Fifth Grade Students' Experiences Participating in Active Gaming in Physical Education: The Persistence to Game

by Lisa Hansen and Steve Sanders, University of South Florida

Abstract

Although video games are often associated with sedentary behaviors, active gaming is a new genre that requires children to become physically active while playing the games. In this study six fifth grade students' experiences participating in active gaming in eight-week physical education classes were explored. Qualitative methods of interviews, journal entries, and observational field notes were employed. Analysis of data reveals a major theme of students' "Persistence to Game" (P_2G) when participating in active gaming during physical education, and seven subthemes associated with the major theme were identified. Both Play theory and Flow theory were used to explain the major theme and seven subthemes that emerged. The findings of this study suggest that active gaming can be used in 21st century physical education class to increase children's physical activity levels.

Key Words: Physical Activity, Exergaming, Video Games, Childhood Obesity

National and international organizations are calling childhood obesity an epidemic (Center of Disease Control and Prevention [CDC], 2006), and one that needs serious attention. Research has shown that physical activity levels decline throughout the lifespan (Caspersen & Meritt, 1995), and a significant decrease in physical activity levels occurs during adolescent years (Caspersen, Pereira, & Curran, 2000; Van Mechelen, Twisk, Post, Snel, & Kemper, 2000). Although it is recommended that children need at least 60 minutes of physical activity daily (National Association for Sport and Physical Education [NASPE], 2004), the majority of children have not achieved this goal (NASPE, 2006). One major cause for the decline in physical activity in children is the reduction in physical education in American schools (CDC, 2010; Davis et al., 2006). For example, only one-third of states in the United States require physical education for elementary and middle school students (Dotinga, 2006). Also, 65% of children aged 9-13 in the United States report that they are not physically active outside of school hours (Davis et al., 2006). These situations call for the important role that physical education can play in providing opportunities for school children to engage in daily physical activity, thus reducing obesity levels in school-aged children.

A significant cause of the increasing rate of childhood obesity is the expanded use of technology. Children are spending more time engaged in sedentary activities such as computer use, video game play, and television viewing. American society is being referred to as a "screen-based" culture due to the amount of time individuals spend with technology involving screens, especially video games among children, who spend approximately 49 minutes per day playing video games on average (Foehr, Rideout, & Roberts, 2005). Recently, a new movement has emerged that involves both video game play and physical activity. This contemporary phenomenon is called "active gaming" and is growing in popularity (Bogost, 2007). Active games are technology driven activities that require participants to engage in physical movement in order to play the games (Hansen & Sanders, 2008). This innovative genre of video games allows children to participate in the activities while being physically active. A noteworthy aspect of active gaming is that children do not realize they are exercising; they think they are simply *playing* video games (Hansen & Sanders, 2008). It is desirable to examine and understand children's experiences while participating in active gaming.

Theoretical Framework

Research suggests that students who are intrinsically motivated to perform a task often experience "flow" (Aultman, Glynn, & Owens, 2005). Csikszentmihalyi (1975a) believes that people are most happy when they are in a state of flow or "the zone" with a particular activity. The flow state is defined as an optimal state of intrinsic motivation, where a person is fully immersed in what he or she is doing. For more than 25 years, Csikszentmihalyi has studied peoples' experiences when they engage in different kinds of activities in a variety of contexts, such as at work or during play experiences. His research results lead to a convincing conclusion: An important precursor to a flow experience is a balance between the individual's skill level and the challenge of the task. If the task is too difficult or becomes frustrating, the individual may experience anxiety. If the task is not challenging enough, boredom may result. There is a significant relationship between fundamental movement skills and self-reported participation in organized physical activity in adolescents (Booth, Okely, & Patterson, 2001). When adolescents do not believe they have the skills necessary to balance the challenge of the activity, they become more anxious and less likely to be internally motivated to participate in or continue the activity.

In addition to finding a balance between the individual's skill level and the challenge of the task, Csiksentmihalyi (1975a, 1975b) has theorized eight other components of flow. The following are the nine components of flow:

1. Balance between a challenging activity with an individual's skills

2. Clear goals

3. Immediate feedback

4. Merging of action and awareness

5. Intense concentration

6. Loss of self consciousness

7. Sense of control

8. Intrinsically motivated

9. Altered sense of time

Csiksentmihalyi's research suggests that the most intense and pleasurable activities are ones that involve focused attention, have clearly set goals, and involve challenges that are in balance

with a person's skill level (Csikszentmihalyi, 1975a). The current generation considers video games to be a popular genre of games. The attraction to video games is said to be instinctive (Koster, 2005). These video games are a mix of entertainment content and technology that are attention getters because they respond to players, providing continuous challenge and allowing players to escape from boredom (Beck & Wade, 2004); this condition is very similar to the challenge-balance precursor for a flow experience defined by Csikszentmihalyi (1975a, 1975b). Csikszentmihalyi's *Flow Theory* appears identical to what a player experiences when totally immersed in a video game (Chen, 2007). Although Csikszentmihalyi (1975a) states that not all the flow components are needed for an individual to experience flow during an activity, most of today's video games incorporate all the nine components of flow (Chen, 2007). Certainly an in-depth investigation of active gaming related to flow theory could provide significant information regarding the value of participating in these technology driven games on the part of children. Therefore, the purpose of this study was to explore children's experiences as they participated in active gaming during physical education classes.

Methods

This study was based on phenomenological case study methods (Patton, 2002). Data were collected on six fifth-grade-children while participating in active gaming during physical education classes for eight weeks. Specific techniques including observational fieldnotes, formal and informal interviews, and journal entries resulted in triangulation of the data.

Setting and Participants

Kadia Elementary is a school in the southeastern United States with 534 students in grades K-5. Students at Kadia Elementary School attended 30-minute physical education class twice a week with a certified physical educator. The school was selected because it had an active gaming facility. In addition, the physical education teacher agreed to participate in this research project and used active gaming as a part of the planned physical education curriculum.

Six students from a fifth-grade class at Kadia Elementary school, were selected to participate in the study. This level was selected because physical activity levels for children aged 9-15 have been shown to drop dramatically (Nader, Bradley, Houts, McRitchie, & O'Brien, 2008). Purposeful sampling was employed in order to select diverse, information-rich participants, which would illuminate the questions under this study (Patton, 2002). Of the six participants, there were three girls (one Caucasian, one African American, and one Hispanic) and three boys (one African American, two Hispanic) representing different races. The physical education teacher served as a key informant in order to support and provide triangulation to the resulting themes. Prior to data collection, parental consent forms were obtained for all the participants.

The active gaming room consisted of nine game stations: Dance Dance Revolution (DDR), Cateye GameBike, Dogfight Flight Simulators, GameCycle Ergometer Bike, Gamercize Steppers, XrBoards, Wii Sports, Xavix Sports, and 3-Kick. Descriptions for each game station are provided in Figure 1.

Figure 1. *Active Gaming Activities and Descriptions*	
Active Gaming Stations	Description
Dance Dance Revolution (DDR)	Players stand on a platform or stage and try to hit colored arrows or characters with their feet to musical rhythm and visual cues. Players are judged by how well they time their dance to the patterns presented to them and are allowed to choose the music to play during each game.
Virtual Bicycles •Cateye GameBike •DogFight Flight Simulators •GameCycle (Ergometer Bike)	These games resemble traditional bikes using game controllers to control on-screen actions, including steering, speed, turns, firing mechanisms and other game components.
Gamercize	Gamercize is an activity where exercise motion on dedicated step or cycle machines activates the input for a PC or Macintosh computer. The computer operates normally while the user is exercising, enabling the use of any educational or gaming software without the need for special consideration or modification. Without exercise the input, the game being played will be suspended and the user has to restart exercise to continue to play the game.
XrBoards	This game uses the concept of a balance board or platform as a controller in which the user stands as they play the game. The games simulate various outdoor recreational activities such as snowboarding, skiing, skateboarding, or various games requiring static or dynamic balance.
Virtual Sport Simulators •Wii Sports •Xavix Sports	These games simulate individual and team sports with common games consisting of striking sports, bowling, boxing, running and others. For these games the controllers serve as implements that simulate a bat, racquet, or paddle, etc during game play.
Martial Arts Simulators • 3 Kick	This game is designed with multiple towers that can be punched, kicked, or tapped with hands and/or feet. A light and audible tone indicates which portion of the tower is to be contacted which goes off when the player correctly strikes the target. The game assigns a score based upon on speed of contact and more points are allocated the faster the reaction time.

Lesson plans of structured play (station work), semi-structured play (scavenger hunt and activity cards), and unstructured play (open play with objectives) with different learning objectives and rotation methods were designed and implemented for the eight-week active gaming period (Figure 2).

Data Collection

Six fifth-grade students participated in active gaming during

Figure 2. *Lesson Plans, Learning Components, and Rotation Methods*		
Lesson #	Learning Objectives	Play Format & Rotation Method
Lessons 1-4	Understanding Large Muscle Groups	Semi Structured: Students chose a new activity in which to rotate every 5 minutes
Lessons 5-6	Understanding Intensity Levels	Semi Structured: Students chose a new activity in which to rotate every 10 minutes
Lessons 7-8	Understanding Muscular Strength and Endurance Sharing activity time and working cooperatively with their peers	Unstructured: Students moved around the room choosing the activity, time spent on the activity, and with whom they played.
Lessons 9-12	Understanding Heart Rates	Structured: Students rotated in 8 minute stations
Lessons 13-14	The 60 minute "rule": National recommendations	Semi Structured: Students completed a scavenger hunt
Lessons 15-16	Sharing activity time and working cooperatively with their peers The 60 minute "rule": Being responsible at home	Unstructured: Students moved around the room choosing the activity, time spent on the activity, and with whom they played.

physical education class twice a week for eight weeks. During each class students were observed and fieldnotes were recorded, which included a written log of the events being observed (Stake, 1995). In the first class of each week students were observed during active gaming in the general environment and notes were recorded in a spiral bound journal. During the second class of each week, detailed, in-depth fieldnotes and informal interviews were recorded in order to explain what was happening with each participant's experience during active gaming in the physical education classes. Each class was videotaped for subsequent review as part of the data triangulation process. After each class the fieldnotes and videotapes were reviewed in order to draft a detailed description of the experience of the six children. Data were also collected through formal teacher and student interviews, which centered on reflective and probing questions to assist in learning the teacher's insights on the children's active gaming experiences and on the children's personal experiences during active gaming. The six students were interviewed in pairs for 15-20 minutes on three separate occasions, and the physical education teacher was interviewed on three separate occasions. All interviews were videotaped, audio recorded, and transcribed for analysis.

Journal entries completed by the student participants and physical education teacher served as another data source. Students were asked to complete journal entries during their reading and language arts classes once before the study began and again during weeks one, four, six, and eight of the study. Students were provided guiding open-ended questions related to the purpose of the study and submitted journal entries in five of the eight weeks of the study. Also, the physical education teacher wrote a journal entry following each active gaming class.

Data Analysis

An inductive analysis approach was employed which involves the discovering of patterns, themes, and categories in a researcher's data (Patton, 2002). Careful comparisons and triangulation of fieldnotes, formal and informal interviews, journal entries, and reviewing of the videotapes were made; differences and similarities of the participants' experiences in active gaming were identified; categories were formed, reduced and organized into themes (Cresswell, 2007); relations among themes were analyzed and identified. Finally, the themes were used to write a narrative presenting an in-depth picture of the participants' experiences in the active gaming participation.

Discoveries

The students' experiences participating in active gaming were summarized by suggesting their participation was a "persistence to game", the major theme that emerged in this study. The persistence to game (P_2G) was defined as a natural characteristic of children to voluntarily engage and remain engaged in technology driven physical activities. Each of the students were consistently motivated to game and remain engaged in physical activity while gaming in the physical education class. P_2G in the studied physical education environment can best be described as including seven subthemes or elements. These elements, when collected together, make up the persistence to game on the part of the students.

Fun

During physical education classes, students were enjoying participating in active gaming. Students' enthusiasm as they engaged in active game play was evident through both verbal and nonverbal communication. Students' were often heard laughing, giggling, or squealing as they played the games. Students expressed they enjoyed active gaming and believed it was fun. One student stated,

> For me this room is just amazing…and it's just awesome, everything. I would have these in every single school, and because the games they have here, it would get kids to have more fun. Like for PE, it's just fun too. But this one you just get their little minds going and just have fun.

Another student commented, "I think it's awesome, because you're playing games and you're having fun." Students also suggested physical education was more enjoyable now that active gaming was a part of class. One student expressed, "I think it's better now that this (active gaming) is here." Another student agreed by saying, "PE is good the way it is but it's more fun with these games now."

Opportunities for Choice

The active gaming environment provided many choices during game play. The unstructured environment allowed participants to choose the activities they played, how long they played, and with

whom they played. Some students would select to repeat activities for extensive periods of time while others would move frequently among games. An entry from field notes stated that: "Wilson has finished his second game on DDR and has gotten back in line to play again. He has chosen to play DDR the entire class period." When students were allowed to select whom they played with, they would often show excitement by grabbing their peer while moving around the game room, choosing to play alone during certain activities or engaging in competition during other activities. Additional choices included identifying the competition level at which they felt comfortable playing. During one experience, a fieldnote entry was as follows:

> Angela and Tammy are on the Dogfighters setting up their game. Angela said, 'what level are you going?' Tammy said, 'Me? I am going easy level.' Angela responded, 'You go easy but I think I will try this moderate one first.'

Providing the students with more choice would not result in an unorganized or off task learning environment. Rather, this less structured environment had actually fostered a more enjoyable and successful active gaming experiences.

Students expressed a desire to participate in an environment with fewer rules. The students suggested the more choices they had the more enjoyable their experiences were during active gaming. One student made a clear summarization by saying,

> I would go to this game, and once I get tired of this game, move on to another game. And when I get tired of each game, I go to a new one. And I would be with partners I choose because it's more fun.

Peer Interaction

While students were participating in active gaming, social peer interaction was evident. Regardless if they were able to choose their partners, play independently, or were assigned a partner or group, the students were consistently involved in social, peer relations. Students would discuss strategies and instructions about the game, engage in competitive conversations, or simply make random remarks. For example, fieldnotes captured two students working through strategies in a game,

> The girls are smiling and laughing playing Batman and Robin. They are talking back and forth about strategies in the game. 'I'm up here now' Ashlyn said. The teacher told Angela to go help Robin. Angela said, 'I'm trying to help but she keeps going over there and I can't get over there.' Ashlyn replied, 'I didn't know you can't get there. I will come back. Just wait on me.' Angela said, 'Ok, but see that (pointing at the screen), don't go there. Go this way because…'

Other discussions were focused on the students competing against one another, as reflected below.

> Wilson and another girl are challenging one another on DDR. This is the girl that Wilson told me had beaten him before. The entire rotation they are challenging one another. Right now they are waiting behind the pad singing to "Get Busy" and practice stepping. Wilson and his peer are on light mode and play the same song. She got a C and he got a D. Wilson just smiled and said, 'Ok, 2 to 1. I will beat you next time.' Wilson is back on against his peer this time choosing to play Standard mode. They both are not doing great. The lights go

off to finish up for the day and they continue stepping until they finish their song. Looking at the score he says to her, 'yeah, I won.' She said, 'No we both got an E.' Wilson said, 'No, look at the actual score, right here' as he was pointing to the number score. She said, 'Oh, ok.' Wilson said with a huge grin and sense of accomplishment, 'yeah, 3 to 2, I won.' She said, 'I'll get you Monday' and sat down quietly.

When students were not discussing strategies or not engaged in competition, they were typically commenting on each other's game play. Sometimes the students got excited about their peer accomplishing something "cool" in the game such as "catching a rail" on the XrBoards while snowboarding down a mountain or knocking out an opponent during Xavix Boxing. Even when students chose to play games independently, other peers were often watching and commenting during game play, or they would ask to join the game and play with the peer.

The teacher agreed that social interaction with peers was not only desired by the students, but it was also important for the students to remain engaged in the activity. She suggested,

> If they're not talking to their friends then they might not have fun. The whole point is to make it a social experience and so that it is something they want to do with their friends, therefore they are more likely to do it.

Peer and Independent Learning

Students worked with peers or independently to progress and find success while participating in active gaming. When asked, the students suggested they would rather learn from the game or from a peer rather than from a teacher or another adult when participating in active gaming. The students would often spend time reading the instructions on the screen and exploring in the game in order to learn while playing. As a student stated, "I'd rather figure it out myself, because I did it without the adults and can probably learn more stuff without them." Another student demonstrated learning through the game as she played a game she never played before. While continuing to step she said, "You try to kill the bad guys; that's what you are suppose to do…that is batman and he is in his demolition suit which means you can blow up stuff… it tells you things like that right here" pointing at the bottom middle of the screen.

Peer assisted learning was demonstrated while the students' participated in active gaming. As one student mentioned, "I would pick the peer to learn. They would tell me the way I need to know." Students would discuss game strategies and assist one another in how to play the game. One student was at DDR talking with his peers about the different songs. They were trying to find a faster song on the basic level. His peers were randomly selecting songs and listening to them trying to determine if they were too fast to play. They did not understand how to tell the beats per minute (BPM) for each song by looking at the screen. This student quickly spoke up and helped the other boys realize which songs were faster by pointing out the BPM segment on the screen. Another experience with peer assistance was evident when two students were playing on the Dogfighter game. One student was helping another student set up the game. The student helping said, "Press fire. Do you want moderate or easy? Go easy". The other student just listened and followed instructions while smiling. The student

helping then showed an adult who was watching there was an eject button. Pointing at it he said, "I thought it wouldn't really do this (eject) but it does. It really works. It is so cool."

Perpetual Movement to be Engaged

The students demonstrated a perpetual movement to be engaged in the active games during physical education classes. When provided an opportunity to play, students chose to participate in the active games regardless of the physical activity involved. In fact, the students suggested playing the active games made "exercise more fun" and they "did not think about exercising." One student was stepping quickly while playing a Batman and Robin game with a peer. She was asked if the game was fun and she nodded her head in a forward motion while saying, "Yes" and then continued, "I love this game." She was then asked if she thought about having to step and she replied, "Not me. I don't think about it at all cause I am just playing. It does not bother me."

Students had a desire to be actively involved in the games as opposed to waiting and watching others play. When working in groups students were often requested by the teacher to take turns playing the games. If provided the opportunity, students would move to play an open game instead of waiting with their group as instructed, as depicted by this fieldnote.

Harris tried to go to online boxing since it was open assuming he did not want to wait to play; however, he was quickly told by the teacher he needed to stay with his group. He apologized and quickly walked back where he watched his partners and continued to talk through the game with them.

The students would even demonstrate frustration if others were still on games that they were supposed to be playing. During one experience, a male student was still playing Nintendo Wii when he was supposed to rotate. A female student arrived at the Nintendo Wii station and said to him, "Hey, get off it's my turn to play. You have to go now" as she walked in front of the screen and reached for the remote control the male student was holding. Students were clearly not competent bystanders.

Unremitting Interest

The student's unremitting interest was evident while participating in active game play. Students were engaged in active gaming from the beginning to the end of each class. No students were observed who wanted to stop class or who appeared relieved when class ended. In fact, the students were smiling, laughing, and enthusiastic throughout each class. Often, when the students were signaled to rotate to a new station or stop game play at the end of class, they were unwilling to follow instructions and reluctant to cease playing. Fieldnotes suggested that "the students were not rotating," "the students were hesitant to end their game," or "the students insisted on finishing their game before rotating." It was obvious that the students did not want to stop in the middle of playing a game to move to another activity. The teacher had to address the class several times to get the students to end game play for class closure. "The lights go off and the boys stay on the XrBoards because Wilson and Harris had just started their game. As the teacher walks closer to them they step off still looking at the screen". The teacher states, "I am trying to let you play up until the very end as you can see but you have to cooperate at the end."

Even after this experience the students demonstrated continued reluctance to cease game play. A situation was observed where some students were called to leave the classroom early. When the teacher instructed the students to finish their games immediately and lineup, several continued to play.

Students' comments and researcher observations suggested students enjoyed participating in active gaming as much after eight weeks as they did when the study began. One student said, "Well, during all those eight weeks it has been the best days of my life and it's like I've never experienced anything like this before." Another student shared similar feelings when he said,

The past eight weeks were the best gaming experience of my life, and it was so awesome, and I loved all the games and room… I wouldn't change anything because that room is the best game room in the entire universe. That room is awesome I would love if I had that exact game room in my house.

Some students believed active gaming was more enjoyable by the end of the eight weeks because they were able to learn the games and experience more success with the games. As a student commented, "It's a lot better! A lot better. Really fun. Now that I got to play all the games and I know what they are like. And they're real fun. Real fun."

The teacher supported the students' statements and believed they remained enthusiastic when playing the active games during the eight weeks. She reported,

I think the students really enjoyed the active gaming. Their excitement was evident in their voices and facial expressions. The six selected students all seemed to be thrilled with the games. In general the class behaved well and I do think that the high level of motivation to participate in the activity contributed to that.

The students' continuous interest in participating in active gaming during physical education class was evident; yet, in addition, they also reported a desire to engage in these activities away from school. Students suggested having the opportunity to participate in active gaming away from school would encourage them to be more physically active. One student said if he had active games at home he would choose to play, "Always! Even every day after school." Another student agreed by saying she would participate in active gaming, "A lot of time, like I'm going to wake up and eat then play before I take a shower. I'll be in the game room from 9:00 in the morning until late at night."

Video Game Motivation

When the students were asked why they enjoyed active gaming, the consistent response highlighted an enjoyment of playing video games. One student made a simple statement about why he enjoyed active gaming by saying, "All kids play video games" (while he smiled and shrugged his shoulders). Other students believed being able to participate in video game play made their physical education experiences more enjoyable. As one student stated,

I think that it's amazing because it's the first time that I've seen anything like this. A lot of children that I know like to play games like this. A lot of these games, I don't really know of. But I like to play them, because it tends to be that I like… like three kick; I didn't know three kick was invented. So as

soon as I tried it was fun...because it's just fun. Videogames in your school is fun.

Another student added, "Sometimes our PE (pause), some people think it's boring. And when they play games when they're exercising they think its fun. So that's why active gaming is here."

Not only did the students enjoy the video games, but they were also able to make a distinct connection between the video games and exercise suggesting the videogames made physical activity more enjoyable. As one student stated, "I think it's (active gaming) awesome, because you're playing games and you're having fun, but you're still doing physical work."
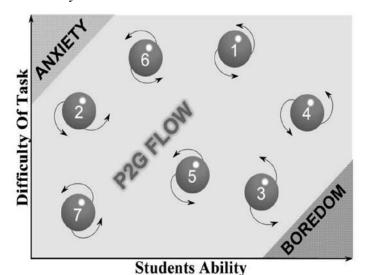
Discussion

The students participating in active gaming during physical education class demonstrated a "persistence to play games," a voluntary desire to engage and remain engaged in technology driven physical activities. Seven elements were observed supporting this persistence to game behavior.

In the Zone

The students participating in active gaming during physical education class were observed to be in "the zone" or "flow". The students demonstrated a "persistence to play games," a voluntary desire to engage and remain engaged in technology driven physical activities. The seven elements that encompass P_2G were found to be present when the students participate in active gaming. Figure 3 illustrates the P_2G Flow Model.

Figure 3: *Persistence to Game (P_2G) Flow Chart and Seven Element Keys*

The Seven Elements of P_2G

1. Fun
2. Opportunities for choice
3. Peer interaction
4. Peer and independent learning
5. Perpetual movement
6. Interest is unremitting
7. Video game play motivation

The P_2G flow zone is visibly wider in this model than in Csikszentmihalyi's (1975a) original flow model, suggesting that the students were in flow more often than they were out of flow.

Students during P_2G rarely experienced extended periods of anxiety or boredom. Anxiety was only observed when the students were reluctant to end game play in order to rotate to a new activity or for class closure. As for boredom, it was only evident when the students had to wait to play an activity. Although all seven elements were present at various times in this inquiry, not all elements were present simultaneously. For this reason, the seven elements highlighted in the model should be envisioned as being in continuous motion, and would shift from one to another.

For example, during some active gaming experiences the students were observed in peer interaction, learning through peer scaffolding, and engaged in the video game while being reluctant to end game play. During other experiences, the students were observed experiencing perpetual movements towards the activities while choosing to play independently. In this situation, the students did not necessarily experience peer interaction or peer learning. These are two active gaming experiences with different P_2G elements; yet, both created flow experiences for the students. Additionally, the students may have initially chose to play alone; however, when the opportunity to engage in peer interaction presented itself, the students would adjust to this element and remain in flow as this fieldnote suggested.

> Wilson is playing 3 Kick alone. He is setting his game to 30 seconds each time. A peer just walked over and jumped in the game with Wilson. Wilson does not seem to care as he continues playing and has a smile on his face. When the buzzer sounds for the game to end, Wilson and the peer smile at each other and the peer says, 'Want to play again?' Wilson shakes his head and the peer resets the game to 30 seconds.

While different P_2G appeared at different times and conditions, they all resulted in flow experiences among the students.

The P_2G flow zone (Figure 3) represents the students flow experiences while participating in active gaming during physical education classes. The described elements are the attributes that create the flow experiences as those elements interact or shift during participation in active gaming. The wide "flow" zone in the model signifies that the students were in flow the majority of time while playing the active games.

The Elements in Review

Research suggests that 86.2% of adolescents rate fun as the single most important element in life (Lindstrom & Seybold, 2003). When students consider an activity to be fun, they are more likely to remain engaged or engage in the activity in the future (Robertson-Wilson, Baker, Derbinshyre, & Cote, 2003; Weiss, 2000). This is one reason why enjoyment is considered one of the most important characteristics of quality physical education programs (Wechsler, Mckenna, Lee, & Dietz, 2004). Having fun has certainly been observed to be a major element in student's participation in active gaming.

Active gaming in this physical education environment provided opportunities for a less structured experience allowing participants to have more choices. Research suggests that self-paced, child-controlled play is the best way for children to optimally develop (Rogers & Sawyers, 1988). Children are more willing to express thoughts, feelings, and experiences when they have more choice and a voice in instruction (Dyson, 1995). When children experience

activities with fewer externally imposed rules and more choice, they are more likely to enjoy and remain engaged in the activity (Rogers & Sawyers, 1988).

When the students were participating in active gaming, social interaction was observed. For voluntary physical activity to occur, children suggest the activity needs to be enjoyable and in a social environment (Robertson-Wilson et al., 2003 Weiss, 2000). In physical education, when experiences meet students' needs for success in a social environment, future participation in physical activity is encouraged (Robertson-Wilson et al., 2003; Weiss, 2000).

Students participating in active gaming would engage in game play and explore the game independently in order to learn how to play using the video game or another peer as a scaffold. Beck and Wade (2004) suggest that this generation prefers to learn from the game or from one another, but not their elders as they are not as motivated by authority figures' demands. Peer scaffolding offers a great opportunity for social interaction and leadership roles to emerge. In fact, at the Summit on Educational Games, 2006, it was suggested "games and simulations can offer scaffolding, providing learners with cues, prompts, hints, and partial solution to keep them progressing through learning, until they are capable of directing and controlling their own learning path" (p.19). In this sense, the video game itself becomes the guidance needed for children to further develop skills as they learn to use the tools provided on the screen to enhance their level of play.

In many traditional physical education classes, students are not excited to participate in the activities and act as competent bystanders (Tousignant & Siedentop, 1983). Competent bystanders act like they understand the lesson and pretend to be on task; however, this behavior is false and often misunderstood by the teacher. In this study, the students consistently engaged in active games voluntarily, and no competent bystanders were observed.

Data analysis revealed that the students' interest in participating in active gaming was unremitting. The students were engaged from the beginning to the end of each class as well as throughout the eight week inquiry and were often reluctant to cease game play. Students also suggested they were interested in participating in active gaming away from the school environment. This element of unremitting interest is significant because the recommended amount of moderate to vigorous physical activity, 60 minutes daily (NASPE, 2006), is not met by the majority of children (CDC, 2006). However, it is known that students are more likely to voluntarily engage in an activity if they consider it interesting and enjoyable (Robertson-Wilson et al., 2003).

The video game component in active gaming is clearly a motivation for student engagement and enjoyment. This study supports this element by suggesting that video gaming is enjoyable and provides a motivation to exercise (Widan, McDonald, & Abresch, 2006). It is evident that children enjoy video games as 83% of American children aged 8 to 18 have one or more video game console(s) and spend on average 49 minutes per day playing these games (Foehr et al., 2005).

Implications

Active gaming experiences inserted into physical education class are new to most students and teachers. However, over the past 10 years active gaming has grown exponentially and is quickly becoming one of the most popular leisure physical activity outlets for children. This trend might suggest that in the next 10 years a large number of school systems will have active gaming facilities as part of their school physical education program. Based on the data from this study, five major implications can be suggested.

Create Play-Like Environments

Teachers interested in using active gaming in the physical education should establish active gaming curriculums based on "play-like" environments. Children at play are intrinsically motivated to participate in the activity. The students participating in active gaming reported their desired to participate in the activities and wanted to continue game play. Playing with technology in the form of games, promotes learning and additional cognitive benefits in children. While playing the active games, the students in this inquiry demonstrated learning independently through exploring the game and via peer scaffolding. Teachers should consider using active games to promote learning through play in physical education classes.

Students suggested an environment that provided them with more choices, and less structure with fewer rules from the teacher was preferred. The students experienced moving around the active gaming room in a structured, semi-structured, and open-structured environment. Having more choices created positive, successful experiences. Based on this discovery, teachers should consider creating play-like learning environments when students are participating in active gaming.

Cultivate the Element of Fun

This study suggests active gaming was fun and students aspired to participate in the activities because they were enjoyable. Implementing active gaming in physical education encouraged students to want to be and remain engaged in physical activity. Active gaming activities were naturally motivating and fun. Physical education teachers should consider creating active gaming environments that focus on the element of fun in order to encourage self-motivating experiences.

Foster Individual and Peer Learning

Students suggested they preferred to learn independently or from a more knowledgeable peer rather than an adult or teacher. Teachers should consider what the most effective strategies are for peer scaffolding to occur and create active gaming environments that allow students to learn independently via exploration or from more experienced peers.

Explore the Teacher's Role

Is it necessary to have a teacher in the active gaming environment? Should students receive instructions via computers and participate in active gaming independently or without teacher guidance? Should the teacher become more of a facilitator for the students? It may be that active gaming technology will serve as a conduit for increased learning and physical activity and that the role of the teacher in the teaching/learning process in this environment will change dramatically.

New Directions

Teacher education in physical education has incorporated active gaming guidelines in physical education programs and the National Association for Sport & Physical Education (NASPE) has created developmentally appropriate practice guidelines for PETE programs (Mears, Hansen, Fine, Lawler, & Mason, 2009). As active gaming becomes part of the physical education curriculum university physical education teacher preparation programs (PETE) must provide training and education to beginning teachers on curriculum and instruction strategies and assessment processes for the active gaming environment. It is necessary that PETE programs realize active gaming can be important in increasing children's physical activity levels.

When future teachers are learning about active gaming in PETE programs, the cost of the equipment should be considered. If funding is not available for a full functioning university active gaming facility, acquiring several active games to include in teacher preparation may be sufficient if implemented appropriately. Active gaming should be considered a tool which teachers use to accomplish learning objectives. Therefore, active gaming may be incorporated into the method courses associated with the PETE program. It is important for PETE programs to assist future teachers in understanding the role active gaming plays in the physical education class and the best teaching strategies associated with implementing these activities. Cost of the equipment, space required, and setting up the environment to maximize participation are a few ideas teacher educators should be prepared to share with future teachers

Investigating student experiences in active gaming during physical education class is an elaborative process. Additional studies using both qualitative and quantitative methods are needed. It is apparent that today's youth have a strong desire to play video games and this desire influences the way they feel about active gaming experiences in physical education. In the very near future active gaming may clearly be a part of every physical education program in the country. Active gaming is not a fad, will continue to grow in popularity, and certainly deserves further exploration.

References

Aultman, L. P., Glynn, S. M., & Owens, A. M. (2005). Motivation to learn in general education programs. *The Journal of General Education, 54*(2), 150-70.

Beck, J., & Wade, M. (2004). *The kids are alright: How the gamer generation is changing the workplace.* Boston, MA: Harvard Business School Press.

Bogost, I. (2007). Persuasive game: *The expressive power of videogames.* Cambridge, MA: The MIT Press.

Booth, M. L., Okely, A. D., & Patterson, J. W. (2001). Relationship of physical activity to fundamental movement skills among adolescents. *Medical Science Sports Exercise, 33*, 1899-1904.

Caspersen, C. J., & Meritt, R. K. (1995). Physical activity trends among 26 states, 1986-1990. *Medicine and Science in Sports and Exercise, 27*, 713-720.

Caspersen, C. J., Pereira, M. A., & Curran, K. M. (2000). Changes in physical activity patterns in the United States, by sex and cross-sectional age. *Medicine and Science in Sports and Exercise, 32*, 1601-1609.

Centers for Disease Control and Prevention. (2010). *Healthy Youth: National Trends in Risk Behaviors.* Retrieved from http://www.cdc.gov/HealthyYouth/yrbs/trends.htm.

Centers for Disease Control and Prevention. (2006). *National Center for Health Statistics: Prevalence of overweight among children and adolescents: United States, 1999-2002.* Retrieved from http://www.cdc.gov/nchs/products/pubs/pubd/hestats/overwght99.htm.

Chen, J. (2007). Flow in games (and everything else). *Communications of the ACM, 50*(4), 31-34.

Creswell, J. S. (2007). *Qualitative inquiry and research design.* Thousand Oaks, CA: Sage.

Csiksentmihalyi, M. (1975a). *Beyond boredom and anxiety: The experience of play in work and games.* San Francisco: Jossey-Bass.

Csikszentmihalyi, M. (1975b). Play and intrinsic rewards. J*ournal of Humanistic Psychology, 14*, 41-63.

Davis, M. G., McKenzie, T. L., Pate, R. R., Robinson, T. N., Stone E. J., & Young J. C. (2006). Physical activity promotion in children and youth. *Circulation, 114*, 1214-1224.

Dotinga, R. (2006). Yoga, hip-hop…this is P.E.? *The Christian Science Monitor.* Retrieved from http://www.csmonitor.com/2006/0615/p14s02legn.html.

Dyson, B. P. (1995). Students' voices in two alternative elementary physical education programs. *The Journal of Teaching Physical Education, 4*, 394-407.

Foehr, U. G., Rideout, V. J., Roberts, D. F. (2005). *Generation M: Media in the lives of 8-18 year-olds.* Menlo Park, CA: Henry J. Kaiser Family Foundation.

Hansen, L., & Sanders, S. (2008). Interactive gaming: Changing the face of fitness. *Florida Alliance for Health, Physical Education, Recreation, Dance & Sport Journal, 46*(1), 38-41.

Koster, R. (2005). *A theory of fun for game design.* Scottsdale, AZ: Paraglyph.

Lindstrom, M., & Seybold, P. (2003) *Brand child: Remarkable insights into the minds of today's global kids and their relationships with brands.* Great Brittain: Kogan Page Limited.

Mears, D., Hansen, L., Fine, P., Lawler, P., & Mason, K. (2009). *Appropriate use of technology in physical education: A position paper.* Reston, VA: NASPE.

Nader, P., Bradley, R., Houts, R., McRitchie, S., & O'Brien, M. (2008). Moderate-to-vigorous physical activity from ages 9 to 15 years. *Journal of American Medical Association, 300*(3), 295-305.

National Association for Sport and Physical Education. (2006). *2006 shape of the nation report: Status of physical education in the USA.* Reston, VA: Author.

National Association for Sport and Physical Education and American Heart Association. (2004). *Moving into the future: National standards for physical education* (2nd ed.). Reston, VA: Author.

Patton, M. (2002). Qualitative Research and Evaluation Methods. Thousand Oaks, CA: Sage Publications.

Robertson-Wilson, J., Baker, E., Derbinshyre, E., & Cote, J. (2003). Childhood sports involvement in active and inactive female adults. *AVANTE, 9*, 1-8.

Rogers, S. & Sawyers, J.K. (1988). Play: *In the lives of children.* Washington, D.C.: The USA.

Summit on Education Games (2006). *Harnessing the power of video games for learning.* Retrieved from http://www.fas.org/gamesummit/index.html.

Stake, R. (1995). *The art of case research.* Thousand Oaks, CA: Sage Publications.

Tousignant, M., & Siedentop, T. (1983). A qualitative analysis of task structures in required secondary physical education classes. *Journal of Teaching in Physical Education, 3*(1), 47-57.

Van Mechelen, W., Twisk, J. W., Post, G. B., Snel, J., & Kemper, H. C. (2000). Physical activity of young people: The Amsterdam longitudinal growth and health study. *Medicine and Science in Sports and Exercise, 31*, 1610-1616.

Wechsler, H., McKenna, M. L., Lee, S. M., & Dietz, W. H. (2004). The role of schools in preventing childhood obesity. *State Education Standard, 5*, 4-12.

Weiss, M. R. (2000). Motivating kids in physical activity. *President's Council on Physical Fitness and Sport Research Digest, 3*(11), 1-8.

Widman, M. S., McDonald, C., & Abresch, T. (2006). Effectiveness of an upper extremity exercise device integrated with computer gaming for aerobic training in adolescents with spinal cord dysfunction. *Journal of Spinal Cord Medicine, 29*, 1-8. ■