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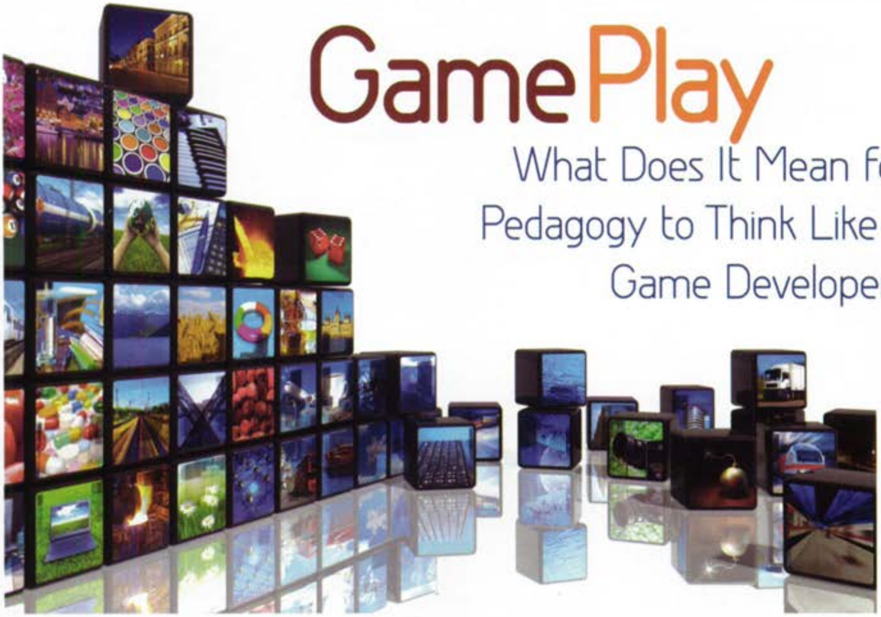

Game Play

What Does It Mean for Pedagogy to Think Like a Game Developer?

SHANE PILL

Digital gaming via computer and mobile devices has become a significant leisure activity for young people, and the time young people spend playing games continues to increase with the advent of mobile technologies (Australian Communications and Media Authority, 2010). Shigeru Miyamoto, designer of games such as Donkey Kong and Mario Brothers, is reported to have once said, "Video games are bad for you? That's what they said about rock n' roll" (Robinson & Robinson, 2005).

Digital gaming is now an important part of many children's leisure, cultural, and social lives (Kirriemuir & McFarlane, 2004). While digital gaming is sometimes cited in the literature as a contributor toward an increasingly sedentary lifestyle (Vandewater, Shim, & Caplovitz, 2004), the health effects are unclear. Digital gaming may not be associated with significantly increased body mass (Wack & Tantleff-Dunn, 2009), but dietary behaviors may change (Chaput et al., 2011). This is not the whole story, however. Neuroscience and cognition research suggests that fast-paced action games requiring rapid responses to visual information while requiring divided attention may improve vision, attention and cue recognition, working memory, and the development of fine-motor skills. These skills do not only apply to the virtual game experience; they are transferable to real-world activities requiring those cognitive functions (Colzato, van Leeuwen, van den Wildenberg, & Hommel, 2010; Greenfield, deWinstanley, Kilpatrick, & Kaye, 1996; Hubert-Wallander, Green, & Bavelier, 2010; Renjie, Polat, Makous, & Bavelier, 2009; Rosser et al., 2007).

What is it that makes digital game play so appealing? This article will consider digital game play from a pedagogical perspective; that is, how do digital games capture and sustain children and youth's engagement despite being challenging and taking a long time to master? This article will then consider whether sport teaching in physical education could learn anything about maximizing student motivation to promote learning outcomes through enhanced task involvement.

Task engagement has been identified as a key for maximizing student engagement and the achievement of learning outcomes in physical education (Duda, 1996; Siedentop, 1994). It will be argued that digital-game design principles hold the potential to direct the work of physical education teachers in the pursuit of enhanced task engagement. Furthermore, the interaction with digital technologies from a young age means that children grow up as digital natives expecting to engage with the world differently than the mainly digital immigrants who teach them (Prensky, 2001b). Digital game play may be encouraging young people to learn in different ways from those evidenced or explicitly valued in the school setting (Kirriemuir & McFarlane, 2004; Prensky, 2001a). It is relevant that physical education pedagogy, like all subject pedagogy,

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take into account the impact of technology in shaping the way young people learn and expect to engage in learning environments.

Sport and Digital Games Have Common Participatory Intentions

Performative sporting discourses continue to dominate physical education (O'Connor, Alfery, & Payne, 2012). Like digital games, sport is a rule-defined experience where participants are placed in a context of play requiring participatory interaction that is clever, imaginative, and skilful, while progressively challenging the skill development and game understanding of the player (Adams, 2010; Grehaigne, Richard, & Griffin, 2005; Salen & Zimmerman, 2004). Similar to digital games, sport provides choices within play that are limited and defined to provide purpose, form, and function to the play and to provide a quantifiable outcome (Grehaigne et al., 2005; Hopper, 1998, 2009; Lindley, 2003; Keramidas, 2010; Salen & Zimmerman, 2004). Rules limit and stylize player action by creating a structural system for player decision-making. In this way, the game is defined and the logic of the game established (Keramidas, 2010; Grehaigne et al., 2005; Hopper, 1998; Salen & Zimmerman, 2004).

Since both games and sport in physical education and digital games have common participatory intentions, we can consider the cross fertilization of sport pedagogy in physical education with digital-game design fundamentals. That is, getting people to enjoy learning a structured or codified form of play — play that is defined by rules and task constraints. If it is as Gee (2005) suggested, "that designers of good games have hit on excellent methods for getting people to learn and to enjoy learning" (p. 5), then it is worthwhile for physical education teachers to consider the design principles employed by game designers to capture and sustain student interest, and to discuss what could be applied to sport teaching in order to enhance learner engagement.

Unlike the traditional physical education method (Metzler, 2005), the experience of digital gaming provides players with interactivity, initiative, and control of their learning through a balance of customizable and structured progressions with "just in time" feedback or tuition (Adams, 2010; Bates, 2004; Gee, 2003; Hopper, 2009; Salen & Zimmerman, 2004). However, both digital game designers and physical education curriculum designers face a similar challenge. Learning to play and participate competently in sport is a long and complex process. It takes an extended period of deliberate and directed "play" to become skillful and to understand the nature of the game (Starkes & Ericsson, 2003).

Digital Game Designers Differ in Their Approach to Designing for Learning

James Paul Gee (2007) suggested that teachers should ask the same design question as digital game designers: "How do you get someone to learn something long, hard, and complex and yet enjoy it?" (pp. 2–3). This consideration is particularly relevant given that critical theorists call for reconsideration of what Metzler (2005) called the physical education method. This method of sport-as-technique (Kirk, 2010) emphasizes textbook techniques (Kirk, 2010; Pigott, 1982) in a multi-activity curriculum design (Alexander, 2008; Kirk, 2010; Siedentop, 1994) in order to increase students' motivation to learn content of substance and meaning. This arguably 20th-century "factory" paradigm of "boxing" curriculum experiences into individual packages delivered via order, drill, and compliance, and a model based on offering a single experience for all students (Alexander, 2008; Kirk, 1996, 2010; O'Connor, 2006) is central to critical discourse about the form and congruence between physical education's rhetoric and the reality of the curriculum. This pedagogical and design structure is predisposed to favoring and rewarding the students with movement competencies that are largely developed outside of the school setting, since the short, frequently changing units in physical education do not give students enough time to develop competency and confidence in sport. This type of curriculum design, and the enactment of sport teaching that it produces, does not produce sport teaching that is about learning. Rather, it reduces sport teaching in physical education to a series of "come and try" experiences. This is especially so if the less experienced and physically developed students come to understand more about what they cannot do than what is possible for them (O'Connor, 2006).

Whether in sport-related games or digital gaming, the author agrees with the premise of O'Neil, Wainess, and Baker (2005) that

> Games themselves are not sufficient for learning, but there are elements in games that can be activated within an instructional context that may enhance the learning process (Garris et al., 2002). In other words, outcomes are affected by the instructional strategies employed. (Wolfe, 1997, p. 465)

However, Trost (2004) suggested that the traditional instructional design of multi-activity physical education is frequently based on unsubstantiated assumptions about skill learning, skill development, and the promotion of active lifestyles. Penney, Emmel, and Hetherington (2008) sounded a further warning through their observation that the persistence of teaching focusing on effort, compliance, and the reproduction of very specific movement patterns may be a reason why physical education finds itself at the margins of learning. However, it is not the activities (such as sport) that lead to the less than meaningful educational experiences in physical education or its marginal status in the school educational experience. It is the persistence of a hegemonic curriculum and instructional emphasis on textbook-technique compliance within a multi-activity curriculum that cannot deliver what physical education claims to be — an educative endeavor.

If the marginal status of physical education (Hardman & Marshall, 2005) as an educative endeavor is to be seriously addressed, one avenue is to investigate the learning principles in another culturally valued form of play built on the learning principles emerging from the cognitive sciences: digital games. If sport in physical

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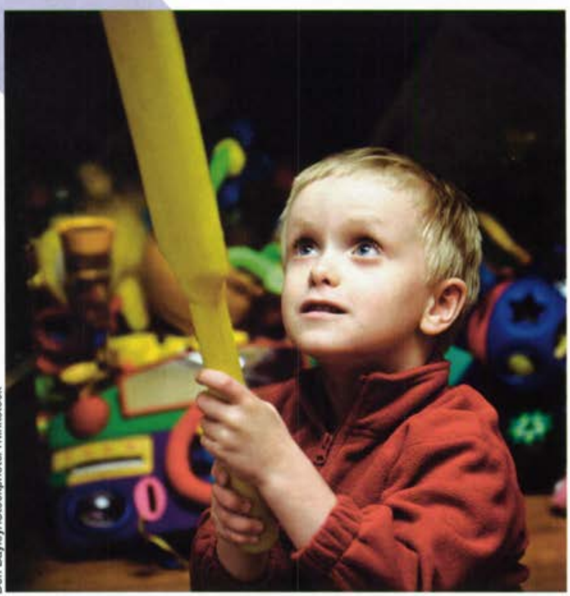
education remains "simply as the demonstration of physical skill, it will remain a second rate form of knowledge" (Hemphill, 2008, p. 15). In Australia, where the curriculum for health and physical education is in its shaping and design phase (Australian Curriculum and Reporting Authority, 2011), there is the opportunity to move beyond the school gates to consider a pedagogy both for the present and for the future.

Children Raised with the Computer Think Differently

Prensky (2001b, 2005) has explained that the changed nature of students requires adjustments in the design and delivery of curriculum. McLean (2007) has also emphasized the generational difference between the way teachers were traditionally socialized to learn, describing how the current "wrap around technology" generation (p. 3) is being taught by the "book" and "screen" generation. McLean asserted that the technological learning environment that this generation is exposed to teaches them to be actively involved as learners in the discourse, design, production, and distribution of knowledge through the gaming experience. Squire (2007) described this as a "literacy of expertise" (p. 639). The digital social experience of young people needs to be considered in the design of school learning environments, including physical education.

Teaching "tricked up" by digital white boards, digital technology (such as cameras), and the Internet has its place, but it does not essentially address the design question related to teacher-centered ecology and the reproductive pedagogy of the classroom. Prensky (2011b) suggested that the problem with the type of reproductive pedagogy typical of the traditional physical education method for learning is that today's students are no longer the types of learners that the textbook paradigm of education was designed for. "Children raised with the computer — think differently" (Pensky, 2001a, p. 3). Prensky encouraged reflection about whether the design and enactment of curriculum is "powering up" or "powering down" the engagement of students in their learning (2001b). While digital game play and sport may not be compared favorably by physical education teachers (Hopper, Sandford, & Clarke, 2010), and digital gaming may be considered "one of the bad guys" acting to constrain physical activity, given the base similarities between digital game design and the sport constraints explained earlier, sport teachers can learn about a literacy of expertise (Squire, 2007) from digital game designers. Why? Good digital game designers are practical theoreticians of learning.

Gee (2005) argued that "the designers of many good games have hit on profoundly good methods of getting people to learn and to enjoy learning" (p. 5). They do not sustain engagement by being "eye candy" but by being built on challenges designed for continual learning, "and lots of it" (Prensky, 2001b, p. 5). The



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learning to play is a deliberate design strategy brought about by incorporating learning principles supported by current research in the cognitive sciences (Gee, 2007, 2009; Hopper, 2009). Digital games are, therefore, problem-solving spaces that use continual learning pathways toward mastery (Gee, 2009) through "game-as-teacher" (Gee, 2007; Hopper, 2009) situated practices (Gee, 2003). This is unlike the traditional physical education method still normatively practiced in physical education today.

Thinking Like a Game Developer — Plan Carefully

Kapp (2011) suggested that thinking like a game developer means planning carefully before delivery. Careful planning is the bedrock upon which good digital games are built to provide players with good learning (Gee, 2003, 2005, 2007), meaning that teaching that is guided and organized by principles empirically confirmed by research provides effective and deep cognitive learning (Bransford, Brown, & Cocking, 2000; Gee, 2009). Game design can therefore be used as "an analog for course and curriculum design" (Keramidas, 2010, p. 2). Having earlier presented the arguments as to why physical education teachers should consider the same learning principles as digital game designers, this next section covers the design elements integrated into the planning of the game experience. While Hopper (2009, 2011), Hopper and Sandford (2010), and Pill (2010) have linked the digital pedagogy of game-as-teacher to the pedagogy of teaching games for understanding (TGFU), the purpose of this article is not to suggest a particular instructional model (Metzler, 2005) that best aligns with the principles employed by digital game designers.

Play Feeds the Learning Process. Play is the basis of player achievement, and so the learning is game-centered (Adams, 2010; Bates, 2004; Keramidas, 2010). Levels of difficulty (Adams, 2010; Bates, 2004; Kapp, 2011) provide coherent complexity as the player moves through a structured learning progression. The levels ground players as they know where they are (game progress), the problem they are facing, what they are doing and why. The levels constrain the situations the player faces and the range of choices the player can make (Bates, 2004, p. 17). Well-ordered (Gee, 2005), achievable, incremental challenges scaffolded by initial game-based tutorials provide coherent complexity and manageable stress levels. "Brains do poorly with boredom; they generally thrive on some level of stimulation" (Jenson, 2006, p. 7). Structured progression is based on the idea that a good game "should be easy to learn but hard to master" (Bates, p. 31).

The game levels provided by Mitchell, Griffin, and Oslin (2006) in the Tactical Games Approach come closest to the idea of incremental levels of progression in sport teaching. From a general curriculum perspective, Willis (2011) suggested effort-to-progress graphs as an instructional strategy to show students their incremental goal progress in a way that mimics the intrinsic reinforcement and feedback provided by getting to the next level on a computer game.

Encourage Player Immersion. Kirriemuir and McFarlane (2004) reviewed the games and learning literature and identified that games were able to motivate players by immersion through challenge and curiosity. Challenge is provided by levels of complexity (discussed earlier) and action that is placed in the context of an interactive relationship. There exists a context of interaction where nothing happens until the player makes a decision, and then the game reacts back. In this way, the game experience is built on empowerment; empowerment of learners to make things happen (Gee, 2005). Through problem solving there is a need to make decisions that affect the progression of the game (Bates, 2004; Gee, 2005, 2009; Keramidas, 2010). This creates an interactive cycle where the player can affect the experience as there is a degree of choice in the customization of player artifacts and character, which act as constraints upon the behavioral choices available to the player, and through game-based problem-solving the player also affects the pattern of the game experience.

Player immersion is constantly developed by encouraging player micro-control via structures such as start-up options and customizable (adjustable) controls (Bates, 2004; Keramidas, 2010). Players therefore become co-designers through the customized decisions they make before the game commences and during games. Beginners are quickly engaged in the game experience as game designers remove technical impediments to protect new game players (Bates, 2004). That is, they do not put players in positions/contexts where they cannot be successful because that is an "experience dampener." This is unlike sport teaching in physical education where a "one size fits all" experience can leave students learning what they cannot do rather than improving their individual performance capacity by the end of a unit of work (O'Connor, 2006). Balancing variability and difficulty is then an important design consideration.

Good game experiences require design structures that put players in experiential learning situations with the right constraints for learning from the experience — boundaries of action (Keramidas, 2010; Salen & Zimmerman, 2004). A similar theory for sport-skill learning has been proposed (see, for example, Chow et al., 2007; Davids et al., 2008). Like the digital -games learning medium, a constraints-led design system for sport teaching presents game challenges and actions that engage the participant at the level of "optimal challenge" (Mandigo & Holt, 2002). That is, "a child's perception of the challenge of the activity should be equal to the perception of his/her skill level or abilities" (Reeve, 1996, in Mandigo & Holt, 2002, p. 2).

Encourage Player Achievement. Games reward achievement (Adams, 2010; Gee, 2005, 2009; Keramidas, 2010). Feith (2011) undertook the challenge of gamification, the process of applying game design principles to teach content, critical thinking, and other important outcomes (Miller, 2011), in sport teaching within physical education. He developed the concept of achievement badges to complement the personal and team responsibility emphasis inherent in a Sport Education model (Siedentop, Hastie, & van der Mars, 2004).

The consequences of failing are lowered since failure is, in essence, feedback and therefore a learning encounter. Failure provides immediate feedback about the progress of skill mastery and game understanding, and is thus part of players' understanding of "where they are at" in ability or confidence. Because the game problems players face are ordered and the solutions routinized through repetition of the skill and knowledge until the challenges are well understood, player decision-making works well when confronted by the harder problems of the next level.

Games also encourage achievement by providing the player with a quantifiable outcome, which Adams (2010) called termination conditions. The first type is a victory condition — an unambiguous situation where the player solves the problem of the level and succeeds at the challenge. The second type is a mastery condition — when the game is mastered and therefore terminated, as the game has reached its conclusion. The levels of tactical complexity provided within the Tactical Games Approach (Mitchell et al., 2006) come closest to providing this type of practical and conceptual clarity within a sport curriculum model.

Digital games position skills as strategies practiced in the context of play and the style of play determined by the characterization assumed by the player. The intent is to immerse the player in the game experience so that what is being learned is meaningful (Gee, 2005). That is, what is learned contributes to being sufficiently skilled to complete the level of play. At each new, more advanced level of play, existing skills and knowledge are consolidated and then the skill and knowledge are extended in order to move through and complete the next level.

The Practical Application of Digital Theory to Physical Education Pedagogy

An existing idea within the field of sport teaching pedagogy that comes close to the customization option provided by the digital game experience is Launder's (2001) description of fantasy games. Launder (2001) has described the use of fantasy cards as a strategy directed to the "never-ending problem of keeping large groups of children of varying ability 'on task,' i.e., positively involved in a practice activity" (p. 154). Fantasy cards are based on great players playing in major competitions. The cards include information about the way the player executes specific movement skills or "game style," and a practice task to be completed before the match can begin.

The digital-game design literature reviewed in this article suggests that immersion and motivation are achieved in three areas. First, a measure of player autonomy is achieved as players have choices about what they can do in the game. Second, the game optimizes the personal challenge by working at the edge of the players' competence. Finally, players are connected to the game through the ability to customize their play. This is not unlike the "backyard" experience of sport games where players customize the play to suit the possibilities of the players and the playing context (Cannane, 2009; Cohen & Pill, 2011; Renshaw & Chappell, 2010). Figure 1 illustrates the pedagogical adaptation of backyard play to design learning experiences in physical education.

The "backyard" design concept gives students in physical education the chance to customize the play while retaining the central "internal logic" (Grehaigne, Richard, & Griffin, 2005) of the more recognizable and acceptable form of the game. The format outlines the task and provides students with a scaffold, which suggests how to design the game. The physical education teachers' role is to facilitate student decision making and intervene where the safety of players may be at risk by any of the proposed aspects of the game design. When the rules are completed, players can try out the game. As problems occur and new design parameters become apparent, the teacher facilitates the design process to ensure the "internal logic" of the game remains intact. As strategies are devised

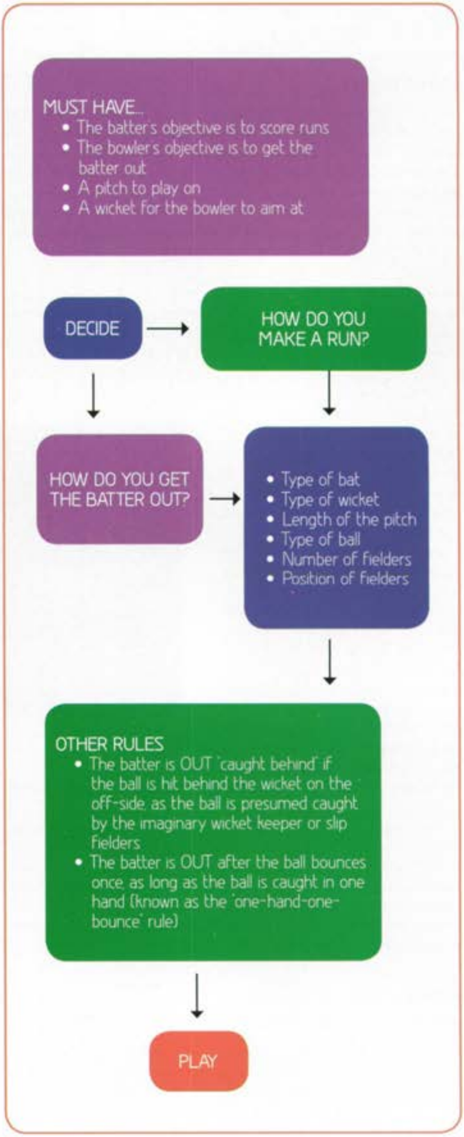

Figure 1.
Designer games — Backyard cricket

to gain advantage over an opposition, exploration of movement techniques is likely to occur.

Conclusion

Game design has been applied in this article as an analog for course and curriculum design (Keramidas, 2010). This article has described how sport teachers in physical education can "think like a game developer." Thinking like a game developer requires thinking about sport teaching as a carefully designed learner-driven system of interconnected experiences (Salen et al., 2011). This aspect of game design emphasizes the value of time spent in the design process. Just as research is the tool of digital game designers in creating the best possible game experience (Dubrofsky, 2007), it should also be the domain of sport teaching in physical education to create the optimal challenge conditions for students. In the discussion of the design questions presented in this article, some indications of contemporary game-teaching theory and pedagogy consistent with principles of game design have been suggested. Particularly applicable to the teaching of sport in physical education, the internal architecture of digital games (rules, goals, competition, space/environment) guide the design of a learning experience in which players act to solve problems that develop core competencies (Salen et al., 2011).

Digital game play is governed by constraints just as the play of sport is defined by the constraints (Chow et al., 2007; Davids et al., 2008) that permit, restrict, or eliminate actions from the game to provide the internal logic of the play (Grehaigne et al., 2005). The learning principles emerging from the cognitive sciences and being used by digital game designers should then be as applicable to sport teaching in physical education as they are to the construction of digital game play.

Teaching this way in physical education requires recognition that physical education extends beyond learning to move to intellectual aspects related to decision making (Griffin & Sheehy, 2004; Moy & Renshaw, 2009). This is a departure from the traditional physical education method (Metzler, 2005) and from the variability and critical interpretation of the learning environment toward a nonlinear pedagogy (Moy & Renshaw, 2009).

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