Chapter 7
Applying Gamification to Problem Solving
Overview

• What are the parameters for designing a game to teach problem solving?
• What are the differences between internal knowledge structures of experts and the knowledge structures of novices?
• How do you gamify the problem-solving process?
• When is gamification of work processes appropriate?
Introduction

• An un-encountered situation
• Apply prior learning or knowledge to address the problem
• Doesn’t necessarily difficulty or troubling situation
• All industries, educational areas are included
• Solving real problems != following rote procedures
• Company don’t solve. People solve. Grok!
• Experts and Novices are different
Differences Between Novices and Experts

- Differences have been observed in both the nature of their knowledge and their problem-solving strategies.

**Experts**
- Represent problems at deep structural levels
- Knowledge is organized in the form of a problem schema
- More efficient in searching their “bundled” or “Chunks” memory
- Strong self-monitoring skills: testing and fine-tuning solutions and challenging assumptions

**Novice**
- Represent problems in terms of surface or superficial characteristics
- Views domain knowledge and problem-solving knowledge separately
- Inefficient use of short-term and long-term memory
- Lack awareness of errors and omissions and the need to continually check solutions and assumptions
Turning Novices into Experts

• Gamification can improve the ability of learners to problem solve.
• Only certain components in the game should exist to encourage problem solving
• John W Rice
• The Video Game Cognitive Viability Index
• Not every component need to be presented, but the more the higher the probability that the game will encourage higher-order thinking.
• Those components can also be used as a guideline for developing
The Components for Designing a Game to Help Learners

- Assumes a role
- Partakes in meaningful in-game dialogue
- Navigates a complex storyline
- Feels challenged
- Immediately is immersed in the environment
- Manipulates variables within the game
- Assumes a lifelike avatar with a third-person perspective
- Interacts with the environment of the game
- Is forced to synthesize knowledge
- Enters an authentic environment
- Replays the games with different outcomes
Assume a Role

• Should assume a role, not just play – Actively thinking about actions, decisions, and choices
• Allowing the learner to mimic or role play desired behavior influences future behaviors of the learner
• Role plays can occur in a classroom setting, e-learning modules or in a virtual 3D environment. Advantages or disadvantages?
Meaningful Dialogue/Interaction

• Engage in dialogue that is meaningful as part of the game and to the learner
• Can also engage in meaningful interaction, which offers additional opportunities for thinking
• Non-Player Characters (NPC)
• Need to maintain the pace of the dialogue
Complex Storyline

• Critical for fostering higher-order thinking skills
• Outcome of the story is not where the learning occurs
• Through the process of the story unfolding
  • Decisions making, objects chosen, questions asked
• A well-designed story = A case study
  • An integral part of the action
• Learn, explore, examine
• Complex *enough* to address the instructional objectives
• Rich *enough* to engage the learner in the process
Challenges the Learner

• Place the learner into a situation in which he or she will be challenged
  • Tasks in the game, seeking the same reward as others, machinations of the NPCs

• Challenges need to be at an appropriate level
Immediate Immersion

• Traditional instruction does not immerse learners in the environment

• Traditionally, how problem solving is taught in a classroom is to list all the elements that need to be learned and then include a case study or role play two-thirds of the way through the instruction

• Instead:

• Start with a problem for which the learner is playing a critical role

• Provide guidance and assistance when the learner encounters an obstacle

• Create the need for the learner to seek or require the information you want them to acquire from NPCs in the game
Manipulating Variables

• The cause-and-effect nature of variables
  • Readjusting variables causes users to readjust their understandings, resulting in increased cognitive functions

• Encouraging variable manipulation causes the learner to weigh options and make tradeoffs
Lifelike Avatars and Third-Person Perspective

• Lifelike avatars are important to learning and promoting behavior change
  • When avatars look like the players, the likelihood of meaningful behavior change increases
  • When an avatar looks like the learner being represented, research indicates that the player is more likely to exhibit the behavior displayed in the game in the near future.

• Viewing yourself performing actions in the third person seems to have a larger impact than viewing yourself in the first person
Interaction with Game Environment

• Meaningful interactions are important, but they just can't be player-to-player or player-to-nonplayer
• Interactions also have to take place between the player and the environment
• Just clicking around a screen doesn't require much cognitive activity
• Being asked to look for specific items or combine one or more virtual elements to create a third or fourth element requires sequencing and problem-solving skills
Synthesis of Knowledge

• Synthesis is a higher-order skill that is valued in many situations

• The ability of a person to synthesize domain knowledge with problem-solving ability is one of the differences between an expert and a novice

• Strive to create tasks, missions, and activities that force the learner to synthesize knowledge from several sources
Authentic Environment

• Simplistic games do have a place in the learning hierarchy for teaching facts
• Higher-order skills are best taught with games that have large elements of the real world (Pilot Training, NASA Training)
• High-fidelity games and simulations have always made sense in medical, military, and aviation situations.
Replayable with Different Results

• Games that are complex and have multiple routes to completion tend to require a great deal of higher-order thinking skills by the players

• Based on decisions the player makes in the game, the non-player characters in the game react differently
Gamification of Problem Solving

- Create a shared purpose
- Celebrate accomplishments
- Allow individual and team efforts
- Carefully consider the point system
- Use a variable interface
- Be transparent about shortcomings
- Create a community around the game
Create a Shared Purpose
Celebrate Accomplishments

- Establish leaderboards
- Scoring mechanisms
- Player profiles
- Recognition of outstanding players
- Achievers need a way to show off!
Allow Individual and Team Efforts

• Let people choose to work together or individually
Carefully Consider the Point System

• How points are awarded?
• Avoid small numbers
• Fair and encourage
• Challenge
Use a Variable Interface

• The initial interface to the game should be easy and straightforward

• But after a short amount of time, after the novice player has been onboarded to the game, he or she wants to have more options

• Allow the player to add windows, customize views, and create the problem-solving dashboard
Be Transparent About Shortcomings

• When problems are brought to your attention, be transparent about them
• Let everyone know what is happening.
• Being defensive or dismissive of issues will not be helpful
Create a Community Around the Game

• Foster that community

• Only when the social aspect of crowdsourced problem solving is attractive to many players

• The more people are drawn to the community and game, the more time and effort will be spent on solving the large problem.
  • Here we need to encourage player-to-player interactions