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Video Games in the Middle School Classroom

* *This We Believe* Characteristics

- Students and teachers engaged in active learning
- Multiple learning and teaching approaches that respond to their diversity
- Assessment and evaluation programs that promote quality learning

*Denotes the corresponding characteristics from NMSA's position paper, *This We Believe*, for this article.

Elizabeth Simpson & Frances A. Clem

During the fall 2005 semester, an eighth grade teacher in a Laramie, Wyoming, middle school made an urgent plea for more progressive tools for a beginning computers course. Janet Johnson, a veteran teacher returning to the classroom after a hiatus of 10 years, was frustrated with the apparent lack of motivation and engagement by the students. She knew the existing curricular materials were outdated and "mind numbing" and was seeking methods more relevant to this generation.

In response, the school district decided to try a radical departure by helping Ms. Johnson implement a pilot curriculum built around a commercially available video game. The project was conducted as a pilot to design a unit plan supported and anchored by a video game simulation.

Albany County School District in Laramie, Wyoming, has begun to take a hard look at whether teachers' techniques are sufficiently up to date for today's learners and whether the teachers know how to integrate new tools to motivate students. This article describes a pilot project to integrate commercially available video games (games that are not primarily intended as learning tools but have inherent learning value, sometimes referred to as "edutainment" games) into a middle school curriculum to hold students'



interest and capitalize on their strengths, while continuing to meet standards.

A new generation of learners

Why are new teaching methods and teaching tools necessary? The current crop of learners differs in significant ways from previous generations because, unlike their predecessors, they have literally grown up "digital." Several main cognitive style changes have been observed in the digital learner generation (based on Beck & Wade, 2004, Deubel, 2006; Glasser, 1998; Prensky, 2001):

- Digital learners are "on-demand," autonomous learners, proactive in determining what information they need and seeking it from the environment to meet their own self-determined goals.
- They tend to process information at "twitch speed," determining what is or is not useful in a matter of seconds, versus conventional speed where information is given, reflected upon, and stored for use at a later date.
- This generation relates to graphics first, versus traditional information acquisition of text first.
- Digital learners tend to learn best through trial and error—random-access versus sequential-direct instruction.
- This generation solves complex problems best within collaborative learning groups, in relevant settings, rather than acquiring skills through isolated learning activities.
- They are active participants in their learning; they "do" first and ask questions later. Failure is a necessary learning experience. If they fail, they press restart and continue where they left off. They are persistent and goal-oriented.
- Technology is an artifact of their culture. They depend on technology daily to meet their needs. They have developed elaborate communication systems built around this technology, which connects them instantly to any information they may seek; unfortunately, most teachers do not allow them to use these tools in the classroom (Bushweller, 2006).

At the same time the student population is getting harder to teach and motivate with traditional approaches, our teacher population is aging. In the Laramie, Wyoming, school district 61% of teachers are over 45 years old; 43% are over the age of 50. In the U.S., in general, more than 25% of teachers are over age 50; the median age of teachers is 44, according to the National Center for Educational Statistics (2000). These teachers are steeped in valuable content knowledge but need new pedagogical strategies to meet the needs of today's learners.

Teachers need methods that create what Covey (2004) referred to as win-win outcomes. With win-win accountability, students evaluate themselves as learners, team members, and contributors to the knowledge needed to solve the problem presented. Covey suggested that teachers explain course goals to kids, then give them the basic requirements for reaching those goals and help them come up with their own understanding of what they want to accomplish.

What Covey suggested closely resembles the learning strategies students use when learning and playing very complex video games.

Video simulation games as learning tools: Game-based learning

Students' experience outside of school with commercially available video simulation games gives them an environment in which learning tends to be fast-moving, self-determining, demanding, graphically oriented, proactive, and technology-driven and supported. These experiences tend to guide students' expectations of learning environments, which poses considerable challenges for educators, especially those who have less digital experience than their students.

Why should experienced teachers modify their curricula to accommodate the needs of digital learners? According to Deubel (2006), the use of video simulation games has great potential in the classroom. "Simply put: It motivates by virtue of being fun. It's versatile, can be used to teach almost any subject or skill and, when used correctly, is extremely effective. What's more, its use is supported by constructivist theory, which calls for active engagement and experiential learning" (p. 1).

This should not surprise us. As educators, we know that students learn more if they are actively engaged. Video games are designed to be engaging: 92% of children ages 2–17 play video and computer games (National Institute on Media and the Family, 2001). And middle schoolers are the most avid players; eighth grade boys average 23 hours a week and girls 12 hours, according to a study released in 2004 by Michigan State University. Research shows that motivation yields time on task, and time on task yields learning (Marzano, 2003). Teachers may not realize that simulation video games employ proven instructional practices that increase motivation such as these: allowances for individual differences, active participation, repeated practice, immediate feedback, realistic contexts, relevant goals, and social interaction.

Video simulation games have a number of advantages in the classroom. They allow students to practice skills that would otherwise be too costly or too difficult to implement in the classroom, such as engaging in simulated virtual business activities or medical procedures. They encourage visualization and creativity in finding new ways to deal with a problem or influence a story (Gee, 2003) while still being able to cater to individual learning styles. For example, many games allow the player to adjust the level of difficulty of the play, make choices regarding how the game works or how it appears to the user, even change the language and add new challenges. Gamers refer to this as "modding" the interface and are always checking games for that type of flexibility (Kirriemuir, 2002). Games put the learner in the role of decision maker and push players through ever harder challenges; players learn through trial and error as the games give immediate feedback via specific consequences. The instant feedback and risk-free environment invite exploration and experimentation, stimulating curiosity, discovery learning, and perseverance (Kirriemuir, 2002).

Many teachers may feel that video simulation games are inappropriate to classroom environments due to violence or inappropriate content. But there are many commercially available video games that are neither violent nor titillating. Examples of such games and the learning content they connect to include:

- Business and Economics: *Restaurant Empire*™ (Enlight Software), *Zoo Empire*™ (Enlight Software), *Oil Tycoon*™ (Global Star, Soft Enterprises), and *The Apprentice*™ (Legacy Interactive)
- Social Studies: *Civilization*™ (Sid Meier), *Capitalism*™ (Enlight Software), *Age of Empires*™ (MS Game Studios, Ensemble Studios), and *Emperor: Rise of the Middle Kingdom*™ (Sierra Entertainment)
- Health and Science: *911Paramedic*™ (Legacy Interactive), and *Spore*™ (Electronic Arts)
- Language arts: *The Sims*™ (Electronic Arts)

It is important to note that commercially available video games tend to employ far more sophisticated graphics and simulated playing environments than typical educational simulations. They have been developed with large-scale initial investments to compete on the open market. Youngsters are familiar with this degree of sophistication and have come to expect it in games. In fact, the Federation of American Scientists (2006) recently released a report suggesting that "video games can redefine education."

Why are more of these rich learning environments not being incorporated in the classroom setting? Can they be used to meet the rigorous accountability requirements placed on teachers today? What do teachers need to know to successfully employ these tools in the classroom?

The pilot project

This teaching project was developed to see if commercially available video games could feasibly be used in classrooms to meet Wyoming content standards (see Figure 1). We sought to answer two questions at the student level and two more questions connected to the teaching approach itself.

Figure 1

Rubric based on Wyoming Vocational Standards for *Restaurant Empire*™

Resources	Effective workers know how to allocate time, money, materials, work space, and human resources in both personal and workplace settings.
Interpersonal Skills	Effective workers can work on teams, teach others, communicate, lead, and work with people from culturally diverse backgrounds.
Information	Effective workers are expected to identify, assimilate, and integrate information from diverse sources; they prepare, maintain, and interpret

	quantitative and qualitative records; they convert information from one form to another and are comfortable conveying information, orally and in writing, as the need arises.
Systems	Effective workers understand social, organizational, and technological systems. They understand how parts of systems are connected, anticipate consequences, monitor and correct performance, and design or improve systems.
Technology	Effective workers select equipment and tools, apply technology to specific tasks, and maintain and troubleshoot workplace technologies.
Careers	Career development is the process through which an individual comes to understand his or her interests, knowledge, skills, and aspirations and begins to make informed career decisions. The process consists, at a minimum, of (1) career awareness, (2) career exploration, (3) career planning/decision making, and (4) career preparation. Students develop through a continuum of career awareness, career exploration, and work exposure activities that help them discern their own career paths.

Questions at the student level:

- Would the use of video games improve student engagement?
- Could students learn effectively from a game-anchored lesson?

Questions about the teaching approach:

- Could teachers use the simulated environment within the game to anchor students' learning?
- Could game play be connected effectively with content standards?

The authors worked with the teacher, Ms. Johnson, to look at whether the simulation video game, Enlight's *Restaurant Empire*[™], could be used as a curriculum tool to ground students' experiences and activities in such a way as to effectively help the class meet state vocational standards.

The researchers were also interested in how the students responded to the use of the game as a teaching tool and what teachers needed to know if they wanted to implement the use of commercial video games in their classrooms.

Ms. Johnson's 12-week beginning computers class was intended to teach MS Word[™], spreadsheets, and presentation software. The class included twelve 13- to 14-year-old students. The pilot teaching project replaced three weeks of the regular curriculum with the pilot project,

which was designed to meet the same goals, using different tools and methods. During the project, students were put through a lesson using a simulation video game as a tool to ground their learning and meet the vocational education standards. The population consisted of four females and eight males. Three of the males were identified as "at risk," and one had a learning disability; he usually had an aide accompany him to all of his classes except the class in which we were conducting the study, presumably because the class was very hands-on. Of the females, one was not a native English speaker.

Enlight's *Restaurant Empire*™ was chosen because it presented the students with an opportunity to work together in teams to run a business. The game presents this challenge to the player:

Starting with nothing except some cash and a passion for food, build a restaurant from the bottom up—hire waiters, decorate, even cook the meals! Buy, build, outsell and under-price your competition. (*Restaurant Empire*™ Players Manual)

Project procedures

Prior to beginning the project, we engaged students in an activity to find out what they knew about the restaurant industry as well as what they wanted to know (Figure 2). The students' experience with the restaurant business varied widely; one student responded that she had worked as a server and bus person in a local restaurant, but the others indicated that they had little experience other than as customers. Ms. Johnson shared with the students that they would be trying something new by bringing in a simulation video game for them to learn the restaurant business while they practiced their computer skills. The students were excited, and immediately the morale of the class changed from disengaged and defiant to upbeat and optimistic.

Figure 2

Setting a conceptual framework

Activity

Have teams examine their preconceptions regarding the restaurant business.

- What makes a restaurant successful?
- What are some jobs that are available within the restaurant business?
- What has been your experience working in a restaurant?
- What are some ways in which restaurants can better serve their customers?
- What is the cost/expense ratio of running a restaurant?
- Tell me about a restaurant you would like to own and why.
- What does location and interior/exterior design have to do with whether a restaurant is successful or not?
- What academic skills are necessary to work in a restaurant?
- What other kinds of skills are necessary to work in a restaurant? (technology, human relations, specialized skills such as cooking, etc.)

The unit plan was based on a problem-based learning (PBL) model (Camp, 1996)¹ that used *Restaurant Empire*[™] to anchor the skills associated with Wyoming's Vocational and Career Standards (Figure 1). PBL aligns with constructivist principles and requires authentic, complex tasks. It emphasizes learner "ownership" of the task or problem, the solution, and the process by which the solution is reached. Knowledge is socially negotiated and learners must have opportunities to reflect on both the content learned and the learning process (Savery & Duffy, 1995). Unique in its emphasis on the integral nature of core content and problem solving, PBL learning challenges students to "learn to learn" (Ngeow & Kong, 2001).

The students worked in teams of three students to one game, allowing them to meet the standard for interpersonal skills. Within the teams, students had unique roles for which they were responsible. Each player on a team took one of three roles (Figure 3). All team members kept individual journals regarding their personal performance in their activity and team collaboration.

Figure 3

Roles and responsibilities for restaurant teams

Role Title	Responsibilities
Human Relations/ Customer Relations	<ul style="list-style-type: none"> • Checks customers satisfaction during determined intervals • Keeps log of customer complaints • Does all of the hiring and firing. Must consult with the team but has the ultimate decision • Keeps a log of who has been hired and fired and the reasons for the actions taken
Food Manager	<ul style="list-style-type: none"> • Determines the menus • Sets up the kitchen • Makes sure all the food is bought and supplies are filled
Finance Manager	<ul style="list-style-type: none"> • Sets the spending allowance for each activity based on money available—set at the beginning of the game • Keeps a spread sheet of how money was spent and money available at the end of game play each day. Could have a laptop with Quicken® and MS Money® to work • on during game • Advises other team members regarding cash flow

The game challenges players to plan, design, set up, and successfully run their own restaurant. Almost every possible aspect of running a restaurant is simulated, from hiring staff and deciding on restaurant décor to deciding on menu items and food ingredients, all within a predetermined budget. The lesson design gave the students as much autonomy as possible; direct instruction was driven by the students on demand and only employed when the students had a "need-to-

know" barrier to their progress toward running a successful restaurant.

Evaluating learner outcomes

We wanted to know whether students could learn effectively from a game-anchored lesson and whether such a lesson would improve their engagement in the class. A challenge for the project was determining how to assess the learning supported by use of the video game, because commercial video games do not have performance tracking built into them, apart from the players' or the teams' scores. However, the results of the game (in terms of the success of the teams' virtual restaurants) allowed for an independent and objective assessment of the learners' ability to grasp, absorb, and consolidate the content areas required for both the class and the game. It also gave the teams feedback on whether they were making successful collaborative decisions.

We also used performance-based assessment, meaning assessment of the processes that the teams engaged in during the course of play. Students had to build spreadsheets and presentations to illustrate and support their success in playing the game. The students also kept journals using MS Word™, which provided insight into learners' ideas and reflections and indicated where learning beyond that expected by the basic curriculum was occurring. The evaluation data (i.e., the PowerPoint presentations, Excel spreadsheets, and MS Word documents) were essentially the same as students would have produced without the game anchoring the lesson; the game provided engaging, motivating content for the tasks.

At the end of the unit, students met with a panel of local restaurateurs. Students prepared and asked the panel questions that would show how well their simulated restaurant experience reflected real-world conditions. Again, the session was taped; students' questions ("How much of an initial investment did you start with?" "How do you train your employees?" "What kinds of customers were you trying to attract?" "How did you get into the restaurant business?") clearly demonstrated their increased sophistication regarding the restaurant business.

At the end of the course, students were asked to evaluate their own learning, using a rubric (Figure 1) based on Wyoming vocational standards. They performed a self-assessment of their perceived success in meeting the standards and commented on what features of the games and the lesson approach supported or hindered their success (Figure 4).

Figure 4

Students' rubric-based feedback after the pilot class

Vocational Standard	Met Yes	Met No	Students' Comments Pro and Con
			<ul style="list-style-type: none"> The game itself helps both because it shows problems

Resources	11	1	<ul style="list-style-type: none"> both real and unreal. Learned more about food of the restaurant.
Interpersonal Skills	6.5	5.5	<ul style="list-style-type: none"> If they know how to make friends they'll know how to communicate. Different opinions from everyone in the group/team. Our team doesn't work together. We don't really have culturally diverse people.
Information	10	2	<ul style="list-style-type: none"> We didn't get to work on presenting or conveying the info very much. The main thing we did was play.
Systems	9	2	<ul style="list-style-type: none"> Don't understand much about the game.
Technology	11	1	<ul style="list-style-type: none"> It was hard to get the game up and running. It took a long time to be able to save the game.
Careers	10	2	<ul style="list-style-type: none"> They need to learn about something if they want a nice job. I don't think very many people thought about their future plans, just from playing this game. Never want to own a restaurant.

Learning with the problem-based approach

I think using video games as a teaching tool makes it fun to learn. The game taught us how to use money which turned into a spread sheet in class. —Hannah, 8th grade

Results from the pilot program were evaluated to assess whether the simulated game environment effectively anchored student learning and connected with state vocational standards. To help answer these questions, the class was videotaped to capture discussions and conversations among students showing their progress in using business tools and software. The videotapes were reviewed to ensure that students were engaged and on task, meeting the standards for teamwork and collaboration.

The pilot confirmed the research regarding the behavior of digital learners. Digital learners are autonomous partners in their learning. Through the student journals, we found the students thought of the video simulation as a shared, collaborative learning experience that related to the standards. For example, Eric, who was very disengaged before the pilot, made connections to the careers standard: "The game taught us how to run a restaurant. It told us what it takes to run a business. I liked the experience and managing the place."

The standard the students had the most difficulty with was interpersonal skills. When working in teams, they were forced to collaborate in real time before the game could go forward. Often, students working in teams will divide the labor and jigsaw the pieces back together to create a product. Instead, the game forced collaborative decision making. Eric, the same student who was disengaged before the project, noted in his journal, "I learned that working on a team is very hard. It taught me to work with people that work different."

Mailen, the only student who had prior experience working in a restaurant wrote: "I learned that working as a team, everyone has different opinions and different ideas. ... It helped me to discuss what we all think was better for us and our business."

Once the students realized they were going to be working in autonomous teams while playing the game, two things happened. First, they started to find the "experts" when they ran into a problem. For example, if one team was not able to make their customers happy, they would ask the other teams what they were doing to raise customer satisfaction and then reevaluate their restaurant against the new information. Second, they became on-demand consumers of knowledge. At one point, two teams simultaneously realized that their spreadsheets were not matching the graphs built into the game. They saw this inconsistency as a learning experience rather than a failure. They also had questions about "revenue," "expenditures," "gross profit," and "net profit." It was a teachable moment—exciting for both teacher and students. Following this discussion, the students went back to the computer and began the game from scratch (their decision) so they could follow the money trail more closely.

Jessie, a self-identified over-achiever who is an excellent "traditional" student, probably took the longest in making the connection between learning and the game. She noted in her journal:

In this class my goal starting out was to get good grades like in every other class. But after a week, I started wanting to make the restaurant better, but I held that back. ... You and your group have to manage the money, the people, food, employees, and so on. I am not sure what everybody thought about it but I thought it was all good. I learned that I do not want to be a business owner!

Teaching teachers to use video games in the classroom

Can video game simulations be effectively used as teaching tools in today's classrooms? Do they provide engagement, excitement, and problem-solving environments that will benefit today's digital learners? Our project showed the answer is yes. However, we found that there are several things teachers need to know before incorporating video simulations into their curricular tools.

Set expectations. Video simulations offer immersive environments, which are designed to allow for trial and error learning, moving the student from novice understanding toward expert understanding within the content domain. Teachers need to let the students know what standards

are being addressed and why the simulation game environment is most appropriate for learning those standards. Because group work is a vital component of problem-based learning, teachers must set students' expectations regarding individual responsibility for problem-solving and group roles. Teachers must also identify their own role as a content area resource that the students can draw upon as needed. As with any new teaching methodology, we suggest that parents be carefully informed regarding the purpose and scope of the video simulation use in the classroom.

Anticipate on-demand learning moments. Clearly teachers must be expert in the content area that the video simulation will anchor, but they do not need to be highly expert in the use of the game itself. The game experts will emerge among the students. The teacher must be well prepared to teach the underlying content that is required by the game. The students will tell you when they need domain-specific knowledge to move forward in their understanding. For example, the students in the study needed to understand why the profit/loss graphs in the game did not match their spreadsheets, even though they had kept meticulous records of spending as they built their restaurant and were recording all of their income once the restaurant opened. The teacher used their question to insert an on-demand lesson on gross and net profit and loss, a concept the students had not considered. Teachers can prepare themselves for such "teachable moments" by researching the game content and components at Web sites such as those found in Figure 5.

Figure 5

Sources of information about video simulation games

Information about commercially available simulation games can be found at the following Web sites:

<http://www.mediafamily.org/kidscore/index.shtml>

<http://www.teem.org.uk/>

<http://videogames.yahoo.com/>

<http://www.gamepro.com/>

Make sure you have the structure and support to keep students on task. The game is likely to be so engaging for students that they may have trouble waiting to start playing or putting it away at the end of the class. Due to the individualized nature of the game play, students need to know and understand goals and objectives before they begin, which means that the teacher must have all the activities lined up, with the relevant standards and assessments determined, before play begins. It is critical to be sure the school's IT expert is involved as well. His or her support will save much time and effort in installing, testing, and saving game results. If you have not tried using video games as teaching tools previously, it can be helpful to work in tandem with someone who has. This will help you avoid pitfalls, stay on track, and stay on schedule with your curriculum.

Couple core course content tightly to the simulations and structure it into learning modules. Be very clear about which aspects or phases of the game will meet specific standards and what assessments will show that the standards have been met. Simply playing the game is not sufficient; students must produce specific results in the form of reports, tables, graphs, and quizzes appropriate to the assessment method chosen. Background knowledge and parallel learning experiences required for the simulation that connect the learning experience to one or more standards should be structured into the learning unit or lesson plan, with associated activities and assessments. For example, the standards behind the use of the unit using *Restaurant Empire*[™] also required knowledge of different types of business organizations such as sole proprietorship, partnership, and corporations. The information was not inherent in the game but was needed to meet the standards. Setting this information out as a separate discussion and having students write a short report on why they chose a specific organization type for their restaurant made meeting the standards more overt.

Ask your school to provide information or training to your colleagues. Every teacher needs collegial support. Having your colleagues understand what you are doing and appreciate your innovations is important. Ask your school to support you by making sure your colleagues understand how video simulations can be powerful teaching tools.

At the Albany County School District, the results of the middle school video game pilot study were so positive that we next tried the approach in a high school economics class. Again, the results were positive in meeting standards effectively. Based on these two pilots, the district offered a summer course to all teachers focused on integrating video games into classroom curricula. Funded by a Wyoming Teacher Quality Enhancement grant, the one-week, 20-hour course focused on helping teachers learn about a variety of age-appropriate video games, how to use them as teaching tools, methods for connecting them to standards and existing curricula, and how to assess learning from them. Ninety percent of the 38 teachers involved said they were planning on trying video games in their classrooms in the near future.

Commercial video game simulations can add fun and excitement to any curriculum. They are a powerful tool for allowing learners to enter a complex and fascinating world that will help them learn more and more effectively—and that is a solid "win" for all concerned.

Editor's Note

¹Two recent articles in *Middle School Journal* (January and May 2007) explored problem-based or case-based learning.

Muth, K. D., Polizzi, N. C., & Glynn, S. M. (2007a). Using real middle school dilemmas for case-based professional development. *Middle School Journal*, 38(3), 4–9.

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