LEARNING MATHEMATICS: SYSTEMS THEORY AS A GUIDE TO PRACTISE

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For the last seven years, a North American Grade 2 teacher has been using an approach to teaching mathematics underpinned by reflexive psycho-pedagogical relationships and systems theory. Mathematics lessons have taken place in an environment where children navigate meaningful experiences through self-regulation operating close to the border of managerial fluidity (chaos) - rather than managerial rigidity (control). The teacher has developed her classroom as an unfolding, evolving and open system determining its own dynamics and direction, and determining its own meaning through dynamic participant interconnectedness; everything has been free to adapt and open to change. Such a classroom is reminiscent of a multi-faceted self-organizing system as portrayed by Ilya Prigogine's dissipative structure wherein order is not imposed but created from within. Such an organizational structure within the mathematics classroom resonates with the new generation of mathematicians and scientists who seek to represent knowledge as a shift from quantity to quality.

Rather than feeling bound by pre-determined outcomes, and subservient to imposed hierarchical curriculum formats the systems-based teacher has played with nonlinear and self-organizing models that reflect open, dynamic, creative, and adaptive processes within the classroom. Learning in a systems-based classroom has revolved around interconnected relationships – among curriculum subject areas of art, craft, language, science, and mathematics; interconnections between social, emotional, physical, and cognitive development; and interconnections between self-regulation, chaos, spontaneity, order, and organization. Allowing children to freely explore and "play-fully" with their emerging ideas is one way in which the teacher has been able to encourage children's autonomous responsibility and self-direction. Through self-direction and self-regulation children have developed a willing disposition towards collaborative participation, active engagement, and creative endeavor. Each mathematical experience has been contingent upon children's emerging appreciation of their teacher's and their own roles during mathematics lessons. As classroom norms are negotiated, new relationships are established as the class co-evolves into new roles with new expectations. As the roles evolve, new norms emerge and so the cyclical and reflexively emergent nature of learning manifests as a process of continuous self-regulation and systemic self-organization. The idea of systems thinking has become the hallmark of 21st century economic, political, social and scientific imperatives and it is beholden upon educators and curriculum decision makers to "keep up the pace" by being responsive with new conceptions of knowledge, teaching and learning….especially in mathematics education.