Chaos and Complexity Theories SIG

AERA 2009 Sessions

Tuesday, April 14

2:15 pm - 3:45 pm Paper Session
San Diego Marriott Hotel & Marina -- Torrance Room

"Caring About the Absence and Emergence of Communities of Learners"

Abstract:

As outlined by Nel Noddings (1983/2003), caring should be an essential part of education. How can communities of learners experience both a community in which collective ideas emerge and a space in which caring is expressed in the collective? These seemingly divergent ideals and collectives of researchers will coalesce their research around the main theme that the complexity sciences offer a space in which the conversation about caring and collectives can be examined simultaneously.

Session Participants:

Chair: Rosemary C. Reilly (Concordia University)

Caring as Recursive Relations
*Sherrie B. Reynolds (Texas Christian University)
Nel Noddings' groundbreaking work on caring established a new perspective on an ethic grounded in the caring relation. Noddings argues that this relation arises from a "longing for relatedness" and a caring response that arises from the memory of being cared for and caring. She argues in this, and subsequent works, that the nurturance of an ethic of caring must be the primary aim of education. I view Noddings' work on caring through the lens of the New Sciences, moving from the reciprocal, dyadic relation that is basic to Noddings' work to the caring context as a recursive system of relations.

Launching and Sustaining Teacher Development Collectives: Complexity Qualities and Conditions That Support Teacher Learning
*Xavier Eric Fazio (Brock University), Tiffany L. Gallagher (Brock University)
This study examined two teacher development cases (middle/secondary school science teachers and elementary learning resource teachers) from which significant professional learning outcomes emerged. Both collectives exhibited characteristic qualities and conditions ascribed to complexity theory. This post hoc analysis provides evidence of the robustness of complexity theory and its applicability to initiating and facilitating

professional development collectives. Recommendations are offered to researchers and teacher development facilitators to use complexity theory at the outset of their projects for planning and implementation purposes. A model is provided as a tool for the development and study of professional learning collectives.

Emergence of a Beautiful Spiral: How to Marry Technology and Life in Designing Virtual Communities

*Lyubov V. Laroche (Western Washington University), Barbara N Young (Middle Tennesse StateUniversity), Diane R. Penland (Western Washington University), Genet Simone (Western Washington University), Laurence R. Antil (Western Washington University), Dina Benedetti (Western Washington University)

In this paper we describe our ongoing attempt to integrate technology with the insights of the science of complexity, so to create a living and breathing virtual community, a space of belonging for adult learners enrolled in the teacher education outreach program. The concept "self-organization" guided our project design and subsequent research aimed to explore associated potentials and challenges. We will describe results of implementation of vital conditions of self-organization such as fluid realm; openness to the information flow; turbulences and changes; freedom within flexible boundaries; multiplicity of possibilities, interconnectedness of all parts of the system; and collective emergence.

The Absence and Emergence of Collective Understanding in the Mathematics Classroom

*Jennifer Susan Thom (University of Victoria), Wolff-Michael Roth (University of Victoria)

In a general sense, collectives as learning systems have been conceived as arising through complex, creative, and emergent processes. Such claims necessitate research that observes in detail, how these processes are evidenced, the events occasioned by them, and the consequent understandings that unfold at both individual and collective levels. This paper responds to this call, in part, by documenting an episode in which both the absence and emergence of collectivity results as three learners work on a mathematical task.

Discussant: Sherrie B. Reynolds (Texas Christian University)

6:15 pm - 7:45 pm Business Meeting and Special Session
San Diego Marriott Hotel & Marina -- Torrance Room

"Searching for the Sacred in the Midst of the Business at Hand"

Abstract:

After some short official business, we will delve into conversations around Kauffman's (2006) *Reinventing the Sacred*, led by science education

researchers.

Then Nora Bateson will show a major excerpt from her upcoming film, ***An Ecology of Mind***, which is a tribute to her father, Gregory Bateson. We hope you will join us for a great time together!

Session Participants:
Chair: Bernard P. Ricca (Saint John Fisher College)

Participant: Donald L. Gilstrap (University of Oklahoma)
Participant: Jeffrey W. Bloom (Northern Arizona University)
Participant: Sherrie B. Reynolds (Texas Christian University)
Participant: Helle Mathiasen (University of Aarhus)
Participant: Sarah Smitherman Pratt (University of North Carolina - Greensboro)
Participant: M. Jayne Fleener (Louisiana State University)
Participant: Jens Rasmussen (University of Aarhus)
Participant: William E. Doll (Louisiana State University, Retired)

Discussant: John A. Weaver (Georgia Southern University)
Discussant: Jazlin Ebenezer (Wayne State University)
Discussant: Nora Bateson (Institute for Intercultural Studies)

Wednesday, April 15

8:15 am - 9:05 am Paper Sessions
San Diego Convention Center -- Ballroom 6A

"Exploring Complexities in Educational Research"

Abstract:

Each paper explores and examines ideas of educational research using lens of complexity and chaos theories. Please join us in these conversations!

Session Participants:

TABLE 6 - *Cinematic Disequilibrium: Analysis of the Use of Film Through the Lens of Chaos and Complexity*
*Kathryne Roden (University of Central Oklahoma)
This paper focuses on the feature of film in relation to chaos and complexity by exploring the cinematic feature of storytelling in relation to why individuals respond to film. To answer what cinematic features speak to individuals, how they speak to people, and why they speak to people the cinematic features of film are explored in terms of: 1) the power of the storytelling, 2) the three acts in film, and 3) the relevance in relation to elements of chaos and complexity. Findings indicate that films are a powerful because films connect to the chaotic disruptions of life, representation of

disequilibrium, and the protagonist's journey towards re-organization.

TABLE 7 - *Emergent Teaching: Embracing Complexity and Contradictions*
*Sean Buckreis (Louisiana State University)
Competing and sometimes incommensurable demands are constantly heaped on teachers. Not only must they aspire to live up to their own constantly evolving ideas of what it means to be a good teacher, but they must also grapple with often differing conceptions of what good teaching means to their coworkers, their school's administration, their students' parents, their students, and others. How then does a teacher deal with these competing views? Drawing on the work of theorists such as Deleuze, Derrida, Bhabha, and Serres as well as the work of those in curriculum studies such as Ted Aoki and Hongyu Wang, I suggest that a teacher must dwell in the tensions of an ever-changing third space.
In this presentation I will explore the complexity of a third space. I understand third spaces as dynamic and emergent, unique to an individual teacher and existing in a specific time and place. It happens when teachers resist the codification of universally applicable methods of teaching and when they shy away from static conceptions of self and other. It is a space where competing ideas can interplay without one idea becoming permanently dominant, and where differences and tensions can be as powerful as synthesis.

TABLE 8 - *Education as Human Development: Putting Theory Into Practice*
*Inna Semetsky (University of Newcastle)
This presentation derives from my paper "Simplifying Complexity: Know thyself…and others" currently in press in the journal Complicity: An International Journal of Complexity and Education. However rather than focusing on theory, I will demonstrate a systems-theoretical approach in action by reference to a particular practice and using data of research conducted under the auspices of the Board of Behavioral Science Examiners in California. I will demonstrate a real-life Tarot reading (with the subject's consent) that shows an expansion of the "circle of knowledge" as the subject's awareness grows due to multiple feedbacks embedded in the relational dynamics of the reading. The chaotic flux of the subject's experiences becomes organized into order at the higher level of complexity.

TABLE 9 - *Issues of Learning and Cognition as Complex Systems*
*Jeffrey W. Bloom (Northern Arizona University)
This paper examines the issue of what is and is not "complex" in learning and cognition from the perspective of complexity theories. The use of "complex" to describe linear and mechanistic learning is problematic in terms of maintaining a sense of rigor with the language we use. If learning and cognition is to be complex, it should meet the criteria of (a) being autopoietic, (b) involving recursive patterns of knowledge production, and (c) involve contexts that are far from equilibrium.

TABLE 10 - *Naming the Space Between: Struggling to Describe Preservice Teachers' Negotiation of Reform-Based Mathematics Teaching*

*Catherine Stein (East Carolina University)

Reform-based mathematics calls for teachers to engage students in the practices of a mathematical community while simultaneously promoting a strong conceptual understanding of and appreciation for mathematics content (NCTM, 2000). Many elementary preservice teachers entering mathematics methods courses have only been exposed to traditional mathematics instruction, namely teaching-as-telling. Learning to teach reform-based mathematics is a complex endeavor (e.g., Davis, 1996). This requires a significant epistemological change, from a mechanistic approach to teaching, in which the teacher "causes" learning to occur, and instead to engage in self-reflexive questioning in moments of teaching, based on input and feedback from students as they express their understandings of mathematics.

For preservice teachers, learning to teach reform-based mathematics is about becoming a member of a community (Lave & Wenger, 1991). As a teacher educator, I examine the folllowing categories with respect to this transition:

· How do changes in beliefs and practice occur?

· What is the role of context in the process?

The study that transpired over a two-year period with elementary preservice teachers revealed that this process "becoming" exists as the space between, the space in which preservice teachers negotiate and re-negotiate their role as mathematics teachers over time.

In my analysis of the data collected during the study, I devised descriptions of the preservice teachers' "positionings." Based on the patterns that emerged, I recognized four typical dispositional norms: resisting, acknowledging, embracing, or creating complexity. Some moved from one position to another during the course of the study, but others remained fixed.

My struggle with my analysis is how to present my findings about the differences among groups of preservice teachers their paths to reform-based teaching without labeling them in a static category on a continuum (a linear trajectory). I subscribe to a more open, dynamic interpretation, much like the Pirie-Kieran Model (Pirie & Kieran, 1994), but I find that words and images are failing me. I wish to have a conversation with other educational researchers about my struggle and for a space to reconsider the "positions" that the preservice teachers to create a more complex description of what I believe are significant movements/moments in preservice teachers' transitions.

TABLE 11 - *The Language of Memory: Slowness in an Age of Virtual Immediacy*
*Stephen Shepard Triche (Nicholls State University), *Marianne Fry (Louisiana State University)
The paper explores the complex elements found in the language of memory. It investigates Derrida's emphasis on the important role played by the remembering of one's heritage in changing one's identity. Second, it examines Heidegger's use of the "step back" to gain understanding of one's lived experience. Third, it explores the increasing domination of digital media as society shifts away from literacy to digital media. Described as "just in time knowledge," people are becoming less likely to access the information by remembering, or from books. "Surfing" the Internet instead. Does education in an era of "just in time knowledge" mean that the mind can now be freed from "memory" as we have understood it in a literate world?

TABLE 12 - *The Mystery of Time: Linear or Crumpled, Illusion or Reality?*
*Jie Yu (Louisiana State University - Baton Rouge)
This paper does not aim to get a general essence of time, but focuses on Michel Serres and Ilya Progogine in digging into their metaphors of time from which are different from the common image of mechanical clock time—Serres's metaphors of time as handkerchief, weather, and dough, and Prigogine's metaphor of time as arrow with irreversibility. The four metaphors touch upon different dimensions of time and I don't want to prove they are the only right or better metaphors of time but tries to add richness and complexities of our understanding of the mystery of time with possible implications for education.

2:15 pm - 3:45 pm Symposium
San Diego Convention Center -- Room 15A

"Nonlinear Complexity in Children's Play: Wholistic, Fluid Connections, Script Theory, Theory of Mind, Brain Development, and Transdisciplinary Trading Zones"

Abstract:

As a non-linear dynamic activity, human play creates meaning and learning throughout the lifespan. This seminar discusses recent theoretical and research perspectives stressing play's role in promoting wholistic, fluid connections among script theory, theory of mind, brain research, and transdisciplinary trading zones. The first presenter will discuss how three non-linear theories (script theory, theory of mind, chaos/complexity) relate to play theory and sociodramatic play. The second presenter will review brain development research that illustrates how the brain's wholistic, fluid connections relate to characteristics of non-linear dynamical play systems. The third presenter will discuss the relationship between dynamical characteristics of play and scientific interdisciplinary inquiry, fostering ability to promote transdisciplinary trading

zones. An interactive dialog with the audience will follow.

Session Participants:

Participant: Doris Bergen (Miami University) -- **Download Paper**
Participant: Doris P. Fromberg (Hofstra University) -- **Download Paper**
Participant: Karen Vanderven (University of Pittsburgh) -- **Download Paper**

Chair: Doris Bergen (Miami University)

Discussant: William E. Doll (Louisiana State University, Retired)
Discussant: Sarah Smitherman Pratt (University of North Carolina - Greensboro)

Thursday, April 16

4:05 pm - 6:05 pm Paper Session

Abstract:

Members in our organization are interested employ complexity sciences as a theoretical framework for educational research. In this session in particular, the conversation will focus on how this framework can enable us to imagine school improvement differently. The overall theme will be the idea that time is irreversible. With this in mind, how can we as educators explain and explore school improvement plans as a complex endeavor? The participants will draw on their research to share from their perspectives how they believe that it is possible to have a plan for school effectiveness, if it is imagined in a sustainable, complex manner.

Session Participants:

Chair: M. Jayne Fleener (Louisiana State University)

Complexity: Implications for Performance Modeling and Improvement in Education Systems
*Claudina Vargas (Complex Systems Optimization Lab)
This work addresses the issue of satisfying completeness in the formalization of a descriptive model of an educational system (ES) with a view at analyzing its performance. Completeness is a necessary condition for model accuracy and resolution, but it is difficult, perhaps impossible, to achieve when the system being analyzed is complex like an ES. An ES may be a classroom or set of interdependent classrooms, a school district, or any part of a larger hierarchal structure. The goal of the modeling process is to understand the structure and dynamics of the educational transformation processes and improve performance. The effectiveness of this process depends on how well

the system is described and how the model resolves the uncertainties. This is difficult to achieve in a model of an ES. In this system, performance-shaping factors are ill-defined as are the process transformation technologies. Due to individual differences, transformation processes have many transformation or learning models, all unique, imprecise, and dynamic The forms of these models are not well-known. In this work we examine the various theories about generally accepted performance shaping factors in education and identify particular characteristics that explain why these factors

Demystifying Epicuris' Dilemma Through the Arrow of Time: Critical Reflection As an Irreversible Process

*Donald L. Gilstrap (University of Oklahoma)

Critical reflection in the classroom has become an increasingly important aspect of teaching and learning. The criticality of complexity theory has been discussed in the C&C Theories SIG, and the concept of critical reflection additionally appears to share a similar framework. This paper extends this research by focusing specifically on critical reflection as an irreversible process that subscribes to Prigogine's Arrow of Time. Therefore, the purpose of this paper is to present an epistemological framework for the metaphorical connection between critical reflection and irreversibility.

Education, Complexity, and the Era of the Incuriosity

*Mike Radford (Canterbury Christ Church University)

We live in an age of incuriosity. We no longer consider questions about educational aims, content or children's learning. We talk instead, about the technical problem of making a system work effectively. The concept of 'progress' has been supplanted by that of 'improvement'. We no longer look for rich and varied explanations but rather for improvement in techniques and processes. Complexity theory pulls this process up short, drawing our attention to schools as sites of conflict, tensions and potential volatility. Complexity sees schools on the 'edge of chaos', where learning is an emergent, creative process. Complexity theory emphasizes the essential unpredictability of educational processes and re-establishing education as a source of curiosity.

The 5-Year Change Process at a Secondary School: A Case Study

*LuAnne Marie Forrest (Washington School District)

This exploratory case study illuminates the interplay between contextual factors within the five-year change process in a school community pursuing improvement. Data from a document review, structured interviews and open-ended observations were analyzed chronologically and categorically using constant comparative analyses. Findings showed the change process occurred in two distinct phases during which a high degree of apparent disorder caused by dramatic changes in the organization's subsystems, reshaped the school's culture through self-organization and self-similarity to one that was consistent with the organization's growing sense of identity and intent. A focus on building relationships through dense, interactive networks; making meaningful connections through on-going, collective inquiry; and

creating a powerful draw through an authentic and unrelenting focus on student achievement was recommended.

Urban School Reform and the Strange Attractor of Low-Risk Relationships

*Brian Robert Beabout (The University of New Orleans)

While it is important for schools to form positive relationships with external organizations, many educators note that layers of bureaucracy filter out much of this feedback. School leaders in a newly decentralized New Orleans public school system have found themselves in a suddenly flat organizational structure, and were forced to reach out to external organizations. Analysis of iterative interviews with 10 principals reveal a range of external partnerships that can be classified into a three part taxonomy consisting of charitable relationships, technical support relationships, and feedback relationships. A discussion of the tendency towards the first two types of relationships and the importance of utilizing feedback relationships concludes the paper.

Discussant: Bryant Griffith (Texas A&M University - Corpus Christi)
Discussant: Patrick J. McQuillan (Boston College)