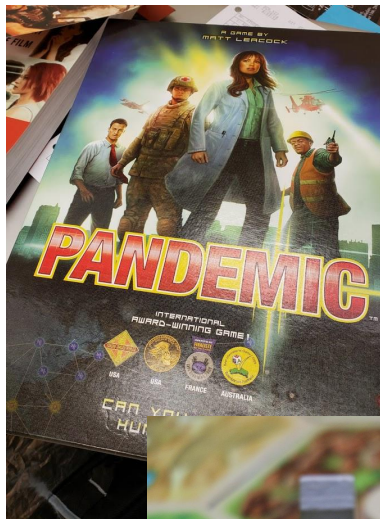


Exploring Educational Research and Literature on Tabletop Games

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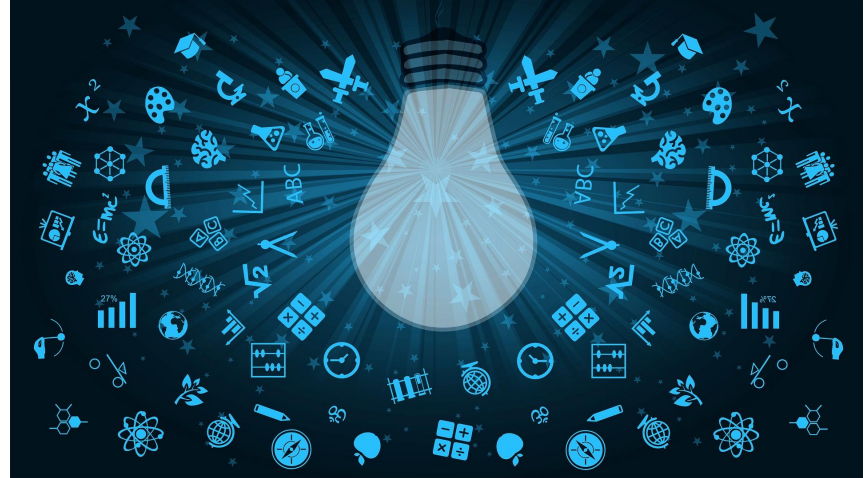
Games Featured in Research and Literature

- Pandemic
- Settlers of Catan
- Snakes and Ladders(Variations)
- Dixit
- Forbidden Island
- Resistance
- Timeline
- Dungeons and Dragons
- Pathfinder
- Roll Through the Ages
- Carcassonne



Areas of Research

- Game-based Learning
- Numeracy/Mathematics
- Literacy/ELA
- Business
- Counselling
- Science
- Adult Learners
- Computer Science/Computational Thinking
- Libraries/Information Literacy
- Health
- Student Engagement
- Design



Game-Based Learning Key Points

Where game content and game play enhance learning, knowledge and skills acquisition (Qian & Clarke, 2016).

- Entertainment games promote meaningful learning with adaptive challenge, curiosity, self-expression, discovery, immediate feedback, clear goals, player control, immersion, collaboration, competition, variable rewards, and low-stakes failure (Qian & Clarke, 2016).
- A consistent finding that games are more interesting than traditional instruction (Randel & Morris, 1992).
- According to Plass, Homer, & Kinzer (2015) the four functions of games for learning are:
 - Preparation for future learning
 - Teach new knowledge
 - Practice and reinforcement
 - Develop 21st century skills



Play and Cognitive Development

- Playing games and having fun are crucial to child development and can be a powerful tool that uses interaction, social connectedness, problem solving, hypothesis testing, cooperation, and collaboration that promote well-being and resilience that can be enhanced by a facilitator (Hromek, 2009).
- Plass, Homer, and Kinzer(2015) explore the foundations of game based learning noting that it:
 - Connects to Piaget's idea that play is integral to and evolves with children's stages of cognitive development.
 - Connects to Vygotsky's idea that play allows children to achieve beyond their age.
 - Allows children to transcend their immediate reality with multiple representations of the same object allowing for symbolic thinking.
 - Good games strive for the "sweet spot" where a players struggle but are able to succeed reaching a state of flow.
 - Games engage players through:
 - cognitive (mental processing) engagement,
 - affective (emotional) engagement,
 - behavioural engagement (embodied actions and movement),
 - sociocultural engagement (social interactions).
 - The goal of these is to foster cognitive engagement of the learner with the learning mechanic.
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Situated Learning

- Games provide the opportunity for situated learning as they can take place in meaningful and relevant contexts (Plass, Homer, & Kinzer, 2015).
- Hattie, Biggs, and Purdie (1996) recommended “that training other than for simple mnemonic performance should (a) be in context, (b) use tasks within the same domain as the target content, (c) and promote a high degree of learner activity and metacognitive awareness”.
- Playing games represents situated learning where we learn through an activity. One hypothesis is that information and facts that are hard to retain come to be learned much more effortlessly when learners are playing a game that the learner wants to play (Gee, 2008).
- Research has also indicated that children are able to perform tasks at higher levels in a playful context (Whitebread et al., 2017).

Modern Tabletop/Board Games

According to Lean, Illingworth, and Wake (2018) Tabletop games are:

- Played on a flat surface such as a board or card game.
- A distinct technology that is different from digital games.
- A tactile experience.
- An experience that can provide shared social spaces.

“Designer Board Games” which feature the name of the designer on the box, differ from traditional games that focus on luck, provide an information-rich environment full of open-ended decisions, while engaging players in a shared community of play that includes common mechanics such as open movement, worker placement, role selection, and cooperation (Mayer & Harris, 2010).

Examples:

- Pandemic
- Powergrid
- Catan
- Ticket to Ride
- Etc

How are these different from traditional games such as Monopoly, Risk, Life, etc.

General Ideas/Trends

- The data appears to support using board games in education but there is currently a lack of empirical research (Gobet, Retschitzki, & de Voogt, 2004; Koehler, Greenhalgh, & Boltz, 2016; Whitebread et al., 2017).
- There is a distinction between educational games (**Edutainment**) and **entertainment** games. Often educational games are considered to be “children” or “family” style games rather than strategic games that require higher order thinking and situated learning such as strategy games, and are considered less enjoyable and rated lower than entertainment games (Koehler, Greenhalgh, & Boltz, 2016).
- Weisberg, Hirsh-Pasek, Golinkoff, Kittredge, and Klahr, D. (2016) suggest that guided play experiences that combine child-directed nature of free play with learning outcomes and adult mentorship, is an optimal medium for delivering educational content in an enjoyable way that facilitates learning with the best possible educational outcomes.
- We should not generalize from research the effectiveness of one game in one learning area to all games in all areas (Hays, 2005).

Mathematics Education

Early Numeracy (Chutes and Ladders)

- Siegler and Ramani (2008) found that playing a linear numerical board game improved low-income children's numeracy skills. Students who played an identical game with colours rather than numbers, did not improve on any measure. Home experience playing number board games correlated positively with numerical knowledge.
- Additional research such as a study by Siegler and Laski (2014) showed similar results with kindergarten students' numeracy and counting skills.
- Scalise, Daubert, and Ramani (2019) examined benefits of playing numeracy card games with children from low income households. They found that the game had a lasting effect on numeracy skills and improvements to executive function.
- Skillen, Berner, and Seitz-Stein (2018) examined using linear number board games in conjunction with models of mathematical competency development with German children. They found that the game they used *100 House*, was an effective way for children to acquire mathematical competencies which is less resource intensive than standardized training programs.

Mathematics

Probability

- Math professors Jathan Austin and Susanna Molitoris-Miller (2015) analyzed *Settlers of Catan* and found that it was an open ended opportunity to teach and develop an understanding of probability, expected value, and logical thinking by developing a strategy, quantifying it mathematically, experimenting with it, and revising it.

General Skills

- Games such as *Settlers of Catan* and *Carcassonne* can supplement lessons with their use of interpersonal skills, intrapersonal skills, and math concepts that include arithmetic, algebra, geometry, using algorithms, tactics, and probability (Dillingerova, 2012).

Literacy

Antero Garcia (2019) examined literacy practices used in tabletop games. Looking specifically at *Dungeons and Dragons* he identified that:

- Playing required talking, listening, and collaborating.
- There were three primary spaces of literacy: At the table, in the game, and beyond the table.
- Specific literacy practices identified included: Record keeping, interpreting rules, analyzing in game choices, engaging in roleplay, mapmaking, producing/writing, and recalling localized history and knowledge.
- Garcia recommended that further research should be done to explore tabletop literacy practices in schools.

Cook, Gremo, and Morgan (2017) suggested that role-playing games such as the *Pathfinder* system can :

- Allow learners to interact with literature in new and layered ways.
- Foster a deeper sense of understanding of story events
- Through gameplay they can begin to recognize relationships across texts, the game, and their own writing

Libraries and Information Literacy

Hill (2016) suggests that libraries should consider gaming programs that feature tabletop games because

- It provides resources and materials that everyone has access to regardless of socioeconomic status.
- Libraries are always seeking ways to attract new patrons.
- Research indicates that library gaming programs will encourage return visits for non gaming reasons.
- Historically games have been part of libraries.
- Educational research shows that games can help people learn better through active participation.
- Games can help students with social skills by allowing older and younger student to interact and help each other.
- Tabletop games can foster community building

Dinardo and Broussard (2019) suggest that by using sound pedagogical practices you can effectively teach informational literacy with commercial tabletop games in a highly motivating and engaging way. Their examples include using the game *Resistance* for teaching information searching behaviours and *Pandemic* for teaching group decision making.

Health and Science

Health Education

In a systematic literature review Gauthier et. al (2019) found:

- Board games have a history of use in therapeutic contexts.
- Board games had a large average effect on health knowledge, small to moderate effect on health behaviours, and a small to moderate effect on biological health.
- There is a need to establish more knowledge about the overall efficacy of board games.

Science

Chiarello and Castellano (2016) developed their own games based on advanced scientific concepts they were teaching

- Game mechanisms were embedded with scientific elements.
- The three games were “Quantum Race”, “Lab on Chip”, and “Time Race”.
- They suggested that their results showed good student understanding, high motivation, high interest, and positive student impact.

Post-Secondary

- For communications, advertising, and bio-tech courses, Gonzalo-Iglesia, Lozano-Monterrubio, and Prades-Tena (2018) used *Dixit*, *Timeline*, and other games to teach concepts. Their results showed positive student perspective, high motivation, and high student engagement.
- A modified version *Settlers of Catan* has been used in counselor education to teach about and experience barriers to career development, cultural awareness, and experience oppression in a safe environment (Pietrantonio, Hennig, Totten, Shindelar, & Keene-Orton, 2019).

Cognitive Aspects and Computational Thinking

- There is the possibility that board game play may accelerate development through Piaget's stages, but the potential has not been fully explored (Gobet, Retschitzki, & de Voogt, 2004). Most of the research has been based on playing Chess and there are mixed results.
- Games can help students by providing an engaging platform for reading, decoding, analyzing, assessing, and taking action on dynamic information while providing opportunity to strengthen informational processing abilities from multiple source and take on situated roles at different times (Randel & Morris, 1992).
- A study that examined the relationship between board game play and dementia suggested that board game play resulted in less risk of dementia, less chance of cognitive decline, and that “board game playing might increase or preserve cognitive reserve (Dartigues, et al., 2013).

Computational Thinking

- The cognitive ability to apply fundamental concepts and reasoning that derive from computer science which include algorithmic thinking, conditional logic, decomposition, abstraction, pattern matching, parallelization, evaluation, and generalization (Tsarava ,Moeller, Ninaus, 2018).
- Berland and Lee (2011) examined the board game ***Pandemic*** in relation to aspects of computational thinking being used while players engaged with the game. “Computational thinking”. They found that computational thinking takes place while playing this game and suggested a next step would be to more closely connect the computational thinking to the instructional design for its development.

21st Century Skills

- Board games such as *Settlers of Catan* can help develop strategic thinking in players by teaching you to manage resources, negotiate, and be more aware and analytic of your environment (Mustata, Guica, & Juliacifre, 2019).
- While examining tabletop games such as *Forbidden Island* and *Roll Through the Ages* in undergraduate classrooms, Hayse (2018) concluded that they required the practice of skills such as communication, collaboration, critical reasoning, and critical thinking, while emphasizing that games pushed students out of passivity and fostered a sense of belonging for students.
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Continued....

Design and Curricular Integration

In a 2011 Case Study, Alexandra Carter explored using a children's version of *Dungeons and Dragons* to a classroom with student designed modifications that tied that game into mathematics, social studies, research skills, and language arts outcomes. Carter reported enthusiasm and excitement from students. Specific students who were apprehensive and not confident in areas such as mathematics and reading, showed significant progress in math, while developing stronger reading and writing skills.

Implementing Games in Schools

Dinardo and Broussard (2019) recommend the following “best practices”

- Know the game had how to teach it.
- Help students understand why they play the games in class.
- Draw on the experience of others.
- Plan in advance for the resources that are needed such as time, knowledge, and money.

Hays (2005) makes recommendations that include:

- The decision to use games for instruction should be based on a detailed analysis of the learning goals and an analysis on the tradeoffs of using other approaches.
- Instructors should view games as adjuncts and supports for educational objectives.
- Learners should be provided with debriefing and feedback that clearly explain how their game experiences tie into learning objectives.

Implementing Games in Schools

Weisberg, Hirsh-Pasek, Golinkoff, Kittredge, and Klahr (2016) suggest that guided play experiences that combine child-directed nature of free play with learning outcomes and adult mentorship, is an optimal medium for delivering educational content in an enjoyable way that facilitates learning with the best possible educational outcomes.

Mayer and Harris (2010) recommend a variety of ways to implement games depending on the game content and subject matter which include learning centre based approaches for smaller group games or whole class experiences for games that are easy to play and scale up nicely with larger groups of players.

My Approach to Implementing Games

1. Know the game.
2. Find a meaningful way to implement it.
3. Explain to students why they are playing it.
4. Guide a playthrough.
5. Allow time for independent play.
6. Debrief, reflect, and provide feedback.

Have the games in your class!

Examples/Play Activities

- Pandemic:
 - Group Decision Making
 - Computational Thinking
- Settlers of Catan:
 - Math Education
 - Strategic Thinking
- Champions of the Elements
 - Literacy Practices
 - Curricular Integration
- Carcassonne
 - Interpersonal Skills
 - Math Concepts

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Other Notable Resources

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