Harnessing Commercial Off The Shelf (COTS) Video Games in Special Education: A Retrospective Reflection of Pedagogy and Learning observed with three Autistic Children in Game Play

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Abstract

The educational use of commercial video games in special education is an unexplored research territory based on findings from searching peer-reviewed journals in electronic databases like ERIC, Pyschinfo and Proquest. Currently, there is no formal consideration of use of video games for learning by autistic children as there is no formal endorsement of its effectiveness for learning. However, many autistic children are highly interested and motivated by computers (Goodwin, 2008; Grynszpan, Martin & Nadel, 2007). Moreover, autistic people do not have impairments in their understanding of physical causality, and may even be superior relative to mental-age matched controls (Baron-Cohen, cited in Wakabayashi, et al.,2007). The author had observed his three adolescent sons with autistic spectrum disorder (ASD) to varying degrees, are able to play and achieve some level of success with Nintendo DS and Nintendo WII games, without the need to first read the game manual or refer to game hint books. Their interest and perseverance in some games of interest have led them to intuitively not only discover the properties, rules and procedures that must be mastered in order to become a "player" (Rosas, Nussbauum, Cumsille, Marianov, Correa, Flores, Grau, Lagos, Lopez, Lopez, Redriguez & Salinas, 2003) but also to win the games, perhaps learning more through situated cognition (Wilson & Myres, 2000) of the complex environment of the games than from behaviorism. It is the hope of this retrospective reflection to generate interest in considering using video games in special education for learning and literacy (Gee, 2007b).

Introduction

Autism or autism spectrum disorder (ASD) affects 60 per 10,000 people (Scahill and Bears, 2009) with about half not mentally impaired (Poon, 2009; Carpenter, Soorya and Halpern 2009). Recently, much media attention has been drawn on the alarming increase in diagnosed cases worldwide of ASD people (Poon, 2009; Carpenter, Soorya, & Halpern, 2009; Lawrence & Karen, 2009). To date, Chia (2008) has reviewed existing definitions of ASD and proposed the following definition as:

> "A neurodevelopmental syndrome of constitutional origin (i.e., genetic and epigenetic causes), whose onset is usually around first three years of birth, with empathizing or mentalizing deficits that result in a triad of impairments in communication, social interaction and imagination, but may, on the other hand, displays (especially by autistic savants) or hides (especially by autistic crypto-savants) a strong systemizing drive that accounts for a distinct triad of

> strengths in good attention to detail, deep narrow interests, and islets of ability" (p.10).

However, autistic people do not have impairment in their understanding of physical causality, and may even be superior relative to mental-age matched controls (Baron-Cohen, cited in Wakabayashi, et al.,2007). This intact systematizing ability (Wakabayashi, et al. 2007; Lawson, Baron-Cohen, & Wheelwright, 2004) is defined as the drive to analyse and build systems, with the aim of understanding and predicting non-agentive events. Lawson, Baron-Cohen, and Wheelwright (2004) elaborate:

> "Systems can be technical (e.g., the workings of a machine), natural (e.g., the process of coastal erosion), abstract (e.g., mathematics). Motoric (e.g., a guitar playing technique), taxonomic (e.g. a criteria for ordering compact discs) or social (e.g. a taxation system). When confronted with systems such as these we don't analyse them in terms of emotions or mental states. Rather, we examine relationships between components and correlations between events which then allow us to understand any underlying rules that may be relevant. By identifying regularities between the input, operations, and output of a system it becomes possible to predict the behavior of a system" (p.302).

Video games are essentially computer programs designed and built based on logic, running on highly customized and purpose built computer systems or game consoles for game playing. The human computer interfaces for interaction have evolved over time and the latest Nintendo Wii interfaces provides 3-D input for working with the 3-D virtual worlds (Sreedharan, Zurita and Plimmer, 2007). In view that video games are based on logic, implicating use of predictable cause and effect logic, I would argue that ASD people with intact systematizing ability will be able to examine the relationship between game constructs and arterfacts and perceive the underlying rules for playing and winning the games, in well designed and successful commercial off the shelf (COTS) video games. Harnessing COTS video games in special education for ASD people can thus be seen as harnessing the intact systematizing ability of ASD people for learning. In this paper, I will work on the research question of what pedagogy is embedded in game designs that works with my three sons with ASD and the corresponding learning that takes place with successful COTS video games by retrospective reflections. As people with ASD are affected differentially depending on degree of neurological dysfunction, no two ASD people can be considered the same. I will therefore use narrative-type narrative inquiry (Polkinghorne, 1995) to explicate my understanding based on the three subjects of this study.

Subject 1 (very high functioning ASD)

Background

Subject 1 is fourteen years old and considered to be very high functioning as he is currently in express stream of mainstream school. He has speech delay confirmed by three years of age and was diagnosed with mild autism at age five. The triads of impairments in communication, social interaction and imagination are still present but he has learnt strategies, knowledge and expertise to circumvent weaknesses with appropriate school and home support for normal functioning in school.

Game Play Recollections

Subject 1 started playing video games when he was four years old. His first game console was Nintendo 64, where he played "Mario Kart", a racing car game involving the Nintendo iconic characters of Mario, Luigi, Donkey Kong, Peach and others. The game rich colour graphics, sound effects, lively and cheerful music, realistic animations and cheerful looking comic characters to play with, attracted him to try the game. I initially tried showing him how to play "correctly" by pressing the appropriate buttons to move forward. He however, chosed to go backwards and tried exploring around. He was happy and pleased with the new playground. I was however perplexed then by his actions and have left him alone to continue playing. The game was only setup on weekends. My wife and myself were surprised after some weeks, to hear a celebration music of his winning a trophy for competing and winning races. We did not know of the existence of trophies for winning a set of four circuit races as we did not play the game. On hindsight, it appears that ***fun*** and ***engaging*** elements in game play are absolutely essential to interest a child to play. I remembered trying various educational computer software titles considered "good", leveraging on my knowledge and expertise in computer based learning education, while working as a project leader in the Curriculum and Development Institute of Singapore, Ministry of Education, but to no avail to interest him. Looking back, ***patience*** on my part was critical to ***allow him time and freedom to learn from failues (Shank, 2002) as well as from his exploration of what's interesting*** through subject own active manipulation, observation and reflection of the cause and effects relationship so as to benefit from the experiences with just in time simple and direct visual instructions superimposed in game play help. I believe the rich, multimedia engaging environment is authentic to him and engages him to want to intentionally learn how to play and win the games.

Just in time visually explicit help

Cinematic authentic game play

Figure 1: Just in time help and cinematic authentic game play.

Another significant game was "Super Mario 64" where Mario will have to explore 3-D worlds to recover power stars to save Princes Peach from Bowser(actually a turle with hideous look and spiky back. I recall events where he was visibly afraid of fighting with Bowser, who appears big, fierce and very powerful capable of not only shaking the floor but also spitting fire balls. Subject was in fact immersed in the game and when fearful would come to me for help to fight Bowser. This is probably an example where social collaboration is being sought out. I guided him and showed him many times how to overcome Bowser. He did overcome his fears eventually with my modeling and encouragement. This events speaks of ***need for facilitator to be***

around during game play to provide help and guidance when occasion arises. I remembered other incidents where he and I could not overcome the level and I have to resort to buying game hint books to learn how to. My reading and showing my interpretation of the instructions to solve the problem interest him then to start reading and learning from hint books. Perhaps, such opportunities may be used to initiate reading books or learning from books.

He also has intense interest in Pokemon games and would patiently train his pokemons over many hours to compete and win in tournaments. He has learnt many different strategies available online and also in hint books to develop his expertise.

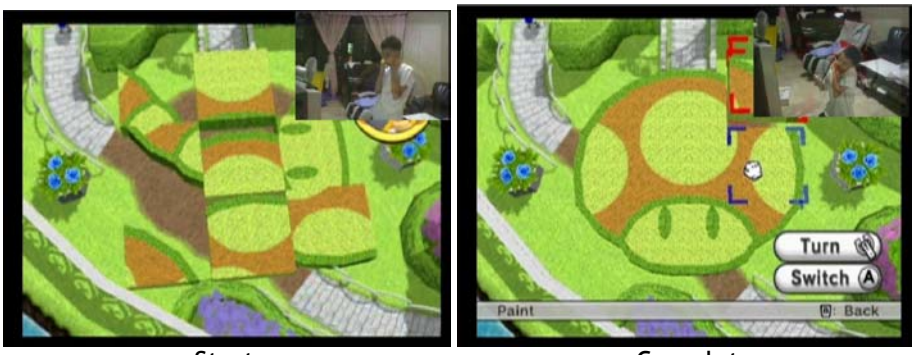
Subject 2 : Moderate functioning ASD child

Background

Subject 2 is thirteen years old with intelligence quotient (IQ) of 55. He also has some sensory integration challenges. Mental retardation is defined by three criteria: cognitive impairment of IQ scores less than 70, adaptive skills deficits, and age of onset prior to 18 years (APA, 2000 cited in Edelson, 2006). Thus only subject 2 has mental retardation. He is currently attending a special education school.

Game Play Recollections

Subject 2 only started playing after ***multiple observations of game play*** by his elder brother of "Super Mario 64". He will not play when offered, but will sneak up and play when the game console is on with no one looking. Perhaps, the engaging virtual world as Mario leaps into the portraits of Mushroom Castle was so inviting that he could not resist the temptation of wanting to go inside and explore the environment. Eventually, he overcame his shyness and actually took over from his brother and wandered around the different virual worlds in each portrait. He did not really play to win any power stars but rather only **enjoyed the opportunity to wander and explore the environment**. He did eventually after sometime, completed some course and won power stars. Nintendo is remarkable in that the design of the game **allows replaying of the same course** even though it has been completed. It not only caters for playing just for **plain fun** with no desire to win but also plans for such behavior in the game design. Subject 2 actually enjoys exploring the environment where there is no restriction or challenges to overcome and there is still fun revisiting remaining in the completed course such as additional power stars. He however has the unfortunate habit of wanting to delete the saved game which has provoked a lot of anger from his brothers. Overtime, he has developed ability to play games by learning the game affordances through observing the causes and effects, as he will not listen or allow others to teach him.
He is currently playing a game ""*Mario Super Sluggers*" ,where in a study I presented during the recent Redesigning Pedagogy 2009 (Kee, 2009), he manages to complete a 3-D square puzzle with gird of 3 X 3 squares where each square can be rotated in four directions, in five minutes. This puzzle is not easy as there was no clue as to how the completed puzzle would look like (see below).



Start Complete

Figure 2: Puzzle activity at start and completion (5 minutes).

Subject 3 : High functioning ASD child

Background

Subject 3 is twelve years old with IQ of 72. He is verbal and is emotionally sensitive to comments. He is attending a special education school.

Game Play Recollections

Subject 3 is the most creative among the siblings being able to create interesting games in "Super Smash Bros. Brawl" where his brothers are interested to play with. He has been observed to frequently freeze fighting frames and rotate them in 3-D to observe how the actions and explosions look like at different angles. The affordances of allowing ***3-D study of the actions*** could possibly develop his ability to appreciate 3-D objects in motion.

Fun element is critical to sustain his interest. In nearly all the games he played he was observed to do "mischievous" actions such as intentionally refusing to "save the world" in "Super Paper Mario" game to see what happens, refusing to feed the dogs in "Nintendogs", pushing snow balls and fishing in "Animal Crossing : City Folk" and refusing to let the avatar in "Sims in the City" ease himself. He enjoyed looking at what happens and would laugh at the avatar predicament. He would even ask me to read the text responses and ask me why.

Fun: Make big snow ball & fishing

Buying house

Selling goods for bells

Payment of house mortage

Figure 3: Fun and societal responsibility of house ownership.

He does not mind repeating procedures to build up his wealth as in "Wario World", "Luigi's Mansion" and "Animal Crossing : City Folk". In fact the ability to build up wealth through repeating procedures, reinforces his motivation to continue in the game. Perhaps the ***positive reinforcement*** and opportunity to ***build up his ego*** arises as he likes to boast about his scores to his elder brother.

Through games such as "Animal Crossing : City Folk", he begins to appreciate societal functions and responsibilities, such as the need to work for "bells" to pay up his house mortgage, to buy furnishing to improve his house, as well as the feeling of success by donating "bells" for society improvement projects with claps and acknowledgement from other avatars.

Discussion

COTS video games that are successful commercially are undoubtedly engaging and immersive and the challenge for many is how to harness the learning for educational purposes (Gee, 2007a; Gee, 2007b; Shaffer, 2006). ASD people are no different from neurotypical people in game play (except in the ability to comprehen the visual text instructions depending on their functioning level), as they have no impairment in systematizing ability and are certainly able to understand cause and effect relationships of game play. Similarly, ASD people must find the game to be interesting to want to play them. My retropection reveals what attracts them are no different from neurotypical children.

In my previous study (Kee, 2009) presented in Redesigning Pedagogy 2009 on "Informal learning from video games of three autistic children in a family: A case study", my findings reveal that Nintendo games that are of interest to my adolescent children engages them in meaningful learning through incorporation of the five attributes of meaningful learning proposed by Jonassen et al.,(2003), namely active (manipulative/observant), constructive (articulative/ reflective), intentional (reflective/regulatory), authentic (complex/contextuatized) and cooperative (collaborative/converstational). The study also reveals the effectiveness of just-in-time simple and direct visual instructions superimposed in game play, fun elements and opportunity to explore game environment in game design for autistic people.

Essentially, depending on ASD people functioning level, the pedagogy in game play leverages on their ability to systematize with the cause and effect affordances in game play and just in time visually explicit instructions to direct procedural learning.

Meaningful learning takes place when the five attributes advocated by Jonassen(2003) are evident.

Perhaps, harnessing the learning from COTS game play in special education can be conceptualised through parallel teaching of metacognitive skills such as self-evaluation, planning and self-monitoring through explication of the winning experience of game play context. Another possible area to harness the learning is through parallel creation of customised learning activity using the context of the virtual worlds such as ""Animal Crossing : City Folk" to help ASD people to conceptualize and appreciate the complexity of living in society (e.g. earning a living by fishing, growing flowers) and the processes that take place(e.g. banking, mortgage payment). Shaffer(2006) revealed that good computer or video games allow "children to live in worlds that they are curious about, or afraid of, or want desperately to try out" (p. 24) and implicitly it is because they want to understand the rules, roles and consequences of those worlds.

Conclusion

Retrospectively reflection reveals that the pedagogy embedded in COTS video games designs that works with my three sons with ASD, leverages on their ability to systematize and the corresponding learning taking place is meaningful learning explicated by the five attributes of meaningful learning (Jonassen, 2003).

Author information

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