

Understanding Teachers' Educative Play with STEM Games

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Introduction

Background

This project is situated within an educational landscape in which board games are becoming a more popular medium through which to engage in processes and practices of *serious play*. After studying the design diaries of two game designers, we turn to what we can learn *through* play with pre- and in-service teachers in their interactions with two games appropriate for integration in math and sciences classrooms.

Research Question:

What and how might we learn from the types of educational interactions that commercial games present that differ from more conventional forms of instruction?

Participatory Review Groups

We are currently conducting participatory review groups with pre- and in-service teachers. Modelled after participatory evaluation (Cousins & Whitmore, 1998), we believe that teachers are important stakeholders in determining pedagogic potentialities with commercial games.

We have collected data with three participatory review groups, each consisting of 6-8 teachers of elementary and junior high school. Each group meets twice, with a session featuring one game. A session begins with playing a game for one hour and then subsequently reflecting on the engagement to evaluate the quality of the learning experience through a group discussion.

Data is collected through video recording and field notes. Video taping game play allow us to capture the enactments of pedagogical pivots through oral and physical interactions.

References

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- Dewey, J. (1934). *Art as experience*. New York: Minton, Balch & Company.
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Theory-driven Prompts

We believe games offer a pedagogically rich text which fails to provide *the* (desired) experience of learning because it differentially provides *an* experience (Dewey, 1934). We draw from the work of Elizabeth Ellsworth (2005) in exploring pedagogically non-prescriptive education texts with the following guide:

Schematic Cue	Analytic Frame	Prompts
Experience of Learning	"What is it, then, to sense one's self in the midst of learning as experience, in the moment of learning, in the presence of a coming knowing, in this interleaving of cognition and sensation/movement?"	As you were playing, did you have an <i>Ah-Ha!</i> Or an <i>Oh-No!</i> moment? What did it feel like?
Play & Creativity	"The creative, playful activity that is learning requires a playmate who does not dominate and who is not preoccupied with his agenda or with a predetermined outcome. It requires a playmate who does not impinge, is not preemptive, and does not presume to know the best outcome of the play."	Are there any moments in which you felt playful? What strategies did you develop? How did they come about? How did you have to get creative about playing trait cards in response to other species?
Future Anterior	"Because pedagogy is a way of conceptualizing the present's problems, all the work of education, all of its labor of producing alternative knowledges, methods, and criteria, has yet to begin. Learning...is entirely of the order of the surprise, of the encounter with the new."	How and when did you know you had made a move / had traits or population size that will have mattered?
Relationality	"They put diverse and occasionally warring ideas, identities, sensibilities, traditions — and people — into relation with each other, actually or imaginatively. Media thus are imbued with the potential for catalyzing new forms of corporeality, new embodiments, new ways of knowing and being human."	How did you and your opponent position yourselves in relation to each other and to the game? Did you find the positioning changing? Were there moments where species were substitutes for you? How did you feel about your species?
Sensation (Embodiment)	"Teachers, understood as being in the making themselves, would necessarily have to create places of learning in embodied terms and in ways that depart from the dominant perception of learning as the acquisition of knowledge driven by cognitive functions."	How did the game pieces encourage you to figure and "play" with strategies? How does the design of the artistic cards and rules influence scientific learning/doing?
Indeterminacy	"A body in the process of learning is a body blurred by its own indeterminacy and by its openness to an elsewhere and to an otherwise."	What were some of the things that were unexpected as you played the game? What surprised you?
Pedagogical Pivot	"They locate pedagogy at and as a pivot place. When they talk about their spaces, events, objects, and pathways as pedagogical — as the vehicles through which we come to know differently..."	What did you feel yourself learning tonight through game play and our discussion? What do you think influenced that learning?

Santorini

Santorini is a pure strategy game designed by Gordon Hamilton, a mathematician from Calgary, AB. The simple rules of move one space and then build open up to complex strategies between players.

We selected *Santorini* because it supports the development of both spatial reasoning and logical reasoning, which is foundational to ways of thinking mathematically. As well, this game appeals to a wide age range and is suitable across most grades in school.



Figure 1. *Santorini* Game Board and Cards.
Image courtesy of <https://travley.com/product/santorini/>

Evolution: The Beginning

Evolution: The Beginning is a science-based card game designed by Dominic Crapuchettes. Players grow and defend multiple species in an attempt to dominate the ecosystem, engaging in imaginative thought with captivating artwork.

We selected *Evolution: The Beginning* because it draws on scientific concepts of adaptation, symbiotic relationships, and evolution of species' traits for survival. This game is suitable for junior high and high school science classrooms.

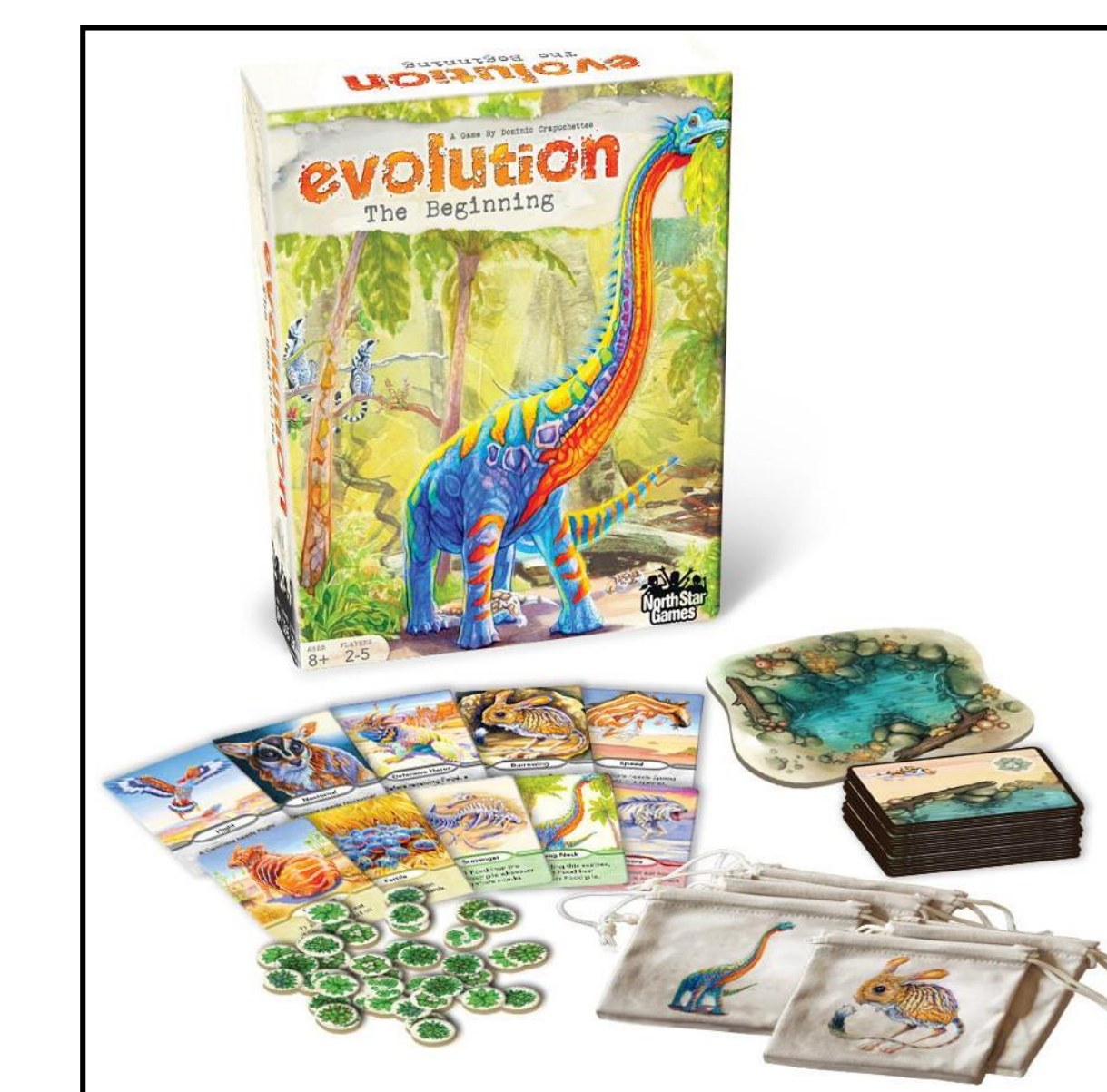


Figure 2. *Evolution: The Beginning* Game.
Image courtesy: <https://www.northstargames.com/collections/strategy-games/products/evolution-the-beginning>

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