

PLAYING (AND LEARNING) TO WIN

Digital Game-based Learning (DGBL) is an emerging frontier in K-12 learning, as well as a training vehicle already widely and successfully used in the military, business, and industry. As with any transformative practice in education, successful integration into everyday practice in schools takes time and effort — prior to, during, and after phase-in. This paper describes the importance of recognizing DGBL's limitations, evaluating costs vs. benefits, keeping it simple, and supporting teachers.

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*The
Transformative
Power of
Digital Game-
based Learning*

CTE Technical Assistance Center of New York: Mission and Purpose

The Career and Technical Education Technical Assistance Center (CTE TAC) of New York assists the New York State Education Department (NYSED) in carrying out its mission of improving the quality, access, and delivery of Career and Technical Education (CTE) through research-based methods and strategies resulting in broader CTE opportunities for all students.

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CTE TAC services are provided to teachers and students in:

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- Integration of the Common Core State Standards
- CTE program and student leadership expansion
- CTE program approval process
- Best practices in CTE



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Playing (and Learning) to Win:

The Transformative Power of Digital Game-based Learning

Why Schools Must Change

Despite the barrage of (often unfounded) criticism from multiple fronts, schools across the nation really deserve a lot of credit. They have faced more than a decade of pressure to improve student academic achievement as measured by mandated state assessments and, more recently, to implement “fewer, higher, clearer” learning standards with aligned “next generation” assessments and enhanced teacher evaluation systems. The vast majority of educators have responded to those challenges with commitment, persistence, hard work and – perhaps most importantly – a willingness to accept that we must replace educational “old-think” with new visions of how learning needs to keep pace with our rapidly changing global society.

Unfortunately, new standards, new tests, and new performance reviews are critical but not sufficient. Not if we aim to put our schools and our students on the change curve that is happening to all of us, with or without our approval.

Yes, American education must continue its ongoing mission of raising academic achievement for all students, but we as education leaders must also accept the new realities and emerging trends and capacities that did not exist a decade and a half ago, when *No Child Left Behind* catalyzed a national focus on accountability and higher academic performance.

Consider the changes that have occurred around us since then – and are continuing to occur at an accelerated rate – in ways that can (and do) impact public education:

- Reductions in school finance and spending are the norm; government and business are still recovering from the “Great Recession” of 2008. Downsides in tax revenues have necessitated cut-backs and the need for schools to do more with less. According to the U.S. Department of Education, total K-12 public education spending (expressed in constant 2012-13 dollars) decreased from \$657.8B in FY2008-09 to \$632.3B in the equivalent 2010-11 period, the most recent data available. See http://nces.ed.gov/programs/digest/d13/tables/dt13_236.10.asp
- The labor market continues to shift as jobs “in the middle” are automated or outsourced overseas; many traditional occupations are simply disappearing or morphing into new roles. According to CNN Money, June 4, 2014:
...it took just two years to wipe out 8.7 million American jobs, but it took more than four years to recover them all, making this the longest jobs recovery on record since the Department of Labor started tracking the data in 1939. Plus, the jobs that have returned are not necessarily the same ones we lost, nor are they in the same regions. Nationwide, about 4.2 million jobs lost in the crisis were in construction and manufacturing. So far, only about 1 in 4 of these blue collar jobs has trickled back. <http://money.cnn.com/2014/06/04/news/economy/jobs-report-recovery/>
- Any workplace task or activity that can be reduced to an algorithm is increasingly being done faster and more accurately by “smart” machines, shepherded by a few digitally-savvy technicians.
- The workforce itself is aging and retiring, which means more people are relying on government and private pensions and Medicare. It is estimated that 10,000 U.S. adults are retiring every day. See <http://www.pbs.org/newshour/making-sense/is-baby-boomer-retirement-behi/> High percentages of teachers and administrators are part of that exodus and will need to be replaced with qualified, younger newcomers to the profession. Several years ago, the National Commission on Teaching and America's Future reported that “in 18 states, more than an half of the public school teachers were 50 or older, with the average teacher retirement age that year at 59.” Those teachers have all gotten older since then. <http://www.newstimes.com/local/article/Teachers-retiring-this-year-in-high-numbers-4628502.php>

- Technology has become pervasive and has improved exponentially in capacity and capability. Technological advances have accounted for significant percentages of growth in the Gross Domestic Product of almost every developed nation. Communications and information technologies have impacted how we communicate, where and when we get and share information and how quickly we can accomplish tasks.
- As a result, quantifiable data and other information have become pervasive, available and accessible – in some cases raising concerns about security and privacy. More readily collectible and analyzable forms of data have raised the “proof-requirement” baseline. Processes and procedures need to be validated by data. Efficacy has become in-demand, including student achievement.
- Moreover, data analytics – the use of data to look forward, not just in reverse – have become more sophisticated. Ask any consumer-focused Fortune 500 company how accurately its marketers can determine your future brand preferences based on your past purchasing patterns. Consider the increasing use of “student growth models” — How much is the student improving academically? Is he or she on track to progress as expected? — in K-12.

Of course, the key point here is that this is no longer the world that *you* graduated into from high school. And if the last decade made you dizzy, take a seat for what’s to come in the next.

Or get on board. Your students already have a front-row seat and are not growing up with the same “dispositions” or contexts as the students of yesteryear.

Today learning has expanded at a rate that has outpaced our conceptions of teaching. Most of our youth now spend significant time outside the school day engaged in the digital world. They have learned that technology helps them communicate, while it challenges them to think and learn. A student recently told me that his life actually began each day *after* he got home from school! In short, the digital world is where students go to discover and learn when away from school.

We must build bridges to their world, not create walls. Moreover, it is time to bring their world inside the school — inside the school where we as educators profess to develop 21st century learners.

— *Ray McNulty, Dean, School of Education, Southern New Hampshire University*

Fortunately, there is an upside to the transformative changes shaping our world – *and* our students. The convergence of information technologies, data and data analytics, education funding, new approaches to instruction, and other shifts in society provide promising opportunities to prepare students for the world that they will both inherit and shape.

Huge potential is there to improve what and how students learn if education leaders think transformatively – outside the box and beyond the blackboard. There can be amazing payoffs.

And we’re not just playing mind-games.

But should we?

What Is Game-based Learning (GBL)?

Game-based learning is not a new concept. From spelling bees to vocabulary development crossword puzzles to using Monopoly to teach math, entrepreneurship and money management to “Jeopardy-style” science and history quizzes, “Beat-the-Clock” multiplication fact drills, and using dice to teach probability theory — and on to electronic learning games such as *Reader Rabbit* to improve reading skills and *Where in the World Is Carmen San Diego?* to teach history and geography — games have long been used to help kids learn at home and at school.

Games are engaging and take advantage of every child’s (and many adults’) desire to play and experience the sheer fun of winning while building self-esteem and learning new skills in the process. The military and business/industry have also made wide and effective use of simulation “games” in training. The essential point is that game-based learning predates not only computers and the Internet, but also electricity.

But what is a “learning game”? Eric Kloptter, Scot Osterweil, and Susan Salen, in their excellent analysis of game-based learning titled “Moving Learning Games Forward: Obstacles, Opportunities & Openness” (The Education Arcade, Massachusetts Institute of Technology, 2009) suggest that

...some of the critical aspects of what make games powerful learning tools [are] feedback, structure, goals and paths to progress.... Gaming ...requires player to be fluent in a series of connected literacies that are multi-modal, performative, productive, and participatory in nature [that] requires an attitude oriented toward risk-taking, meaning creation, non-linear navigation, problem-solving, an understanding of rule structures, and an acknowledgement of agency within that structure. (pp. 5 and 14). http://education.mit.edu/papers/MovingLearningGamesForward_EdArcade.pdf

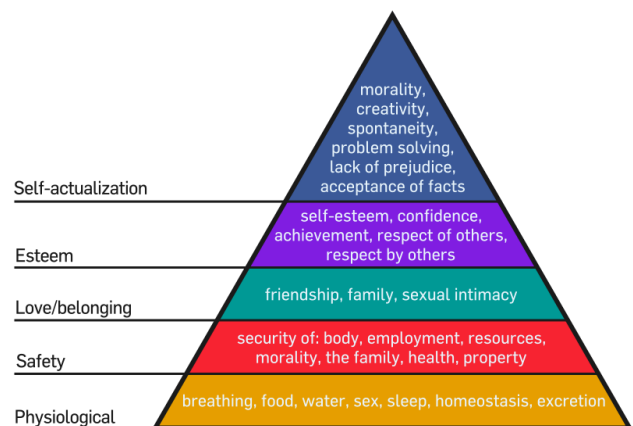
In other words, game-based learning is not just fun for fun’s sake. It has rules, boundaries, and goals; and requires – directly or indirectly – higher-order thinking and “attitudinal” competencies.

Another scholar in the field of game-based learning, Jay Lemke, as quoted in the above resource, speaks of a “stance of playfulness,” which is “a cognitive attitude tied directly to the creative, improvisational, and subversive qualities of play.” See “Games and Learning: Diversifying Opportunity or Standardizing Advantage?” (AERA, 2013) <http://www.jaylemke.com/storage/Lemke%20GamesEquity%20AERA%202013.pdf>

In fact, classroom educators, administrators and education researchers alike generally seem to agree on the advantages and potential of game-based learning. The possibilities are many and varied:

- **Fun is a human need, especially for children.** Kids constantly learn through play, digital or otherwise. Whether through playing peek-a-boo as babies or later in life through sports, tag, hide and seek, playing house or video games, kids like to play and learn from it. Games have the proven potential – intentionally or incidentally – of making learning fun.
- **Games provide active engagement.** Kids learn best when they actively and willingly take responsibility for their own learning. Engagement is an essential ingredient of Quadrant D (high rigor/high relevance) learning in the Rigor/Relevance Framework®. As Ray McNulty explains in *It’s Not Us Against Them: Creating the Schools We Need*, International Center for Leadership in Education, 2009:

“Learners achieve their fullest potential when academic rigor is combined with an equally high level of relevance. ...You can’t help kids reach their highest potential if they are not engaged.” (pp. 64 and 73)
- **Game-based learning provides intrinsic rewards and recognition.** We need not look beyond the top two levels in Maslow’s classic 1943 Hierarchy of Needs (see graphic). Students, like adults, want to be successful and to feel confident about themselves. In this regard, digital game-based learning is especially forgiving. It allows repeated tries at “winning” and provides immediate feedback. Of course, teachers are the ultimate providers of recognition for progress.



Advantages of Digital Game-based Learning (DGBL)

With the increasing capacities of digital technologies and anytime/anywhere access, game-based learning has evolved from the CD-ROM “edutainment” games of the 1990s and early 2000s, which were largely targeted for the home-consumer market and were developed by software specialists, not educators. Games ranged from short and goal-specific – like *Math Blaster* – to longer and more complex simulations that required more complex thinking, such as *SimCity*.

Today’s robust digital game-based learning (DGBL) environment is exploding with education-focused developers, including the major educational publishers as well as spry, smaller, innovative newcomers to K-12 learning resources who focus specifically on digital learning tools.

That said, and cognitive research aside, many teachers (including thought-leaders) have formally and informally observed in classrooms the many potential advantages of DGBL. According to a 2013 survey by the Joan Ganz Cooney Center, conducted by VeraQuest:

- Half of K-8 teachers use digital games two or more days a week; 18% use them daily.
- Roughly 70% feel that “lower-performing students engage more with subject content with use of digital games.”
- 60% noted increased attention to specific tasks and improved collaborations among students.
- 60%-plus said that digital games “help personalize instruction and better assess student knowledge and learning” and “make it easier to level lessons and effectively teach the range of learners in their class.”

See Digital Games in the Classroom: A National Survey

<http://www.joanganzcooneycenter.org/2014/06/09/digital-games-in-the-classroom-a-national-survey/>

There are many reasons to investigate the use of DGBL:

- **Kids are “digital natives.”** According to the second annual Halifax Insurance Digital Home Index, one-third of 7- to 8-year-olds, two-thirds of 9- to 11-year-olds, and nearly nine in 10 12- to 14-year-olds have a mobile phone. Common Sense Media’s report “Zero to Eight: Children’s Media Use in America 2013” indicates that the percentages of all children 8 and younger who have ever used smartphones and tablets increased between 2011 and 2013 from 62% to 75%; the percentage who had never used either dropped from 62% to 38%. The amount of time spent using these devices in a typical day has tripled, from an average of 5 minutes per day among all children in 2011 up to 15 minutes a day in 2013. Among those who use a mobile device in a typical day, the average went from 43 minutes in 2011 to 1 hour, 7 minutes in 2013. <https://www.common Sense Media.org/sites/default/files/research/zero-to-eight-2013.pdf>
- **DGBL enables individualization of instruction.** With growing enrollments and class sizes, even the best teachers struggle to address individual student needs. The capacity of digital learning — and of DGBL in particular — to do so efficiently and effectively allows teachers more time with individual students.
- **The most effective forms of DGBL are adaptive to learner needs.** This is an extension of individualization. Effective teachers know how to match students’ ability levels with learning needs and tasks, but are forced to make subjective judgments for many students at the same time, often without sufficient data. DGBL uses computer-managed data collection, analysis and analytics to find the right learning level for each student. Students move “down” or “up” the hierarchy of skills, so that every student is learning at her/his appropriate level of difficulty and can gain confidence by experiencing success.

Experts on the Key Notion of “Adaptive Learning”

To be truly effective in schools, adaptive learning must meet certain criteria.

- **Range of complexity of content**

Credible adaptive technology must be sensitive to the specific knowledge and skills that a student does and does not know. Performance on content standards begins with understanding

foundational knowledge and skills. The adaptive engine makes sure that the foundational skills recognize the learning levels of individual students. What is foundational for a struggling learner is not foundational for an accelerated learner. The curriculum must be a blend of rigorous material for advanced learners and also provide less rigor for remediation for struggling learners.

– *Margaret Jorgensen, Ph.D., LTS Education Systems Advisory Board Member*

○ **Precise skill sequencing**

Adaptive learning is grounded on the correct sequencing of the skills. To accomplish this, there must be a combination of empirical evidence of content difficulty based on what students at specific grade levels can do and what they struggle with. It also requires a logical structure consistent with each content domain so that students are not driven through the content only by content difficulty, but by content difficulty within strands that are logical and help the student connect the dots between the skills and the ultimate end game of rigor in each discipline. This combination is achieved when seasoned educators with detailed knowledge of their subject matter in each specific grade examine the empirical analysis and validate the strand structure by grade and content area.

– *Margaret Jorgensen, Ph.D., LTS Education Systems Advisory Board Member*

○ **Engaging experience**

Effective adaptive technology must be embedded in an engaging learning experience that is more motivational than any traditional instruction, so students want to stay focused and on task longer. This results in more learning for more students, as well as more current and accurate information that both drives the adaptive engine and shows what each student is struggling with. Equipped with this information, teachers can do what they do best – direct differentiated instruction.

– *Brian M. Shulman, Founder and CEO, LTS Education Systems/Stride Academy*

- **DGBL promotes active learning.** Game-playing integrated with learning is, by its nature, “active.” Kids learn when they “do.” DGBL is learning by doing. Enough said.
- **DGBL is multi-sensory.** Sight, sound and touch all come into play to address different learning styles.
- **DGBL offers support when needed.** Digitally-managed instruction can alert the teacher that intervention is needed and offer support to the student.
- **DGBL can address short-term and long-term learning goals by monitoring and supporting growth.** With increased emphasis on the use of achievement data and growth models, the analytic and predictive capacities of robust DGBL provide teachers with constant and current information to use in assessing student achievement and development.
- **Immediacy is good.** Quick, which is better: Being first in line at the checkout or 27th? Waiting 3 minutes for Internet connectivity or 3 seconds? Seeing results of learning efforts and getting feedback – positive or otherwise – work best when provided in a timely – even immediate – fashion. Quality digital learning operates at “nano-speed” to engage learners continually and to provide teachers with the most current data.
- **DGBL’s scalability is efficient and effective.** Migrating to or expanding the use of DGBL in a district, school or classroom doesn’t have to happen overnight. Usage can start small, with a limited number of students, teachers, digital devices or timetable slots.
- **DGBL is private, respectful, forgiving and therefore “embraven-ing.”** No one likes to fail or be seen to fail when attempting a task, especially students who may lack self-confidence or who have become defensive and therefore fear peer or adult ridicule. In extreme – but surprisingly frequent – cases, such anxiety has a clinical name, *atychiphobia*, which is defined as “a persistent, abnormal, and unwarranted worry of failure.” See <http://www.phobiasource.com/atychiphobia-fear-of-failure/> Fortunately, the vast majority of students never reach the phobic level, but almost every student learns best in a forgiving environment in which mistakes are noted in private, followed by constructive and empathetic corrective hints, prompts

and encouragement to “try again.” That environment is respectful and supportive and encourages students to take risks and not be afraid of getting something wrong. This approach promotes learning from mistakes – i.e., by trial and error.

- **DGBL provides “stretch learning.”** Similar to learning by trial and error and taking chances, DGBL encourages students to reach higher and “up their game” by accepting and embracing more difficult learning challenges involving more rigorous knowledge — in terms of the Rigor/Relevance Framework, moving from Quadrant A (low rigor/low relevance) to Quadrant C (high rigor/low relevance) — or higher orders of application — moving from Quadrant B (low rigor/high relevance) to D). Stretch learning is one of the four components of the *Learning Criteria* that emerged from the SPN/ICLE 2003-2008 Gates Foundation-sponsored research study of *America’s Most Rapidly Improving Schools*. Successful schools embed stretch learning into their curriculum.
- **Feedback/assessment is automatic.** The best examples of DGBL have robust and computer-managed tracking/assessment/monitoring/recordkeeping functions that exceed the capacity and accuracy of even the most conscientious teacher or aide, especially for multiple students, each working on different activities and at different levels of ability. Moreover, DGBL can have adaptive capabilities that adjust learning activities to individual student needs.
- **“Open-ended” or “closed”:** DGBL offers different approaches and benefits. “Closed” learning games are targeted at specific learning outcomes, such as understanding subject-verb agreement or solving systems of equations. Their objective is focused on specific learner needs and addressing gaps in learning. The student still has control, goals and fun, but the “pathways” to reach the objectives are more directed and restricted. Students win by getting the right answers. “Open-ended” DGBL is more of a “journey” involving decision-making, creativity and options, with fewer forced choices and more room to be inventive and exploratory. Simulations, such as experiments, exploratory “field trips,” and projects (e.g., running a business or constructing an amusement park) offer a wide range of typically interdisciplinary challenges. Closed DGBL tends to be “chunked” into short time blocks. Open-ended DGBL requires longer blocks of time, sometimes days and weeks, and may be better suited to extended learning outside of class time, similar to a major report or research project.
- **DGBL is anywhere/anytime.** Teacher-led instruction is limited to available class times and bell schedules. DGBL works anywhere and at any time of day: in class, after school, during summer or winter vacation, at home, in the library, on the school bus, at grandpa’s cottage, wherever a computer or tablet can go. And these devices don’t require sleep or lunch breaks.
- **Forms of DGBL can be played solo, collaboratively with teammates or competitively.** Each mode has its benefits and purposes.

And finally, but not least importantly...

- **DGBL is both efficient and cost-effective.** In a time when school funding is limited and already-overloaded teachers are being asked to do more with less, DGBL provides a cost-considerate and reliable way to give more students the attention and support they need and deserve, allowing more time for teachers to provide one-on-one support to those who need it most.

In short, there are multiple benefits from the use of DGBL that teachers, administrators and education stakeholders can exploit to the advantage of their students’ engagement and learning.

Which Way to Start with DGBL: Simple vs. Complex?

The obvious and most pedestrian answer to that question is, of course: It all depends.

The varieties, purposes, levels of complexity, cost ranges, levels of infrastructure needed – including teacher training and support – school culture and other variables in the use and value of DGBL are vast. And increasing.

Before deciding to embrace DGBL, certain determinations need to be made.

1. **Be clear on needs, goals and purpose.** Determine the perceived needs that DGBL is intended to help address. Is the issue learner engagement, academic proficiency or both? Is there a desire for more enrichment or stretch learning? Do you want DGBL to help address socio-emotional skill development in such areas as group collaboration, team building, peer communication, respect for other students, confidence-building and so on? As stated by Klopfer *et al.*: “Games work well for many audiences, topics and contexts, but they may not be the best tool for all audiences for all topics in all contexts.”

If the concern is raising academic achievement around specific standards or topics, tutorial-style games for individuals may be the optimal choice. These may be particularly useful if teachers and other human resources are overstretched or limited. If the purpose is to provide students with enrichment in the realm of applying higher-order thinking skills, simulations or discovery/exploration/field trip games can deliver these enhanced learning opportunities.

Just be clear on your needs and purposes. It’s easy to be either overly cautious or overly ambitious in introducing DGBL into a learning environment.

2. **Don’t overreach and move too fast, too soon, too elegantly.** Or too slowly. Start simply and expand usage incrementally, adjusting as experience and experimentation indicate. The teacher or teachers who have endorsed or expressed interest in DGBL may be the best candidates for initiating use of DGBL in their own classrooms. Bill Daggett has referred to them – complimentarily – as the “lunatic fringe” who are ready to try anything that holds promise for enhancing student learning. Let the “naysayers” or “agnostics” keep their worksheets until gradually, a number of them will become curious, recognize the advantages of DGBL, and take the plunge. The die-hards will likely never be won over so let them stay behind and mutter among themselves that “this, too, shall pass.” DGBL can be - and probably should – evolutionary, not revolutionary.

Of course, implementation and ongoing costs – both direct and indirect – are also a consideration. Yes, quality DGBL involves additional expense, but also provides an impressive return-on-investment, especially in terms of enhancing student learning and achievement – a primary goal that cannot be optimally achieved without incurring additional expense. Think of the alternative.

And remember: the least expensive DGBL may be least expensive for a very good reason. Quality in DGBL matters. Planning and phased-in implementation will help control costs.

3. **Don’t confuse entertainment (or “edutainment”) with learning.** Many of the early “education games” (mostly home versions) played on consoles and PlayStation-type platforms and many digital “learning games” were and are of questionable education value. This issue may have been caused initially by game creators overly catering to the home market and with an overemphasis on digital “sizzle” versus educational substance. As Brian Shulman, Founder and CEO of leading DGBL developer and Successful Practices Network partner, Academy, points out:

“... looking back at the 80’s and 90’s... the new edutainment offerings... did well and then flamed out. Essentially, the companies messed the whole thing up by focusing more on the business aspect rather than listening to customers. High development costs coupled with downward pricing pressures in the competitive (primarily) consumer/retail marketplace also dis-incented developers to invest in new products.” (See also Carly Shaker, *What in the World Happened to Carmen Sandiego?* 2012. The Joan Ganz Center at Sesame Workshop.)

Today, with the lower cost and logistic of online delivery of DGBL and the proliferation of platform-compatibility, the return-on-investment issue has been largely solved. But more importantly, the most successful DGBL developers now focus on teachers and listen to their needs and advice in designing digital learning games.

Innovative educators who embrace DGBL should also be mindful of how the “gamification” aspect within the DGB learning model operates. Is the educational/learning value of the DGBL overly subordinated to the entertainment value? How is the “games” dimension used to enhance learning? Do the games make sense in the larger DGBL context? Are the games fun, engaging, and deemed worth playing by students?

- 4. Choose the most appropriate – “short-form” vs. “long-form” – types of DGBL for the intended classroom use/purposes.** Choose among- long- and short-form gaming (i.e. individual and group simulations and discovery projects that provide options, choices, and alternative pathways to “win” – each with its own advantages and disadvantages) can be both engaging and powerful. The best-of-class long-form games also create virtual scenarios that require players to experience “being there” and to practice high-level decision-making and exercise advanced levels of reasoning.

In contrast, short-form DGBL is narrower in scope and often focused on specific academic skills and knowledge. Examples are tutorials or remedial/intervention activities that address new or previously taught content. Options are more limited, and students are monitored and assessed from lesson to lesson or level to level as they progress through the learning. Both forms of DGBL serve a purpose, and each provides value to students.

Many educators applaud the value of long-form DGBL, but also see some limitations:

- It is time-consuming if used in class.
- It involves complex learning that may require guidance and oversight from already-overburdened teachers.
- It can be challenging to monitor, assess, track and report student progress.
- It often is more expensive than short-form DGBL.

All of that said, long-form DGBL offers intrinsic and important value, but short-form DGBL may be a more manageable starting point for schools.

- 5. Use forms of DGBL that are kid-friendly, but functionally robust.** Teachers are busy enough, and quality DGBL should offer sufficient advantages that ease and enhance teaching duties and responsibilities, not complicate them. Look for DGBL resources that are easy for students to use, require minimal teacher management and oversight, align to key standards, provide continuous reporting of student achievement and – this feature may trump all others – are adaptive to individual learners. The most effective and efficient forms of DGBL “manage traffic” for teachers, tracking each student’s progress, and – like a human tutor or coach – provide feedback, praise and encouragement while directing the student to the learning outcome(s) s/he needs to master, in the right sequence, at the right time, with the right pacing and with close monitoring and recording of all related achievement data. DGBL cannot replace the teacher. However, it can effectively “sub” for that teacher and do so with infinite patience, awareness, tracking and directing capacity and with empathy and embarrassment-free forgiveness.

Some of the more sophisticated forms of DGBL go further and offer the convenience and advantage of allowing teachers to upload their own content (lessons or assessments) into the DGBL platform’s database. The power to do so not only helps teachers and curriculum specialists “localize” and customize content to maximize its relevance and currency for their students, but also provides educators with an enhanced sense of ownership and control of their digital “teaching assistant.”

- 6. Provide teachers with support and professional development in the use of DGBL.** As with any new instructional method, teachers will need technical assistance to become comfortable with DGBL and use it effectively. Training must involve understanding how the DGBL itself “works” and its functions, capabilities, “rules” and systems. In addition, quality teacher support should help teachers gain confidence in their evolving roles as learning facilitators – as opposed to being a traditional “front-of-the-room” dispenser of knowledge, assigner of all activities and tracker of learning and progress. This new role also involves the ability to analyze data, to recognize when direct, in-person intervention with

individual students is needed and to communicate the advantages and benefits of DGBL to administrators, colleagues and parents.

Any change brings with it challenges, and no system or specific type of DGBL will ever be a panacea. There will always be skepticism about any potentially transformative or disruptive change in a school's game plan. It is important to address issues related to the school culture – typically by putting on the table and openly discussing *why* change is needed before introducing *what* or *how* to change. A thoughtful needs assessment – arrived at collaboratively and in advance of introducing DGBL into the school or classroom – will pay dividends in supporting a culture shift with efficiency and effectiveness.

Effective and Emerging Best Practices in DGBL

There are many promising examples of DGBL resources available to districts and schools.

The not-for-profit Successful Practices Network, an educator support and research organization founded in 2003 by Bill Daggett, has been partnering and collaborating with Stride Academy/LTS, a DGBL-focused, innovative educational organization. The goal is to identify best practices and collect teacher/administrator experiences with DGBL that can be shared with other educators across the country.

Brian Shulman founded LTS (LTS Education Systems) in 2001 after recognizing the need to reach at-risk youth and teach them basic skills in a new and engaging format, online and using motivating video games and competitions among peers. For over a decade, LTS's work has focused on reaching underperforming students to improve academic outcomes, while continuing to challenge their high performing peers – using one platform for all types of learners. They accomplish this through DGBL and an adaptive diagnostic technology that teaches skill acquisition at the right pace that each student requires.

LTS's Stride Academy "edugaming" platform been shown to be highly effective in improving math, reading and science test scores – as well as behavioral issues – in classrooms across the country. See some of Stride's success stories, reviews, case studies and results at <http://www.ltseducation.com/research.php>

The Stride Academy/LTS instructional resources align well with the attributes of efficient and effective DGBL and have some unique attributes:

- **Adaptive Learning.** Stride Academy/LTS's adaptive diagnostic technology identifies and remediates only the skills and sub-skills that a student has not yet mastered – not the entire strand to which a skill belongs – saving learning time and ensuring that students focus on the foundational areas where they are struggling most, not relearning skills in areas where they are already proficient.
- **Comprehensive Curriculum.** Personalized learning paths address preK-12 education using a rich database of questions, problems, rationales, reading passages, video lessons and printable lessons, designed by educators to deliver grade-level appropriate content and end-of-course content aligned with the Common Core and individual state standards.
- **Automated and Robust Reporting.** Flexible, on-demand reporting enables teachers to view exactly the data they need to continuously monitor progress, inform instructional decisions and provide accountability. Educators can generate data in a variety of formats in real-time. The platform provides usage reports, diagnostic reports, student grouping reports and assessment reports at multiple levels: individual student, class-wide, school/site-wide, and district-wide.
- **Learning Tools for Students.** An integrated and embedded "multimedia toolkit" allows students to personalize learning with adaptive skills practice questions, instructional video lessons and printable, offline lessons selected especially for them. Teachers can also supplement Stride Academy's embedded learning tools by uploading their own instructional materials for automatic delivery to students, or select from fellow teachers' resources made available to them.
- **Data-Rich and Customizable to Meet Individual Needs.** School data from the school's and classroom's own formative and summative assessments can be imported into the Stride Academy system's adaptive

engine to place students exactly where they need to be in the program and map their personal learning paths moving forward.

- **Blended Learning.** The combination of individualized online practice and informed, dynamic teacher-led instruction creates an inclusive learning environment in the classroom. All students feel actively engaged and connected.
- **Choice of Short-form Game Genres Reward Students of Varying Interests.** Game-playing doesn't interfere with learning, but is "earned" as a reward for mastering academic content in which students "win" and accumulate "coin" credits, earn badges and compete on a "leaderboard." Genres include arcade, physics, logic, puzzle and sports — all with high-quality graphics — and offer fun, rewards and competition without interfering with essential learning.
- **Game-building and Sharing.** The StrideBuilder™ program uses simplified visual HTML5 game-creation tools to allow students to build and share their own games while learning basic computer programming and design skills.

If we consider the many reasons to investigate the use of DGBL \discussed previously – for example, student engagement, active learning, individualized and adaptive instruction, kids' natural attraction to both games and the digital domain, robust data management and so on – the Stride Academy/LTS instructional platform and resources align positively with the many potential benefits of DGBL for both students and teachers.

To learn more about Stride Academy/LTS and about DGBL in general, watch a video and test-drive a Stride Academy demo, visit www.strideacademy.com.

Summary/Conclusion

DGBL is an emerging frontier in K-12 learning, as well as a training vehicle already widely and successfully used in the military, business, and industry. As with any transformative practice in education, successful integration into everyday practice in schools takes time and effort — prior to, during, and after phase-in. Be sure to reflect on the benefits and caveats describe earlier in this paper:

- **Recognize DGBL's limitations.** Teaching and learning are complex activities, perfect panaceas are rare and every school improvement/ transformation initiative has its challenges as well as its benefits and rewards.
- **Evaluate costs vs. benefits.** Define the costs associated with DGBL and justify the expense in terms of resources, enhanced infrastructure, time, student digital devices, professional development, opportunity costs, and so on. Identify and estimate both direct and indirect costs. Measure all variables, including quantifiable and other results. And remember that DGBL is scalable; it can be phased in over time, according to school culture, needs, affordability and efficacy.
- **Keep it simple, at least initially.** Short-form DGBL may be more manageable, measureable and practical within most classrooms. Starting small and simply will help energize DGBL awareness, planning and implementation.
- **Support teachers.** DGBL challenges some "sacred" assumptions about what effective teaching is and what high-quality teachers do in the classroom. For many teachers, DGBL is a no-brainer. Other teachers – even excellent and deeply committed ones – may feel overburdened, skeptical, challenged, or even threatened by DGBL. Provide ample technical training, professional development, assistance, support and – yes – patience in any implementations of DGBL.

Keep an Eye on the Prize

Imagine if kids poured their time and passion into a video game that taught them math concepts while they barely noticed, because it was so enjoyable. As students play, their progress is visible to the teacher on his or her computer, allowing the educator to see instantly what concepts students understand.

– Bill Gates

The ideal of interactive, highly-engaging training and education is ancient. A Chinese proverb says: "Tell me, and I'll forget. Show me, and I may remember. Involve me, and I'll understand."

However, the gap continues to grow between antiquated, passive training methods and a workforce that lives an ever more interactive, multimedia, user-controlled lifestyle. With game-based learning tools to bridge that gap comes the promise of vastly more productive and engaged students and workers—ones who embrace learning rather than view it as ... disruptive.

– Jessica Trybus, Carnegie Mellon University

And Finally...

Although Stride Academy/LTS is currently partnering with SPN in DGBL research, there are a number of high-quality, educator-focused game-based learning developers passionately and creatively at work in this emerging frontier of learning and instruction. We encourage readers to investigate all resources and the emerging bodies of research.

To help advance our ongoing research, SPN and Stride Academy would also be grateful to receive from educators any examples of DGBL best practices that will inform the efforts of districts and schools across the nation. Your comments are very welcome and appreciated. Please contact:

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