

Game-Based and Gamified Learning Within the Elementary Classroom

by

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BEd University of the Fraser Valley, 2016

BA University of the Fraser Valley, 2015

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Supervisory Committee

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Abstract

Within elementary classrooms educators still struggle to determine the best way to differentiate instruction and provide student-centered approaches to learning. Gamification and game-based learning are ways in which students can be engaged with various types of subjects and content. Education is moving towards having students learn a variety of skills such as collaboration, inquiry, and self-regulation. However, many educators continue to teach with whole group instruction where every student is given the same task. Gamification and game-based learning allow students to be given a low stress, individualized game to practice their skill. Educators are able to adapt their instruction to whole group games, small group games, or partner games. Through the use of these strategies the educator can target lagging skills such as self-regulation in regards to winning or losing or even how to work with a partner. They are also target content skills such as mental math strategies, spelling, and science concepts without rote memorization and regurgitation of information.

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Dedication

This project is dedicated to my mother Lesley Nicholas-Beck, who since the beginning of my education journey has stood beside me with unwavering support. I can not express my gratitude towards her for every time she encouraged me, edited a paper with enthusiasm and hugged me as I broke down in tears when I felt I couldn't handle the challenge. She is the yard stick to which I measure myself. Her love, passion, empathy and strength are qualities in which make her my most admired person. She has reminded me every day that my strength, perseverance and love of learning is a special bond that we share. I could not have gone through my educational journey without her. Thank you for igniting my love of games by playing with them with me, despite my tempter tantrums and occasional board throwing. With all my love, I thank you.

Chapter One: Introduction

This project is meant to be a resource in which teachers can access easily implementable educational games. These games are provided in the form of printable and technological games. This resource will focus on how to implement, manage, and diversify an elementary classroom through the use of student-centered learning. It will also highlight how educational games are able to create a stress-free and engaging form of learning. These resources will focus specifically on math and literacy, as well as at-home options for parents. The at-home resource section will be used to provide parents with accessible resources that mirror their child's learning within the classroom.

Personal Story

Since I was a child, I have been extremely competitive and unregulated when it comes to playing and losing games. Despite this, I have continued to love playing and learning games in all aspects. When I started my teaching journey six years ago in a traditional elementary school, I quickly realized that the traditional way of teaching through textbooks, memorization, and worksheets did not feed my love of teaching.

In my first classroom, I was teaching a grade 2/3 split. Not only was I struggling as a first-year teacher with meeting two curriculum objectives, but I also encountered daily behavioural issues with my students. These two factors created an environment of frustration, anxiety, and boredom and made it extremely difficult to feel successful for both my students and myself, despite my teaching experience. I was introduced to a learning support teacher from my district, who then introduced me to the idea of small group, center-based learning. Center-based learning is a teaching approach of one subject area, where students are put into groups and given a variety of tasks to accomplish as they move through stations. A large part of this center-based

learning included the use of math games. These games allowed for a range of mathematical skills, level of difficulty, and mathematical concepts to be covered. As my students engaged with these games, I observed their enthralled focus and attention to the activity. Even students who had strong mathematical knowledge were challenged, not only by the content, but by adapting the game to meet their needs of perceived challenge. Thus, students were encouraged to adapt a game if it was too easy and make it more difficult for themselves by using different manipulatives or changing the way in which the game was played. Similarly, students who lacked a strong foundation of mathematical skill, enjoyed the games at an appropriate level in which they could feel success. This provided them with the chance to increase their skills and knowledge independently without my direct support. Despite me knowing that different groups were playing games with varying degrees of difficulty, students were unaware, making them all feel equal. Not only were they able to practice mathematical concepts at their level, but they also were collaborating with peers. Sometimes peers even engaged in teaching one another skills they had already mastered. My students demonstrated increased engagement and often cheered when receiving a new game or even when they were simply assigned to the game station.

The use of games then became a necessary tool within my classroom as I continued in my teaching career. Over this time, I have noticed and observed that my students continue to demonstrate strong engagement with games. Furthermore, they demonstrated increased mathematical skills when combining games and direct instruction. On another note, I observed that some students struggled with self-regulation during this time. Through playing games, I had the opportunity to work with these students on their self-regulation skills within a game setting. Some of the things I focused my attention on were:

- students fear of failure,

- the inability to accept loss,
- the negative interaction when encountering unfair play, and
- the anxiety that can occur when a task was perceived as too difficult.

In playing games with my students, I have been able to specifically target and teach to those missing self-regulation skills resulting in decreased, unwanted, or disruptive behaviours.

Due to this overall success, I started to wonder if games could branch out from math alone and into areas across the curriculum. Could games allow students in all areas of education to practice and solidify new or previously taught content? Could they increase and sustain engagement within students? Would they allow students to feel independent and create a safe space for them to develop their self-regulation skills alongside their peers? Could games provide the opportunity for students to positively impact their perception of self? Would it deter negative behaviours and increase positive behaviours within the classroom? Are games able to be inclusive of all learners including students with disabilities? Are there many games out there for content areas other than math? These questions all guided me toward wanting to learn and know more about the effectiveness and impact games had within an elementary classroom setting. It is commonly known that many students engage in commercial game play outside of school hours. Therefore, it is possible that gamification or game-based learning would be able to engage learners who previously were reluctant towards traditional teaching methods of curricula. Many students perceive games and gaming as fun. Thus, can gamification allow educational content to also be perceived as fun and less intimidating to all learners? I had already seen success; however, I wanted to learn how to make gamification or game-based learning a focal point within my classroom as a whole. I wanted to know what other educators were doing in terms of this research and how I could adopt or mold my teaching of other content areas into gamified

experiences for my students. I wanted to create this project in order to share my experiences and love of games with other educators so that they may find success for themselves and enjoyment and success for their students as well.

Research Problem

As education continues to progress and evolve, the idea of student autonomy, student-centered learning, and engagement becomes more apparently necessary as elementary classroom teachers are faced with a large diversity of learning needs. Is it more important than ever for students to be able to problem solve, collaborate, and engage with their peers as the job market continues to require workers that have these skill sets. However, there is a lack of resources and support within British Columbia's curriculum to implement games in to classrooms (Province of British Columbia, 2015). Therefore, how can teachers meet all the needs of the students while meeting their curricular requirements?

Literature Review Overview

I chose gamification as a focus area, because I have seen the powerful positive impact it can have on students' engagement and self-regulation within the classroom. When examining the gamification one must consider the how engagement occurs within a classroom. Throughout the literature, obtaining engagement is broken into the use of rewards, appealing visual aspects, feedback, and progression of difficulty. Furthermore, engagement is also highlighted in the form of student attitude, behaviour, and perceptions of learning. Moreover, the studies consider the effects of student-centered learning and collaborative opportunities on engagement. In order to determine the effectiveness of gamification, this paper highlights the evidence of increased student learning within the research. In order for it to be a viable option for educators the alignment between game and curriculum is examined. In some studies, teachers and students

were involved in the actual creation of the game itself. Thus, this design is driven through teacher and student perceptions. Whereas, some of the research excludes the input of teachers and students. The inclusive design of gamification is highlighted when examining how games can be used with students who have exceptionalities. When considering the diverse needs of all students the limiting factors of games are discussed.

Methodical Review of Literature

To conduct this research, I examined articles, periodicals, and editorials that are specific to games and elementary classrooms. The research reviewed is from a variety of countries and on differing subject areas.

From 1975 - 2019, I conducted research on gamification within elementary classrooms using words such as gamification, elementary education AND gamification, primary education AND gamification, gamified learning AND elementary education, game-based learning AND education, emotions AND gamification, student learning AND game-based learning, elementary student learning AND gamification, serious games AND disabilities. I conducted my research by searching for peer-reviewed articles, textbooks, editorials, and literature reviews through the UVic online library online databased such as EBSCOhost, Science Direct, and Springer Link.

Theoretical Framework

Within education, educators are continuously seeking way to engage their students in learning activities. The focus of this research within this paper is on game-based learning or gamified learning. Game-based learning is when an educator uses games in order to teach or reinforce educational content such as using tablet-based games to teach kids mathematical equations. Gamification is defined by Nand et al. (2019) as “the application of game mechanisms in non-gaming environments with the objective of enhancing user experience” (p. 1). In other

words, when an educator teaches a concept through the use of a game such as teaching literacy by using a game. These terms are interchangeable in the sense that they both have the same purpose and use the same methods. However, they can differ in that game-based learning can be a more independent learning or small group experience. Whereas, gamification which can be independent, small group, or whole group learning experiences. Engagement within education is defined as the degree to which a student is focused, curious, and interested in their learning task. The degree of engagement is essential for motivation and progression of learning.

This research is based upon Piaget's Constructivist theory on play. Piaget suggests that there are four stages within a child's cognitive development through the use of play. Play is highlighted as an important role within each of the stages, although the type and focus of the play differ throughout the development of the child. Piaget suggests that the richer the play within a child's development the better their schema will be. My research focuses on the latter three stages being preoperational stage, concrete operational stage, and the formal operational stage. The preoperational stage focuses on a child development from the ages 2-7. Throughout this stage, children are engaging in pretend play that derives from their experience and imagination. Within the preoperational stages, there are also sub stages being the symbolic function sub-stage and the intuitive thought sub-stage. The symbolic function sub-stage is when children between the ages of 2-4 are representing their environment and the important people in their life in various ways. The intuitive thought sub-stage is between the ages of 4-7 when children are asking a lot of questions. This stage is where children establish reasoning and building schemas that are contextualized to their world experience. Throughout the preoperational stage, children are using imaginative play to understand their environment and social situations within their own contexts. The concrete operational stage occurs during the ages of 11 through pre-adolescence.

This stage is where children use logic to build their schema and identify their own thoughts in comparison to others. They become less egocentric and start to interpret and change their schema based on their various experiences. Finally, the formal operational stage is from ages 11 to adulthood where children logically explain their experiences and their abstract reasoning that continues to form their schemas for the rest of their life. Within this stage, they are able to understand their own thought processes. Throughout these stages of cognitive development, children engage in play that aids them in understanding their world and their place within it. Within these experiences of play, children start to develop skills in which they learn how to interact with others in an appropriate manner based on the situation. They develop the understanding of how actions affect others and themselves within varying circumstances. It is seen how play is an important part of a children's cognitive development. Thus, as educators, it is imperative that the appropriate play stimuli and environment is provided to children in order for them to progress through these developmental stages.

My research focuses on game-based learning or gamification in order to engage students in a non-stressful learning environment. The use of games within my research highlights how play, within games specifically, is used to teach educational content in a disarming manner while also allowing children to develop self-regulation skills. My research highlights how play, whether independent or group based, can increase a student's engagement and curiosity of educational content (Nand et al. 2019). It allows for students to interact with the content through the use of reviewing previous concepts, transferring known skills into new environments and allowing students to continually revise how they approach game play. An example being when students play a tablet-based game, that provides them with a challenge, they must go through trial and error attempts while interpreting the situation in order to pass a level. They must then

interpret that information by asking themselves questions and then apply their new thought process to progress throughout the game. Also, within games, the use of rewards and achievement is part of play as well. When engaging in play, students have personalized goals or set goals and meeting these perceives challenges allows them to work through their cognitive developmental stages. When looking at goals specifically, Piaget notes that children must receive the appropriate amount of stimuli in order to progress through the developmental stages.

Similarly, when educators are providing game play the goal, whether internal or external for the student, must also have an appropriate level of difficulty and challenge so to not deter the student from quitting, but also not making it so easy that there is no learning occurring. Piaget's theory of cognitive developmental stages on play highlight that all stages require self-regulation to occur. Similarly, when students are playing games in all stages they have to learn how to regulate their emotions, how to act socially appropriate and how continuously interpret new information in order to redefine their schema of play. My project will allow for educators to understand how play can work within their classroom and how to get resources that are developmentally appropriate and engaging.

Project Overview

The purpose of my project is to aid educators in understanding the many benefits of game-based learning and gamification within elementary classrooms. This project aims to suggest ways in which teachers can conduct gamified learning to increase student engagement and shift classrooms into student-centered learning forums. It also seeks to lessen prep-time for teachers while increasing student responsibility and independence to allow teachers more time for small group teaching. Education is constantly evolving and teachers are continually looking for ways to engage students. The lack of student engagement and student-centered learning

within the classroom has led to boredom, anxiety, stress, and frustration for both students and teachers. Game-based learning allows for the teaching of curricular content, self-regulation and provides an independent, hands on, engaging learning opportunity for students. In order to examine this idea, one must consider what the effects of gamification are on student perception of learning, behaviour, and attitudes. Notably the attitude of students toward learning can often decrease throughout their elementary education as teaching shifts from play-based learning in Kindergarten to a heavy amount pencil and paper work within later grades. Games are appealing to all age levels from infancy to adulthood. Thus, gamification or game-based learning is a way in which educators can maintain a play-based learning approach, that is relevant for their students' particular skill and grade level. The research has highlighted that what a student believes and thinks of themselves within an educational setting is a determining factor for a student's success (Gennari et al., 2017). In other words, if a student enjoys and believes that they can achieve their goal then it is more likely that they will. Importantly, if gamification is to be valued then there must be an increase in not only engagement and enjoyment, but for the educator they must see an increase in student learning. When students play games, they have dual foci, in that one focus is on achieving their desired goal and the other is on the content itself. Therefore, the research suggests that having this dual foci, students engage with the content more because it is provided in a fun and enjoyable way (Gennari et al., 2017).

Overall, this project aims to make educators aware of how game-based learning or gamification of learning is not a huge undertaking. In fact, there are many available resources that can be duplicated or adjusted to meet the individual needs of the students and teachers. Thus, if a teacher wants a low-prep math game, there are many available to them. The explicit teaching part is the only preparation required other than printing the resource for use in class. In order to

successfully implement this, my project provides educators with a step-by-step way in which they can scaffold students to become independent game players. Game-based learning provides an equal opportunity for teachers to assess and observe their students in a way that is not stressful for the students. Teachers are given immediate feedback on a student's strengths and struggles within their self-regulation skills and the skills within the content area assigned.

Chapter Two: Literature Review

Summary of Research

Today gamification is a teaching tool that can allow teachers to take a step back and put students in the driver's seat. The objective of the educational games are to reinforce students prior knowledge of a subject or to increase their engagement with new curricular content. There are various gamification options that range from high-tech video games to simplistic poster boards. These poster boards consist of visual elements, alike video games but require teachers to physically hand out rewards or read the next chapter of the journey in the game. The following studies speak to the varying implementation of gamification that will be discussed in this literature review.

Table 1.

Comparison of the 11 studies on effects of gamified learning in elementary learning.

Authors	Year	Participant Size	Duration	Country
Garcia-Redondo et al.	2019	44 students	28 sessions	Spain
Gennari et al.	2017	35 students	Unknown	Italy
Jagušt et al.	2018	54 students	6 months	Croatia
Jones et al.	2014	180 students	13 days	United States
Halloluwa et al.	2018	130 students	2 weeks	Sri Lanka
Hsu & Wang	2018	242 students	Unknown	Taiwan
Meluso et al.	2012	70 students	4 days	United States
Nand et al.	2019	120 students	2 weeks	New Zealand
Sun-Lin & Chiou	2019	72 students	4 weeks	Taiwan
Watson & Yang	2016	15 teachers	Unknown	United States

* Note: “Year” refers to publication year.

Introduction

Gamification and game-based learning have become a popular topic as education shifts from the traditional teacher-centered classroom to an inclusive environment for all students. The introduction and availability of educational games has come swiftly, making the stakes for educational game research evident. Game-based learning is defined as using a game element within the teaching context. Gamification is the implementation of game mechanics into a non-gaming environment to increase engagement and learning. Serious games are defined as games that provide a specific educational purpose, not just the purpose of entertainment such as commercially used video games. Within most of the research, gamification and game-based learning are used interchangeably. Educational games can take many forms such as tablet or computer-based games, games through storytelling and serious games.

This literature review focuses on whether gamification and game-based learning increases student learning, engagement, attitude, and perception towards learning. Furthermore, this paper discusses the various educational content that could allow for easy integration through curriculum alignment. Given the educational nature of gamification and game-based learning the consideration of student and teacher involvement is also examined. Throughout the literature, overarching themes of increased engagement and enjoyment are demonstrated. Much of the research emphasises that in order for gamification to be successful there must be a delicate balance between challenge, reward, and feedback. Despite gamification providing a positive student-centered approach to learning, there lacks longitudinal data to support continued positive effects. Many limitations derive from lack of accessibility, current negative perception, inclusivity as well as lack of definitive assessment of engagement. Similarly, none of the

research determined whether there were negative affects of overexposure to technology. The purpose of this review is to analyze how gamification and game-based learning influences classroom engagement and whether there is evidence that it can increase learning for elementary students.

Engagement

The literature suggests engagement is one of the main driving forces behind including gamification or game-based learning in an elementary classroom environment. Engagement is defined in this paper as sustained, elevated focus on one task for a certain period of time with heightened interest and enjoyment. (Papanastasiou et al., 2017, p. 425) Therefore, when using gamification or game-based learning models one must consider what factors lead to engagement. The occurring themes that appeared in the literature suggests to increase or provide engagement are rewards, visually appeal aspects, progression of difficulty, feedback and limitations.

Rewards

Smith and Abrams (2019) note that rewards are already a naturally occurring system within classrooms. Teachers provide students with an achievable goal asking students to demonstrate a certain behaviours or tasks in order to gain the reward once the goal is met. Similarly, one of the ways in which engagement is achieved in gamification or game-based learning, is through the use of visual rewards. Hsu and Wang (2018) and Halloluwa et al. (2018) suggest that having a story or theme, providing badges, illustrating leaderboards, progress bars, points, sound and a clear goal sound all contribute to engagement with games. This higher level of concentration and engagement is suggested by Sun-Lin and Chiou (2019) due to the fact that students have visual records of their progress. Similarly, Smith and Abrams (2019) note that this type of incentive has not only been used successfully within the classroom, but through everyday

life such as the dollar rewards provided through many credit card and airline companies. Notably, Pivec (2007) highlights that engagement does not consist of a one-time use, but the ability of students to return to tasks unprompted and repeat cycles with continued engagement. The concept of continual return is mirrored in Jones et al. (2014) study which uses a non-technological game. Non-technological games, alike technological games, must include some of the same reward-based aspects for engagement purposes. Jones et al. (2014) uses a poster board to display student progress, providing virtual currency, virtual equipment and receiving new episodes of the heroes storyline when goals are met. The overall consensus is that in order for engagement to occur a determining factor is that rewards must be displayed.

Visually Appealing Aspects

Additionally, games must be visually appealing to the users in order for engagement to occur. Nand et al. (2019) suggests that children will be motivated and engaged if educational tools are designed similarly to commercial games. When using technology-sourced games, Nand et al. (2019) surveyed 120 students determining that challenge, feedback, and graphics were the three main aspects that make games appealing. Furthermore, they determined that colourful images, high definition, and real-life characters were key factors in the graphics of creating quality educational games. However, Hsu and Wang (2018) notes that educational games are created to increase learning making them less attractive than commercial games which are designed for enjoyment and entertainment. Throughout the literature, there is a significant emphasis on the physical appearance of the games themselves and how, when done thoughtfully, educational games can provide increased engagement.

Progression of Difficulty

It is suggested throughout the literature that games need to not only include factors such as visual representations of score but an appropriate level of progression in difficulty. Smith and Abrams (2019) quote Vygotski and Cole (1981), that in order for people to learn they must be in the *proximal zone of development*, in that the task cannot be too hard or too easy. Gennari (2017) uses behaviour and emotions as indicators of engagements, thus suggesting that, when students feel enjoyment, they emulate positive behaviours. Adversely, when students feel boredom, frustration, or high anxiety with a task the result produces negative or undesirable behaviours. Agreeably, Jagušť et al. (2018) stated from their study that when tasks were too difficult performance levels dropped and students became frustrated. Hsu and Wang (2018), Nand et al. (2019), Sin-Lina and Chiou (2019), and Jones et al. (2014) all used increased reward sizes to encourage students to solve more difficult tasks. When given the opportunity to engage in more difficult tasks, students were able to choose for themselves and not be forced by the game. Furthermore, all of the games progressed in a fashion in which the games themselves automatically increased in difficulty as students learned new skills, providing them with a feeling of success. In the studies by Hsu and Wang (2018) and Nand et al. (2019), players were provided higher rewards when the answers to higher level questions were correct. This was used in order to encourage students to try more difficult tasks without the fear of failure. In the Hsu and Wang (2018) study of online puzzle games, the challenge of copying line graphics and using blocks to solve puzzles was used. They specifically challenged the students to use the least number of blocks to solve the puzzle. Nand et al. (2019) provided challenges to the students via questions that increased in difficulty as they continued through the game. Jones et al. (2014) provided challenges to the players that were perceived as achievable. A 10-day baseline of fruit

and vegetable consumption was recorded in order to inform appropriate goals. Then, these goals gradually increased weekly by using 60% of the collective student consumption in order to make the goals attainable. Pivec (2007) highlights that one of the reasons that games are often played by not only children, but people in general, is because of the intrinsic challenge to be beat others or beat a previously earned score. Therefore, having an appropriate progression of difficulty and encouraged challenge is a vital factor in maintaining student engagement throughout gamification and game-based learning.

Feedback

One way that educational games seek to provide the appropriate level of challenge is by providing timely feedback through online characters, teachers, or consequences. Meluso et al. (2012) used a computer-based game called *Crystal Island* to increase student knowledge in math and science. The feedback provided was the opportunity to converse with characters such as the mayor or citizens to gather advice and assistance in completing their given tasks or to learn about scientific concepts related to the game. Moreover, Gennari (2017) when assisting students in game design, an expert designer was used in order to provide students with various types of feedback. Feedback in the form of question clarification and written feedback were used. The question clarification was verbal and immediate in order to prompt students to think about specific parts of their game design. The written feedback was used in order to encourage critical and self-reflective skills about their projects progress thus far. Both forms of feedback were used in order to guide and aid students in their creations, allowing for success and better engagement as opposed to frustration and anxiety. When focusing specifically on engagement Jones et al. (2014) used verbal feedback to the students by teachers reading messages from the fictional characters to consume more of one category. When students accomplished their goals, they were

given positive feedback by moving into the next chapter of their journey and eventually meeting their goal of helping the heroes capture various villains. These forms of feedback both encouraged students to continue on their journey without the fear of failure. Similarly, Sun-Lin and Chiou (2019) used feedback by providing students with a message of congratulatory achievement and then prompted them towards a similar, yet more challenging task. This was used in order to increase transferability skills and to help students feel successful when meeting the assigned goal. When playing games, feedback is an essential piece to encourage engagement as Pivec (2007) notes that when games provide feedback consequences are given or new knowledge is attained within in a world that is deemed 'safer' than the real world.

Limiting Factors

When implementing gamification or game-based learning there are limitations to the factors that promote engagement. With the use of rewards, a possible limiting factor as suggested by Smith and Abrams (2019) is that students may focus solely on the rewards instead of the content and feedback which focus on the increase in learning of content. Furthermore, they note that although many students are motivated by rewards, others may find the gaining of rewards as a stressful task as they perceive it as being continually tested. Another limiting factor of game-based learning could be with visually appeal aspects of the game itself. Children are often engaged with commercial games outside of the school environment. Yet, in comparison to educational games, commercial games are not limited to providing only educationally sound content and appropriate graphics. Thus, things such as fighting and killing are often left out of educational games. These aspects themselves are not necessarily drivers of engagement but they could be a limiting factor for students as they may become less engaged with an educational game because they are of lesser quality compared to commercial games. Also, in regards to

students with disabilities, Smith and Abrams (2019) highlight that when giving feedback via images or sound may exclude students with visual and auditory disabilities. Similarly, in order for students to progress through the game, Smith and Abrams (2019) note that additional technology such as keyboards, or auditory assistance may be required, yet many are unaware that these types of aids are available. They also note that cognitively disabled students may not experience motivation. In fact, the concept of competition and badge-earning may cause anxiety. Furthermore, it may be difficult for students with cognitive impairments to process leaderboards and performance graphs at the same rate as other students.

Effects on Student Attitudes, Behaviour, and Perception of Learning

When including gamification in the classroom, one must consider the positive or negative effects on students. In 8 of the 11 studies on gamification, the findings resulted in an increase in either positive behaviour, learning perception, motivation or all three. Several trends occurred throughout the research, in that gamification activities were found to be more enjoyable, learner-centered, collaborative, motivating, and fun. These factors are necessary in order to modify students possible negative prior preconceived experiences with learning. Prensky (2001) highlights the fact that many learners have a positive attitude towards game play, whereas these same learners can have a negative attitude toward learning. Nand et al. (2019) determined in their study through student feedback that mathematics was an area in which students preferred game-based learning. One student responded to their study by saying "*I don't like maths so learning a game and playing will be better*" (p. 5). It can be determined that this perception of not liking math is held by students within classrooms everywhere. This then demonstrates how a student, who dislikes a subject area, can be convinced or engaged in that area by simply making it a game. Thus, in order to positively increase student attitude toward learning, tools such as

game-based learning and gamification of learning provide a non-stressful environment while still engaging in learning content.

Student-Centered, Collaborative, and Positive Behaviour

The use of gamification and game-based learning provides students with the opportunity to collaborate with their teacher and peers, provides a more student-centered approach and can increase the amount of positive behaviour seen within the classroom. Halloluwa et al. (2018) study focuses on a student-centered environment through collaborative tablet-based gamification which aims to increase students' eagerness to learn. The atmosphere shifted from a traditional learning environment to one where students with more competent skills worked in collaboration with less competent students providing student leadership roles within the classroom. Halloluwa et al. (2018) was the only study to comment on the decrease in students fear of the teacher as a result of this collaborative approach. Whereas, in the literature reviews done by Hsu and Wang (2018) and Sun-Ling and Chiou (2019) there was an emphasis specifically on elementary mathematics. Hsu and Wang (2018) noted an increase in positive behaviour occurred when using game mechanics during a puzzle-based learning system that aimed to promote algorithmic thinking skills. Similarly, Sun-Ling and Chiou determined after comparing two study groups, that the group with gamified elements had increased perceived value, motivation, and enjoyment when solving algebra word problems. Notably, students who used gamified tools were observed and demonstrated increased positive behaviour within the classroom. In order to determine increased positive behaviour, Gennari et al. (2017) observed facial expressions and body language during gamified learning. This study used self-reporting as a way to calculate increased positivity through emotions in elementary students. Overall, students from this study determined that they enjoyed, were relaxed, and challenged efficiently. In addition, Protosky (2002)

emphasizes that students experience playfulness through games, which increases their academic self-efficacy. Also, Sun-Lin and Chiou notes that a positive increase in student perception of learning, attitude, and behaviour occurred when fun gamified tools infuse learning content.

Overall, gamification and game-based learning has been shown to increase positive student attitude, perceptions and behaviour as it has a greater ability to be student centred, engaging and fun in comparison to traditional teacher directed approaches. This is not to say that direct instruction is replaced, instead games provide an extra option to having only direct instruction. Pivec (2007) suggests that gamification is used as a way to bridge the gap between students and teachers who have learned in different areas of education. Students growing up now are enveloped in technology and thus, games provide teachers with a different way of introducing new topics or having students practice previously taught concepts.

Increased Student Learning

For the purpose of this paper, student learning is defined as a proven increase in content knowledge or skill. Although all conducting various types of research and using different models, all 11 papers concluded that an increase in students learning took place.

Nand et al. (2019) highlighted that numeracy outcomes increased for primary students who were given a feature enriched game version that included specified features for attractive game design of *Who Wants to be a Millionaire*. Similarly, Hsu and Wang (2018) study determined that game mechanics can increase algorithmic thinking and puzzle solving. In their study on gamification of algebraic word problems, Sun-Lin and Chiou (2019) also reported that the group with gamified elements resulted in higher scores in comparison to the groups who did not have gamified elements. The positive results were named through students' ability to concentrate on studying the various algebraic example problems within the game in order to

solve their own algebraic problems. In addition, Meluso et al. (2012) determined that there was no difference between collaborative and singular player learning advancements, but that both groups who played the *Crystal Island* game increased their scientific knowledge as well as their self-efficacy. Jagušt et al. (2018) also reported increased learning performance in all three of their gamified groups as a direct result of the gamification elements. The highest learning performance was a combination of narrative, competitive, and adaptive elements. Halloluwa et al. (2019) in their study of mathematics in two Sri Lankan primary schools found that when comparing traditional teaching methods to the gamified tablet-based learning, the students performed better when given the tablet-based learning method. It was noted, that when gamification is paired with instruction, learning performances increased. Whereas, Gennari et al. (2017) did not focus specifically on the increase in student learning for the purpose of their study. However, it does highlight that when students felt an increase in positive emotions throughout their game design process, they developed better and more sophisticated products. Thus, it can be concluded that student learning occurred throughout this process, despite it not being specifically measured. Also, Watson and Yang (2016) although did not conduct research specifically on students learning, they note that when choosing appropriate games and given proper supports that game-based learning can result in an engaging and learner-centered approach within the classroom. Therefore, this concludes that gamified learning can increase student performance although several conditions must be met in order to gain learning experiences as previously mentioned.

Curriculum Alignment

When using educational gamification or game-based learning, curriculum is another important factor to consider as it is the content that drives everyday teaching. Six of the 11

papers specifically mentioned the direct connection of the research to the curriculum of the country. The other five, although not directly connected, include some curricular connections while others did not.

Specific Curriculum Alignment

Halloluwa et al. (2017), Nand et al. (2019), Jagušć et al. (2018), and Meluso et al. (2012) present studies that directly correlate with the curriculum of the schools' location. Halloluwa et al. (2017) designed and implemented the gamified activities aligning with the grade three curriculum in Sri Lanka. The study focused on mathematical aspects of measurement and currency. It is notably mentioned that an initial project failed during implementation due to the lack of correlation between content and curriculum. Nand et al. (2019) used the New Zealand Numeracy Curriculum to determine the suitable level of questions for the selected children of the study. The curriculum was specific to the 9-10 years of age test subjects who used a technological game to focus on increased numeracy comprehension. In their study, Jagušć et al. (2018) used competitive, collaborative, and adaptive gamification of grade two and three mathematics curriculum. They specifically aligned their research with the math curriculum for students aged 7-8 in grades two and three in a Croatian primary school. Meluso et al. (2012) used the *Crystal Island* game which focused specifically on Full Operation Science System content and course study material of landforms and ecosystems for 100 fifth graders. Thus, the study was fully aligned with academic curricula for the fifth-grade participants within the North Carolina K-5 elementary school.

No Curriculum Alignment

Other studies, however, did not align their research with specific curricular content of the grade level. Yet, all of the following studies mentioned ways in which their research connected

to parts of the curriculum. The study provided by Hsu and Wang (2018) focused on the skills of critical analysis and problem solving to promote algorithmic thinking in computer science for fourth grade students. It notes that the skills being practiced were skills necessary for daily life but did not specifically mention these skills as being tied to the Taiwanese curriculum. Similarly, Jones et al. (2014) focused on fruits and vegetable consumption through game play. This study, although it did not use specific curricula content to teach students. They did however have teachers read to their students about the heroes within the game, thus making the activities curricular appropriate for elementary school. Sun-Lin and Chiou (2019) also did not specifically align their study around a given curriculum. However, they focused specifically on algebraic word problems for sixth grade instructional materials and used four expert teachers to appropriately design the word problems for the age of the participants.

Despite the fact that many of the studies aligned with specific curricula, some only loosely aligned with aspects of the curriculum. Pivec (2007) notes that teachers often avoid using games because they do not correlate with the specific curriculum topics assigned to their grade. Also noting, that ministries of education could be more intentional about supporting teachers in the shift towards game-based learning by including it specifically it into the curricula. However, the “meaningful use of game[s] depended far more on teachers’ knowledge of the curriculum” (Sandford et al., 2006, p. 157). Overall, the studies focus on the implementation of gamification into educational settings of elementary schools with a varying degree of curriculum alignment. Although the studies implemented the games into educational settings, it is unclear whether the need for specific curriculum alignment is needed. However, it can be assumed that if teachers are to implement games into their classrooms, they would want games that align with what they are teaching or it may lose its usefulness. Although, it could be also be suggested that alignment with

curriculum may not be necessary for those teachers who are well versed in their curriculum content.

Student and Teacher Involvement or Input Within Games

When considering the implementation of games into an educational setting, such as a classroom, there are two groups which are directly affected: the students and the teachers. In addition to data collection of student achievement or success, student and teacher perspectives are an integral part of the research process as suggested by the following studies. The involvement of students and teachers varied throughout the studies, some included students and teachers specifically in the design and integration of the gamified content. Whereas others, gathered data from teachers and students on their perception of the gamified content.

Student Involvement and Input

Gennari et al. (2017), Halloluwa (2017), Hsu and Wang (2018), Meluso et al. (2012), Nand et al. (2019), and Jones et al. (2014) all included student involvement within the games that reached outside of just playing and interacting with the gamified element. Nand et al. (2019) used student input in the game design specifically by providing student questionnaires to determine the most appealing attributes to be included in the game. Hsu and Wang (2018) focused heavily on student involvement as the study used student-generated questions to promote algorithmic thinking skills. The research went further by extending a questionnaire to students in order to determine their perceived attitude and engagement towards the puzzle-based game. In addition, Jones et al. (2014) involved students by having them vote on specific dates to determine the direction of the game narrative. They democratically chose which planets heroes would travel to or which tool to buy using their rewarded earnings. However, student input was not considered when designing the game itself. Moreover, Gennari et al. (2017) used researchers

and teachers to interview the participating students to determine their experience with the gamified element. However, results were not shared in this paper as it was not the focus of the study itself. Furthermore, Halloluwa et al. (2017) did not use student input to create or design the game itself, but they did use an interview to determine the learning, collaboration, and overall effects of the gamified element. Similarly, Meluso et al. (2012) recorded the increase of self-efficacy skills by coding student responses to eight questions around whether they felt they would be able to learn science content from the gamified element. Thus, all of the studies mentioned included some form of student involvement beyond just participating in the study itself.

Teacher Involvement and Input

In addition to student input, the following studies also included varying degrees of teacher involvement. Gennari et al. (2017) relied heavily on teacher observation, input, and expertise to conduct their research of children's emotions when creating game design products. They were the only study to include a six-hour pre-training with the GaCoCo design protocol (Gamified CO-design with Cooperative learning). GaCoCo is the way in which creators design the game for an educational setting. They were given hands on experience and able to see the application from the perspective of the student before implementing it into the classroom. After this session, teachers gave feedback on GaCOCo design protocol to which researchers revised the gamified product based on this feedback. Teachers had a major role in this study as they were responsible for providing information on students such as age, gender, social skills, work attitude, and overall school skills. They were required to gathering data on children's emotions, collaborative skills and product design throughout the study. In comparison, Hsu and Wang (2018) used an overall of three computer science expert teachers with Masters degrees. One

evaluated the pre-test and post-test results of the study to measure the algorithmic thinking skills of the students. The other two computer science teachers, with 22 and 26 years of teaching experience, were used to ensure the game design aligned with the content specific area of puzzle-based learning system. They also ensured the pre-test and post-test questions have content validity. Similarly, Sun-Lin and Chiou (2019) specifically used expert teachers in the area of mathematics to create the questions for their study. They included a middle-school teacher, two elementary teachers with five years of teaching experience and an author of a mathematics reference book with over 13 years of teaching experience. In addition, Halloluwa et al. (2019) used four teachers within their study as experts in the content area. The teachers provided input on how to align the game with appropriate curricular content for grade three. Teachers were tasked with separating students into their respective groups of gamified element or traditional setting, in which the same teacher taught both groups. Two of the teachers collaboratively created a math test specific to grade three to evaluate student skills. Teachers were then interviewed following the study to determine their learning, collaboration effects between teacher and students and engagement of using the gamified element.

In comparison to the previous studies with heavy involvement, the following studies include low teacher involvement. Jones et al. (2014) used optional e-mail surveys to determine teacher, student, and parent satisfaction from the study on fruits and vegetable consumption through gamification. Unfortunately, the response from all groups was too low to render any conclusions. Teacher roles were to facilitate the study through reading the chapters and providing the dialogue from the characters after a successful or failed mission, but they were not consulted or used as experts for the game design. Jagušt et al. (2018) used teachers to assist in the use of the gamified elements as well as teaching in the non-gamified portion of the study. However,

teachers did not have any input or effect on the creation of the gamified element itself. They were used as facilitators of the four conditions. Nand et al. (2019) mentioned in their study of using gamification to increase mathematical knowledge that, when implementing the curricular portion, teachers were consulted, but the pretest was the defining factor of the content. Meluso et al. (2012) did not use any teacher input for their study to increase science knowledge and self-efficacy through gamification, despite the gamified research being done in a public elementary school. In commenting on the gamification process, Pivec (2007) highlights that it is essential that teachers are trained and comfortable with teaching content through games in order for it to be successful.

Overall, the literature demonstrates studies that include a varying degree of student and teacher involvement. The literature illustrates the direct connection of the studies to both teachers and students within a classroom, but the importance of their involvement is not concluded. None of the discussed studies determined that student and teacher input directly affected success or failure. However, the literature indirectly highlights the importance of teachers and student involvement in facilitating and participating in the studies. It could be determined or inferred that, because teachers are experts in their fields of the day-to-day classroom, they would be the best resource in order to provide sound suggestions on what is or can be included in the study. All participation from students and teachers provided researchers vital information on the success of gamification within educational classroom settings. Throughout some of the studies, very little emphasis is given to teacher and student input towards the design. Further investigation toward gamification with student and teacher assistance is needed. In order to have successful implementation of gamification within educational settings, the collaboration between researcher, teacher, and student is necessary. Teacher, student, and research collaborative

cooperation is desirable to achieve successful results in the research; however, it is unclear as to which type of collaboration produces the most effective implementation

Teacher Perceived Barriers of Implementation

Given that gamification and game-based learning take place mostly within classroom environments, it is understood that the teachers themselves are the ones who make the decision whether to implement them or not. They also decide as to how they implement them and how often they occur within the classroom setting. It is reasonable to understand, that with the vast curriculum and many options which to teach it, barriers can occur for teachers, which indicate “something material or immaterial that impedes or blocks” (Watson & Yang, year, p.157). When considering why and if gamification and game-based learning are implemented, one must also understand the perceived barriers teachers face.

Watson and Yang (2016) examined the barriers teachers perceived when considering whether to implement games in their classrooms. They looked at four specific criteria of

1. Challenges of implementing games effectively;
2. Challenges with use technology;
3. Current educational system;
4. Challenges with obtaining games. (p.153)

They mention that of the research performed, most suggest teachers have a positive attitude towards using games within education as they believe it can be motivating. However, gamification is not implied within any curriculum. Thus, Watson and Yang (2016) note that the Ministry of Education had “no specific policies regarding game adoption, which led to a lack of instructional game materials, inadequate training for teachers and inadequate administrative support for innovation” (p.157). If gamification or game-based learning is not suggested or taught to

teachers, then it is understandable that many teachers would perceive it as a larger undertaking than its perceived worth. They mention that games being implemented into classrooms can often have “inaccurate or inappropriate game content, lack of supporting materials, negative effects of gaming, high cost, licensing and technical issues” (p. 157). Thus, the perceived challenges with implementation were “regarding student and teacher interest, student attention, class management, game content and its alignment with learning objectives, game availability and assessment” (p.166). The overall concern noted from Watson and Yang (2016) regarding implementation, was that teachers were concerned about students being sidetracked or having difficulty managing a class while using a game. Moreover, teachers perceived the challenge of using technology and finding games as an inhibiting factor. Another note provided by the teachers was that teachers are not properly funded in order to implement these games. Many schools are unable to purchase games and more specifically, games that the teachers view as acceptable or helpful. Watson and Yang (2016) also note that these barriers are not without promise.

It is understandable that teachers who have already utilized games for learning have successfully overcome the barriers at some point and thus are more confident to deal with challenges of implementing games within the existing educational system than those who have not implemented games. (p.166)

Overall, Watson and Yang (2016) are able to provide a comprehensive understanding of teacher concerns and potential barriers. Although, many of these barriers are ones that can be overcome with training and experience. However, relevance and potential benefits must be demonstrated for teachers in order for them to buy in. Furthermore, the issue of purchasing comes

more with tablet or computer-based games. There are options such as paper and pencil games that can work as a replacement, provided that more preparation is needed.

Learners With Exceptionalities

Within the classroom scope, there is a wide variety of learners. Thus, when one considers implementing gamification or game-based learning into the everyday classroom, one must consider how it affects all learners. Thus, the implementation of gamification and game-based learning should include all learners and be equally accessible to those with disabilities and impairments. These learners can include conventional students with no limitations, to students who have socio-economic, physical, visual, mental, or learning impairments. Some examples of mental and learning disabilities that are commonly found in elementary classrooms, are learning disabilities, ADHD, ADD, and dyslexia. There are also students who have more dire challenges such as blindness, chronic health issues, and autism to name a few. Despite, the dynamics in a typical elementary classroom, gamification is one way in which educators can provide academic content to all learners with a variety of challenges. However, Smith and Abrams (2019) notes that gamification can both support and limit learners with disabilities. Many of the previously discussed papers did not mention the impact on students with disabilities. However, Pivec (2007) briefly mentions learning disabilities, whereas Smith and Abrams (2019), Garcia-Redondo et al. (2019), and Papanastasiou et al. (2017) all explore in-depth the effects of gamification and game-based learning on students with various impairments. This section explores the benefits and limitations that are highlighted throughout their papers.

Pivec (2007), Smith and Abrams (2019), Garcia-Redondo et al. (2019), and Papanastasiou et al. (2017) all found benefits of gamification and game-based learning within their studies. Smith and Abrams (2019) note that the statistics from NCES, 2018 determined that

between the years of 2015-2016 there were a reported 6.7 million U.S students from the ages of 3-21 who received educational assistance due to their disabilities. Similarly, Garcia-Redondo et al (2019) notes that “video games are increasingly used in the field of special education to support well-being, social skills, independent living, and inclusion in varied samples of students with special needs such as autism spectrum disorders, learning disabilities, and giftedness” (p.2). Thus, the exploration of whether gamification and game-based learning can aid these students is critical. This section explores the learning disabilities of attention deficit/hyperactive disorders also known as ADHD/ADD and cognitive disabilities such as Autism.

Attention Disorders – ADHD/ADD

Gamification and game-based learning can have positive effects for students with a variety of disabilities such as ADHD/ADD. Smith and Abrams (2019) wrote their literature review specifically on the way in which gamification effects students with disabilities and what is necessary to consider when creating games for these students in an educational setting. They suggest that positive effects of gamification and game-based learning and students with attention deficit disorder as it was able to engage them in an activity for sustained periods of time. Similarly, Garcia-Redondo et al. (2019) focuses on the use of serious games as a way to improve attention in students with learning disabilities. They identified from Bul et al. (2018) study that there was an increase in skills such as “time management and planning/organizing, as well as a reduction in hyperactivity symptoms in a group of students with ADHD who played an [serious game] intervention” (p. 9). Although these skills are not specifically curricular driven, they are skills in which teachers are often required to teach these students in order for them to be seamlessly integrated into the classroom. Furthermore, Papanastasiou et al. (2017) wrote their paper on specific benefits and limitations of serious games on students with attention, memory

and development disabilities within the K-12 setting. They state that students with attention and impulsive behaviour difficulties from ADD or ADHD can benefit from technological serious games that focus on information and communication. However, the use of computer-based games was targeted towards training students to reduce their impulsive behaviours and increase attention as opposed to focusing on the learning of educational content. Despite the lack of curricular alignment within these studies it can be derived that curriculum is not the only important factor for students with attention disabilities. In fact, it is understood that these students need direct teaching of skills to increase their social behaviours within the classroom. Moreover, Pivec (2007) highlights that games provide an experience of the world for students with disabilities that typical learners take for granted. Throughout the literature there is an indication that students with ADHD, ADD and attention disorders can benefit from the use of gamification and game-based learning.

Neurological Disorders – Autism

Neurological disorders are ones that impair a student's brain function. Smith and Abrams (2019) describe these disabilities as “anxiety, seizures, memory impairment, attention disorders, processing disabilities, learning disorders, and socio-cognitive impairments related to autism spectrum disorder” (p.108). Thus, when considering gamification, they suggest that creators consider that

some users will need sound or images to help facilitate their reading of a text, and others may need consistent buttons and functions across the site. Additionally, some may need simple and short sentences, and others may need to adjust the size and presentation of information on the screen. (p.108)

Similarly, Papanastasiou et al. (2017) noted through their literature review that students with autism spectrum disorder benefited from their increased engagement with the game and their peer partners without assistance from adults. The study used interests and strengths of the students in order to create games around motivating students with autism to positively engage with their typically developing peers. The games were used as a specific intervention method with young students and the follow-up study from Jung and Sainato (2015) concluded the game was meaningful, feasible, and effective. Moreover, Garcia-Rodondo et al. (2019) highlighted in their study that, when students with autism were provided with games that required multiple intelligences, they demonstrated increased social gains and problem-solving skills. The concept of multiple intelligences, as mentioned by Garcia-Rodondo et al. (2019), is derived from the “8 intelligences recognized by Gardner’s theory of multiple intelligences from his book *Frames of Mind: The Theory of Multiple Intelligences*, which suggests that learning takes place through (musical, bodily-kinaesthetic, logical–mathematical, linguistic, spatial, interpersonal and intrapersonal, and naturalistic intelligence)” (1983. p. 7). Overall, we see that students with neurological disorders specifically, autism are able to gain valuable skills through gamification and game-based learning methods. Students with cognitive disorders not only have to learn curriculum within mainstream education but need extra support with social skills. Thus, gamification and game-based learning can be used to aid these students in both curricular and social areas of education.

Limitations

When discussing gamification in classrooms one must also consider the limitations this presents to students who have disabilities. Smith and Abrams (2019) note that likely “learners with auditory, cognitive, physical or visual disabilities may experience barriers using a game,

especially if its navigation requires the use of a mouse and keyboard interchangeably, captions are not available, and the game uses color to indicate success and achievement (p. 114).

Furthermore, they highlight that “there are concerns regarding the ‘emotional reaction’ for those who have increased sensitivities to sound, moving images and feelings of failure, as these features may startle learners who are cognitively sensitive (Smith & Abrams, 2019. p.111).

Moreover, Papanastasiou et al. (2017) notes that “a large segment of the population may experience barriers using this form of learning depending on how – and in what ways – gamification informs the instructional sequence” (p. 111). They also note that “if a gamified approach involves time-based activities or kinesthetic movement for navigation, then it is possible that those who are disabled may not have equal advantages as others” (Papanastasiou et al., 2017, p.112). When considering the nature of games Papanastasiou et al. notes that

Competition, collaboration, and cooperation in a game-related activity may pose challenges for individuals who are disabled in cognition and dexterity. Their peers may present a competitive advantage, as most educational gamified activities that require collaboration and team competitions gear toward those considered as non-disabled learners. (p. 113)

Furthermore, Papanastasiou et al. states that “what is clear is that, despite best intentions to motivate and engage learners or determine knowledge and skill sets, gamified designs may not be accessible to those with auditory, cognitive, neurological, physical, speech, or visual disabilities” (p. 118). Overall, the literature suggests that although gamification and game-based learning can create an engaging avenue for students with disabilities, there are many limitations that must be considered when implementing them into the classroom. Depending on the students

disability, there are a vast amount of considerations that a teacher must note before using gamification with all students.

Research Limitations

All research has limitations that must be explored further. Throughout the research, most of these studies were done using technological games. Thus, it should be considered whether the same amount of engagement and learning takes place with simpler games such as word board games or paper math games. Throughout the literature, several limiting factors were noted. Researchers expressed concern of overstimulation, the small duration of the studies, the accessibility to all learners, and suggestions that should be considered when future research takes place.

Study Participant Group

The research highlights the variety of varying participant groups in terms of age range and the number of participants within each study. Throughout this specific literature review the smallest participant group size was 35 students in Gennari et al. (2019) study and the largest was 242 students in Hsu and Wang (2018) study. Majority of the studies ranged between 50-100 students. A possible reason for these findings is that many primary and elementary classrooms average between 20-30 students, making the classroom sample group small in and of itself. Many of the researchers highlight that the small participant groups only suggest that positive results occur within in a small setting. Therefore, future research could consider an increased participant size to better understand whether gamification can increase student learning and engagement.

Duration

All studies unanimously agree that more evidence is needed to support gamification within an educational setting. Specifically, to determine whether results derive from the novelty factor. The studies varied in their duration from the shortest study being 13 days in Jones et al. (2014) study to Jagušť et al. (2018) study which lasted approximately six months. The research typically lasted around 2-4 weeks on average. Jones et al. (2014) suggests that research should aim at investigating gamification interventions over a longer period of time. Similarly, Nand et al. (2019) suggests the necessity to conduct a long-term study focusing around whether learning increase and enjoyment of the games continues. Also, Halloluwa et al. (2018) also conducted a short two-week study to which they emphasized that the novelty factor could have contributed to not only their positive results but results of other studies with short durations. Despite Hsu and Wang (2018) conducting the longest study reviewed here, it is specified that once again student engagement and motivation using the same game needs further investigation. Overall, each study provides positive findings towards engagement while using gamified materials within educational settings. Although, it is evident that the researchers agree that more time and evaluation needs to be put into longer studies to determine the longevity and effectiveness of the games.

Overstimulation

Another consideration, when using technological games, is amount of time children are interacting with them. Many of the studies required students to interact with the technology between 15 to 30 minutes. However, Nand et al. (2019) briefly noted the negative impacts that have been discovered with student over stimulation, extended periods of game play and decreasing interaction with society when given technological games within the classroom. No

other studies mentioned concerns around this area of technology, although it is an important issue to consider in further research given the abundance of technology available to youth in the current times. It is important to consider whether engagement and learning will continue to occur when the length of time increases. Also, future research could consider the ramifications on student obsession and overexposure to screen time when technology is implemented into the classroom. Especially given the fact that majority of students are probably exposed to hours of screen time at home as well. Furthermore, could the use of technological games decrease engagement with other mainstream ways of teaching? Therefore, screen time and overstimulation should be considerations within future research.

Accessibility

Another consideration with gamification is the accessibility to teachers in terms of technological availability and cost. Halloluwa et al. (2018) highlights the limitations gamification can face when implemented into rural areas. They specifically speak to the cost of internet usage, power consumption, and limited battery life of tablets. Cost could be a possible limitation to the everyday implementation of technology within the classroom. Watson and Yang (2016) suggest that quality educational games are often more geared towards high school versus elementary level students, making it more difficult for elementary teachers to have access to engaging games. Accessibility is a common and recurring issue given geographical and monetary situations especially when considering the implementation of tablet or computer based games. Future research should consider the cost and accessibility of paper or board games and whether they are a more easily implementable source of gamification. Although, for districts and ministries that have access to tablets or computers, there appears to be a limiting availability to the classrooms themselves when trying to access curriculum driven games. Watson and Yang

(2016) note that with increased or better “technology assistance and financial support for purchasing computers and suitable games could go a long way to supporting the effective implementation of game-based learning” (p.166). They go on to say that by producing more research on how teachers overcame the various perceived barriers that more teachers will be willing to implement them. Thus, for everyday teachers, accessibility and implementation is a limitation.

Overall, the size of participant groups, duration, overstimulation, and screen time are limiting factors to the implementation of gamification. Further limitations occur when considering learning outcomes, although there appears to be increased learning when using gamification, more research is needed to determine whether students are able use their learning in flexible ways. This could include research into learning disabilities and whether gamification provides similar positive results for those students. Research into how gamification can include a variety of diverse needs is another avenue to explore.

Conclusion

Throughout this literature review, various aspects of why and how to implement gamification or game-based learning within elementary classrooms have been examined. The varying studies range in years from 2003 – 2019, demonstrating that the research of gamification is newer. The overwhelming consensus is that gamification can positively increase student engagement and student learning, while allowing for a positive student-centered educational experience. The gamified tools used were slightly different in how they were created and implemented. The studies give a well-rounded and in-depth look at how gamification is being used around the world. It is evident that there is a lack of teacher, student, and curricular influence within majority of the studies. Thus, it is vital that further studies include these aspects,

as they are driving factors of measuring student learning. Moreover, all researchers highlighted a significant need for further investigation into the novelty factor of games by increasing the participant size and duration of the research. Similarly, the concept of implementing games into a classroom environment must be accessible and available for all learners including learners with exceptionalities. More research is needed on how to create games that support all learners in a way that is inclusive of the diversity found within the classroom. It is an evident point that all researchers suggest that gamification requires more support and direct teaching from Ministries in order to have successful implementation within the classroom. Thus, more support needs to be given to teachers in order for them to access and implement gamified educational tools. In conclusion, gamification offers students and teachers a less stressful, more hands-on, and engaging avenue of learning. It provides an increase in student learning through a combination of teacher instruction and reinforcement of concepts through gamified condition.

Chapter 3: A Website for Gamified Learning

To support the need for gamification within the elementary classroom, I created the following website for teachers to access with sample instructions and games.

<https://alllearningrequirescoffee.opened.ca/>

A copy of this document has been uploaded to DSpace.

Chapter 4: Summary and Reflection

Education is a field that is constantly changing. What is seen as best practice from one year can quickly change to next. What is has reminded consistent is for educators to find ways in which they are engaging students in the learning opportunities provided. Games have been used outside of the classroom for centuries. Across the world different games are developed, played, and enjoyed from babies to adulthood. By combining both education and games, a new opportunity of learning is created. It is one where teachers can take a step back and students take a step forward in being responsible for their learning. When games are integrated with purpose, a vast amount of learning can occur across the curriculum. In using games, teachers are able to differentiate, provide extra assistance, allow students to collaborate, and help build students self-esteem and a positive perception of learning.

Reasons for Project

I have seen many games available for all different subject areas on the internet and I was curious about whether games provided an alternative learning opportunity for students. I was also interested in learning about whether games provided opportunities to teach social emotional skills. I was interested in this because these skills are ones that influence children's abilities to learn within a classroom environment. I have found that children who are emotionally dysregulated have difficulties learning new concepts, persevering through challenges, and viewing themselves in a positive way. I wanted to find a way in which to empower students to learn independently and collaboratively with peers while differentiating instruction.

I chose games specifically because I have always used games with my students in my classroom. Thus, I wanted to narrow down the various aspects that make them so effective and low stress. I also wanted to learn the theory behind gamification in order to share it with others in

my field. In order to share it with others, I had to consider what may prevent other educators from using games within their classroom. It has been eye opening to see the various reasons that teachers are against using games or the negative perception they may have around the implementation of games.

Personal Connection to Research

Throughout my research of gamification and game-based learning, I have identified the positive impact that games can have on students learning. I have found throughout my years of teaching that one of the hardest things to teach students is how to be confident in their abilities. Many students experience anxiety and become nervous when trying to learn new concepts. However, gamification is a way in which this anxiety and nervousness can be lessened. This can be achieved when students are learning new content with a peer in a low stress environment and the learning is continuously rewarded. Even when students get things wrong in a game, rewards still continue and feedback is given to steer them in the right direction. However, there is a potential factor for students to become hyper focused on the goal of winning versus the content itself. Alleviating this comes down to teaching them how to self regulate and highlighting the intended purpose of educational games versus commercial games. Using games as a teaching tool within elementary schools also allows for the teaching of self-regulation.

As a teacher it can be overwhelming to meet all the curricular competencies and content within a grade level for various subject areas. Games allow teachers to think across the curriculum as opposed to a singular subject focus. Moving forward, I hope to advocate for the use of games within the classroom and demonstrate the various teaching opportunities that they provide. I also hope to increase the awareness of how to implement games within elementary classrooms, not to replace directed instruction, but to add to it. Furthermore, when considering

the diversity of a classroom I wanted to learn what impact games could have for learners with exceptionalities. Majority of elementary classrooms have one or several learners who possess an one or more exceptionalities. Given the large diversity that can take place within a classroom one must consider all students and how to best teach them. Gamification demonstrated a way to allow for complete inclusion for students with exceptionalities and ways for them to be supported in learning with their peers.

The research has shown me that there is still a lot of research that needs to be done in terms of the effects of gamification within education. This research should also include games that are not technology based. Going forward, I will continue to use games and expand them into different subjects, as opposed to just literacy and math. Given the multitude of research that supports game based learning, I hope to continue building my website as a useful resource to other teachers. When using games, I also hope to help other teachers understand how games can be used as a classroom management tool as well. I want to be able to explain the benefits of games of all subjects to my colleagues and demonstrate how to use them within their classrooms.

Project Specifics

I chose to create a website that provided reputable resources for literacy, math and at home connections. I chose a website because I felt that it was the best way to display gamified content, to direct educators towards other websites, and it provides a central database for those who are in varying place in their journey of gamified teaching. To display this I separated my Resources Page into Math Resources, Literacy Resources and At Home / Parent Resources. The website gave me a way to demonstrate how I implement games within my own classroom. I created a separate page for Classroom Management to help others learn about implementation. This implementation takes many forms in that I had to sort through the important considerations

and strategies that I needed when starting this process. A large part of the implementation process for me was collaborating with my District 35 Math and Literacy coach. The many strategies and thought processes have been written on my website pages for other educators to use and learn from. I also wanted this website to aid not only myself, but other educators and parents, with being able to provide stress free games at home. This is a big part of why I chose a website as well because either parents ask me for extra homework or their child needs extra work at home. I have often found that parents are quick to jump to using the worksheets or workbooks that they used when they were in school. My website encouraged them to use games to not only help their child in whichever area is required, but to also allow for some spent between parent and child. This could also take shape in the form of siblings playing games together to increase their learning at home. Since games can be a stress free or less stressful and more engaging way of learning than worksheets and workbooks, I wanted to take the opportunity to provide those resources to my students parents.

Suggestions for Further Research

Further research should be conducted on the effectiveness of games that are not technology based. For technology-based games, research could focus on the potential for overstimulation and what effects that could have on students learning. Research could also focus on the effects of gamification for extended periods of time including larger participant groups for both technological and non-technological games.

Suggestions for Other Educators

When considering implementing games into your classroom, first consider what subject areas will be the most beneficial. Consider the intended purpose of each game and outline explicitly what you want students to be able to accomplish. Search for reputable websites and

Youtube channels that provide instruction and accessibility to reproducible games. Consider which way you will use gamified learning; small group instruction, whole group instruction, or a combination of both. Also consider how to best use any support workers within your classroom to best aid your students during game play.

Collaboration Between Colleagues

When implementing games into your classroom consider collaborating with a colleague. They can be the same grade level or a different grade level. Use one another to research games, theories, and reputable sources to get your materials. Collaboratively consider how you will implement games within your different classrooms and what your goals are. By collaborating with a colleague you have someone to converse with, problem solve with, and be able to revise your thinking on gamified learning. Seek out professional development opportunities that focus around game play.

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