

JunkBall

*Developing environment-friendly
habits in school age children*



Learning and Games

Introduction

Clark Aldrich (2005) points to three elements necessary for learning with games – Simulation, Games, and Pedagogy. Simulation refers to the elements in a learning game that relate to the real world and allow for transferability of new knowledge to real life situations. These elements provide the context that helps encode information in a useful way in the learner's brain. Game elements provide a fun, familiar setting for the learning that happens in a game or simulation. These elements can be motivating for learners who are not otherwise motivated to learn the information contained in a game or simulation, and can also dilute simulation elements that may be too realistic to be useful in a game, such as activities happening in real-time or allowing a player to have powers that would be impossible in real life. The final element, pedagogy, refers to elements that encourage learning through use of the game environment. More pedagogical elements can be used when learners need more guidance, and less when exploration and discovery is encouraged. This framework of Simulation-Games-Pedagogy can be used to align relevant learning theories with game design when creating an educational game environment.

Learning Theories and Games

Learning happens best when it is situated in the context where it will be applied; where there are experts to model performance; and where assessment is integrated within learning tasks. **Situated cognition** explains that thinking and learning are affected by the context in which they occur. They involve the relationship between a learner and a situation (Schunk, 1999). Instruction should not be linear, or present information in a cut-and-dried way, but rather should incorporate some of the “messiness” that exists in real-life situations. Students should learn how to find relevant information and how to frame the problem (Prensky, 2001). Games place the user into a situation where they very often have to figure out what the task is, and how to accomplish it. This requires articulation of the

environment, and provides an authentic assessment of skills learned in the game – if you've done what you were supposed to do, you should be able to pass the level.

Activity theory postulates that learning emerges from activity and exploration. In activity theory the object (learning game) is acted upon by the subject (player/learner) (Schunk, 1999). Because of the high level of interaction present in games, their use constitutes activities that can create new learning (Gee, 2008). Many games are meant to be used in groups and therefore encourage collaboration. A lot of meaningful activity takes place within groups – even if a certain action is performed individually, like practicing an instrument, it affects a larger group – for example, an orchestra. The social relationships among collaborators in a specific activity affect the interaction (Jones & Bronack, 2007). Learning Games should avoid showing users too much or explaining too much to users before they play since knowledge comes out of activity.

Game Design Theories and Learning

The **flow** experience as identified by Csikszentmihalyi (1996) is a pleasurable state that can be described as intense focus on the task at hand, to the exclusion of irrelevant stimuli but with the enhancement of relevant stimuli. It is often reported as a feeling of being incredibly satisfied with the current environment. The flow state is conducive to new learning and creating strong memories. Successful learning games help users achieve this state of flow. Flow can be created by presenting users with a challenging situation that is within their achievement level. The key is to maintain the balance between “not too easy” and “not too hard” and to increase the challenge as the user's skills increase.

Motivation theory states that motivation is stimulated when there is a perceived gap in knowledge or achievement, when new knowledge or achievement is thought to be relevant to the player's goals, when the player believes he or she can master the knowledge and requisite task, when the player experiences a satisfying outcome on a task, and when the player can self-regulate his or her own achievement (Keller, 2008). Motivation must be aroused, but also maintained. The player has to

believe they can master the challenge they are currently presented with; they should experience positive outcomes; and self-regulate their behavior in relation to the gameplay. Frustration can reduce motivation; challenge can increase it. This reflects the balance in creating flow where the game designer has to walk the fine line between too-easy and too-hard activities (Becker, 2007).

JunkBall

JunkBall is a game that relies on speed and reflex, known as a “twitch-speed” game. This genre of game is good at developing a player's intuition about a set of rules or a specific scenario. Repeated gameplay creates an instinctive response in players. JunkBall was developed to encourage players to become so accustomed to sorting recyclables they start to do it without thinking and begin separating garbage in real life and recycling more. JunkBall places players within the real-life context of sorting garbage and requires them to apply problem solving skills to pass the various levels. Through the interaction with game activities players develop new knowledge and skills relating to recycling. Flow state is maintained by starting the game off with easier levels and increasing the challenge as players increase their skills. Motivating factors including points, increasing levels and status, and bonuses are included in the game to maintain interest in gameplay. The name of the game comes from a play on the words “Jump Ball,” familiar to all basketball players.

JunkBall

Overview

Recycling and conservation are important issues, and it helps to teach kids at a young age about how they can have an impact on the environment. More important than simple understanding, however, is the practice that kids get in following through on what they learn and developing routines that can turn into habits they continue to follow as they get older. Games, especially fast-paced “Twitch speed” games, are a great tool for developing habit-forming routines. JunkBall was developed to be part of a larger social 3D space where kids can interact with each other, play games, and learn about helping the environment.

JunkBall - Game Characteristics

This list of game elements was taken from *Game Design Workshop* by Fullerton, Swain & Hoffman (2004). The boundary element was not used since it is less relevant in most digital games. This outline describes the game JunkBall, which is part of a larger game on ecology and conservation.

Formal Elements

1. Players

JunkBall is a single player game where players have to sort trash into the appropriate recycling bins. Bonuses are given for accuracy and for speed. Players can customize their avatars, and bonus points unlock further customization options.

2. Objective

Collect all the trash in the factory and sort it accurately before the clock runs out.

3. Procedures

1. Click to start the game

2. Choose a character and customize your avatar
3. Click to scroll through the conversations that explain the backstory and premise of the game, or click the Skip button if you already know the story
4. Click on pieces of trash to pick them up
5. Once you pick up some trash, click on a basket to throw it in
6. Continue until all the trash has been cleared

4. Rules

1. Trash must be thrown into the appropriate bin
2. If trash is thrown into the wrong bin it will bounce out and be returned to the floor
3. All the trash must be collected from the floor before the player can advance to the next level
4. Extra points will be awarded for percentage of accuracy and speed of completion

5. Resources

1. Time: Players have a limited amount of time to clear each level. If time runs out before they finish, they are grounded by their parents for coming home late and lose the level
2. Energy: Players have a limited amount of energy to finish a level, which can be replenished by drinking juice boxes that will appear during gameplay
3. Juice boxes: Juice boxes will appear at random intervals during gameplay and can be picked up by running into them with a player avatar. Juice boxes will add energy to a player's energy levels but also take time to collect so the player must balance need for energy with need to save time
4. Points: Points are awarded based on speed and accuracy of performance and can be redeemed between levels for further avatar customization options. Customizations will

include things like extra time in levels (ie “being allowed to stay out later”) and more energy (“your parents are so proud they bring you a pizza – the meal refreshes and energizes you”)

6. Conflict

Players will have to race the clock in order to finish each level and also try to finish before their energy levels run out

7. Outcome

A player wins the game by successfully clearing all game levels of trash. Players with high scores upon completion will be able to write their name on the high score board to compare with other players.

Dramatic Elements

1. Challenge

The element of challenge will be maintained in this game by increasing the difficulty as players progress through levels

2. Play

Gameplay can be described by Prensky's term “twitch-speed” play – fast point and click play where the player is focused on beating the clock while finishing the task as accurately as possible. Gameplay will consist of three tutorial levels to teach players which items goes in which bin, and three levels of main gameplay (see Appendix A for screenshots):

- a) Tutorial levels consist of one bin and all 8 items that belong in that bin. Players will play each of three levels for a set time to learn how to properly sort items and then move on to the main gameplay.
- b) Main factory floor – floor is covered with different kinds of trash that must be sorted before

time runs out. There are 5 kinds of each category of recyclable. Trash will keep appearing on the floor until time runs out.

- c) Left side office – floor is covered with different kinds of trash, this time there are 8 kinds of each type of recyclable. Trash will keep appearing on the floor until time runs out.
- d) Right side office – floor is covered with different kinds of trash, consisting of 8 kinds of each type of recyclable, and at random time intervals the contents of a full trash can are thrown in through the window by neighborhood kids who want to keep using the factory for themselves.

3. Premise

The kids have been given the use of Sam's dad's old factory to use as a clubhouse, because the building is still in great condition but hasn't been used since the company moved to a newer, bigger warehouse. However, neighborhood kids have been using the building to hang out and not cleaning up after themselves. The garbage needs to be sorted and cleared so the kids can start using their new clubhouse. Time is of the essence so they can finish cleaning with enough time left to summer vacation to enjoy the clubhouse.

4. Characters

- a) Sam – Sam is a non-player character (NPC) who lets the player know what the premise of the game story is at the beginning of the game. He sets the game in motion.
- b) Player-character – The player takes on the role of one of Sam's friends by choosing a look and name for the player avatar. Players are motivated by wanting to clean the factory so they can turn it into a clubhouse, in addition to all the bonuses they get along the way.
- c) Other NPCs – there are various other NPCs who play the role of other kids cleaning the clubhouse. When a player clears a level, they cheer and encourage the player to continue.

5. Story

JunkBall's story consists of the backstory described above in the game premise. A more sophisticated story will emerge through play of other areas of the larger game.

2009 New Jersey Core Curriculum Content Standards

Content Area: Science

<https://www13.state.nj.us/NJCCCS/Home.aspx>

Content Area	Science		
Standard	5.4 Earth Systems Science All students will understand that Earth operates as a set of complex, dynamic, and interconnected systems, and is a part of the all-encompassing system of the universe.		
Strand	G. Biogeochemical Cycles: The biogeochemical cycles in the Earth systems include the flow of microscopic and macroscopic resources from one reservoir in the hydrosphere, geosphere, atmosphere, or biosphere to another, are driven by Earth's internal and external sources of energy, and are impacted by human activity.		
By the end of grade	Content Statement	CPI#	Cumulative Progress Indicator (CPI)
P	Investigations in environmental awareness activities form a basis for young learners' understanding of biogeochemical changes	5.4.P.G.1	Demonstrate emergent awareness for conservation, recycling, and respect for the environment (e.g., turning off water faucets, using paper from a classroom scrap box when whole sheets are not needed, keeping the playground neat and clean)
2	The origin of everyday manufactured products such as paper and cans can be traced back to natural resources	5.4.2.G.4	Identify the natural resources used in the process of making various manufactured products
6	Personal activities impact the local and global environment	5.4.6.G.3	Describe ways that humans can improve the health of ecosystems around the world

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Appendix A

Tutorial – Cans



Tutorial – Glass



A cartoon illustration of a recycling center. A blue recycling bin with a green circular arrow logo and the word "Paper" is in the center. A yellow recycling symbol is on top. A person in a blue shirt and green cap is running towards the bin. Various pieces of paper and cardboard are scattered on the floor.

Left Side Office



Right Side Office

