunities and asking students to reflect upon them, it is important to do it in a way where each new one builds on the previous ones. My students understand that this is how knowledge is constructed, and I can see how by the end of the semester, many of them are on their way to becoming more reflective, deep learners.

As I accompany my former students into their own classrooms during their first year of teaching, I am continuously reminded of the fact that rather than *being* teachers now, we are in the constant process of *becoming*. In our traditionally arranged classrooms, where the teacher often takes center stage, we are constantly challenged not to return to approaches that resemble the kind of Socratic dialogue Doll describes as “recollection-oriented ... designed to discover previously known truths” (Doll, 1993, p. 25). And therein lies every educator’s personal “difficulty that bears in itself its own solution” as it represents our own paradox and the chance to make progress in our individual becoming as educators.

## CONCLUSION

*“The opposite of a fact is a falsehood, but the opposite of one profound truth may very well be another profound truth.”*

Niels Bohr

Throughout the work of William Doll, one underlying thought becomes apparent: “The future evolves from the present (and the past) and is dependent on interactions that have happened and are continually happening” (Doll, 1993, p. 72). This means we cannot simply discard the views of a previous paradigm but must understand them as one step in the becoming of a new one

The pre-modern society experienced its perturbation when its world view was no longer sufficient to explain discrepancies, such as those in the movements of celestial objects. In its state of chaos, self-organization resulted in a heliocentric world view, and a paradigm shift took place. But as Doll made so clear, we

must not discard the pre-modern philosophy as a whole; it is still important to find our essence, only now we understand that it continually changes as we become. Balance is important for us like it was for Aristotle because it is still “the dose that makes the poison” in our personal and professional lives as in our classrooms.

The new equilibrium that followed brought stability and certainty because that was what was needed. In modern society, all was orderly and reasonable again until our understanding of a clockwork universe failed to explain the unpredictability of phenomena occurring outside our cause and effect chains. And yet, the last two actions can still be explained by that relationship, and our *becoming* is at least in part based on our being.

At the moment our global village is in its natural state of chaos and, because of its fractal character, so is our education system. Our post-modern society brings with it exciting times which afford us the opportunity to self-organize by searching for solutions within the difficulties themselves. We will be able to design them if we understand our dependence on each other and all things involved. What will emerge is a new equilibrium whose name I’d like to know but probably won’t as it takes time for a system to run its course and encounter new paradoxes which will be the foundation for new possibilities.

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