GAME ON!

What school board members should know about games for learning

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Why Video Games?

We now live in a 24/7 digital world. Smartphones and tablets are staples in our homes, the workplace and higher education. Video games are ubiquitous, whether in the form of mobile apps, consoles for television or online. Morever, the video games of today – complete with 3-D environments, intricate plots and levels, avatars and guild play – are far more sophisticated than yesteryear's *PacMan, Frogger* or *Asteroids.*

But for most New York K-12 public schools, video games – along with mobile digital devices – have yet to become a staple for learning. Computerized Adaptive Testing (CAT), a method of computerized testing involving progressive "questions that challenge, but don't overwhelm, the student," though, is knocking on New York State's back door, which also makes it timely to understand a little more about its not-so-distant cousin, games for learning, which shares this same learning philosophy.[1]

No doubt, many parents and educators still see video games as the educational equivalent of junk food and something to be done outside of the classroom. Therefore, it might surprise many outside of the gaming world to know that there are video games aligned to the new Common Core Learning Standards. Video games can serve as a way of engaging students in the digital age and help make them college- and career-ready. Even President Obama, when announcing his technology and learning K-12 initiative, ConnectED, acknowledged that personalized learning with "apps and platforms that adapt to the level of individual student knowledge" is important.[2] In fact, Apple is working with ConnectED to provide iPads for students at 114 schools in 29 states.[3]

School board members also see applications for video games in schools. A recent NYSSBA Pulse Poll showed support for digital learning in the classroom. Eighty percent of 494 school board members who responded to a question about computer games for learning agreed that "computer games should be incorporated into the cur-

**Potential Benefits
of Gaming in Schools**

- **Encourages exploration and experimentation**

- **Develops problem-solving skills**

- **Motivates students to learn**

riculum if they increase student engagement and academic performance," while 11 percent disagreed and 10 percent were unsure.[4]

This report is intended to inform school board members about the considerations regarding student performance and engagement, equity, cost, infrastructure, professional development and community engagement they must make if they adopt an emerging digital learning initiative in their school districts: video games for learning.

What Do Video Games Have to Do with Learning?

Taken at face value, it may be difficult to see the attraction of video games for learning, but science supports it. Judy Willis, neurologist, former teacher and adjunct faculty member at UC Santa Barbara, links game design to brain design and learning to explain why gaming plugs students into learning and keeps them there.

Willis explains the attraction of games in terms of physiology. Games attract students, she says, because they target players at a level that is neither too easy nor too difficult – one that challenges them enough to achieve success – which triggers the release of dopamine, a neurotransmitter that regulates pleasure and provides satisfaction for

the player.[5] This reaction, says Willis, is based upon a person's knowledge of completing a task correctly, which games allow through "points, visual tokens, or celebratory sound effects."[6] This creates a cycle that requires the player to advance to the next level of play before dopamine is released.[7] This pattern sustains prolonged engagement for the player, similar to that of Flow, a concept developed by psychologist Mihaly Csikszentmihalyi.[8]

Game design also incorporates a learning framework called the zone of proximal development (ZPD), which allows the learner to work on a task in a challenging but not unattainable environment aided by a more skilled individual who can guide his or her learning. This "scaffolding," or guided support, is provided by games through the online community and game feedback.[9]

A key negative predictor of achievement is student abandonment when failure occurs, says Dan Schwartz, a professor of education at Stanford University and director of the Stanford AAALab, a learning and technology center.[10] But, kids feel they can experiment in games because failure is not finite, says Pamela Rutledge, Director of the non-profit Media Psychology Research Center. Instead, she says, "Failure is equivalent to feedback and the risk of failing is minimal and recovery is easily achieved, encouraging exploration, experimentation and the development of new problem-solving strategies."[11]

Gaming can also motivate students, especially

Characteristics of Flow

On-task
Time disappears
Capable
FLOW
Very happy
Clarity of mind
At peace
Driven

Adapted from Mihaly Csikzentmihalyi's 2004 TED Talk, *Flow, The Secret to Happiness.* Per Csikzentmihalyi, qualities of Flow include being on-task, capable, very happy, driven, at peace, having clarity of mind and losing time. According to his TED Talk, the conditions for Flow to occur are when high challenge meets high ability.

boys, to learn in the classroom, says Ali Carr-Chellman, a professor of instructional systems at Penn State University. "The way that they [boys] exist and the culture they embrace isn't working well in schools now," says Carr-Chellman in a 2011 TED Talk. Three primary reasons why it isn't working well, she says, are: zero tolerance policies, fewer male teachers and a "compressed curriculum" whereby "kindergarten is the old second grade." According to Carr-Chellman, "we have to change the culture and the feelings that politicians and school board members and parents have about the way we accept and what we accept in our schools today."[12]

While Carr-Chellman's TED Talk focuses on the use of video games to engage boys in the classroom, more recent research shows that video games attract females too. Females above the age of 18 comprise 36 percent of those playing video games compared to only 17 percent of males 18 years of age or younger, per 2014 research. According to the same research, there is only a four percentage point spread between the population of males and females who play video games (52 percent vs. 48 percent).[13]

Games for learning are diverse and can be divided into long- or short-form games. Long-form games are more in-depth and have a longer duration than that of one class compared to short-form games, which can be played in one class period.[14]
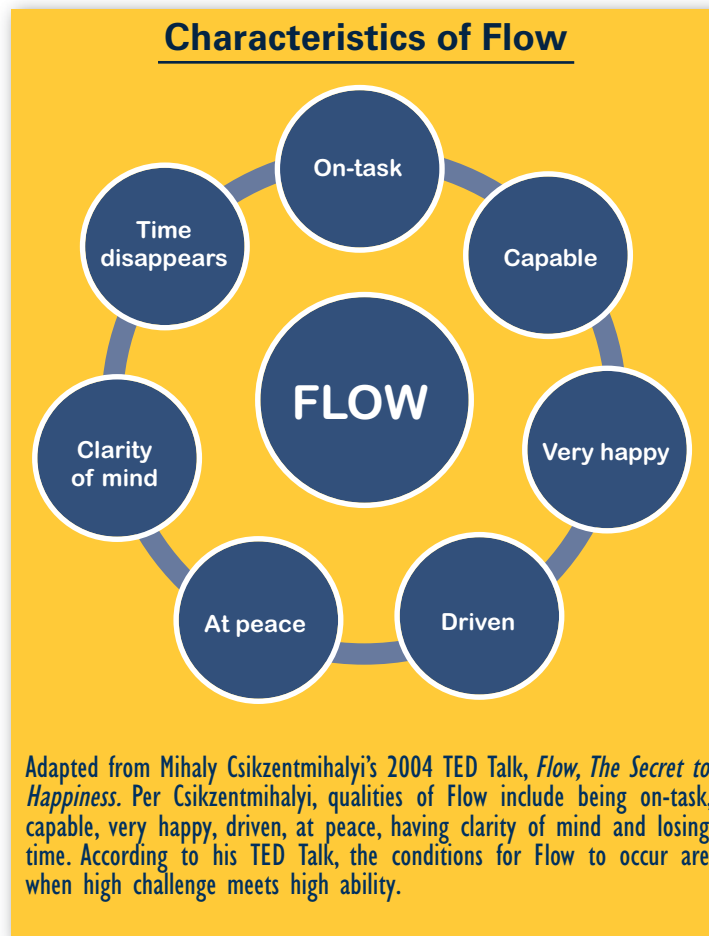
For example, *BrainPOP* (www.brainpop.com) is a digital warehouse that has short-form math, science, literacy and social studies games aligned to Common Core standards. Nationally, over 20 percent of K-12 schools use this digital warehouse.[15]

A 2009 study on the effectiveness of *BrainPOP* showed that students who used *BrainPOP* "made significant improvement in science, reading comprehension, language and vocabulary skills during one school semester (January through June) as compared to students in classes that did not use *BrainPOP*."[16]

There are many different game categories, including (but not limited to) interactive learning tools (with game-like elements such as *BrainPOP*), drill and practice (with skills practice via repetition) and role-playing (with actors in different settings and time periods). Short-form drill and practice games aligned to standards include the math game *Motion Math* and the game *Study Island*, which offers skills practice for various subjects and assessment data for educators. Motion Math is played on an iPad or iPhone, while Study Island requires a PC or Mac. *iCivics* (www.icivics.org) is a non-profit organization committed to fostering civics education via interactive media (such as games). *iCivics* has role-playing civics games aligned to standards that include lesson plans that can be played on a PC or Mac.[17]

Finally, it's important to consider "the whole ecosystem around the game," which is key for community engagement and support of this type of curriculum, says Dr. Eric Klopfer, MIT professor of science education and engineering systems. Klopfer uses the term ecosystem because "games alone are unlikely to 'teach'. It's the combination of game and supported reflection and abstraction that is likely to lead to learning. That means you can't just drop a game into a classroom, but you need to bring it in some thoughtful way that the teacher can connect with. It also means you need to think about the software (the game), plus curriculum, plus community (which could be in the classroom and/or online)," he told NYSSBA.[18]

Video Games in Action

iCivics at White Plains High School

iCivics was founded by former U.S. Supreme Court Justice Sandra Day O'Connor to address the lack of civics knowledge of the nation's youth. The program was featured in the U.S. Department of Education's report, *Advancing Civic Learning and Engagement in Democracy: A Road Map and Call to Action*, as one of several initiatives to increase civic learning.[19] *iCivics* consists of games and lesson plans that teach youth about civic matters such as The Bill of Rights and the different branches of government. Teaching units consist of a combination of games, lesson plans, web quests (Internet-based "guided research activities" relevant to the unit) and other resources. Examples of units include The Constitution, The Legislative, Executive and Judicial Branches of Government (3 units) and Civil Rights.[20] Several studies listed on the *iCivics* website point to the effectiveness of the program. Annually, over 40,000 educators incorporate *iCivics* in their teaching.[21] Arlene Garcia is one of those teachers.

Garcia, who teaches 11th- and 12th- grade U.S. history and law classes at White Plains High School in White Plains, NY has used *iCivics* for three years. The educational games component of *iCivics* "was another means of teaching the material," she told NYSSBA. *iCivics* games are "a motivating piece" for her students when it comes to learning, and the games are just one piece of a more "comprehensive" civics lesson.[22] Garcia uses *iCivics* games like Argument Wars, which enables students to "argu[e] a real Supreme Court case"[23] or Do I Have a Right? Bill of Rights, to learn about the Fourth Amendment.[24] As an administrator on the account, Garcia can track her students' progress.[25]

While there are many benefits to using a program like *iCivics*, says Garcia, there are downsides too. "I struggle with access," she says, with 150 students and three computer labs in the school, it's difficult to use the computers all the time.[26]
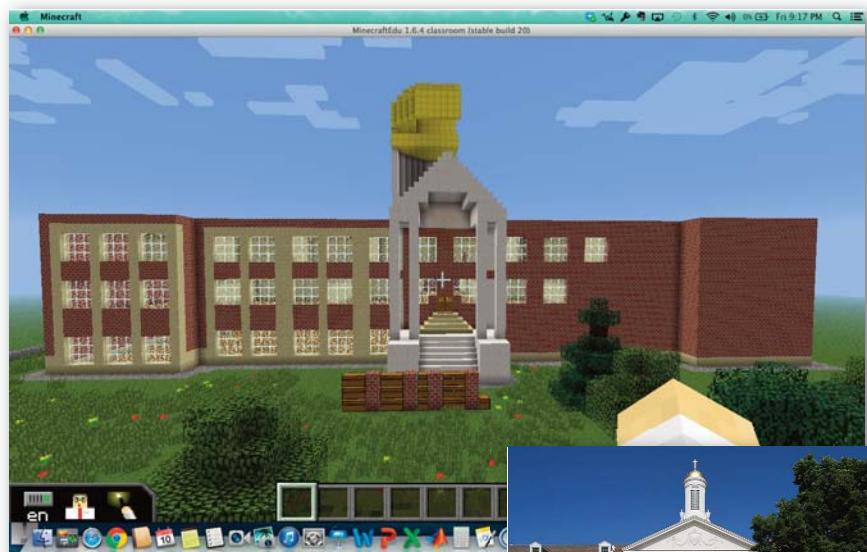
MinecraftEDU at Siena College

Microsoft recently bought the gaming company that created the mega-hit video game, *Minecraft*, for a whopping $2.5 billion. Introduced in 2009, *Minecraft* is called "a sandbox game," which means that there are not a lot of pre-set goals or even storylines in the game; rather, it is a construction-based game akin to "virtual Legos."[27] On the day the acquisition was announced, Microsoft CEO Satya Nadella stated "…it's the one game parents want their kids to play."[28] He further said, "If you talk about STEM education, the best way to introduce anyone to STEM… it's *Minecraft*."[29]

Siena College, in Loudonville, NY, offers a summer camp to middle-school-aged students and a 14-week program during the academic year to Albany City School District students that features the popular video game. Michele McColgan, assistant

professor of physics at Siena College, oversees MinecraftEDU programming and curricula for the students. She is assisted by other Siena faculty, Siena pre-service teacher candidates and high school mentors who participated in the program in previous years. While *Minecraft* is popular recreationally, the game can be used educationally to learn about science, technology, engineering and math (STEM) subjects. According to McColgan, to use MinecraftEDU in education, good computers and a license for each player playing the game simultaneously are needed. *Minecraft* can be played on a PC or Mac, but not an iPad, says McColgan. Siena's program has students and mentors take pre- and post-program STEM surveys which gauge their interest in those subjects.[30]

While Siena's program is not mandatory, the student attendance rate is close to 70 percent for those who participate more than one time in the Saturday program. The level of engagement students have with MinecraftEDU is evident as McColgan explains that once students start playing MinecraftEDU at Siena, "they don't want to go to lunch."[31]

While most of the 9:00 a.m. to 3:00 p.m. schedule is focused on *Minecraft*, the day also consists

A middle school student at Siena College's *Minecraft* camp created this likeness of a campus building.

of learning about other topics like nutrition and the arts. Writing is incorporated into each class and Internet etiquette, a.k.a. digital citizenship, is constantly being discussed. History is not taught as a separate subject, but, rather, the head of Siena's History Club recreates the Revolutionary War in MinecraftEDU. Students learn about that time period as they demonstrate critical thinking and team-building skills by reading and analyzing war-time documents, building Revolutionary War camps and waging a war.[32]

Siena's program, says McColgan, also teaches topics "in physics including kinematics such as motion at constant velocity and accelerated motion. Students perform experiments and record and graph their data in the game. Students also learn about momentum using a game-based tool called minecarts." McColgan uses the equation: mass x velocity = momentum as an example of how students grapple with ways to use features of the game to change mass, build conversations about speed and understand how their calculations in the virtual world of *Minecraft* translate to application "in the real world."[33]

Ratio and scaling are two architectural concepts students learn as they construct Siena College's own Siena Hall building in the game. A review of the curriculum for the architecture course in *Minecraft* demonstrates that alongside learning rigorous science and math concepts and developing skill-building, students are building their academic vocabulary in these disciplines.[34] For example, Adam and Ben, two students who took the Siena course, explain how *Minecraft* helps them learn and develop such skills and how the game differs from paper and pencil classwork (see ArchF13M2Ben_Adam.MOV at www.sos. siena. edu/~mmccolgan/UrbanScholars/movies/).

Suffern Middle School's *WoW* program

World of Warcraft (*WoW*) is an example of a massively multiplayer online role-playing game (MMORPG). A MMORPG is a "story-driven online video game in which a player, taking on the persona of a character in a virtual or fantasy world, interacts with a large number of other players."[35] The game offers players different types of reading texts such as online references, community discussion forums and tutorials, according to a study examining boys' reading comprehension and video games. The study's findings show that online reference texts associated with *World of Warcraft* are comparable to 11th to 12th grade reading. When an adolescent subset of the study's 46 participants chose a piece of text to read irrespective of their reading ability but based on interest, they could read text far above their ability.[36]

Suffern Middle School in the Ramapo Central School District is using *World of Warcraft* in a curriculum aligned to the Common Core. NYSSBA spoke with Brian Fox, principal of Suffern Middle School, and Peggy Sheehy, ITF/media specialist/instructor in teacher humanities and self-proclaimed "gamer," to understand how Suffern addresses IT, policy, infrastructure and cost considerations in light of their use of *World of Warcraft*, and more recently, *Guild Wars 2* in the classroom.[37]

Sheehy crafted a sixth-grade humanities Common Core-aligned curriculum using games including *World of Warcraft* via a quest-based course management system for educators called 3D Game Lab (http://3dgamelab.com/). She now refers to her classroom as a "Learning Studio." Desks are gone and in their place are "bean bag chairs and couches, clipboards, carpets and gaming consoles."[38]

"In addition to the language arts and social science components to the learning, the game-infused approach presents so many teachable opportunities," says Sheehy. Students learn socio-emotional skills and the hidden curriculum, which, she says, includes "the things you can't measure with a scantron," such as empathy, time management, how to negotiate, and being part of a community. She sees her job as a (digital) citizenship guide for the students, since students only have access to *WoW* (which has over 9 million players) after Sheehy "logs them all in." After all, she says "if you're going to teach driver education, you get in the car with the child."[39]

There was never any pushback from the community about this curriculum, but both Sheehy and Fox say Ramapo has the right climate for digital learning – they're "on the cutting-edge of technology."[40] Sheehy also holds "Tech Nights" for parents to acclimate them to the game-based learning program.[41]

Fox cautions, however, that you have to have adequate bandwidth and "a pretty decent set of computers." Suffern has 3 computer labs in the school's library and the district is getting set to transition to Chromebooks.[42] Their new digital platform, 3DGameLab is very sophisticated and a quest-based alternative to Moodle, says Sheehy, which is the platform they previously used.[43]

Since funding these programs is important, Fox told NYSSBA, "The kids funded the program."[44] The students made a video for the Net Generation Education Challenge and won money, which

Food for Thought

Prior to incorporating games for learning in the curriculum, school board members should consider the following:

- **Professional development for educators**
- **Time constraints affecting use of long-form or short-form games**
- **Infrastructure capacity, including hardware, software and IT needs**
- **Cost (one-time or continual)**
- **Alignment of learning needs and grade-level standards to game design**
- **Community support**

Sheehy says "went to funding the initial dozen accounts and subscription costs." Sheehy was able to supplement this initial funding to enhance the program with grant support from the Ludus Project (www.ludus-project.org/), an organization that provides grants for games for learning initiatives.[45]

Guild Wars 2 is more cost effective than *WoW*, says Sheehy – it's $60 for the initial license and there's no subscription or monthly fee. She provides this choice to students, but most, she says, stay with *WoW*. Every two to three years enhancements to the video game typically cost $50 to $60, but she says the game publisher, Blizzard Entertainment, is "supportive of *WowinSchool* and has provided Sheehy's students with game keys for the expansions that are released every few years."[46]

A School Board Member's Perspective

One reason video games are appealing is because they "…are kind of natural to learning," says Matt Nolin, Cohoes City School District's board of education president and a game designer at 1st Playable Productions, a game development company in Troy, NY. They are adaptive to learning because they let most players come in at any level and feel challenged, he told NYSSBA.[47]

1st Playable Productions developed a science game, The Ruby Realm, for middle-school-aged children, which is housed in *BrainPOP*'s game repository called Game Up. The Ruby Realm is an example of an education-based video game because students learn about photosynthesis and

Matt Nolin, Cohoes City School District's Board of Education president and game designer at 1st Playable Productions.

increase their academic vocabulary through familiarity with prefixes such as geo, hydro, photo and thermo.[48] *BrainPOP Educators*, a digital resource warehouse for educators, integrates use of this game within a lesson plan for sixth through eighth graders aligned to Common Core Standards available at www.brainpop.com/educators/community/lesson-plan/ruby-realm-game/.

While games are adaptive to learning, Nolin says it is difficult to say what the effects on student achievement are because there is not a lot of longitudinal data about games for learning and student achievement.[49]

Nolin recommends three things school board members should consider prior to implementing video games for learning in school districts:

• Decide what you want students to learn. Games may not apply to all curricula.

• Teachers and curriculum coordinators need to "drive the choice to adopt those measures in the school," says Nolin. Although school board members can broach the idea, the adoption process should proceed from the classroom to the board room. And, don't forget to include the IT department.

• Review a helpful resource on the topic.

A cultural shift in technology; a philosophical shift in self

With all the benefits that online environments provide, there are some caveats. In a 2012 TED Talk, Sherry Turkle, a faculty member in MIT's Science, Technology, and Society program, explains that technology has produced a cultural shift in "…how we relate to each other" and, by doing so, "how we relate to ourselves and our capacity for self-reflection." Technology now allows people to control and "customize their lives," says Turkle, so they can be connected to others 24/7 "… at a distance, in amounts they can control." The technologies we create, says Turkle, "…give us the illusion of companionship without the demands of friendship."[50]

These uses of technology as communication tools, she says, allow us to avoid the complexity of relationships and, by doing that, lose the richness of conversation. She explains, "We use conversations with each other to learn how to have conversations with ourselves." This lack of conversation hinders our ability to self-reflect, which is crucial to development and the formation of authentic relationships.[51]

While Turkle's comments relate to an array of online technological capacities, video games can be included in such a generalization. Overall, online games for learning can be beneficial to students, but it is important to incorporate them mindfully in the curriculum and balance this pedagogical tool with face-to-face interactions.

Moreover, digital connectivity drives the need for students to understand digital citizenship, so having digital citizenship guides like Suffern's Peggy Sheehy or Siena's *Minecraft* teaching team are important. "You're kind of thrust into a territory with ethical challenges and ambiguity as soon as you become a member of any digital community," says Howard Gardner, the John H. and Elizabeth A. Hobbs Professor of Cognition and Education at Harvard Graduate School of Education.[52]

Commonsense Media (www.commonsense media.org) provides resources about media and technology to parents and teachers to help them navigate children's development concerning these topics. Included in these resources are digital citizenship lesson plans for K-8 that include topics such as Internet safety, digital footprint and reputation, information literacy and cyberbullying (see www.commonsensemedia.org/educators/ scope-and-sequence).

Video gaming is a burgeoning trend in education that, if used wisely, can enhance student engagement and academic performance. Based on research and the current best practices of school districts, NYSSBA recommends that before making decisions regarding the use of video games in the classroom, school board members ensure that the educational end goals drive the decision to adopt gaming; align school district policies, pedagogy and professional development with adoption of gaming initiatives; and garner in-school and community support for this initiative through a clear school leadership vision, a series of meetings, effective communication and opportunities for hands-on workshops.

Note to reader: NYSSBA provides this report as a resource to school board members and other school personnel. With this report, NYSSBA is not advocating for the use of video games as an instructional tool. Such decisions should be made by qualified educators based on circumstances in their school districts.

This report was researched and written by **Gayle Simidian, Ed.D.** research analyst, New York State School Boards Association (NYSSBA).

This report was edited by **David Albert,** director of communications marketing and research and **Barbara Bradley,** deputy director of online communications and project planning.

The report was designed by Communications Associate **Barbara Bennett**.

Footnotes

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