

COMPLEXITY THEORIES IN EDUCATION SIG 2024 AERA ANNUAL MEETING PROGRAM

THURSDAY, APRIL 11, 2024

2:30 – 4:00 PM Complexity Theories in Education Poster Session
Pennsylvania Convention Center, Second Floor, Exhibit Hall A

SATURDAY, APRIL 13, 2024

1:15 – 2:45 PM Integrating Life-Informed complexity for Practical Professional
and Higher Education (Symposium)
Philadelphia Marriott Downtown, Level 4, Room 401

SUNDAY, APRIL 14, 2024

9:35 – 11:05 AM Complexity Theories in Education Roundtable
Pennsylvania Convention Center, Second Floor, Exhibit Hall B

4:55 – 6:25 PM Complexity Theories in Education Business Meeting and
Reception + “Sprint” Program In-Progress Poster Session
Pennsylvania Convention Center, Level 100, Room 120A

Complexity Theories in Education Poster Session

Jessica Hadid, Temple University

The proposed paper examines traditional approaches to teacher expectation research and argues for a revised conceptualization of the central construct: academic expectations. It argues that academic expectations constitute emergent, co-constructed phenomena that are shaped in part by sociocultural and sociohistorical context. It applies a complex systems approach to understand the consequential compounding of expectation effects for historically marginalized populations in some settings. This theoretical paper reviews selected literature to understand and explain the academic expectation research trajectory to date, and offers a revised understanding based on a methodological critique.

Integrating Life-Informed complexity for Practical Professional and Higher Education (Symposium)

Chair: Aliko Nicolaides, University of Georgia; Discussant: Sean Justice: Texas State University

Henriette Lundgren, University of Georgia; Dimitrios Papanagnou, Thomas Jefferson University

"Figuring it Out on the Fly" Learning through Complexity in Clinical Practice During Covid-19"

As educators in the health professions, we require an understanding of the requisite skills learners will need to rely on when navigating complexity and uncertainty in their clinical practice. To date, formal training to navigate uncertainty in practice is lacking despite the fact that uncertainty and complexity were amplified by the Covid-19 pandemic; it illuminated the gap in training physicians receive to function in uncertain environments. Through our study we hope to take practical steps to integrate observed findings into formal curricula. We use the Cynefin framework (Snowden & Boone, 2007) as a sensemaking tool combined with the informal and incidental learning theory (Authors). Both frameworks are dynamic in nature and allow for situational perspectives to be included in the analysis. We interviewed frontline physicians with varied clinical experiences who either worked in the emergency department (ED) or the intensive care unit (ICU) at an urban, academic, tertiary-care hospital in Philadelphia, Pennsylvania. We used Critical Incident Technique (CIT) to explore the lived experiences of these frontline physicians as they worked through uncertainty and complexity during the first wave of the Covid-19 pandemic. We find decision making and learning patterns as a consequence of the decision burden that physicians face amidst uncertainty and complexity in their clinical practice. We further find that learning and decision making are influenced by the physician's physical, emotional, social and situational contexts (see Figure 1. attached at the end of the document). The Covid-19 pandemic changed the environment that health-care workers were accustomed to working in. Physical spaces were reorganized, new equipment was utilized, evidence-based literature was sparse or non-existent, and there were more questions than answers. We describe how changes in the physical, situational, emotional, and relational domains were influential to our participants ability to "figure it out on the fly" (PHY03) and make decisions. In this uncertain, complex and often chaotic learning environment, the themes that emerged for decision-making and learning were interdependent: applying prior knowledge, using pattern recognition, and then cross-checking information with team members. Learning emerged through trial and error, intentional and thoughtful experimentation, poking at the periphery of a problem, accessing alternative sources of information, and, ultimately, the accumulation of knowledge. Through this study, we have identified decision-making and learning patterns that can help medical students to prepare for uncertain and complex environments. Our findings can directly lead to new curriculum development, for example in the form of case-based learning where students are prompted to engage in: 1) sense-making using the Cynefin framework; 2) naming the type of uncertainty at hand; and 3) identifying appropriate problem-solving strategies. Our work is significant as it contributes towards normalizing uncertainty intrinsic to clinical practice and provides students with the tools they need to address uncertainty in the clinical learning environment.

Ahreum Lim, University of Georgia

“I Am Going to Sound like a Hippie but”: Desiring Difference for Socio-technical Engineering Education”

This study explores the action logics of senior and graduate engineering students within the context of socio-technical complexity arising from Human-Artificial Intelligence interaction (HAI). This qualitative study was a follow up to a pedagogical experiment that examined how collaborative inquiry facilitated young adult learners’ experiences with HAI (Authors). Adult development theory (i.e., Torbert’s action logic theory (2004)) is used as a schematic framework of this study. Torbert’s theory introduces the concept of action logic, which refers to the archetypical strategies of individuals to the external environment as per their developmental stage. The theory was used as a heuristic tool to understand participants’ development of action logics throughout their early career development—becoming an engineer in Artificial Intelligence-infused workplace. Nine individual interviews were conducted to glean participants’ perspectives on habits, mindset, and capacities that are necessary to be responsive to the socio-technical complexity. Inductive coding following grounded theory principles was used to analyze the interview. 112 emic codes were generated and subsequently categorized into three overarching themes: entry point, current action, and future goal. The findings of the study highlight the emergence of alternative engineering practices (i.e., reflexive engineering and ethical engineering) challenging the dominant engineering rationality centered on efficiency and effectiveness (Picon, 2004). Interviewees expressed a desire to seek new meanings and alternative approaches to their profession or, in one participant’s comment, the ‘hippie’ way of performing engineering. This reflected a yearning to move beyond the technocratic culture prevalent in the field. This study argues that the alternative learning practices (i.e., inquiry) possess the potential for transformative change in engineering practice. The obdurate culture of an engineering school is often argued to be sedimented (Tonso, 2006). I would like to argue, in the lineage of Deleuze and Guattari, that creative becoming(s) of engineering education is possible through different ways of knowing. These bottom-up yet subtle solicitations for the difference in engineering practice signal a molecular movement that escapes the easily represented and palpable mass of engineering culture. Molecular movement “thwart and break through the great worldwide organization.” (Deleuze & Guattari, 1980/1987, p. 216). It is easily imperceptible, overlooked by the dominant discourse, and thus inherently minoritarian. Yet it still possesses the power to create a difference in the sedimented discourse of engineering education. The implications of this study highlight the importance of providing a safe and dialogic space for young adult learners to freely express their ideas and perspectives on different engineering practices. By doing so, this approach encourages young adult learners’ divergent and non-conformist approaches, deviating from dominant discourse and defeating the fear of being seen as others.

Jill Jinks, Stetson University; Karen E. Watkins, University of Georgia

“Capturing the Wholeness of Learning Process in Complex Environments: A Fractal Analysis”

This session proposes an intervention index that effectively captures learners’ capacity to adapt and self-direct in complex environments. The authors challenge the overreliance on Ebbinghaus’ learning curve in understanding human learning efforts in complex environments as it oversimplifies the adaptive nature of learning with a fixated view of the learner’s inherent adaptive capacity. To address this, this study introduces an evidence-based intervention index considering individuals’ varying prior learning experiences and adaptive learning capacity. We developed an intervention index that adequately captures the wholeness of the learning experience in a complex environment simulated in a rule-based game, which we call in this study CraftDawg. The development of an intervention index is undergirded by complexity science and learning theory. First, informal and incidental learning theory (Author) is utilized to explain the irregularity and messiness of learning, leading to tacit knowledge (Polanyi, 1996/2009) and adaptability. Second, the wholeness of learning experience encompasses both chronological order and opportune moments of learning based on complexity theorists’ perspectives (Pendleton-Jullian & Brown, 2018a, b; Juarrero, 1990; Siemens, 2005) Third, insights from complexity scientists engaging game theory (Holland, 1998; Miller & Page, 2007; Mitchell, 2009) inspire the use of a rule-based game to observe learning processes in complex environments. An

experimental study was conducted, observing the online game play of 95 self-selected participants in a Minecraft-like environment. Participants' success is measured with their health score at the end of each session. Participants, recruited in a liberal arts college, were mostly non-traditional learners. Their survival rate over five game sessions was recorded and calculated using fractal dimensions, a method commonly used to assess complexity at scale (Guo, 2017; McCauley, 1994; Skjeltorp, 2000). The visualization of the learning process using fractals reveals that learners' adaptive capacity, regardless of their prior learning experience, is inadequate to support "learning your way out" without intervention, particularly on the edge of chaos. This highlights the significance of timely interventions during such critical moments. Incorporating complexity into the learning environment is vital yet it requires thoughtful intention and intervention. This study presents an evidence-based tool to measure and assess learning in complex environments. The intervention index assists professional educators in identifying the need for and nature of interventions, helping manage complexity in the learning environment and determining when to support learners' self-directed learning.

Neal Herr, Trisha Barenfield, & Aliko Nicolaides, University of Georgia

"Facilitators Fostering Half-baked knowledge: World Building in a Graduate-Level Course"

This session shares the journey of a teaching team that facilitated an experimental graduate course targeted for the adult educators and human resource professionals. The course utilized worldbuilding, an adaptable system-modeling technique borrowed from architectural design studios and fictional world creation for film or television. It promotes the design of the system responsive to the interwoven tapestry of complex problems. World building translates a series of "what-if's" speculation into the detailed design of the "as-if" future world. We introduced the technique to non-traditional learners in a graduate-level course, which aimed to inspire innovative solution-seeking to systemic problems. The session explores the facilitators' experiences of experimenting with new pedagogical intervention in a graduate-level course, and realigning students' expectations, discomfort and achievement through scaffolding. The facilitators' journey of introducing worldbuilding is explored through the lens of Deleuze and Guattari's (1986) minor pedagogy, which advocates for representational expression, also known as minor language, and embraces resistance against normative paradigm. Minor language is a deliberate practice that resists the majoritarian logic in aim to affirm the agency of language-users within the condition of power. Being minor is a resistant move for "potential (puissance), creative and in becoming" (Conley, 2010, p. 167), as language, is a means of action that is also "shaped by structures of power" (Bogue, 2003, p. 100), deriving from one's political choice. We viewed our facilitation as an embodiment of minor pedagogy as we introduced world building into the learning environment that has privileged "instrumental problem solving" (Pendleton-Jullian & Brown, 2018a, p. 71) in support of the pedagogy for certainty. We resisted this standard, normative paradigm by promoting the use of half-baked knowledge generated through the world building protocol. Our experience of facilitating world building in a graduate-level course is narrated with autoethnography, a research method that highlights power dynamics, system interlocks, and relational dynamics in personal experiences (Adams et al., 2022; Boylorn & Orbe, 2020). We used Tillmann et al. (2022) dialogue protocol that incorporates autoethnographic description, collective reflection, generalization and reimagination. Following the protocol, individual vignettes were generated by the facilitators to describe the experiences in joining the teaching team and conducting the course. The collective reflection involved in-person discussion, exchanging views on each vignette, and identifying common themes. The discussion focused on meaning-making of the experience, abstract conceptualization of the meaning-making and reimagination of the doctoral education for professionals. The overarching theme was the sensed dilemma of acculturation and decolonization, reflecting the tension between conforming to the academic system and challenging it. The facilitators recognized and empathized with the non-traditional students' stressing condition with a multitude of conflicting life commitments. The ethical reflection on promoting different ways of knowing to non-traditional students in a graduate-level course holds practical implications for decolonizing doctoral education. Providing supportive scaffoldings and creating a condition for a compassionate disruption can pave the way for transformative experiences in graduate education.

Complexity Theories in Education Roundtable

Chair: Alycia Michelle Garcia, University of Victoria

Michael Holden, Queen's University - Kingston

"Footprints of emergence": Visualizing the features that support or constrain complexity in education"

Complexity researchers are interested in the interactions, patterns, and features of complex systems. These systems are notoriously difficult to examine and conceptualize. One approach to understanding complex systems is data visualization, arranging data from portions of a system to support analysis and new perspectives that can inform decision-making. This paper examines one such visualization tool – modifying Williams et al.'s (2012) "footprints of emergence" – in the context of a study on formative classroom assessment and emergent learning. After a three-stage revision process, the instrument was used to visualize the features of three teachers' classrooms. Analyses highlight the ways features of each system may foster or constrain students' learning, with implications for other studies interested in visualizing features of complex systems.

Richard Douglas Fossey & Eugene G. Kowch, University of Calgary

"Decolonizing Dialog for Leaders: Toward a Framework for Describing the Adaptive Capacity of Leadership Teams"

In an unsteady state world, organizations must adapt (Uhl-Bien & Arena, 2018). We must mitigate organizational inertia and social pathologies like racism. These "vexing" (Howard, 2023) problems defy linear either/or solutions (Cabrera & Cabrera, 2018; Smith & Lewis, 2022). "A good way" for leading decolonized education systems is to focus more on relationality and collectives (Wane et al., 2023) where adaptable agents in complex ecosystems are better prepared to work in complex organizations (Author 2, 2021). Another vexing problem is knowing the potential or adaptive capacity of a team. Here we propose a method/tool for describing complex organizations (teams) as a function of its proactivity and adaptability features presented as the "Leadership Team Adaptive Capacity" matrix or typology.

Jason Ribeiro & Eugene G. Kowch, University of Calgary

"New Possibilities for Higher Education Through Cross-Sector Partnership Leadership: A Constructivist Grounded Theory Framework"

The study purpose was to understand how leaders in a large Canadian education cross-sector partnership (XSP) network involving higher education, industry, and nonprofit partners, generated and exchanged knowledge to address complex problems. A constructivist grounded theory methodology was employed, 40 participants were recruited, and data was analyzed using computer-assisted qualitative data analysis software and constant comparison. The resulting grounded theory framework demonstrates that as partnership deepens, from simple operational transactions to more complex adaptive work, greater capacity for emergence is generated. Leaders address complex problems through both organized mechanical structures and more flexible opportunities for experimentation. This theory has implications for education XSP leader development because the findings stress the importance of healthy organizational leading/learning conditions in relational space.

Serina A. Cinnamon, University of North Carolina - Pembroke

"What's complexity got to do with education? Complexity theory as a theoretical framework for educational spaces"

The environments of educational spaces are often complex, deeply inter-relational, and highly dynamic.

The ebbs and flows of interaction as both teacher and student seek to achieve their individual and collective goals. This presentation seeks to explore the ways in which complexity theory serves as a framework for both interpreting educational spaces as a complex dynamic system and explaining these complex interactions and collaborations that unfold among varying actors. We offer both an understanding of the ideas of complexity and their applications in constructing educational environments.

Anna Noble, Boston College; Patrick J. McQuillan, Metropolitan Police Training Academy

“Initial conditions, relational trust & leadership transitions”

The stress of myriad educational challenges has led to a marked increase in principal turnover in recent decades (Snodgrass Rangel, 2018) necessitating an understanding of the impact changes in leadership can have on a school’s ability to meet new challenges. This paper considers the experiences of three schools as a single principal transitioned among the school sites over seven years. Drawing on complexity thinking (Davis & Sumara, 2006; Lichtenstein & Plowman, 2009), this study explores the extent to which the principal impacted each school’s readiness for change through interconnected processes of distributing authority, creating a common vision, and fostering relational trust—with a focus on how one may navigate the initial conditions they came to face but could not control.

