Play to Learn: Using Game to Drive Learner Engagement and Learner Outcomes

Symbols and Icons

Below is a list of symbols and icons that will trigger you to important items within this Handout

Symbol/Word	Meaning
✓ Note	Important information for you to know or remember.
? Question	Write an answer or think about and write a response or ask a question.
Write	Take notes or write information into your learner guide.
Think	Think about a concept or idea.
Definition	Definition of a term you should know.
Play	Play a game or participate in an activity.

✓ Note

Research shows that longhand note takers engage in more processing than laptop note takers, thus selecting more important information to include in their notes, which enables them to study content more efficiently.

Muller, P. A. & Oppenhiemer, D. M., **The Pen Is Mightier Than the Keyboard: Advantages of Longhand Over Laptop Note Taking**. Psychological Science 0956797614524581, first published on April 23, 2014

Think

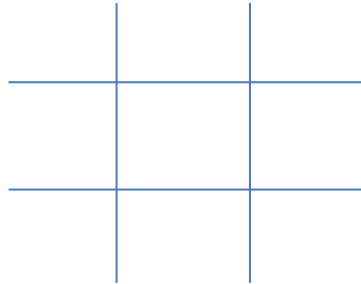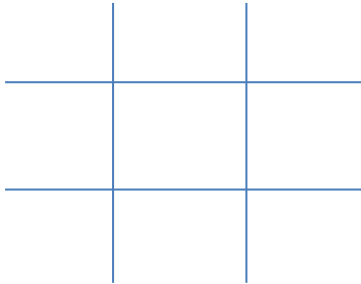What is it about games that make them "fun"?

Games

⬚ Play

What is a game? Before defining a game, let's play a few.

🗨 Think

What makes Tic-Tac-Toe fun? Did you keep score? How did the mood of the room change? What is it about games that motivate people?

Objectives

In this Session, we will do the following:

- Examine the required tradeoffs, discover how to add the game elements of challenge and story to training events and learn how the combination of fantasy and branching story techniques leads to real learning outcomes.
- Learn how an underlying competency model can be used to evaluate the effectiveness of the learners' game play by providing feedback to improve their performance in the field.
- Examine the games elements that are so compelling for learning and engagement
- Learn how to think like a game designer when approaching your learning content
- Discover the link between game elements and specific learning outcomes

? Question

What is your goal for this session? Write down your goals and make sure the presentor is on-target with meeting your needs. If not, ask questions and make sure you gain what you'd like from the information presented.

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What Research Says About Effectiveness of Games

The chart below summarizes the findings from the article Sitzmann, T. (2011) **A meta-analytic examination of the instructional effectiveness of computer-based simulation games.** *Personnel Psychology*. As indicated by Sitzmann, "Meta-analytic techniques were used to examine the instructional effectiveness of computer-based simulation games relative to a comparison group (k=65, N=6,476). Consistent with theory, post-training self-efficacy was 20% higher, declarative knowledge was 11% higher, procedural knowledge was 14% higher, and retention was 9% higher for trainees taught with simulation games, relative to a comparison group.

Type of Knowledge	% Higher with Simulation/Games
Declarative	11%
Procedural	14%

Sitzmann found that simulation games were 17% more effective than lecture and 5% more effective than discussion, the two most popular instructional methods in classroom instruction.

Type of Delivery	% Higher with Simulation/Games
Lecture	17%
Discussion	5%

Sitzmann goes on to indicate that "Trainees learned more, relative to a comparison group, when simulation games conveyed course material actively rather than passively, trainees could access the simulation game as many times as desired, and the simulation game was a supplement to other instructional methods rather than stand-alone instruction. However, trainees learned less from simulation games than comparison instructional methods when the instruction the comparison group received as a substitute for the simulation game actively engaged them in the learning experience."

What Research Says About Effectiveness of Games

Game Element	Impact	Research Indicating Effectiveness
Gaming uncertainty (Chance)	Learners preferred activities that included an element of chance.	Howard-Jones, P.A., & Demetriou, S. (2008, September 11). Uncertainty and engagement with learning games. *Instr. Sci., 37,* 519–536.
Challenge	Motivational to the learner. Caution: Too much or too little challenge will decrease learner's perception of the training value.	Wilson, K. A., Bedwell, W.L, Lazzara, El. H., Salas, E., Burke, C.S., Estock, J. L., Orvis, K.L. & Conkey, C.(2009, April) Relationships Between Game Attributes and Learning Outcomes. *Simulation & Gaming.* 40(1). 217-266. Serrano, E.L., & Anderson, J.E. (2004). The evaluation of food pyramid games, a bilingual computer nutrition education program for Latino youth. *Journal of Family and Consumer Sciences Education*, 22(1), 1-16.
Assuming a role as an avatar	Change's a person's real-life perspective.	Yee, N., & Bailenson, J.N. (2006). Walk a mile in digital shoes: The impact of embodied perspective-taking on the reduction of negative stereotyping in immersive virtual environments. *Proceedings of PRESENCE 2006: The 9th Annual International Workshop on Presence.* August 24–26, Cleveland, Ohio.
Learner watching an avatar that looks like the learner	Influences the learner to perform a similar or the same activity in the future.	Fox, J., & Bailenson, J.N. (2009). Virtual self-modeling: the effects of vicarious reinforcement and identification on exercise behaviors. *Media Psychology*, 12, 1–25.
Flying around as a superhero	Influences a learner to be "nicer" in the physical world	Rosenberg, R.S. Baughman, S.L., Bailenson, J.N. (2013) Virtual Superheroes: Using Superpowers in Virtual Reality to Encourage Prosocial Behavior. PLOS One., 8(1), 1-9.

What Research Says About Effectiveness of Games

Game Element	Impact	Research Indicating Effectiveness
Narrative Context	Motivates learner through content.	Dondlinger, M. J., (2007). Educational Video game design:A review of the literature. *Journal of Applied Educational Technology*. 4(1), 21-31.
Goals at different levels.	Motivates learner through content.	Dondlinger, M. J., (2007). Educational Video game design:A review of the literature. *Journal of Applied Educational Technology*. 4(1), 21-31.
Interactivity and Multisensory Cues	Gains attention and engages the learner.	Sitzmann, T. (2011). A meta-analytic examination of the instructional effectiveness of computer-based simulation games. *Personnel Psychology, 64*(2), 489–528.
Specific, immediate feedback.	Positively related to learner motivation and attitudinal valuing.	Ronen, M., & Eliahu, M. (2000) Simultiaotn-a bridge between theory and reality: The case of electrical circuits. *Journal of Computer Assisted Living*, 16, 14-26.

Design Takeaway Challenge

What design decisions, related to games were used in the presentation? Write the game attributes that you see in the spaces below.

Defining the terms "Game" and "Gamification"

✎ Write

Write your definition of a game below:

_____
_____
_____
_____
_____

📚 Definition

A game is a system in which players engage in an abstract challenge, defined by rules, interactivity and feedback that result in a quantifiable outcome often eliciting an emotional reaction.

What is the concept of "Gamification"?

📚 Definition

Gamification is using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems."

📚 Definition

Simulation is a realistic, controlled-risk environment where learners can practice specific behaviors and experience the impacts of their decisions.

Elements of Effective Learning

Here are elements of effective learning, these can be part of gamification or part of a well design interactive lesson.

- Spaced Retrieval

- Retrieval Practice

- Require Action in Your Learning

- Challenge

- Flow

- Fantasy

- Risk

Applying Games and Gamification to Learning Domains

Type of Knowledge	Definition	Instructional Strategies	Gamification Elements
Declarative Knowledge	An association between two or more objects. These are typically facts, jargon and acronyms. Content that must be memorized.	Elaboration Organizing Association Repetition	Stories/Narrative Sorting Matching Replayability
Conceptual Knowledge	A grouping of similar or related ideas, events or objects which have a common attribute or a set of common attributes.	Metaphoric devices Examples and non-examples Attribute classification	Matching and sorting Experiencing the concept
Rules-Based Knowledge	A statement that expresses the relationships between concepts. Rules provide parameters dictating a preferred behavior with predictable results.	Provide examples Role Play	Experience consequences
Procedural Knowledge	A series of steps that must be followed in a particular order to reach a specific outcome. Step-by-step instructions for performing a task.	Start with the big picture Teach "how" and "why".	Software challenges Practice
Soft Skills	Non-sequential guidelines for dealing with social interactions. This includes negation skills, leadership skills and selling skills.	Analogies Role playing	Social Simulator
Affective Knowledge	Knowledge about attitudes, interest, values, beliefs and emotions.	Encourage participation Believing success is possible Celebrity endorsement	Immersion Providing success Encouragement from celebrity-type figures
Psychomotor Domain	The intersection of physical skills and the cognitive knowledge.	Observe Practice	Demonstration Haptic Devices

Type of Game Dynamics

What's the game about? What's the point? When you tell someone about a game, you typically describe it in a sentence or two. Example for Risk: "Be the one to take over the most territories and achieve world domination." The core dynamic is part of the fun; we play because we want to engage in whatever core dynamic(s) the game includes.

Here are several common core dynamics. Any game you design will likely use one or more of these dynamics. Some games have only one. Others may use a couple:

Dynamic	Games that use this dynamic
Race to the finish – get to the finish before anyone else	Mario Kart,
Territory acquisition – acquire – or take – land, typically to create an empire or own the most of something.	Risk, Settlers of Catan, Monopoly
Exploration – wander around and check out various aspects of your game world to see if you can find things of value.	Minecraft, Myst
Collecting – find and get specified objects/people.	Trivial Pursuit, Checkers,
Rescue or escape – get out of a situation/place you are in.	Forbidden Island, Capture the Flag
Alignment – arrange game pieces in a particular order	Candy Crush, Tic-Tac-Toe
Forbidden Act – get fellow players to break the rules, make a wrong move, or do something they shouldn't	Twister – get someone to fall; Operation – get someone to touch an edge, Great Divide – get someone to break contact, Stare contest – get someone to laugh
Construct/Build – create something using specified resources.	Sims, Roller Coaster Tycoon
Outwit - Use specialized knowledge or skill to defeat an opponent	Chess, Stratego
Solution: Solve a problem or puzzle.	SpellTower, Rooms and Doors
Matching: Match one or more items.	Go Fish, Uno,

Elements of Games that Aid Learning

Aesthetics – the visual look of the game and the various game parts.
Chance – elements you include to equalize the playing experience, to add an element of surprise, or to derail players. Chance can be useful; it can often be unintentional. Playtest is required to make sure you aren't creating a game where winning occurs largely by chance.
Competition – players are in opposition to each other with one player attempting to gain the advantage over another.
Conflict – something the player has to overcome; something to be conquered or to create a sense of urgency.
Cooperation – players work together to achieve a goal – or at least to manage a given challenge within a game.
Levels – a game can be organized into levels of play to allow players to go from novice to mastery or to allow players from different experience levels all play the same game. Many games do not have levels; others offer them. Levels typically indicate a progression of difficulty through a game.
Resources – assets such as money or objects that help a player gain an advantage. Typically resources can be acquired or lost during a game with some resources allocated to a player at the start.
Rewards –achievements players earn – either based on performance or completion. Not all games include them.
Story – a narrative that either weaves throughout an entire game or sets up the reason you are playing the game and elaborates on the theme.
Strategy – elements you include to force the player to analyze and consider various options. Gives the player high control over the game's outcome. (Think Chess, Stratego, Risk)
Theme – a backdrop for a game. Some games use them; others are devoid of theme. (Scrabble has no theme. Forbidden Island has one.)
Time – in a game, time can be compressed (something that would really take hours or days can be compressed into minutes) it can serve as a resource that players can gain/lose, or it can be a complete nonfactor. It can also be integrated into the game goal with players racing against time to win the game.

Tell a Story

Although not commonly considered in the same sentence, storytelling and presentations have a lot in common. In fact, in many areas they have a high degree of overlap. In presentations we have an agenda, in a story we have a plot. In presentations we have goals or information we want to impart, in a story we have a morale or an underlying theme or symbolism. In storytelling we have characters; in presentations we want people to take action or perform a certain task.

Elements of a Story

To create a good story, the following elements must be present:
- Characters
- Plot (something happens)
- Tension
- Resolution
- Conclusion

Adding these elements together creates an effective story for a presentation. In fact, research shows that people remember and act upon facts more easily when those facts are contained in a story than we the facts are presented in a list.
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According to an article in the May 22, 2007 issue of the *New York Times*, an article titled ***This is Your Life (and How You Tell It)*** psychologists are starting to research how people tell their life stories as a method of gaining insight into the personalities of people and understanding how they learn.

The article notes that:

> Researchers have found that the human brain has a natural affinity for narrative construction. People tend to remember facts more accurately if they encounter them in a story rather than in a list… and [individuals] rate legal arguments as more convincing when built into narrative tales rather than on legal precedent.

Putting It All Together

Zombie Sales Apocalypse© uses evidence-based best practices as they relate to game-based learning. Research has shown that games are effective for learning because they actively engage learners in the course material as opposed to passively conveying it during a lecture, assigned readings or a watching a video (Sitzmann, 2011; Wouter et al, 2013).

When a learner makes a decision in a game, he or she receives immediate feedback either reinforcing or correcting the decision. *Zombie Sales Apocalypse©* consists of three parts designed to increase learning. First is a pre-call process where the learner indicates a strategy for the call and determines collateral to bring on the sales call. This uses a process called Advanced Organizer which focuses the learners attention on what he or she is about to learn. It stimulates thinking about the subject matter.
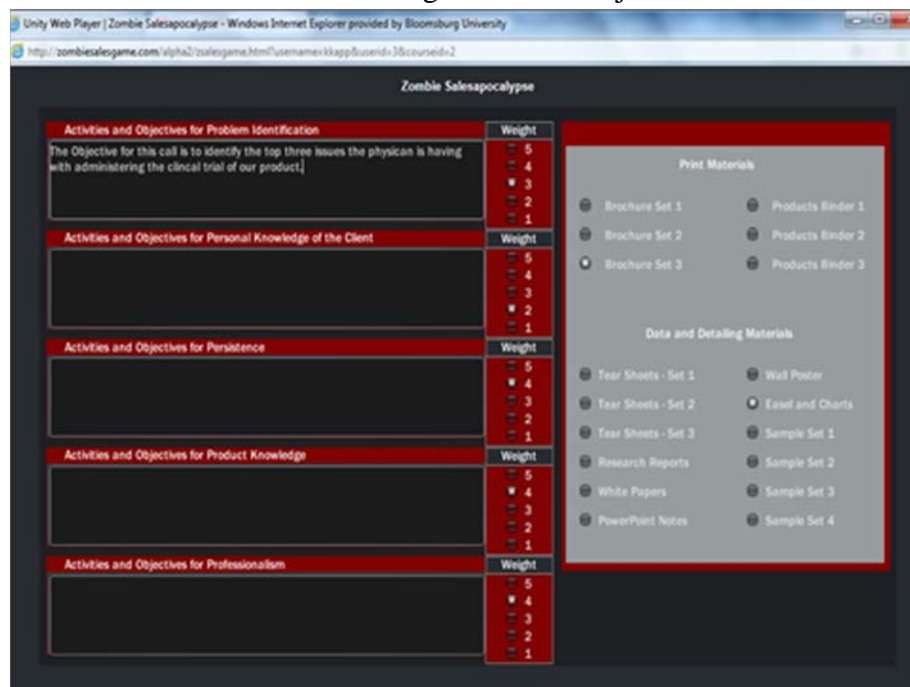

Figure One: Learner must complete pre-call sales strategy and
determine appropriate collateral material to bring on the call.

After the sales representative completes the section asking them to relate a specific sales strategy to an element of the sales model, the sales representative then begins playing the game where he or she must execute a successful sales call.

During the call, the learner encounters a series of sales conversations with different individuals. These individuals include a receptionist, a nurse and a physician but can vary depending on the sales process of the organization. The learner interacts with these characters reinforcing and practicing the skills associated with the organization's sales model and process.

Figure Two: Learner must make choices during the call based
on proper application of the organization's sales model.

Each interaction leads to a branching scenario, some branches will be correct and others incorrect. Feedback guides learners to appropriate learning outcomes and reinforces the desired sales behaviors.

The focus on quick decision making and immediate consequences for incorrect answers provides authentic cognitive practice for the skills you want your sales representatives to possess. Each decision is scored against the sales model. At the end of every level, learner performance is compared to the ideal sales process.

The third learning element comes into play when the learner reflects on the experience and how they executed against the sales model. This helps the learner to focus on the experience and highlight what he or she did well and identify areas for improvement. This is accomplished through a series of summary questions.

Figure Three: Learner is asked questions to force reflection upon the learning experience.

Reflecting upon a learning experience is a high effective methodology for achieving the desired results using game/simulation-based learning tools (Stefano et al, 2014).

Fantasy

Why zombies or robots? Why Fantasy in "serious" learning games? In a game like *Zombie Sales Apocalypse©., why* include a fantasy element and not just a serious branching-simulation with no gameplay. The use of fantasy is a purposeful design decision having a direct positive impact on learning. In fact, research indicates that fantasy provides cognitive emotional and motivational advantages for learning (Malone, 1981).

In terms of the cognitive benefits, the issues confronted and successfully resolved in the fantasy world provide the learners with natural constructive feedback in an uninhibited interaction. The learner is often more open to receiving feedback in a fantasy world because it is unfamiliar and they need feedback to understand the new environment. (Lepper, 1988)

Feedback is conveyed in a safe environment with specific, but not catastrophic, consequences for failure. The fantasy of dealing with the zombies means that failure and experimentation are allowed and encouraged. Humans learn from failure more than instant success. The fantasy environment allows for failure and re-engagement with the content again and again which leads to mastery.

We also know that if a simulation provides the same cognitive activities as the real-life situation, the skills are transferable to the actual in-the-field situation. In the Zombie game, the sales model is the exact model used in the field. The different environment actually helps with generalizing of the knowledge and creates, in the mind of the learner, a set of heuristics to deal with sales situation rather than creating a rigid set of algorithms that are difficult to generalize.

In terms of emotional impact, fantasy provokes vivid images related to the material being learned, thus improving the learner's memory of the material. Emotionally, fantasy also helps to break down the defenses of a learner. When confronted with many sales situations, the learner may feel he or she is already well versed in their subject viewing the training process as a waste of time.

Fantasy helps to break down that resistance because the environment is new, novel and different. The learner doesn't know how to deal with zombies or the new environment; it makes them more open to exploring the learning environment and less defensive (Lepper, 1988; Malone, 1981).

Finally, games can be highly motivational. While not everyone loves to play games, a large portion of most populations like to play games and enjoy the opportunity to gain mastery of the game environment. Games provide an immersive learning environment because they require continual vigilance, provide constant feedback, correct incorrect activities and reinforce correct performance which eventually leads to mastery of content.

Action Items

Write

Three things you are going to implement based on today's workshop. Provide an estimated date.

	I AM GOING TO IMPLEMENT….	BY THIS DATE
1		
2		
3		

About Your Presentors

Karl M. Kapp, Ed.D., is a professor of Instructional Technology at Bloomsburg University in Bloomsburg, PA. where he teaches several game design related classes and serves as the Director of Bloomsburg's Institute for Interactive Technologies which works with government and private corporations to create interactive online instruction. Karl has authored six books including *The Gamification of Learning and Instruction* and its accompanying how-to-book *The Gamification of Learning and Instruction Fieldbook*.

Karl's writing, research and practice explores the research, theoretical foundations and the application of effective game-based learning. He examines everything from variable reward schedules to the use of avatars to the gamification of pro-social behaviors. Karl is quoted in several volumes of Jeannie Novak's "*Game Development Essentials*" series and is author of the Lynda.com course "Gamification of Learning." Karl has served as a Co-Principle Investigator on two National Science Foundation (NSF) grants related to games and simulations. One is titled "Simulation and Modeling in Technology Education (SMTE)." The goal of that grant was to develop a 3D interactive video game teaching middle school student's math, science and engineering concepts. Karl's team was responsible for combining game play and pedagogy (http://www.gaming2learn.org/). The project is now being commercialized into a game-based product and can be seen at http://2klearning.com/.

The other project, still on going, is titled "Virtual Online Tensile Strength Testing Simulation." Karl's team is heading up the design and development of the interactive simulation. Karl blogs at the popular Kapp Notes blog at http://karlkapp.com/kapp-notes/.

Karl is the chief game designer and architect of the *Zombie Sales Apocalypse©* game.

Christopher Porfido, MSIT, is a project manager at PharmaDigital Communications, where he is responsible for overseeing the development and implementation of eLearning modules and other instructional materials. Chris has a passion for building engaging and interactive content that motivates learners to do more than average training methods.

Chris studied under Karl at Bloomsburg's MSIT program, and worked with him on the Zombie Sales Apocalyspe game, where he managed content development. Chris' team at PharmaDigital developed the branching dialog, points/scoring system, item selection, and other functionality items for an early prototype of the game.

Get in contact with Chris Porfido, MSIT on LinkedIN
Find out more about PharmaDigital Communications at http://www.pharmadc.com/

TO FURTHER YOUR KNOWLEDGE AND SKILL BASE

These are useful resources on game design and/or learning game design:

Blogs and Articles

Knowledge Guru Learning Game Design blog. (You can sign up for a monthly newsletter in addition to subscribing to the blog):

> http://www.theknowledgeguru.com/blog/

Kapp Notes

> http://karlkapp.com/kapp-notes/

Think Like a Game Developer:

> http://www.nxtbook.com/nxtbooks/trainingindustry/tiq_2011fall/index.php?startid=33

Five Game Elements for Effective e-Learning:

> http://www.nxtbook.com/nxtbooks/trainingindustry/tiq_2012fall/index.php?startid=31

If you have Lynda.com search for "Gamification of Learning Course"

Karl Kapp Books

- Gadgets, Games, and Gizmos for Learning by Karl Kapp

- The Gamification of Learning and Instruction by Karl Kapp

- The Gamification of Learning and Instruction Fieldbook (available January 2014) by Karl Kapp, Lucas Blair and Rich Mesch

Other Good Books

- The Art of Game Design: A book of lenses by Jesse Schnell.

- Challenges for Game Designers by Brenda Brathwaite, Ian Schreiber.

- Game Development Essentials by Jeannie Novak

- Game Design Workshop: A Playcentric Approach to Game Design by Tracy Fullerton