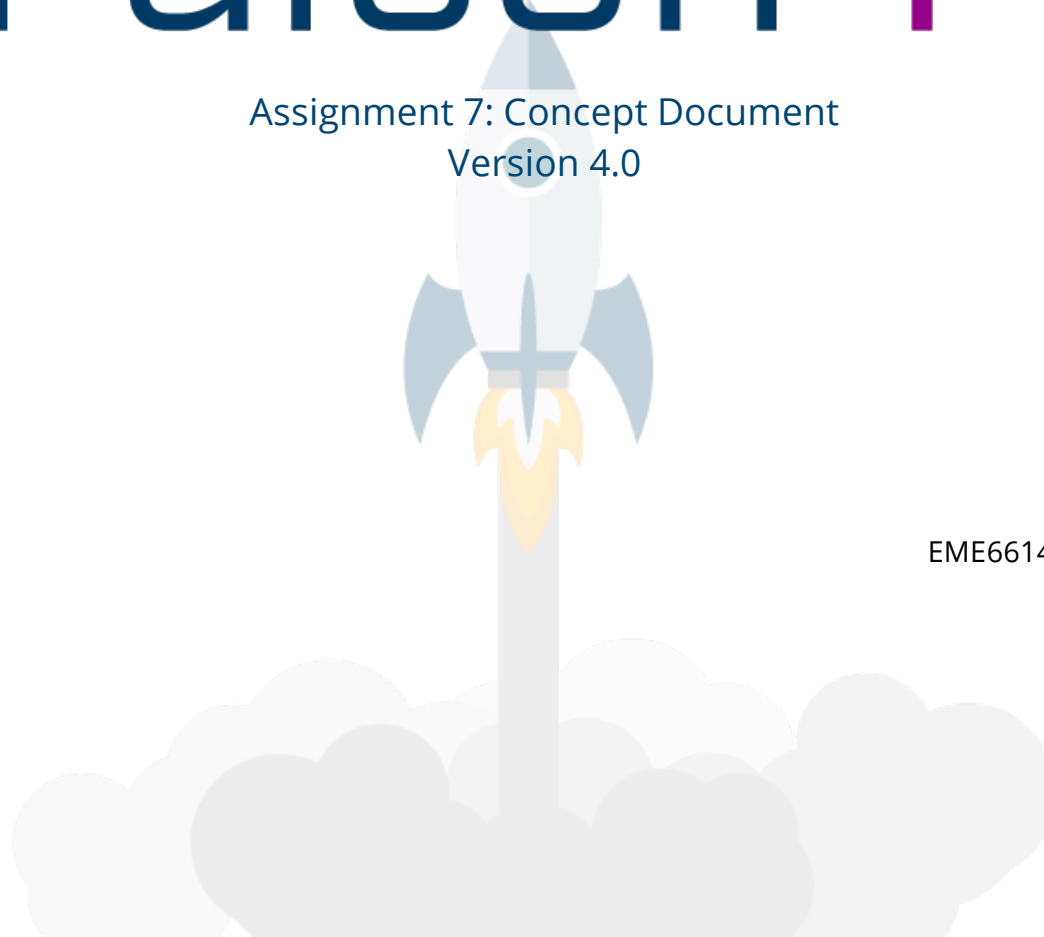


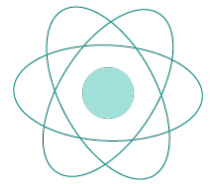
# MISSION Falcon 14

Assignment 7: Concept Document  
Version 4.0

Prepared By  
Mary Ann Hrynko  
Sylke Lopez  
Hannah Nye  
Joseph Wileman

EME6614: Instructional Game Design  
Atsusi "2c" Hirumi, Ph.D.  
Spring 2016





# Instructional Context

---

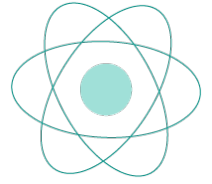
The primary target learner population is middle-school students, 11-14 years of age. The majority of students are taking science classes, have an interest in science, technology, engineering, and mathematics (STEM) topics and enjoy game-based learning. In order to take full advantage of the game, internet access will be required and learners will have the ability to play in the classroom or at home. The primary learning outcome is to increase learners' problem-solving skills, apply logic skills, and demonstrate the importance of showing humility in group settings. Learners will be able to identify STEM fields as potential careers.

## *High Concept*

Falcon 14 is ready for launch to Jupiter had to abort seconds before takeoff! Help Elon Musk and SpaceX solve the problem by talking to and obtaining items from some of history's most famed scientists and engineers!

## *Genre*

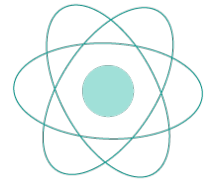
Mission Falcon 14 is a single player, educational, adventure game.



# Game Features

---

- **Mini-games:** Candy Crush style puzzle games that reinforces and tests the player on their knowledge of the specific STEM lessons they learned throughout their journey. Each puzzle will have STEM elements instead of “candy” that corresponds to each setting, pioneer and theme.
- **Dashboard:** The dashboard feature will serve as the landing page once the learner logs into the game or navigates through the main menu during the game. It displays the player’s last checkpoint, overall score, friend’s list, map, number of inventory items and player settings.
- **Interactive Map:** A map of the world with clickable (or tappable) location quests that allow the player to examine an overview about each quest, the time period, and the scientific pioneer. It also indicates the status of each quest, showing if it has been completed or in progress.
- **Transponder:** A time-travel compatible transponder that allows video and audio. This will be used to explain each new time period and to interact with Elon Musk. It will show a real video of Elon Musk speaking to the user to explain the time period/setting.
- **Character creator:** This feature will give the player the ability to create their own avatar. They start with choosing the gender, a boy or a girl. The player has the option to take a picture of their own face with the camera and have the game use their major features to create a caricature that looks like them (similar to the Wii U character creator). Then they have the ability to outfit the avatar with hairstyles, clothes, shoes, etc. Lastly, they enter their name, which will appear in some of the dialog boxes between the student and NPCs. This step will only be done once.
- **Art Style:** The game has a 3D art style, similar to EA’s The Sims. The textures are more realistic than stereotypical cartoon games, but not overly detailed to cause the player to use higher-end graphic settings.



# Pedagogical Foundations

---

## *Learning by Doing*

A learner-centered approach has been established for this game, specifically a Learning by Doing Approach (Schank, Berman & Macpherson, 1999 as cited in Hirumi, 2016). The goal of this instructional theory is to learn valid information and develop skills. The information is learned primarily through showing the learner how it is used. The assumption is that players learn the most when the information presented is meaningful, interesting and relevant to them as well as being applicable outside the classroom. The Learning by Doing Approach is based on the experiential learning theory. The experiential learning theory is based on two key principles, continuity and interaction. Continuity meaning that players learn by doing and interaction meaning players learn by interacting with others and the environment around them. (Clark, 2004 as cited in Hirumi, 2016) Experience is relevant to learning because it engages the players while teaching them the skills embedded in the game. The players will have a better understanding and knowledge by completing the game in an environment that appeals to them.

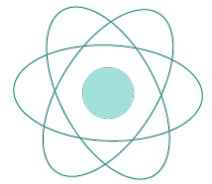
There are seven instructional events associated with Learning by Doing (Schank, Berman & Macpherson, 1999 as cited in Hirumi, 2016). These events are listed below:

1. Define goals
2. Set mission
3. Present cover story
4. Establish roles
5. Operate scenarios
6. Provide resources
7. Provide feedback

Mission Falcon 14 will give players a goal that is embedded within the mission and cover story. They will establish their role in the game prior to beginning their mission. Resources and feedback will be available to players throughout the game. The players will be presented with different scenarios that will require them to make decisions throughout the game. These decisions will alter subsequent choices in the game.

Based in the theory of Learning by Doing, Mission Falcon 14 will present players with valid historical and scientific facts, along with developing problem-solving and logic skills in an environment that is meaningful, interesting and relevant to them. This will be accomplished by presenting the historical and scientific facts through familiar STEM pioneers such as Elon Musk, Albert Einstein, Archimedes and Yukako Uchinaga. These STEM pioneers will also give feedback to the players. The feedback the player receives from the STEM pioneers will allow them to make decisions on what their next move in the game will be. The problem-solving and logic skills will be developed through a series of mini-games that the player will have to complete in order to finish the game. In these mini-games, the player will be experiencing learning by doing. For example, in one of the mini-games they will be learning how to solve physics formulas by playing a candy-crush style game, in which they have to repeatedly match three components of the formula in the order it is written. The player will learn different ways of manipulating these formulas to be able to solve for different things. Take for instance the formula for distance (distance = speed x time), the formula can be written  $v=d/t$ ,  $d=vt$  or  $t=d/v$ . The definition of the formula will be displayed at the top of the game. There will also be hints on the side of the game that will help students play the game but at the same time will teach them how to use the formulas in real-world contexts.

The environment will consist of several cities, the SpaceX summer program and the launch site for Falcon 14. These environments will encourage players to explore and learn. The goals, mission and role of the player will be established at the beginning of the game which the players find themselves in the SpaceX Summer program and need to help Elon Musk launch the Falcon 14 rocket. By playing and finishing Mission Falcon 14, players will have expanded their knowledge and learned problem-solving skills.



# Story

---

## *Heroic Time Traveler*

You are a STEM (science, technology, engineering and math) enthusiast student, taking the highly sought after SpaceX summer program for gifted and talented students. The player is on their first tour in the program at the SpaceX center in sunny Los Angeles, California. The player learns about the latest rocket they will be sending to Jupiter soon, the Falcon 14! The tour explains all of the items they are researching and need to complete the rocket. On the tour, the user notices a secret door and separates from the group to investigate. To their surprise, the door is unlocked to reveal the time machine. The user presses on the red button to activate the machine and trips into the metal box. The door closes shut and the Time Machine 3000 starts to shake and whirl as space and time is ripped open.

Your goal is to collect important items from the famous historical figures, but you must complete all the challenges they set for you. After completing a series of mini-games related to their expertise and defeating the evil rocket scientist, you can come back to the present and help SpaceX get Falcon 14 up and running to be the greatest planet exploration of all time!

## *Major Characters*

**The Player** interacts with NPCs and chooses their dialog in discussion scenarios. The player develops their character's personality by the choices they make. Therefore, the player is a dynamic character, evolving by learning from interacting with the other characters.



*Figure 1. The Player*

**Albert Einstein** is a male theoretical physicist known for his general theory of relativity (GTR) and special relativity photoelectric effect. He will be displayed in his white lab coat and dress pants, his hair will be white and messy. He will speak in a German accent. He has a love of music from Mozart, which will be playing in the background. Albert will state one of his famous quotes before the player leaves him. In the game, he is a static character. A few famous quotes to possibly be included:

- Strive not to be a success, but rather to be of value.
- We cannot solve our problems with the same thinking we used when we created them.
- Once we accept our limits, we go beyond them.
- Learn from yesterday, live for today, hope for tomorrow. The import thing is to not stop questioning.



*Figure 2. Albert Einstein*

**Yukako Uchinaga** is the technology innovator in the game. She joined IBM Japan in 1971 as a systems engineer after earning her bachelor's degree in physics from the University of Tokyo. She has been the Technical Advisor of IBM since 2007, and has struggled with gender inequality for about two decades. She is a passionate advocate for promoting women in technology fields. She was the first woman to be appointed to the board of directors for IBM in 1995, and first for any major computer company in Japan. In the game, she is a static character.



*Figure 3. Yukako Uchinaga*

**Elon Musk** is the engineering innovator and also the player's guardian in the game. Elon Musk is currently of the world's leading technology entrepreneurs, simultaneously leading two of the most groundbreaking companies, Tesla Motors and SpaceX. He was born in South Africa in 1971. At age 12 he taught himself computer programming and made his first game, which he then sold for \$500. In 1995, he moved to California at age 24, in order to begin a PhD in applied physics at Stanford University, but he only lasted 2 days as a PhD student. He left the program in order to dedicate his time to advancing the internet, renewable energy and outer space. Space Exploration Technologies, a company that creates and manufactures space rockets. He hopes to reduce the cost of spaceflight in hopes of expanding human life beyond Earth. Elon Musk is very soft spoken, and he is reserved most of the time, but becomes very enthusiastic when explaining his innovative ideas. In the game, he is a static character.



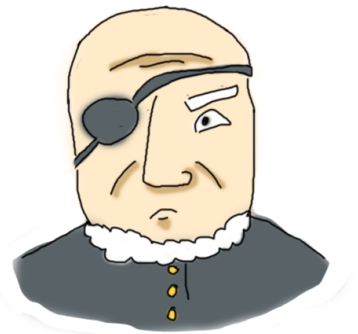
*Figure 4. Elon Musk*

**Archimedes** is the math pioneer, born 287 B.C. in Syracuse, Sicily. Archimedes is a revered Ancient Greek mathematician, physicist, and engineer. He is a white male commonly known for having a beard and wearing a toga. Some of his most popular mathematical achievements include founding modern-day calculus and deriving approximation of pi. Some of his most popular inventions include the Archimedes Screw, the Claw of Archimedes, and the heat ray. He was killed in 212 B.C. by a Roman soldier during the Siege of Syracuse, who was sent to retrieve him with the orders to leave him unharmed. Archimedes is known for his dedication to his work, often quoted as dying protecting his work from the Roman soldier uttering, "do not disturb the circles!" indicating the circles drawn in sand in Archimedes' study. "Give me a place to stand and I will move the earth." As a young man, Archimedes was tasked to determine how much of the king's crown was made of gold. The king was paranoid the blacksmith was stealing some of his gold when tasked to make the crown. Archimedes discovered the solution while taking a bath, observing how the water rose when he placed his foot in the water. Archimedes was a quiet man, often preferring to be left alone to attend to his work. In the game, he is a static character.



*Figure 5. Archimedes*

**Jack Parsons** is Jack Parsons is the antagonist/enemy of the game. An American occult rocket scientist Parsons is a white male, 65 years old, bald, white beard, has a black eye-patch, and a deep voice with a stutter. Parsons was loved by the public, and even published as the top rocket scientist of the time. He loved his darling fiancé, Maye Haldeman, a beautiful model from Canada that was the light of his world. However, after going on a business trip to South Africa with his fiancé, a man named Errol Musk swept his to-be-wife off her feet and Maye left Parsons. Parsons sunk into a deep depression and started to experiment with the occult, vowing to find a way to get his revenge on Errol Musk for stealing Maye. He was ridiculed by the science community and shunned. Before Parsons could get revenge, Errol Musk died in 1950. Parsons was believed to have died in 1952 from a pre-built explosion. This was thought to be suicide, but nobody was found. Parsons actually built a time travel machine to go to the future, where his arch nemesis, Errol Musk's son (Elon Musk) is flourishing in Parson's own field - rocket science! Enraged with envy, Parsons is committed to sabotaging the Falcon 14 to get his revenge! In the game, he is a dynamic character because of his transition from evil to good.

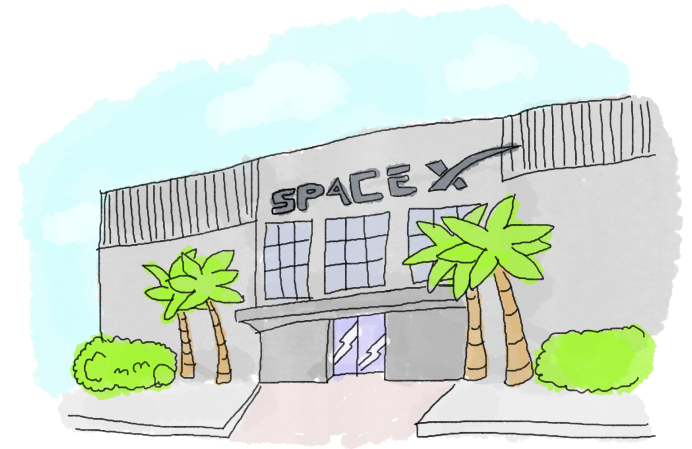


*Figure 6. Jack Parsons*



## Settings

The player will begin the game in a tour with his/her summer camp program of the SpaceX Headquarters in Los Angeles, California. Los Angeles is often hot and sunny, but spacious enough to construct space crafts and other technologically advanced toys. SpaceX headquarters, the safe haven, is a tall open building with mirrors on every floor reflecting sunlight throughout the building. The main atrium often has futuristic music playing when visitors and tourists enter the building, but other forms of music can be heard on every floor. Engineers of all fields fill each hallway, some moving quicker than others. Each lab has a different sign posted on the door indicating the lab's use for that day. All of the lab doors are automatic, making it easier for engineers to travel when they have their hands full. Some engineers keep a neat workspace, while others have piles of papers and tools on every surface. Certain labs are covered with large signs reading "SECRET" or "AUTHORIZED PERSONNEL ONLY". Each engineer's white lab coat matches his or her personality. Some engineers have their lab coats neatly buttoned and others have their lab coats tied around their waists.



*Figure 7. SpaceX Facility*

Albert Einstein is in his lab in Germany, it's a safe haven for the player in the game. Mozart is playing in the background. The lab includes a chalkboard and chalk, a bookcase filled with books, a large lab table, the Einstein refrigerator and a telescope protruding out a window in one corner of the room. The chalkboard is filled with formulas and equations. On the lab table there is an oscilloscope, pen, open notebook with several calculations, clock and an interferometer.

Elon Musk's office is an open, inviting room, with large windows inside the SpaceX headquarters, it's a safe haven for the player in the game. The office has no distinct smell, but the air is clean and cool to accommodate his vast array of futuristic toys. His entire desk is a touch screen monitor, where he also keeps his piles of engineering magazines, books on thermodynamics and differential equations, and minimalistic decor. His desk also includes gesture sensors that allow him to collaborate with the engineers in other labs and design rocket parts by moving his hands. The back of his office looks out toward the main atrium where visitors and tourists appear as small as ants.

Archimedes' tower houses some of his prized bronze spheres and telescopes, each reflecting sunlight to brighten the tower rooms every morning. It smells of old bread and parchment, indicating the time in isolation spent by Archimedes attending to his work. Doodles of his inventions are drawn on parchment and pinned to exposed wood around his tower. The floor conforms to the shape of the tower providing Archimedes with a spiraling workspace, similar in design to the Archimedes Screw. At the top of the tower is a cone roof with a rectangular window that looks out to the countryside. When asked why Archimedes didn't place the window facing beautiful Syracuse he simply replied, "then I wouldn't be able to see the stars!"

Jack Parson's secret lab, the hostile territory, is in a dark, rancid, decrepit cave with flickering lights from an old mine shaft. It smells of mold and rusted metal, and the air is humid from the moist cave walls. At the end of the main tunnel his deranged lab features missiles, different sizes of rats in small cages, multiple tables filled with scattered papers and books, beakers boiling with green oozing liquid, and a worn out time-traveling machine similar to Elon Musk's time machine.

### *Plot/Events*

The player is on their first tour in their summer space camp program at the SpaceX center in sunny Los Angeles, California. The player learns about the latest rocket they will be sending to Jupiter soon, the Falcon 14! The tour explains all of the items they are researching and need to complete the rocket. On the tour, the user notices a secret door and separates from the group to investigate. To their surprise, the door is unlocked. Inside the room, it is chilly and the walls are lined with humming computers. In the corner of the room, a tall piece of machinery covered with a white cloth towers above the player. Very curiously, the user slips off the white cloth, to find a gray, metal box with a door and one big, red ominous button. The user then can either click the button and walk in the metal box or not click the button, then stumble over their own feet backing away, click the button on accident, and fall into the metal box. All of a sudden, the door closes shut and a Siri-like robot voice sounds out, "Welcome to the Time Machine 3000 version 1.0. We will now begin the jour- errr - journey to the - errr ehh - time period of the amazing - herrr ehheh ekkk" the voice turns into static and then dead air. The Time Machine 3000 starts to shake and whirl as space and time is ripped open, this is the hook.

The machine comes to an abrupt stop, and the player is desperate to get out of the box. On the inside, the player presses a button on a wall panel at random until a hidden panel opens, showing a handheld device - labeled as a "transponder". The player picks it up and it immediately turns on, a one-way video chat from a shadowed figure. The audio occasionally cracks up but the user can hear what the shadowed figure says - that the Time Machine is programmed to only return to the SpaceX

complex when the programmed mission has been complete. The shadowed figure had planned on doing the mission himself, but now he can only talk the player through what they must do to complete the mission. With the transponder, the player leaves the time machine and embarks on their first quest - to speak with Albert Einstein. Inside his office, Albert Einstein explains his theory of relativity and ask the player for some help (the puzzle). When the puzzle is completed, the player asks about a piece to the Falcon 14 that they need, which Einstein happily supplies - an oscilloscope.

Inside the Time Machine 3000, the player consults the transponder to speak with the shadowed figure about the next quest - to meet with Yukako Uchinaga in Japan. Uchinaga explains her latest undertaking - getting Asian languages on the computer. After the player helps with a puzzle, Uchinaga provides the player with another item for the space rocket - a micro chip. At the next destination, the player travels to South Africa in the 1970's to meet a young, genius - Elon Musk. Elon Musk also calls for the player's help in a puzzle and provides the player with an engineering related item.

On board the time machine, the shadowed figure in the transponder explains that this is their last destination - to meet the infamous Archimedes in Sicily in 287 BC. The player helps Archimedes complete a challenging puzzle involving math and collects the last item - a math formula. The player returns to the time machine and is happy to hear the Time Machine 3000's voice announcing that the mission is over and that they are returning back to Los Angeles. The time machine starts to shake and go through time and space, but when they land, the Time Machine 3000 announces that the destination has been rerouted and they are currently on unknown land. The player tries to contact the shadowed figure via the transponder, but the transponder does not turn on. Without any choice, the player leaves the time machine to find that they have landed in a dark, humid cave.

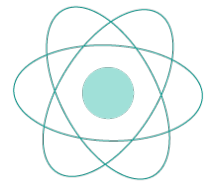
Traveling the tunnels, the player walks into a wide, open space that looks like a madman's laboratory. Here, they meet Jack Parsons - an evil mastermind that has been one step ahead of the Time Machine 3000 to destroy the labs of the pioneers and to stop the person who should have been in the time machine - Elon Musk! The player is surprised; the shadowed figure had been none other than Elon Musk the entire journey! The transponder beeps and the player sees a broken video of Elon Musk - explaining the entire situation. Elon Musk explains that he needed someone else to embark on the journey, because he could not



*Figure 8. Jack Parson's lair*

meet with his old self or else the time-space continuum would be ruptured and cause a black hole within time. Musk explains that he can reroute the time machine to return to Los Angeles, but he needs the player to buy him some time. The transponder then shuts off again.

Jack Parsons throws out a maniacal laugh and starts to turn on his own time machine to get to Elon Musk. The player must stop him, but has a series of trap doors that hold puzzles that he must defeat to get to Parsons. These series of trap doors will only unlock once the user has figured out the answer to the puzzle that unlocks it. After unlocking all of these puzzles the user gets to Parsons just in time and destroys Parsons time machine. Parsons is in such defeat and sadness, that he gives up his revenge plan. The player uses the Time Machine 3000 to return to Los Angeles and delivers the items they collected to Elon Musk. After Elon Musk has the items, he congratulates and thanks the player for their help and invites the player to view the space launch at the Kennedy Space Center in Florida.



# Game Play

---

When the player initially starts the game, they are allowed to create their own avatar. After this is completed, the story begins and the player will be instructed on how to move their avatar around the current scene (the SpaceX summer program class), how to talk to an NPC (non-playing character), and how to inspect items. The player must speak with NPC's to continue the storyline. Within many of their conversations, the player has the choice to reply to characters with a set of pre-written answers that determine NPC reaction. After being introduced to the game controls, the player will be inside of the Time Machine 3000 to start their time-traveling journey. From here, they will be acquainted with the dashboard where they can view their map, inventory, scoreboard, settings, and friends list.

The player must choose their next quest on the map - location points with information about each quest will be clickable. In each quest, Elon Musk will focus player efforts by introducing the setting, time period, quest, and a scientific pioneer via a time-travel compatible transponder. The player must move around their current scene, can inspect their surroundings, and must speak with the specific pioneer to start the puzzle/mini-game.

## *Fundamental Play Primitive*

These puzzles and collection of items are the basic game mechanic that are repeated throughout the game. In the game they must solve simple puzzles by applying what they learned from speaking with their pioneer/inspecting their surroundings earlier. Each puzzle is set up as Candy Crush, where the player must repeatedly match three or more specific elements across a grid to complete one puzzle.

**Play:** The short, 5-10 seconds of matching three or more elements is the basic game mechanic of this game.

**Cause/Stimulus:** The stimulus is the elements within the grid. These can be colorful, eye-catching elements.

**Effect/Response:** The response is the user swiping the elements to match them.

**Consequence/Result:** The consequences is a match or no match, according to what the user swiped.

To ensure play is fun, the player is rewarded whenever they finish their puzzle within a certain time period, when they finish it under the allotted turns, and when they achieve a high score. Each match equals a certain amount of points, depending on the amount matched and the type of elements matched. If the user does not finish the puzzle within the allotted amount of turns, they fail and must restart the puzzle from the beginning, this is the overarching victory condition mechanic.

Between each setting and level, the elements within the grid will change according to the specific lesson taught by the pioneer. The amount of turns (swipes) they are given to finish each puzzle will gradually decrease as the storyline is told, this will increase the challenge level and encourage the player to use their problem solving skills.

Once a puzzle is complete, the mini-game will present the player with their score, their friend's scores, and where they rank on the scoreboard. They have unlimited chances to play the mini-game again to get a higher score. When they have successfully completed a set of puzzles, the pioneer will

congratulate them and give them an item that is crucial to the development of the SpaceX Falcon 14 rocket. They can view this item inside of their inventory.

### *Adaptations of Play Primitive*

The fundamental play primitive becomes more engaging when the user advances in the storyline. The alternative play primitive is when a user matches four elements or more in a combination. If the user is able to combine four or more of the same element, three of the elements will combine to create one, big element. This big element can be matched to small, like-elements in groups of three or more. If the big element is matched, the big element will explode and eliminate the entire line (horizontal or vertical) of element items.

All of the elements are different in each time settings, here are base examples of how the puzzles will be used as teaching elements:

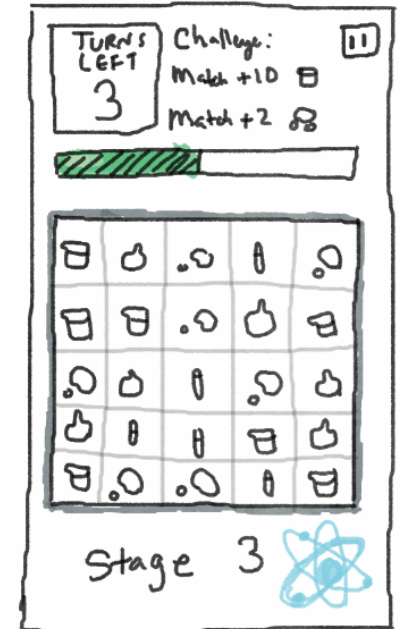


Figure 9. Mini-games

- **Science (Einstein):** Einstein will give a brief tutorial on physics formulas and show the user how to create and change the formulas to solve for something different. For example: distance = speed x time -- the formula can be written  $v = d/t$ ,  $d=vt$  or  $t = d/v$ .
- **Technology (Yukako):** Yukako will give a brief tutorial on Morse code technology and show the user the alphabet in Morse code and how to make word combinations. The player will have to match certain Morse code letters on the board into words in order to win.
- **Engineering (Elon Musk – child):** Elon Musk will give a brief tutorial on certain combinations of real, simple circuits. The player will have to match these engineering elements to make circuit connections.
- **Math (Archimedes):** Archimedes will give a brief tutorial on simple math problems - including addition, subtraction, multiplication, and division. The player will have to match certain numbers and symbols to complete a set amount of sums, differences, products, or quotients.

### Fun in Failure

To include fun in failure, the player will be presented with a fun animation each time they fail a puzzle. When the puzzle is not completed in the allotted amount of turns, then an animated explosion will pop-up across the game screen. The smoke from the animation will reveal the face of the current setting historical figure, surprised, silly, and distraught.



### Final Boss Battle

When the player has completed all of the quests on the map, they will be surprised with the final scientific pioneer antagonist who halts them from proceeding to the present time. This antagonist has been following the player in the shadows forces them to duel the antagonist in four ultimate puzzle mini-games. These mini-games will allow the player to demonstrate their acquired knowledge in STEM. Each mini-game will use the specific elements that were used within each level. The final mini-game will combine all of these elements. Once these mini-games have been completed, the player has defeated the antagonist and heads back to the current time to deliver the items to Elon Musk and complete the game.

Figure 10. Fun in failure explosion

## Secondary Play Primitive

Encouraging Humility: During a conversation with an NPC, the player will choose a response out of three choices, if the player chooses a negative response, then they will be given feedback on how to be humble in their interaction with others. If the player chooses a positive response, then they will be praised and continue on their adventure.

- **Play:** The short, 10-15 seconds of reading an NPC's dialog and deciding which choice would be best (which choice would reflect a good personality).
- **Cause/Stimulus:** The stimulus is the dialog from the NPC.
- **Effect/Response:** The response is the selecting a dialog choice – good or bad.
- **Consequence/Result:** The consequence is an approval or disapproval from the NPC, according to which dialog response the player chose.

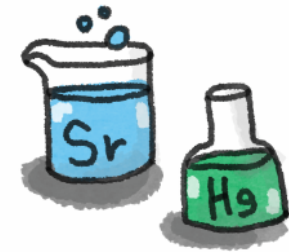


Figure 11. Science

## Game Goals

The player will time travel with the guidance of Elon Musk to collect important information and items needed to help finish the rocket for SpaceX. The items will be acquired from the famous historical figures all over the world after completing a series of mini-games related to their expertise. The player will be able to continuously attempt the mini-games until they are complete. They will then return to SpaceX and deliver the items to Elon Musk in order to win the whole game.



Figure 12. Transponder



## Game Tools

| TOOL                      | FUNCTION  | ACQUISITION   | USE/MANAGEMENT   | LOSS   |
|---------------------------|---|---|--|--|
| Interactive Map (tool)    | The interactive map shows the world with locations which takes the player to the quests.  | Player receives the interactive map once they enter the time machine. | Players use the interactive map to view, click/tap on location quests and travel to the country where the quest takes place. | Player will always have the accessible interactive map, except while in mini-game mode and during the boss battle level. |
| Transponder (tool, power) | The transponder is a wireless device that receives and transmits electrical signals. It will show a silhouette of Elon Musk and gives the player the ability to time-travel while using it. | Player finds the transponder while in the time machine.               | Players use the transponder to communicate with their mentor, Elon Musk, to receive instructions during the quests.          | Player will always carry the transponder since they need it in order to time-travel and communicate with their mentor.   |

Figure 13. Game Tools table

## *Game Rules*

Rules help to distinguish the abilities the player can or can not perform within the game. Rules can be separated into three different types: Constitutive Rules (Essential game logic rules), Operational Rules (Rules that direct player's actions), and Implicit Rules (Unwritten rules of behavior). Listed below are the rules for this game.

### **1. Constitutive Rules**

- The player can not walk through objects or walls.
- The player must match at least three objects and can match up to four objects in the mini-game.
- The next part of the story will be unlocked by solving the preceding mini-game.
- Each conversation will progress once the player chooses a dialog option.
- The player cannot move outside of the location of each STEM pioneer, including Elon Musk's lab and Jack Parson's lair.

### **2. Operational Rules**

- The player starts the game with the ability to only roam within a single room and inspect items.  
The player cannot go into any time period at any time they want to. This limits them from jumping around the storyline and missing important lessons. Each level/time period a player completes; they progress in the story line.
- Players must make a decision when interacting with the NPC. They cannot advance the mini-game without responding to the NPC.
- The player cannot advance in the game without completing the mini-games. Each mini-game will take the player to the next world.
- During the end game (final boss battle), the user is not allowed to use the time machine to travel or to use the transponder to speak with Elon Musk.

### **3. Implicit Rules**

- Life, Liberty, and the pursuit of Happiness.
- Be kind to your fellow players. There are no consequences to being a better player. Congratulate your friends for doing well and move on.

- Don't be a spoiler. Don't tell your friends what happens in the game or how to advance. Let them play and find out for themselves.
- Don't go back and change your responses to the NPC. Move forward with the consequences. You can always play again!

# References

---

Clark, R. E. (2004). *Design Document for a Guided Experiential Learning Course*.

Submitted to satisfy contract DAAD 19-99-D-0046-004 from TRADOC to the Institute for Creative Technologies and the Rossier School of Education, University of Southern California.

Hirumi, A. (2016). *Grounded Strategies for Instructional Design*. Instructional Game & Design Course, University of Central Florida.

Schank, R. C., Berman, T. R., & Macpherson, K. A. (1992). Learning by doing. In C. M. Reigeluth (Ed). *Instructional Design Theories and Models: A New Paradigm of Instructional Theory* (pp. 161-179). Hillsdale, N. J.: Lawrence Erlbaum Associates.