

Chapter 21

Collaborative Strategic Board Games as a Site for Distributed Computational Thinking

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ABSTRACT

This paper examines the idea that contemporary strategic board games represent an informal, interactional context in which complex computational thinking takes place. When games are collaborative – that is, a game requires that players work in joint pursuit of a shared goal -- the computational thinking is easily observed as distributed across several participants. This raises the possibility that a focus on such board games are profitable for those who wish to understand computational thinking and learning in situ. This paper introduces a coding scheme, applies it to the recorded discourse of three groups of game players, and provides qualitative examples of computational thinking that are observed and documented in Pandemic. The primary contributions of this work are the description of and evidence that complex computational thinking can develop spontaneously during board game play.

INTRODUCTION

A great deal of interest has been expressed as of late in the complex reasoning that takes place during gameplay. This interest has developed for a multitude of reasons, including the inherent motivational aspects of gameplay, the awareness

that there are millions of people across the country who are actively participating in games and gaming communities, and the extant design features of many modern-day games that foster learning (Gee, 2007; Nasir, 2005; Steinkuehler, 2006). Often, these benefits are associated with video games and other highly interactive computational

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media. It is largely thought that the ability to foster a sense of immersion is a genuine strength of video games that distinguishes it from many other learning contexts (Shelton & Wiley, 2007).

Still, there are reasons to suspect that some of the generative potential of games is not restricted to those that take place on a computer platform. At their most base level, games are systems of rules in which players operate on representations. In a computer game, those rules are generally executed and strictly enforced by the game itself. Board games and other tabletop games, on the other hand, have no such inherent game rule management; it becomes incumbent upon the players themselves to know and execute the rules of the game. The players are doing the computation that would normally be the purview of the computer or console in a video game. We consider the new genre of board games, of which *Pandemic* is an instance, to be an especially interesting context. These board games, which we often refer to as ‘strategic’ board games, involve complex coordinated play and highly motivating contexts. This class of games has also been referred to as German-style games, Eurogames, and designer games.¹

In this paper, we show how this family of strategic board games can prompt novice game players to engage in relatively complex computational thinking. Through the gameplay we observed, players came to understand, ‘debugged’, and created global rules to guide their play of the game and their development of strategies. They did so in a socially distributed way; the players created rules together, they helped each other understand those rules, and they collaboratively built complex logics. To investigate this computational thinking, we created and deployed a coding framework for distributed computational thinking, which we present with examples.

In this study we recruited 3 groups of 3-4 college-age novice players. Each group played the selected board game (Leacock, 2007) at least once, and we video-recorded their gaming sessions. For this paper, we focus strictly on the first gaming

session for these groups. We present three sources of evidence for the students’ computational thinking: 1) quantitative analysis of the makeup of the students’ computational thinking; 2) quantitative analysis of code counts for instances of ‘global’ and ‘local’ computational thinking; and 3) some descriptive examples of computational thinking.

Our work complements earlier findings with pen-and-paper role-playing games (Fine, 1983), in which players were found to do significant mathematics in order to play strategy games. Our data suggest that this claim can be made stronger – players are doing more than simple math, they are doing computation.

THEORETICAL ORIENTATION: COMPUTATIONAL THINKING

This particular paper is guided by a mutually shared interest by the authors to understand the nature and development of computational thinking. Given the increasing role that computation plays in teaching and learning (Borgman et al., 2008), understanding how people both interact with computation and learn to think through the language of computation has become an area of interest for education and media researchers (National Research Council, 2010). Computational thinking has been discussed in detail beneath the larger umbrella of computational literacy (diSessa, 2000), the broad suite of practices associated with using computational media in our everyday and professional lives. Of specific interest to us here and most relevant to the study of computational thinking is what diSessa describes as the ‘cognitive pillar’ of literacy – how to use computation to think through hard problems. Papert (1980) calls this type of thinking ‘procedural thinking’ and his work focuses on students’ problem solving with programmatic representations and symbol systems. According to the National Research Council (NRC) (2009), computational thinking is roughly defined as using the methods, language,

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