A Model for Exploring the Usefulness of Games for Classrooms

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ABSTRACT
Meaningful use of digital games can create a more potent schooling environment where students are engaged, focussed and motivated to learn. However, the potential impact of games in the classroom will not be realised until teachers learn to embrace the strengths of digital games. This paper presents the *Game Uses Model for Classrooms* (GUMC), a Model to help teachers explore the use of digital games in their unique classroom context. The GUMC was directly derived from experiences of educators in Queensland, Australia. It aims to make explicit the intuitive thought processes of teachers who use games effectively, and can be used as a planning tool for all teachers to help them to richly and elaborately intertwine games into their curricula. The GUMC can also be used by game designers to help them create games that have subtle but powerful classroom relevance.

Keywords
game-based learning, video games, elementary education, secondary education, pedagogical issues

INTRODUCTION
This paper presents the *Game Uses Model for Classrooms* (GUMC) to help teachers explore the use of digital games for their unique classroom context. Short form, edutainment-style games that commonly focus on content delivery or recall are most often used in classrooms (Takeuchi and Vaala 2014). The GUMC encourages teachers and game designers to consider games as much more than content repositories when considering classroom suitability.

We begin by presenting an outline of the discourse on Games and Learning in Classrooms. Next, we give an overview of the GUMC. Then, we present 3 vignettes illustrating various aspects of the GUMC. The GUMC is then discussed further by relating it to three contemporary learning theories and principles and then the teachers' role using the GUMC is explained. Finally, we present our conclusions.

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GAMES AND LEARNING IN CLASSROOMS

Worldwide, there are many initiatives that encourage teachers to use digital games in primary and secondary school classrooms (see Scottish Government 2014, Queensland Government 2008, The Joan Ganz Cooney Center 2014). By digital games, we mean any game that uses electronic hardware to deliver some or all of the game. This includes video games played on home and handheld consoles, PC games, web-games, mobile phone games and games such as alternate reality games that blend the analogue and digital worlds. It does not include traditional board games or card games – although some of the principles identified will equally be applicable to non-electronic games. There are many ways to include digital games in teaching and learning. For example, the state education department of Queensland, Australia, ran a games in learning program encompassing four overlapping strands: digital game-play, game-study, game-making and game innovation (Queensland Government 2008). This paper is focused solely on digital game-play, the act of participating in a digital game.

The benefits of using digital games in the curriculum have been well documented in the literature. Arguably the most attractive feature of digital games for educators is their ability to keep players engaged and motivated whilst building high levels of understanding of the game-world and their actions within it (Gee 2008, Klopfer et al. 2009, Beavis et al. 2014). This understanding and motivation partly comes from the regular, immediate feedback that allows players to understand the impact their decisions have on the game-world in real-time (Gee 2008, Kirriemuir and McFarlane 2004). Further, games also provide players with opportunities to fashion and experiment with identities and choose the amount of effort they wish to expend in a low consequence environment (Gee 2008, Klopfer et al. 2009) that nevertheless feels authentic (Barab et al. 2012). Moreover, games can elicit social interactions between players in the virtual game environment, in online communities associated with the game and in real life (Gee 2008). Educators and researchers alike see the appeal in harnessing these features to engender better learning in classrooms.

Despite there being a plethora of complex and engaging digital games available, a recent report by Takeuchi and Vaala (2014) found that, although most United States K-8 teachers were using games in their classrooms, most teachers were using short-form learning games (drill and practice, trivia and puzzle games) rather than the types of games students would choose to play at home. Other studies have found similar trends (Kirriemuir and McFarlane 2003, Rice 2007). Short form learning games tend to feature game mechanics largely based on learning by repetition (Okan 2003). They do not tend to meet learners' expectations (Kirriemuir and McFarlane 2004, Takeuchi and Vaala 2014) and only encourage lower levels of learning (Rice 2007). More complex and engaging games have been designed for classrooms (eg. *Lure of the Labyrinth* (Maryland Public Television 2009), *Orbit* (University of the Sunshine Coast 2013)) but they are not as frequently used in classrooms as short-form learning games (Takeuchi and Vaala 2014).

The literature has also documented the barriers to using digital games in classrooms. Commonly cited barriers include difficulties matching games to the curriculum (Kirriemuir and McFarlane 2004, Takeuchi and Vaala 2014), insufficient access to adequate software and hardware (Sandford et al. 2006), negative views on games (Anderson 2004, Dill and Thill 2007, Kim et al. 2008, Kirriemuir and McFarlane 2004) and insufficient time in the school day (Kirriemuir and McFarlane 2003). Perhaps it is this difficulty matching games to the curriculum that causes teachers to mostly use short-form learning games in their classrooms (Takeuchi and Vaala 2014, Kirriemuir and McFarlane 2004).

Due to the barriers cited above, the use of games in classrooms is dependent upon the enthusiasm and ingenuity of individual teachers and their advisors (Kirriemuir and McFarlane 2003). For example, Van Eck (2006) argues that introducing games requires "careful analysis and a matching of content, strengths, and weaknesses of the game to the content to be studied" and Egenfeldt-Nielsen (2005) states, "the fruits of computer games can only be enjoyed if the teacher learns how to harvest the fruits". Some researchers attempt to bridge this gap by providing examples of how teachers use games in their classrooms (eg. Jenkins 2003, Mitchell and Savill-Smith 2004). Whilst these are useful, they may be difficult to apply to different teaching contexts. Therefore, a model that helps teachers realise the benefits of digital games for their classroom is needed.

There are already a number of useful models and theories aimed at helping teachers use digital games in curriculum. For example, the *Games as Text, Games as Action Model* (Beavis 2014) is designed to provide teaching foci for using games in the English curriculum, Rice (2007)'s *Video Game Cognitive Viability Index* helps teachers calculate a score for the level of Higher Order Thinking associated with playing a game. Others offer methods for digital game professional development programs for teachers (Ketelhut 2011), a theory on how learning occurs through the use of educational computer games based on Kolb's experiential learning (Egenfeldt-Nielsen 2005), and how to design games for education (Zin et al. 2009, Echeverría 2011). Perhaps the most similar in intent to our Model is Gros (2007)'s *Pedagogical Use of Videogames in School* study where she outlines a methodological approach to creating a learning environment in which a game is the "starting-point of students' experience". It provides a series of steps teachers can follow when using games in the classroom. Our *Game Uses Model for Classrooms* (GUMC) is more open-ended and aims at making explicit the considerations of teachers who use games successfully in the curriculum.

A MODEL FOR EXPLORING THE USEFULNESS OF A DIGITAL GAME FOR DIVERSE CLASSROOM CONTEXTS

In this section we present the *Game Uses Model for Classrooms* (GUMC), a Model for exploring the usefulness of a digital game for diverse classroom contexts (see Figure 1). The GUMC was developed through qualitative analysis of in-depth, semi-structured interviews, ranging from one to two hours in duration, with 13 educators and education advisors from Queensland, Australia whose use of digital games has extended beyond using short form games and beyond using games as a non-integral part of the learning process. It aims to make explicit the intuitive thought processes of teachers whose use of games is successfully and elaborately intertwined with curriculum. It is designed to help educators holistically explore how games can be useful in the classroom with a focus on pedagogies rather than evaluation of student performance.

This model is best used during the teachers' curriculum planning phase. Firstly, teachers identify a digital game or games that they wish to explore for possible links to their curriculum. Secondly, the teacher develops some familiarity with the game through any or all of the following methods: playing the game themselves, observing children playing the game and/or watching online game-play videos. Finally, they use the components of the GUMC as prompts for exploring potential uses of the game(s). The GUMC encourages teachers to look beyond content-oriented teaching goals to also include social goals as well as the unique affordances playing a game in a classroom setting offers. The Model helps teachers think more holistically about how games may be used to benefit students.

There are four student-centred components of the GUMC:

1) **Practising** – game-play provides opportunities for students to practice skills
2) **Influencing** – students can be influenced by games
3) **Discovering Affinity** – games can be a conduit to help students discover affinity with class members
4) **Inspiring** – capitalises on the motivation derived from (1) playing, (2) being influenced by games and (3) discovering affinity with class members through game-play to inspire students to learn, create and apply their learnings in new contexts.

The focus questions listed in each section of the GUMC help teachers consider the game's possible curriculum uses from a variety of viewpoints. These focus questions were inductively derived through exploring how study participants were using digital game-play in their classrooms. It is not expected that answers to all focus questions will be equally useful for planning purposes as it will depend on the nature of the curricula being addressed. Also it should be noted that there is overlap between components and also focus questions. The components and focus questions may not be exhaustive, however consideration of all four components can assist teachers to use games more holistically in their classrooms.

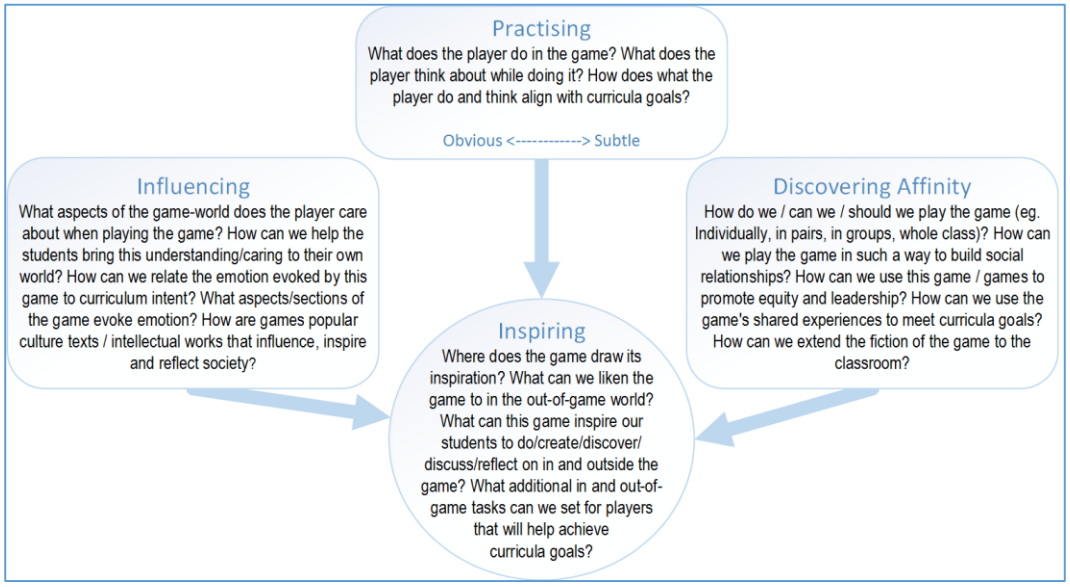

Figure 1: Game Uses Model for Classrooms (GUMC).

In this paper we are taking a broad view of the term "curriculum" as "any learning that occurs in a school". This includes government-mandated curricula (eg. Mathematics, Science), school-based curricula programs (eg. Social and Emotional programs, Higher Order Thinking programs) and curriculum that may be intuitive to the teacher (eg. "I like to create a family atmosphere in my classroom").

Next, we will explore each of the four components of the GUMC in turn. Each section begins with its list of focus questions followed by a more detailed description. We hope that the GUMC will prompt teachers to explore new ways of experiencing games in their classrooms.

Practising

Focus Questions: What does the player do in the game? What does the player think about while doing it? How does what the player do and think align with curricula goals?

Almost all games require the player do something to succeed in the game. In game design terms, what the player "does" is known as a mechanic (Hunicke et al. 2004). In some cases, the game mechanic's alignment to curricula goals is blatantly obvious but for others it is more subtle. For example, a dance game such as *Dance Central* (MTV Games 2010) may be suitable for a dance curriculum and a mathematics learning game such as *Personal Trainer: Math* (Nintendo 2008) may be useful to give students times tables practice. These examples are both blatantly obvious curriculum matches. Unfortunately, many games that have a blatantly obvious curriculum alignment do not live up to player expectations (Kirriemuir and McFarlane 2004) and bear little resemblance to the types of games students would choose to play in their spare time despite being widely used in classrooms (Takeuchi and Vaala 2014). If teachers only look to games that have blatantly obvious but shallow curriculum alignment, then they may miss the potential richer, deeper, more engaging games that have subtler but arguably deeper ties to the "big" ideas of the curriculum, also known as curriculum intent.

To identify these types of games, the teacher needs to think more deeply into the total experience of playing the game and to think about not just what the player is doing in the game but also what the player is thinking whilst doing it. For example, what sorts of decisions is the player making? How can the teacher use those game decisions to relate the game-world to curricula? Other components of the GUMC can also help identify subtler alignments between games and curriculum.

Influencing

Focus Questions: What aspects of the game-world does the player care about when playing the game? How can we help the students bring this understanding/caring to their own world? How can we relate the emotion evoked by this game to curriculum intent? What aspects/sections of the game evoke emotion? How are games popular culture texts / intellectual works that influence, inspire and reflect society?

As created works, games have a set of values and underpinning beliefs that permeate each game and evoke emotional responses in the player. Game designers use the term "aesthetics" to refer to the desired emotional responses the game evokes in the player (Hunicke et al. 2004). This section of the GUMC explores how values, beliefs and emotions embedded in, perpetuated by and evoked by the game can influence students' attitudes to and understandings of the world. This influence can be used to help students be critical of games as popular texts that influence, inspire and reflect society but can also be used to embody desirable values and beliefs that align with curricula intent.

Discovering Affinity

Focus questions: How do we / can we / should we play the game (eg. Individually, in pairs, in groups, whole class)? How can we play the game in such a way to build social relationships? How can we use this game / games to promote equity and leadership? How can we use the game's shared experiences to meet curricula goals? How can we extend the fiction of the game to the classroom?

Games can provide the basis to build rapport between class members through the shared experiences offered by the game-play in a non-confronting way. Whilst this can happen organically, it can also be purposefully planned by the teacher through the way students interact with the game (eg. individually, in pairs, in groups, whole class). Teachers can also facilitate **Discovering Affinity** by: (1) providing opportunities for students to share their game-play experiences with their classmates, (2) allowing students to help each other with

game-play and (3) extending the fiction of the game to the classroom. Many games have in-built elements designed to increase affinity between players (eg. visiting other players' game spaces to see their game rewards or how they decorated their game space, multi-player games played at the same game console, multi-player online games, message boards, cooperative game-play). For example, *Orbit*, a sexual abuse prevention game, allows other players within their class to visit their in-game spaceships and has some cooperative play elements (Stieler-Hunt et al. 2014). The teacher can consider how to effectively use built-in elements offered by the game and also purposefully architect how students interact with it to increase student affinity. Teachers can also use games to encourage student leadership through allowing students to help each other with elements of game-play and allocating responsibilities to individual students for setting up and caring for game equipment. Rotation of leadership responsibilities and using game-play rosters can ensure equity in the benefits from using games. Further, playing games in class also helps to establish an affinity between the student's home and school worlds.

Inspiring

Focus Questions: Where does the game draw its inspiration? What can we liken the game to in the out-of-game world? What can this game inspire our students to do/create/discover/discuss/reflect on in and outside the game? What additional in and out-of-game tasks can we set for players that will help achieve curricula goals?

The **Inspiring** component of the GUMC refers to additional teachers-designed tasks authentically related to the game that progress curricula goals. These non-game mandated tasks can include additional in- and out-of-game tasks set by the teacher or collaboratively negotiated with students. In this way, the game acts as a stimulus inspiring students to do, create, discover, compare with or reflect on something authentically game related. The best examples of **Inspiring** will allow students to apply their game-learnings to their out-of-game world. Whilst planning is essential to make the most of games in the classroom, teachers can also look for organic "teachable moments".

VIGNETTES

The vignettes below outline three instances of how educators who participated in this study used digital game-play in their classrooms. These three distinct examples are a subset of the practices used to derive the GUMC and are provided to help the reader understand how to apply the GUMC. For each vignette, a brief description is given of the game(s) used and how they were used. To further illustrate the application of the GUMC, the teachers' practises are explained according to each section of the GUMC.

Vignette 1. Endless Ocean

An Australian year 7 primary school class (11-12 year olds) was part of a national Reef Guardian School program. Students played the game *Endless Ocean* (Nintendo 2007) to help them understand ocean environments and the creatures that live in the ocean. This vignette's most significant feature is that the game contributed to the curriculum intent of building conservation attitudes by building a sense of awe and wonder of marine environments (see **Influencing**) and the motivation the students had to play the game carried into a number of related out-of-game tasks (see **Inspiring**). Further, the way students were tasked to play the game helped them to engage more deeply with the game and arguably learn more from the game than someone playing purely for enjoyment (see **Discovering Affinity**).

Practising

In *Endless Ocean* the player character is a professional scuba diver. The game's core mechanic involves scuba diving a coral reef to explore different marine environments and discover and learn about marine animals. Undertaking player-directed tasks within the virtual marine environments helps students develop familiarity with diverse marine environments and the creatures that live there. This level of familiarity achieved through interactions with the virtual environment would be difficult to achieve cost-effectively in other ways.

Influencing

The curriculum intent was for students to develop empathy for marine environments in order to influence their ongoing values and beliefs about marine conservation. In *Endless Ocean*, the aesthetics of diving in the reef promote a sense of awe at the beauty, magnitude and diversity of marine environments and the creatures within them. The game dynamics producing this aesthetic include the ethereal music that plays as the player character dives in the ocean, the number of different marine areas the player can explore and the peaceful ways the player character can interact with the marine life (eg. feeding them). The children played the game in small groups and the teacher noted that they were extremely immersed in the game to the point that some of the children were looking into the TV screen to "find" things. Sometimes the children would pretend that they were swimming too, to the point that their breathing would be affected whilst they played. The game was providing an experience that had an authenticity for the players.

Discovering Affinity

The teacher extended the fiction of the game to the classroom by changing the name of their regular reading groups to "diving groups". These small groups were allocated time to play each school week so that each group received equitable game time. Each group continued the previous group's save game so that the whole class was playing one continuous game. This worked for *Endless Ocean* but may not work for games where narrative or progressive skill development has more of a focus. The group played the game in their regular classroom space. When something significant happened in the game, the teacher would allow the class's focus to switch briefly from their schoolwork to the game-screen.

Within the diving groups students had roles. One student was using the game controller, others were watching carefully for creatures they were trying to find and another was the "navigator". The students experienced difficulty navigating the environment using the in-game navigation map so the teacher printed maps of the game environment from a game fan website and students used these to navigate the game's extensive marine environment. Playing *Endless Ocean* also became a map-reading exercise with a purpose. Resources available about the game located outside of the game environment, such as the game maps, are called paratexts.

Another paratext the teacher used from a game fan site was the complete list of sea creatures appearing in the game. Each child selected a different creature on which to give a presentation for assessment. This gave the "diving groups" another focus for their dive missions alongside their in-game missions. Allowing students to choose their own animal also helped catered for diversity in the students (eg. some chose sharks, some chose penguins, some chose fish).

The use of this game built an affinity based in the shared experience the game evoked. For example, when a "diving group" found a particular sea creature everyone had been waiting to see, the whole class stopped to watch and they sent a student to find the advisor teacher so that she could share in the experience. This affinity group was grounded in the game-play experiences and was co-crafted by the game designers, the teachers and at times, the students. Collectively, the students played the game more deeply than most players would. Through the game the children developed an appreciation of the many and varied creatures living in the ocean and experienced the types of reef environments in which different creatures reside.

Inspiring

The use of *Endless Ocean* inspired the class in many ways. The initial out-of-game task set by the teacher was to give a presentation on a sea creature that appeared in the game. This task changed the way the students played the game because, alongside the game-issued challenges, they were also looking for the creature that each group member had chosen. In the game, each time the player finds a creature and interacts with it, the game provides a small piece of information about that creature until the player has three pieces of information. Once unlocked, this information can be revisited at any time via an in-game "sticker book". Elusive creatures led students to do internet searches to discover the environment the creature would most likely reside and then use the game map to navigate to the location. For some creatures, they discovered that they only appear in that environment at a certain time of year, so they had to wait for the game to progress to that time of year before the creature could be found.

The class produced an award-winning dance performance based in a marine environment for a national dance competition. Whilst constructing the dance set, the students had developed such a deep knowledge of the marine habitats that one student noticed that one of the sea creatures had been placed in a habitat that it did not belong. The teacher recalls the student saying, "Mrs <teacher name>, this is a sting-ray. It doesn't live here. You can't have it!"

Students freely chose to paint sea creatures for their art projects much to the surprise of the specialist art teacher. The class members also had an in-depth discussion about where this reef could be located in the world.

Vignette 2. Mathematics drill and practice games with a difference

An Australian year 9 middle school class (13 – 14 year olds) used a series of network-play Mathematics drill and practice games on the Nintendo DS handheld gaming console. The teacher brought two Nintendo DS consoles into the classroom every day with a number of network-play Maths games that can take up to 16 consoles at a time. These had been purchased personally by the teacher. Students could also optionally bring in their own Nintendo DS consoles from home.

The games were used as a reward for completing work tasks assigned and in each class a new student was allocated to be the "leader" for that day until everyone had a turn at being the "leader". The leader was responsible for the devices and could choose who got to use the consoles on that particular day. Anyone using the consoles had to have finished their work before they were permitted to play. For those who were not "chosen" on that day, other enriching activities were available such as using robotics kits.

Ostensibly, this is a standard use of drill and practice games as a reward. However, the teacher decided to use this as an opportunity to develop leadership skills, build stronger relationships between students and encourage students to take responsibility for their own classroom learning (see **Discovering Affinity**).

Practising

The games used encouraged the development of automaticity with basic number facts and were designed to be a part of their preparations for nationwide standardised mathematics testing. The games used allowed players to use the Nintendo DS's networking capabilities to form adhoc networks to compete against each other in real time. The ability to compete in real-time with their friends was motivating.

Influencing

This section does not apply to this example because although the teacher was using games to influence student attitudes, it was towards completing school work generally, not to anything specifically relating to the game content.

Discovering Affinity

Throughout the year, the teacher rotated the "leader" on a daily basis so that there was equitable sharing of the leadership role. The teacher explained that "even the worst behaved child" got to be the leader. The teacher further explained that when it was a student's turn to be the leader, s/he "could take anyone around him or her to participate in his little group, the catch being that anyone he chose had to have finished all their work and their homework". Before starting she impressed on the students the importance of the leadership role, "These (consoles and games) are mine. I bought these. I bought the software so one person is going to take complete responsibility… It is your responsibility to return everything to me in the way that I gave it to you so that it's ready for the next class… If anything happens, that's the end." The teacher noted the many benefits of this approach, including students were motivated to do their school work, looking forward to Mathematics class regardless of their academic ability level and building stronger student rapport and leadership within a class that had been presenting challenging behaviour.

Inspiring

This model of adoption encouraged a "difficult" class of students to get their regular school work done.

Vignette 3. Using "nice talk" with Wii Fit

An Australian P-1 multi-age primary school class (4 – 6 year olds) played *Wii Fit* (Nintendo 2007) in groups in 15-20 minute blocks. The teachers used this experience to help students understand the benefits of daily exercise as well as improve their social skills. What is most significant about this vignette is that when the teachers looked at how *Wii Fit* would be played as a class, they realised that a portion of the children's time would be spent waiting their turn. The teachers chose to use both the physical activity and the waiting time purposefully (see **Practising**) and this translated into students being nicer to each other (see **Discovering Affinity**).

Practising

The teachers used *Wii Fit* to promote both physical activity and the use of manners. *Wii Fit* provides opportunities for players to engage in a series of physical challenges in yoga, strength training, aerobics and balance games using the Wii Balance Board thus providing

a whole body gaming experience. *Wii Fit* is a single player game so its use required adaption to be suitable for a classroom environment. The teachers had students use the game in small groups which meant that waiting your turn was something the students were required to do. The teachers encouraged students to use this waiting as an opportunity to use manners and "nice talk". This included using "please" and "thank you", waiting your turn and encouraging others. These teachers took what was seemingly only a physical activity and turned it into an opportunity to teach social skills.

Influencing

Wii Fit was used to promote the health benefits of exercising every day as well as the benefits of being kind to each other.

Discovering Affinity

By having the students play the game in groups and modelling "nice talk" prior to playing, students were able to develop positive social skills. The teachers noted that students transferred these social skills to other classroom activities.

Inspiring

The additional out-of-game activities that accompanied the game were explicit teaching of key concepts around the healthy movement of bodies and social skills and reflection check-lists and discussions. Points covered in explicit teaching sessions on healthy movement included the benefits of exercise, being "huffy puffy" (the term the teachers used in the classroom to describe heavy breathing), muscles getting tired, and signs that your body is working to its optimum when exercising. During explicit teaching sessions on social skills, the teachers modelled the use of "please" and "thank you", waiting your turn and encouraging others.

Simple personal checklists allowed students to reflect on their physical activity and their use of social skills. The physical activity checklist explored how the student was feeling, how tired their muscles were, how they were breathing and whether they had a good exercise workout. The social skills checklist indicated whether the students had been able to wait their turn nicely, whether they had said "please" and "thank you", and whether they had encouraged other players.

DISCUSSION

In this section we investigate how the GUMC aligns with three learning theories and learning constructs: modified *Situated Cognition Theory*, building a *Sense of Community* and elements of Noddings (2002)'s *Model of Moral Education through Care Ethics* which is based in *Care Theory*. We chose *Situated Cognition Theory* because it has been identified as a useful lens for games' research (Van Eck 2006). *Sense of Community* and elements of Noddings (2002)'s *Model of Moral Education through Care Ethics* were chosen because they provide more specific insights than is achievable through broad, generalized theory. Finally, we explore the integral role of the teacher in implementing the GUMC.

Modified Situated Cognition Theory

Situated Cognition Theory proposes that attaining knowledge is dependent on social and physical contexts at the time of learning and therefore it cannot be assumed that conceptual knowledge can be applied to new situations (Brown et al. 1989, Greeno 1989). Critiques of *Situated Cognition* agree that learning is grounded in the concrete situation in which it is attained but posit that sometimes knowledge can be applied to new contexts (Anderson

et al. 1996). Further, researchers have identified factors that will influence knowledge/skill transference. Four factors are listed in the first column of Table 1.

Factors influencing knowledge/skill transference	**Alignment of GUMC with this Factor**	**Related aspects of the GUMC**
1) Providing enough practice (Anderson et al. 1996)	Games themselves provide opportunities to practice learnings in a low consequence environment.	Practising
2) Providing a number of contexts in which the knowledge/skill is learned (Bjork and Richardson-Klavehn 1989)	Additional out-of-game tasks can provide new contexts in which to apply new knowledge and skills.	Inspiring
3) Drawing attention to the cues of where the knowledge/skill is applicable (Anderson et al. 1996)	The teacher can draw attention to where the knowledge/skills are applicable during class discussions and debriefs of game-play.	Inspiring
4) Using concrete examples to illustrate abstract concepts (Anderson et al. 1996)	Games often provide concrete examples that can be used to illustrate abstract concepts. For example, the mathematics game *Lure of the Labyrinth* has a series of mini-games that can be solved intuitively by students. Its accompanying lesson plans use these concrete examples to introduce abstract mathematical concepts.	Practising, Inspiring

Table 1: Alignment of GUMC with Factors influencing knowledge/skill transference

Table 1 explains how the **Practising** and **Inspiring** sections of the GUMC address these 4 factors. Games present opportunities to practice learnings and provide concrete examples teachers can draw on to help students understand abstract concepts. The teacher can also provide additional contexts for students to use their new knowledge/skills. They can also make explicit the implicit cues for appropriate situations to apply the knowledge/skill.

Sense of Community

Osterman (2000) defines a *Sense of Community* as a "feeling of belongingness within a group". Researchers use different labels such as "belonging" and "relatedness" to describe similar psychological experiences (Osterman 2000). Motivational researchers (Connell and Wellborn 1991, Deci 1991) posit that relatedness is one of three basic psychological needs essential for humans to grow and develop. However, traditional organisational practices of schools can cause students to feel alienated from schooling (Osterman 2000, Earl et al. 2013). The first column of Table 2 lists Osterman (2000)'s strategies to facilitate building a *Sense of Community* between class members.

Strategies to facilitate building a *Sense of Community*	**Alignment of GUMC with this Strategy**	**Related aspects of the GUMC**
1) frequent positive interaction between students featuring helping behaviours rather than competitive behaviours	The GUMC prompts teachers to explore different ways students can engage with the game (eg. in groups, pairs, individually in a network, individually but with peer support) to facilitate positive interactions between students.	Discovering affinity
2) using cooperative learning	By looking at different ways students can play games in the classroom, it is possible to facilitate cooperative learning.	Discovering affinity
3) promoting dialog	Out-of-game tasks may include classroom discussions that relate the game to real life.	Inspiring

4) providing students with feelings of autonomy.	Games themselves allow players to achieve in their own way. The extra in- and out-of-game tasks can also provide autonomy. For example, in the *Endless Ocean* unit, students gave presentations about a marine animal of their choice appearing in the game, thus catering for students interested in predators as well as students interested in "cutesy" animals.	Practising, Inspiring

Table 2: Alignment of the GUMC with Strategies to facilitate building a *Sense of Community*

Table 2 explains how each community building strategy is catered for in the GUMC. The **Discovering Affinity**, **Practising** and **Inspiring** sections of the GUMC provide room to implement these four strategies to build a *Sense of Community*. For example, having success during game-play can provide the learner with feelings of autonomy. The way the teacher sets up the environment for game-play (eg. group play, opportunities to help each other) can induce cooperative learning and positive interactions between class members. Further, out-of game tasks can be used to facilitate dialog between class members.

Games can help to build community through participation in 'semiotic domains', that is, games help players understand the signs and symbols of social relevance within a field of action or thought (Gee 2003, Kirriemuir and McFarlane 2004). This shared understanding turns the classroom into an 'affinity space' (as described by Gee (2003)), a place where players can share their thoughts and ideas about a game. Providing extra activities around the game (**Inspiring**) and purposefully choosing how students interact with the game (**Discovering Affinity**) can deepen this affinity.

Nodding's Model of Moral Education through Care Ethics

Noddings (2002)'s *Model of Moral Education through Care Ethics* has its foundations in Dewey's Pragmatic Naturalism. At its core is the belief that students should learn to be cared for and learn to care for "self, intimate others, global others, plants, animals, the environment, objects and instruments and ideas" and that this kind of education will supply a firm foundation for both intellectual and academic achievement (Noddings 2002). Further, Noddings (2002) posits that current educational models can cause important ideas to be lost in the bevy of facts and skills being taught; and that current approaches may neglect the range of human capabilities, especially when students are forced to study areas that they do not care about. In the first column of Table 3 we have identified five points from Noddings (2002)'s *Model of Moral Education through Care Ethics.*

Summary of key points of Noddings (2002)'s Model	**Alignment of GUMC with key points of Noddings (2002)'s Model**	**Related aspects of the GUMC**
1) Shared meaning - Education should be based on construction of shared meanings not just in processing of information.	The act of students playing the same game together in the classroom builds a shared understanding of the game and related issues which can form the basis of discussions and other classroom activities.	Discovering Affinity, Inspiring
2) Exploring own interests and capacities - Students can "learn to care" by being permitted to explore their own interests and capacities and not being forced to study areas they do not care about.	Games are a medium that most students enjoy interacting with. They provide new experiences for students. They can broaden students' horizons and may prompt students to do more research into the game's subject matter. Games allow players to focus their attentions in areas that are of most interest to them thus building personal capacities.	Influencing

3) Key components: Modelling, dialogue, practice	Games can provide opportunities for modelling, dialogue and practice. Modelling and dialogue can be provided by non-player characters and other players whilst practice is provided through game mechanics. Teachers can model skills that will be useful for game-play, use it a basis for dialogue and link to practising related skills out-of-game.	Practising, Inspiring
4) Stories can provide starting points for dialogue	Many games have rich narratives which can be purposefully used to have meaningful dialogue with students.	Inspiring
5) Engrossment and motivational shift – Engrossment indicates that the person's "attention (is) acutely receptive and directed to the cared for". As a result of this engrossment, there is a motivational shift towards the needs of the cared for.	Engrossment and motivational shift naturally occur during game-play. Through carefully planned learning activities (these may be co-planned with students), the engrossment and motivation can also translate to related out-of-game activities.	Influencing, Inspiring

Table 3: Alignment of the GUMC with key points of Noddings(2002)'s Model

Table 3 explains how the GUMC links to the five key points of Noddings (2002)'s Model. An appropriate game can provide opportunities for the whole class to build shared meanings (**Discovering Affinity**), follow their own interests and develop personal capacities (**Influencing**). Many games also provide opportunities for modelling, dialogue and practice (**Practising**). Further, good games are easy for players to be engrossed in and motivated to play (**Influencing**) and teachers can use the game as a stimulus for out-of-game activities **(Inspiring)**.

Integral role of the teacher

In many classrooms games are used as an extra add-on to other schoolwork or possibly just as a reward. Many teachers are not familiar with the games they use in the classroom, they are seen as something that students interact with but not the teacher. Full engagement with the GUMC will require attitude changes towards the role of games in education. The GUMC aims to assist teachers to use games as an integral intertwining part of their curriculum. We want teachers to see games as part of the craft of teaching, not a replacement for the teacher (Kebritchi 2010). Using the GUMC requires the teacher to have familiarity with the games they are planning to use. This familiarity can be achieved through playing the game themselves, watching children play, watching game-play videos and/or engaging with game reviews and other related paratexts.

Without significant teacher involvement, this elaborate intertwining of game and curriculum will not be achieved, therefore games will not be used to their fullest potential in classrooms (Kebritchi 2010, Jenkins 2003). This concurs with much of the research around the recommended role of the teacher when using games in the classroom. For example, Proserpio and Gioia (2007) state that students are capable of making connections between game-worlds and out-of-game worlds but lack the judgment to know which connections to make. Therefore, teachers can help students identify connections and develop rationales for their importance. Similarly Egenfeldt-Nielsen (2005) posits that the teacher's role is to guide students to find deeper meanings and see how it applies beyond the game-world. Van Eck (2006) calls this using and making "teachable moments" through an understanding of the game-play and designing meaningfully linked out-of-game activities that can be used pre-, post- and during game-play.

CONCLUSIONS

We have presented the *Game Uses Model for Classrooms* (GUMC) to help teachers explore the usefulness of a digital game in diverse classroom contexts. Primarily, it is a planning tool to help teachers richly and elaborately intertwine games into their curriculum. It expounds upon intuitive thought processes of teachers who use games regularly. We also believe the GUMC will help game designers understand how games can be used effectively in the classroom and therefore drive game design decisions, especially if the game will have classroom applicability. The GUMC is unique because it is grounded in teaching practices and takes a holistic view of curriculum and education that includes, but also looks beyond, subject content areas to also encompass how games can influence thoughts and feelings, how games can provide a context upon which to build shared understandings and affinity groups, and how games can inspire action in the out-of-game world.

We do not claim that the GUMC is exhaustive. For example, none of the contributing teachers were using games as assessment items. Therefore, we invite others to evaluate the GUMC for usefulness and build upon it.

Embracing digital games in meaningful ways can create a more potent schooling environment where students are engaged, focussed and motivated to learn. We believe that the GUMC could be instrumental in helping teachers realise the potential of games in their classrooms. Until teachers embrace all of the strengths of digital games, the potential impact of games in the classroom will not be fully realised.

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