

Finding Opportunities to Pursue Interest in the Classroom: Contrasting Two Cases of Redesigning Tabletop Games

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Abstract: This paper explores how some elementary students' pursuits of their interests led to different social and disciplinary engagements while redesigning tabletop games, namely *Inversé* and *Triominos*. Using the ethnographic data collected over two years, we chose and compared two tabletop game design projects. We investigated their design changes and conversations that indicated their learning and design process. Our findings indicate that these two groups found the opportunities or openings to connect their designs with their interests through teacher's questioning or in the process of co-defining the design tasks. We argue that providing design constraints, such as redesigning certain aspects of existing games, may provide opportunities for learners to create continuity between the school disciplines and their personal interests.

Tabletop game (re)design as a democratic learning approach

Researchers have explored games for decades, considering what are socially and culturally deemed enjoyable, to make learning more engaging. Research on video games has flourished in the last two decades for their capacity to model systems and rules (Gee, 2008). In addition to engaging in disciplinary meanings during the play, gaming often engage learners (or players) in some level of design practices (Zimmerman, 2013). Scholars have also used tabletop games to engage learners in disciplinary practices, especially in mathematics (e.g., Civil, 2002), but much infrequently. Tabletop games provide unique learning opportunities while breaking down the barriers of access for both designers and players. Carrying complex meanings, tabletop games also support social interactions and comradeships (Gatti Junior et al., 2019). Tabletop games make players' movements with the game pieces visible, communicating their desires, intentions, and goals, or even their hesitations and transient decisions.

In designing games or any other artifacts, scholars have attended to learners' interest-driven design practices, that is focusing on their needs to negotiate their identities and express them in their own pleasurable ways (Kim et al., 2015). Learners' creative expressions, i.e., designing personally meaningful artifacts, have been advocated for many decades (e.g., Dewey, 1934). Azevedo (2018) argued for more investigations on how individual interests influence situational interests to inform our design of learning environments. Even when the activities are not "driven" by their interests, learners may find opportunities to pursue them, creating continuity among their activities. Scholars are also concerned about learners' improving upon their ideas and creating disciplinary meanings (Kim & Bastani, 2017). Civil (2002) specifically showed the struggle to balance between learners' interests and disciplinary engagement in a tabletop game design context. While she saw some mathematically rich moments of fifth grade students' game design work, reflecting students' interests (e.g., sports) and board game experience, she saw many mathematics exploration opportunities were missed. Barta and Schaeffer (1998), on the other hand, reported first and second grade students could invent alternative ways of knowing, through developing new rules and a scorekeeping system for a simple game. Our positioning the tabletop game redesign as a democratic approach is twofold: (1) it is relatively undemanding to create common experiences and resources for designing tabletop games, compared to digital games; (2) with the constraints provided with the task of redesigning a common tabletop game, with established orders known to the class, learners could engage in the democratic process of negotiating, readjusting, transforming, and reconstructing those orders (Kim, 2018), bringing their interests through the design process. Learners look for opportunities to pursue their interest, which marks the moments of their intellectual and emotional engagements (Kim & Ho, 2018). This study positions the activities of redesigning tabletop games, i.e., identifying and modifying their components and properties, as an approach that could help the individual interest and the disciplinary engagement merge.

Research design

This study was part of a design-based research project (Collins et al., 2004). We worked with an elementary school in a western Canadian city over two years (2018 and 2019). In the first year (2018), grade 3/4 students of Ms. Lennox redesigned a tabletop game called *Inversé* as part of their mathematics learning. *Inversé* is a 2-player game where each player takes turns to put down one of the five wooden blocks of different volumes and colours on a grid board. The rules include not touching the same colour, not in the same orientation of the same colour

block, and not next to a same height block. They created a paper-based 2-dimensional *Inversé* using area and multiplication concepts. In the second year (2019), Ms. Lennox and grade 3/4 students used *Triominos* in a STEM learning class. *Triominos*, a 2 to 4-player game, has 56 triangular tiles with three numbers (between 0 and 5) in three corners. Each turn, players should match the sides of the triangles (i.e., matching the two numbers on the sides). They add up the three numbers of the placed tile to determine the points. The first player to reach 400 points wins the game. Students paper-crafted their redesigned games to explore the system and rules with shapes and symbols. We took an ethnographic approach to understanding the students' game redesign process for both years. We collected observation notes, video recordings of classroom and photos of students' in-progress and final games. The teacher sometimes held an action camera to capture her conversations with groups. We also conducted interviews with each group by playing and discussing their games. In the analysis discussed in this paper, we investigated where learners' interests were invited, how they flowed into the design decisions, and how learners' decisions led to different pursuits. We considered how Dewey (1913) saw play as an important process for learning and productivity. He argued that when play naturally transitions into work, the productivity (or social efficiency, in Dewey's term) reconciles with the individual's fullness of life, using imagination and emotions.

Findings

The choice of the game (*Inversé* or *Triominos*) created different opportunities and challenges. In redesigning *Inversé*, some chose to draw rectangles rolling dice while others decided to create pre-made pieces. We feature *Blockade*, in which a group used two dice to create a rectangle in each turn, and a group member, Jian, who had moved to Canada three weeks prior to our observation. Redesigning *Triominos*, students explored different shapes (e.g., squares, rhombuses, circles, stars, right triangles), and symbols. The game (*Typeominos*) used triangles and symbols, created by three members (Eddy, Chanjin, and Liam). We discuss how their games were transformed into unique artifacts, and how we retrospectively understood the process that supported their pursuits of interests.

Learners' ideas entering the classroom design activities

Learners brought unique ideas when additional constraints were determined; that is, after they had made some initial decisions. On February 7 (2018), after confirming that each player would draw a rectangle with a colour pen in each turn by rolling two dice, Ms. Lennox mentioned, "Now your job is to come up with some interesting rules to make it more challenging." After her mentioning of the rules for *Inversé* (e.g., not touching the same colour), Jian blurted, "I have a game." He demonstrated his game by rolling dice and drawing rectangles (Figure 1a). He drew a rectangle in orange and four more rectangles in purple trapping the orange one. He pointed to the purple rectangles and said, "I win." Ms. Lennox complemented the rule and told the group to test this rule. In this new game, the *Inversé*'s rules of not touching the same colours or lengths were no longer relevant (Figure 1b).

For redesigning *Triominos*, Eddy, Chanjin, and Liam became a group from January 30 because they chose triangle as the shape of their game pieces. Liam explored using the plus sign before the number. After forming the group, Eddy explained the game idea to Ms. Lennox, which sounded very similar to the original *Triominos* (Jan 30). After working together for a few days, some symbols and the title of the game, *Typeominos*, appeared on their idea sketches. This entrance of symbols started making their game unique, deviating it from *Triominos*. Using symbols, the *Triominos*'s rule of adding up three numbers in the placed tile became irrelevant. For both groups, these departures were important for transforming the existing games into their own.

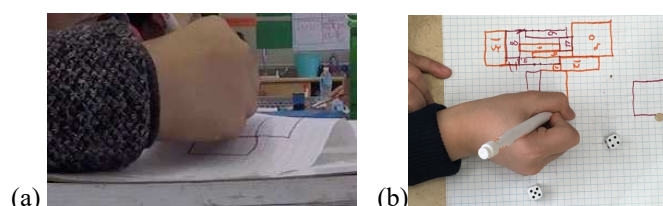


Figure 1. Creating and testing a new rule: (a) Jian explaining the rule; (b) Jian's group playing the game.

Learners' engagements in intended or unintended learning pursuits

Bringing their interests and ideas into their games, learners were engaged in intended or unintended learning pursuits during the creation process. For Jian's group, the use of area models was integral to creating their game components as well as playing their games. Using a dice with a bigger range of numbers (1-10) (Figure 2a), they explored making the game faster, but they ran out of space before one of the players could surround the opponent. They had to consider the appropriate size of the board in comparison to the rectangular shapes they draw for the game. They finally used the regular dice (1-6) with a bigger board (30×30) after figuring out how many 10×10

squares they need to put together to create their board with Ms. Lennox (Figure 2b). They then went through the process of playing their game multiple times, so they could write a rulebook for others to play (Figure 2c).

Group *Typeominos* assigned points for each game piece (i.e., the number in the middle of each triangle, Figure 3a), which replaced the points determined by adding the numbers in three corners in *Triominos*. They had five different symbols, and called them steel, grass, fairy, thunder (or lightening), and water. They learned that drawing on black papers in gold was aesthetically pleasing, but not suitable for a group work (only one person could draw) (Figure 3b). While many students had difficulties in cutting identical pieces and systematically creating all the possible combinations, this craft was somewhat crucial for an important game rule: getting extra points for creating a bigger shape by making a difficult match (i.e., two corners vs. three corners). The *Typeominos* group traced and cut triangles after creating a few good pieces and learned to be more systematic in creating the game pieces. They went through each of the five symbols: one tile has the same symbol for three corners; three tiles have the same symbol for two corners and one other symbol; and they replaced the last combination with a tile with a star in the middle (a wild card) to be placed anywhere (Figure 3c). After these combinations, they created tiles that had three different symbols. They often arranged their tiles into hexagonal shapes, perhaps to make sure that they were creating all combinations, but it was unclear if it became part of their rules, i.e., creating a bigger shape to earn more points. For both *Blockade* and *Typeominos* groups, turning their game ideas into material forms challenged them both mathematically and practically beyond the mathematics topics they were using. While Jian's rule was fundamental to designing and playing *Blockade*, *Typeominos*' unique feature (i.e., five symbols) did not influence their rules much. That is, the rule changed because they wrote the points in the middle, but the points were decided rather randomly based on our conversation with them in the interview. In the next theme, we discuss the stories behind these two groups as to where their interests and ideas were coming from.

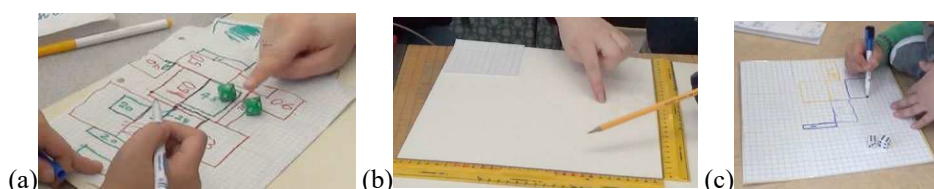


Figure 2. Exploring the elements of *Blockade*: (a) Dice (Feb 9, 2018); (b) Board (Feb 23); (c) Rulebook (Mar 5).

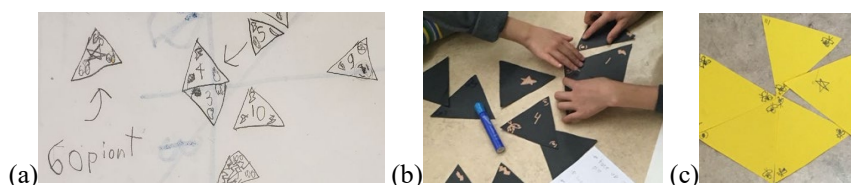


Figure 3. Crafting *Typeominos*: (a) Initial rules (Feb 7, 2019); (b) Crafting (Feb 20); (c) Systemizing (Feb 27).

Recognizing learners' cultures and interests

In both groups, the students took pleasure in discussing the inspirations of their ideas. Through these conversations, we could make sense of their cultures and interests that made it possible for their ideas to come into their designs. When a researcher visited the *Blockade* (2D *Inversé*) group on March 1, 2018 and asked about the game, Jian wrote a Chinese character (围-wei, meaning surround) and demonstrated surrounding a classmate to explain his game with a big smile on his face. On March 21, a Mandarin-speaking graduate student helped with translation during our interview. Jian shared how he got the idea from the Chinese game of *Go* (or *Weiqi* in Chinese) for the rule of placing rectangles to enclose opponents' rectangle(s). In *Weiqi*, black and white stones are placed by two opponents on a grid board. One of its rules is for players to capture the opponent's stones by surrounding and enclosing them with their stones (black or white). When we asked about possible further changes to the game, Jian suggested that a harder level would use dice with lower numbers, such as 1-3. Jian could create connections between the game from his culture and the school mathematics. Jian could confidently engage with the tasks of game design and play because of his use of gestures and drawings. These modes of communications were not only essential for the nature of the task, but also seen as the diverse linguistic resources in this classroom.

For *Type-ominos*, Ms. Lennox understood their symbols as students' artistic expressions. We noticed that Chanjin was drawing the symbols most of the time. During the interview, Eddy and Chanjin shyly explained their game and the process of creating it. When we asked about any difficulty in making it, Eddy said it was difficult to create symbols initially and that was when they decided to use the "types" of *Pokémon* cards. From then on, they started listing other types they did not use in their game and which *Pokémon*s belong to which

types. They also spoke about the cards they had, different kinds of Pokémon digital games they played, and the names they gave to the evolved Pokémon. They also shared about the students' practices that were not visible in the classroom, such as bringing their cards and trading or battling them during recess. Eddy was, in fact, introduced to *Pokémon* after becoming a group with Chanjin. We later noticed that most of the side chats captured in our vides were about the *Pokémon* game. After the interviews, the teachers shared with us that students, to our surprise, were not allowed to bring *Pokémon* cards due to some incidents, such as cards being stolen. When we further asked about how the types on their *Typeominos* could use the characteristics of Pokémon types, Chanjin suggested using actual Pokémon, such as Pikachu face, as symbols and having booster balls instead of stars, to adopt the concept of Pokémon battles. Eddy and Chanjin could slip their interest into their game design activity, which made the activity more interesting to them. However, they did it in a way that was not noticeable to the outsiders (i.e., the teacher and the researchers), possibly due to the school rules of *Pokémon* cards. At the same time, their design was not clearly connected to either *Pokémon* or the purpose of this particular game redesign activity.

Discussion and conclusion

The above two cases show how learners could make connections between their interests and cultures and the game redesign process. In both cases, the possible openings to pursue their interests came about when they made some initial design decisions but were not able to move forward. For *Blockade*, it was about how to make it more challenging to place a rectangle by adding more rules. For *Typeominos*, it was about what symbols to use in their triangles (possibly not to make it too similar to the original game). These provided the opportunities to create the forms that learners' interests and the game design activities could meet. On the other hand, the two cases contrast when we observe how *Blockade* (a game that merged *Inversé* and *Go*) became the students' play in the classroom whereas *Pokémon* remained as Eddy and Chanjin's interest in and out of the classroom. At the same time, the conversations during the interviews were focused on the forms they were interested in. For Eddy and Chanjin, it was more of *Pokémon* than *Typeominos* whereas Jian could discuss the connections between *Go* and *Blockade*. Jian's design and play of *Blockade* demonstrate how his play transitioned into work and vice versa, thus may have achieved what Dewey (1913) argued as the reconciliation between the productivity and the individual's fullness of life. The members of *Typeominos*, however, could have had additional opportunities to create a continuity between their world of *Pokémon* play and the game design activity, if they were able to bring their knowledge and ideas about *Pokémon* more profoundly into their design. Both cases demonstrate a potential for tabletop redesign as a democratic learning approach that does not privilege the dominant cultures and languages. It could include not only the cultures of new immigrant students but also children's culture that adults often do not have access to. We suggest that design constraints, i.e., redesigning certain aspects of existing games, could provide more opportunities for learners to pursue their own interest and transform the existing games into their own.

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