Game-Based Learning with Tabletop Games: Exploring the Research and Literature

Niall McFadyen
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About Me

Niall McFadyen

- Teacher-Multimedia and Technology.
- Parent.
- Avid game player.
- M.Ed, B.A., B.Ed, PBDE
- Website: www.niallmcfadyen.ca
Table-Top Games

- Very broad term.
  - Sometimes refers to board games or card games.
  - Sometimes includes role-playing games.
  - Sometimes includes social games.
- Involves playing on a surface or table.
- Can be competitive or co-operative.
- Can be played solo or with two or more people.
- Usually use tangible objects/pieces such as dice, cards, markers, miniatures, player boards, etc.
Modern Games
“Educational vs Entertainment Games” 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. Education games are considered less enjoyable and rated lower than entertainment games. (Koehler, Greenhalgh, & Boltz, 2016).

“Designer Board Games” 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).
Why modern games?

- Modern games are designed with participation, interesting mechanics, time limits, and ease of play in mind.
- Qian & Clarke (2016) suggest that entertainment games promote meaningful learning with:
  - Adaptive challenge
  - Curiosity
  - Self-expression
  - Discovery
  - Immediate feedback
  - Clear goals
  - Player control
  - Immersion
  - Collaboration
  - Competition
  - Variable rewards
  - Low-stakes failure
Game-Based Learning
Game-Based Learning

- **Game-Based Learning** is where game content and game play enhance learning, knowledge and skills acquisition (Qian & Clarke, 2016).

- 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 indicated that children are able to perform tasks at higher levels in a playful context (Whitebread et al., 2017).
Four Functions of Games for Learning:

Preparation for future learning.
Teach new knowledge.
Practice and reinforcement.
Develop 21st century skills.

(Plass, Homer, & Kinzer, 2015)
Engagement Through Games

**Cognitive** (mental processing) engagement.

**Affective** (emotional) engagement.

**Behavioural** (embodied actions and movement) engagement.

**Sociocultural** (social interactions) engagement.

(Plass, Homer, and Kinzer, 2015)
Cognitive and Developmental Considerations

Hromek & Roffrey (2009) suggest that 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.

Plass, Homer, and Kinzer (2015) suggest that games:
- Connect to Piaget’s idea that play is integral to and evolves with children’s stages of cognitive development.
- Connect to Vygotsky’s that play allows children to achieve beyond their age.
- Allows children to transcend their immediate reality with symbolic thinking.
- Good games strive for the “sweet spot” where a players struggle but are able to succeed reaching a state of flow.

Järvinen (2008) likens game rules and systems to schema theory emphasizing that mental structure like schemas help players understand games, take actions in games, predict how the game system works, and interact with other players.
Situated and Experiential Learning
Games as Situated and Experiential Learning

- Hattie, Biggs, and Purdie (1996) recommended that most learning should be in context, use tasks in the same domain as content, and promote a high degree of learner activity.

- Games can help students by providing an engaging platform for reading, decoding, analyzing, assessing, and taking action on dynamic information while in situated roles (Randel & Morris, 1992).

- Games can take place in meaningful and relevant contexts (Plass, Homer, & Kinzer, 2015).

- Playing tabletop games can represent experiential learning through game actions as concrete experience, reflective observation, creating new strategies through abstract conceptualization, and testing them through active experimentation (Hays & Hayse, 2017).
Exploring the Research
General Ideas/Trends in Research

- The data appears to support using board games in education but there is currently a lack of overall empirical research. (Gobet, Retschitzki, & de Voogt, 2004; Koehler, Greenhalgh, & Boltz, 2016; Whitebread et al., 2017).

- We should not generalize the research on the effectiveness of one game in one learning area to all games in all areas (Hays, 2005).

- A consistent finding that games are more interesting than traditional instruction (Randel & Morris, 1992).
Research on Game Content and Mechanics in Games

What you do when you play a game
What do you do when playing?

**Computational Thinking**
- 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.

**Mathematics**
- 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.

- 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).
According to Mustata, Guica, and Juliacifre (2019) games such as *Settlers of Catan*, *Through the Ages*, and *Puerto Rico* can help develop strategic thinking by teaching you to:

- Manage resources
- Negotiate
- Analyze your environment
- Think ahead
- Deal with change
Literacy in Games

Garcia (2019) examined literacy practices used in tabletop role-playing games. 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 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
The Learning and Cognitive Impacts of Playing Games

Do games make you smarter?
The Learning and Cognitive Impacts of Playing Games

- 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).

- Board game play may foster skills that generalize to other domains and may accelerate development through Piaget’s stages of development, but the potential has not been fully explored and results have been inconclusive, lacked details, or have been problematic (Gobet, Retschitzki, & de Voogt, 2004). Most of the research has been based on playing Chess and there are mixed results.

- Bartolucci, Mattioli, and Batini (2019) conducted a study on the the effect of a group of children playing board games in lieu of traditional teaching. Their results showed a positive effect on the cognitive and creative side. They noted that games helped students concentrate on complex tasks and they hypothesized a link between board games and working memory.
Importance to Early Numeracy

Multiple studies have shown playing linear number board games have improved numeracy skills, executive functioning, and mathematical competencies.

- 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.
- Siegler and Laski (2014) improvements with kindergarten students’ numeracy and counting skills.
- Scalise, Daubert, and Ramani (2019) playing numeracy card games with children from low income households 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 and found it an effective and less resource intensive than standardized training programs.
Research on Using Games In Educational Contexts

How do educators use games?
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.

Stuart West (2015) a evolutionary biology professor tested tabletop including *Evolution*, and suggests that it would work as effective teaching aid for students 10 and up.

Language, Literacy, Design Thinking, and More

Language and Literacy
With EAL learners, teaching language and multiliteracies with careful integration of goals, activities, and games resulted in:
- Literacy, intellectual, and participatory development.
- Multimodality and affinity spaces contributed to more linguistic exploration.
- Learning repertoires were extended and elements were transferred. (Dehaan, 2019).

Cross Curricular
Alexandra Carter (2011) 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 and that apprehensive and non-confident students in areas such as mathematics and reading, showed significant progress.

Design Thinking
Raymond (2020) explored using games such as Wingspan as models for design thinking projects in post-secondary courses, he found that some evidence emerged that these changes improved students’ reactions to design thinking and did not impair their ability to learn course content.
Games and simulations have been used in business training and education with a history dating back 5000 years to the development of board games (Faria, Hutchinson, Wellington, & Gold, 2009).

For communications, advertising, and bio-tech courses, Gonzalo-Iglesia, Lozano-Monterrubio, and Prades-Tena (2018) used Dixit to stimulate lateral thinking, creativity, and teach communication skills. They also used Timeline to teach documentation search and graphic design. Their results should positive student perspective, high motivation, and high student engagement.

Hays and Hayse (2017) suggest that Monopoly could be used to teach economic development through cutthroat competitions while Settlers of Catan could be used to teach it through collaborative and mutually beneficial play. Different games can teach different perspectives on the same topic.

Huang and Levinson’s (2012) study on board games in civil engineering and urban planning courses suggest that board games with appropriate levels of ease, stimulation, and satisfaction can align with students learning styles and be effective for teaching open ended subjects such as transportation planning, economics, and policy.
Lesson Plans in Literature

There are lesson plans and ideas online that feature tabletop games for learning at primary, secondary, and post secondary. Some that are featured in academic literature include:


Implementing games

How to plan to effectively use them
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.

This can happen in many ways such as learning centres, whole class activities, small group activities, etc.
Implementing Games

Dinardo and Broussard (2019) “best practices”

- Know the game 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 should be based on a detailed analysis of the learning goals and an analysis on the tradeoffs of using other approaches.
- 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. Also emphasized by Hays and Hayse (2017).
References and Further Reading


Dillingerová, M. Commensalism between board games and teaching maths. TEACHING MATHEMATICS III: INNOVATION, NEW TRENDS, RESEARCH, 61.


Hargreaves, E. (2019). Wingspan.[Board Game]. Stonemaier Games


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